

A stack of several books with thick, yellowed pages and dark blue or black covers, positioned on the left side of the image. The books are stacked vertically, with their spines facing right. The top book is slightly offset to the left, showing its top edge. The stack is set against a light blue background.

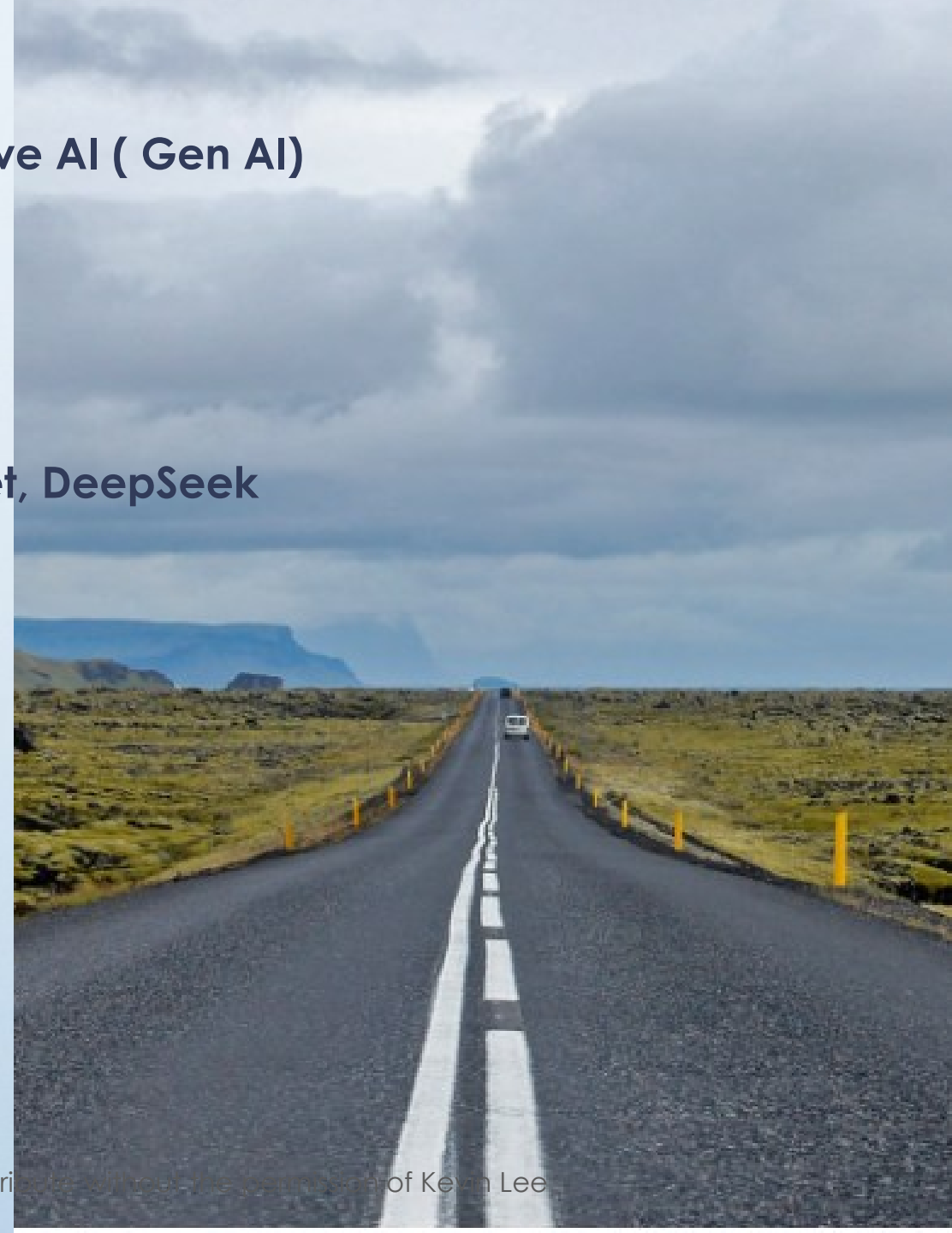
Gen AI / LLM Training

Rules for Today

- Participate. Get engaged.
- Make mistakes.
- Learn from mistakes. Learn from each other.
- Raise your hands.
- Ask questions. There are no dumb questions.
- If you need a break, please take a break.
- Bring notepad so you can do exercise.
- Discuss.
- Laugh. Have a fun.

Agenda

- Introduction of Large Language Model (LLM), Generative AI (Gen AI)
- ChatGPT Introduction and Application
- ChatGPT Use Cases
- Prompts, not Search
- Prompt Engineering in Gen AI (ChatGPT)
- Gen AI functionality – ChatGPT, Copilot, Gemini, Sonnet, DeepSeek
- Application using Gen AI API (SAS & R & Python)
- LangChain & RAG LLM application development
- AI Agents, Agentic Workflow, Agentic AI
- MCP
- Vibe Coding
- Claude Code
- Enterprise level Gen AI Implementation
- Biometric Leadership in the era of Gen AI
- Future of Gen AI and Us
- Discussion



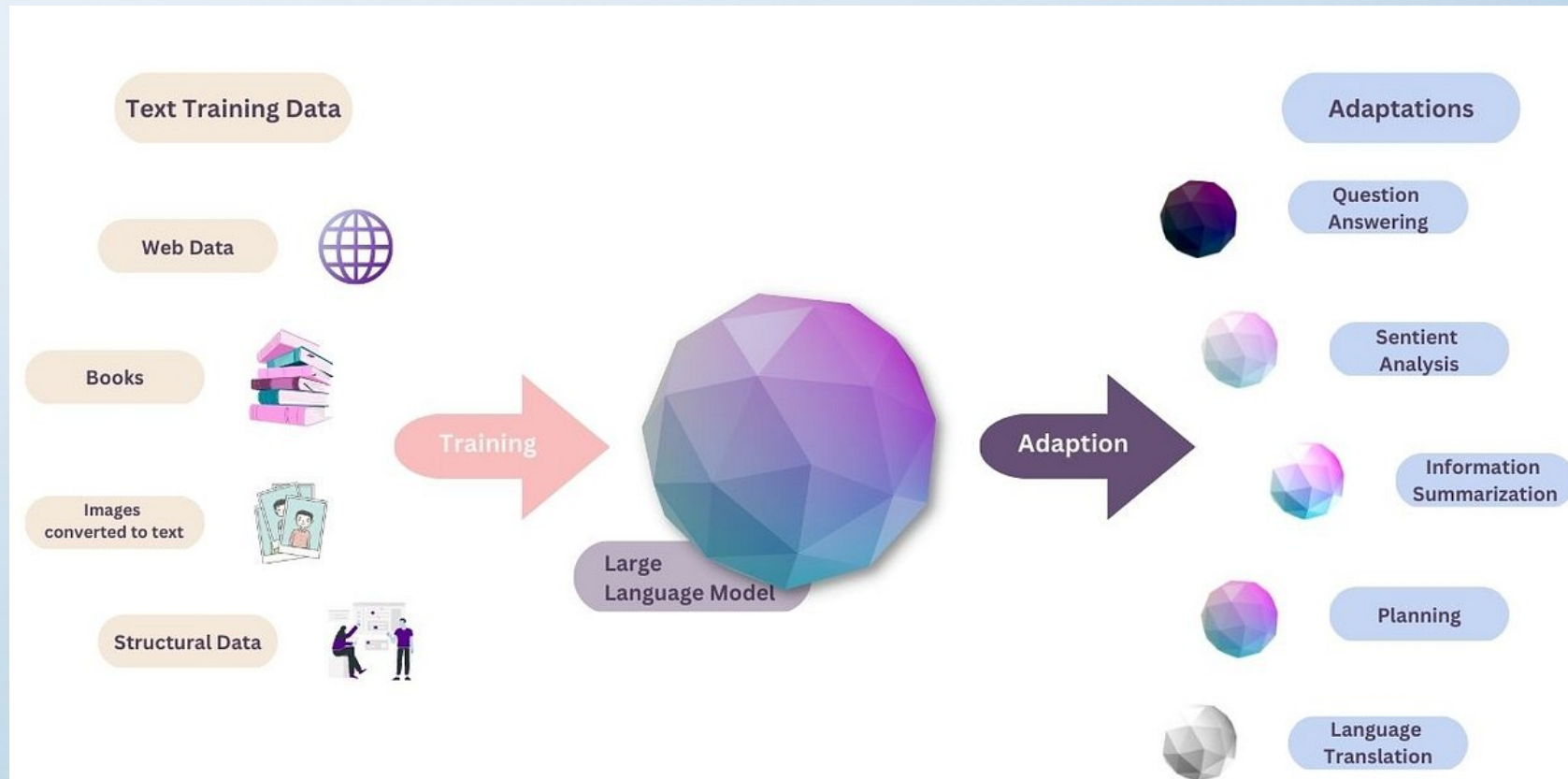
Large Language Model

- Introduction
- LLM in AI Landscape
- LLM Architecture
- History of LLM Development

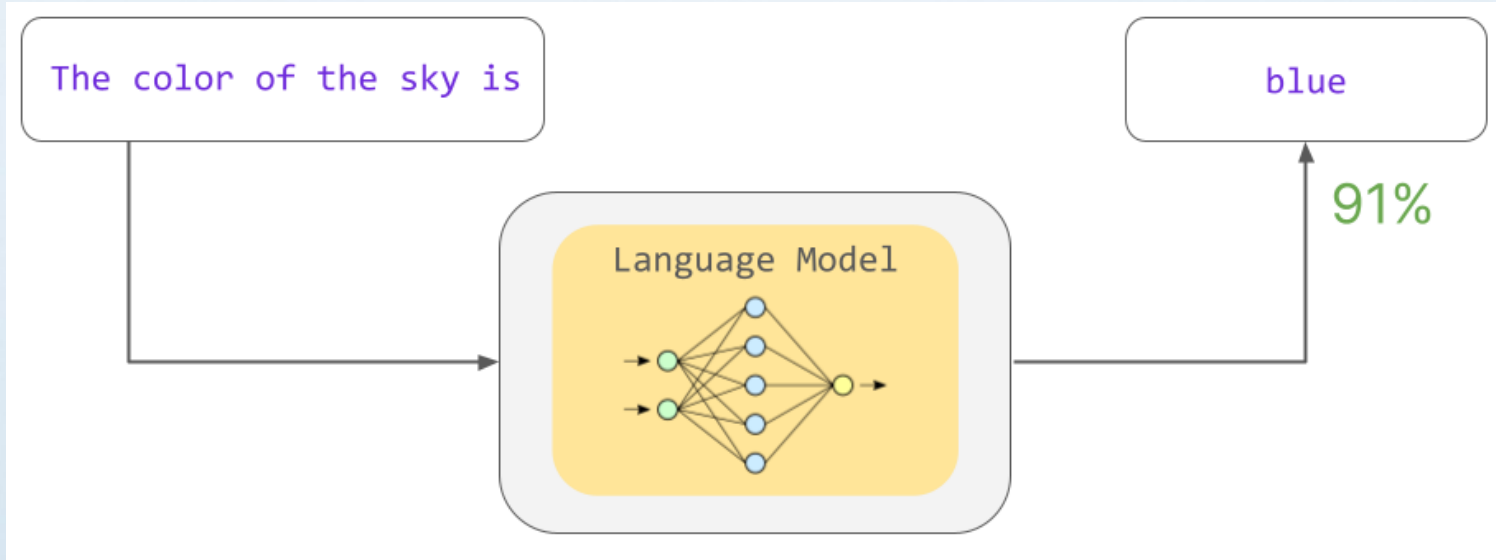


What is LLM?

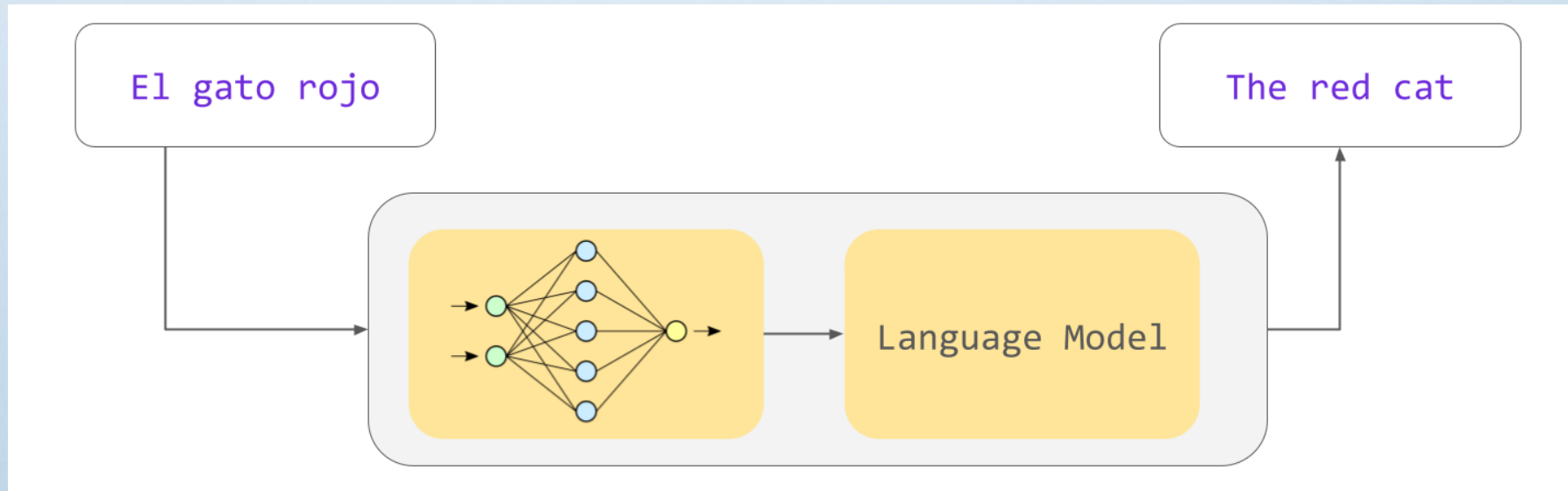
- Large Language Model (LLM) – a trained Machine Learning model that understands and generates text in a human-like fashion.
- LLM has been trained on a huge corpus of data (a large numbers of texts)
- Highly efficient in generating language-based outputs.
- Popular LLM
 - BERT
 - ChatGPT3.5
 - ChatGPT4
 - GPTs
 - Llama
 - Copilot
 - Bard / Gemini



How LLM Works



- Large Languages are used to train LLM
- So, when 'input texts' are prompted into LLM, LLM provide 'response', which show a highest probability.



Gen AI (Generative AI)

- Introduction
- Gen AI Market Trend

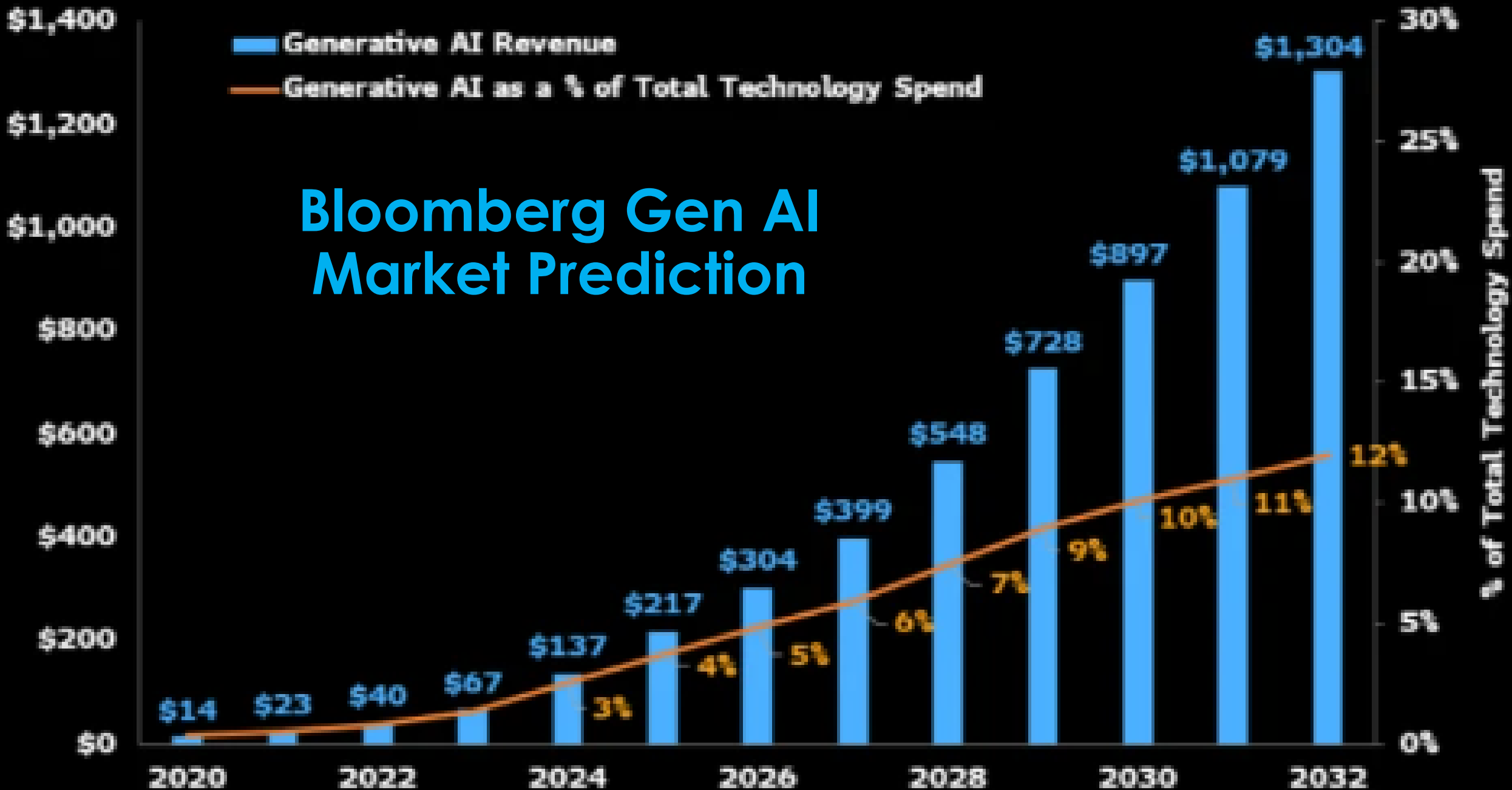


What is Gen AI?

Gen AI – a trained Machine Learning model that generate new contents with a simple prompt.

- Text : Content Writing, Chatbots, Assistants, Search
- Code : Code Generation, Data Set Generation
- Image : Image Generation, Image Edit
- Audio : Voice Generation/Edit, Sound creation, Audio Translation
- Video : Video Creation/Edit, Voice Translation, Deepfake





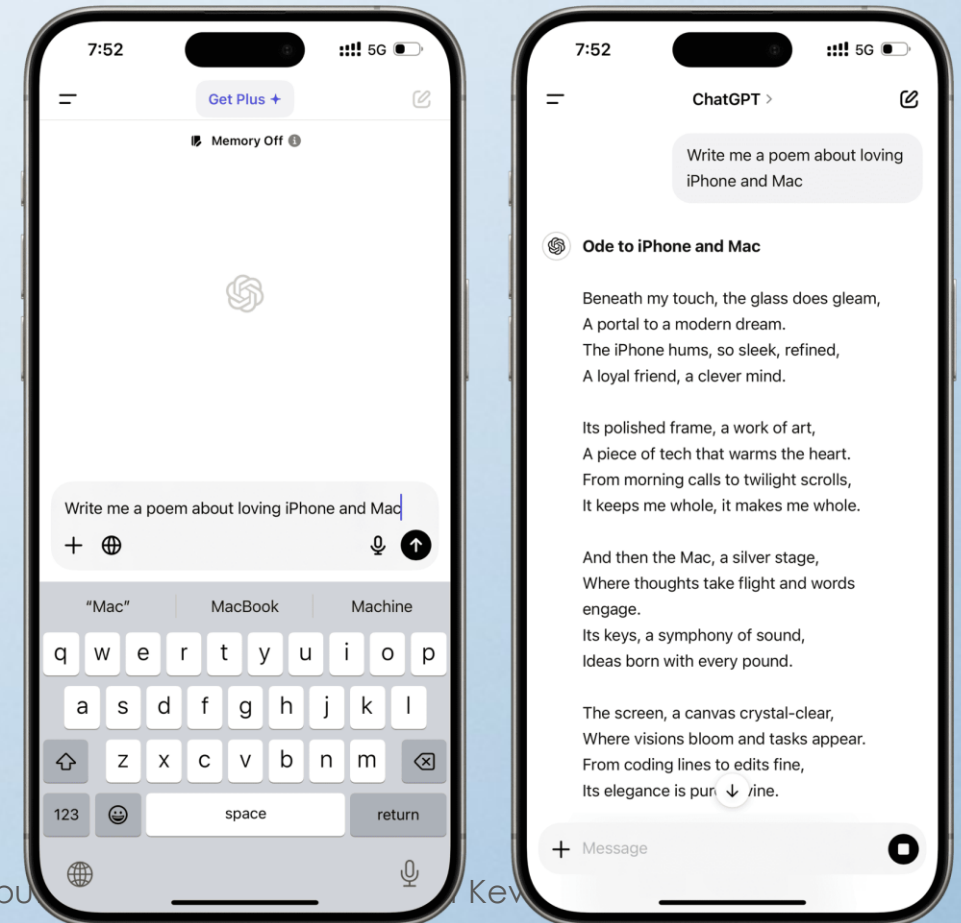
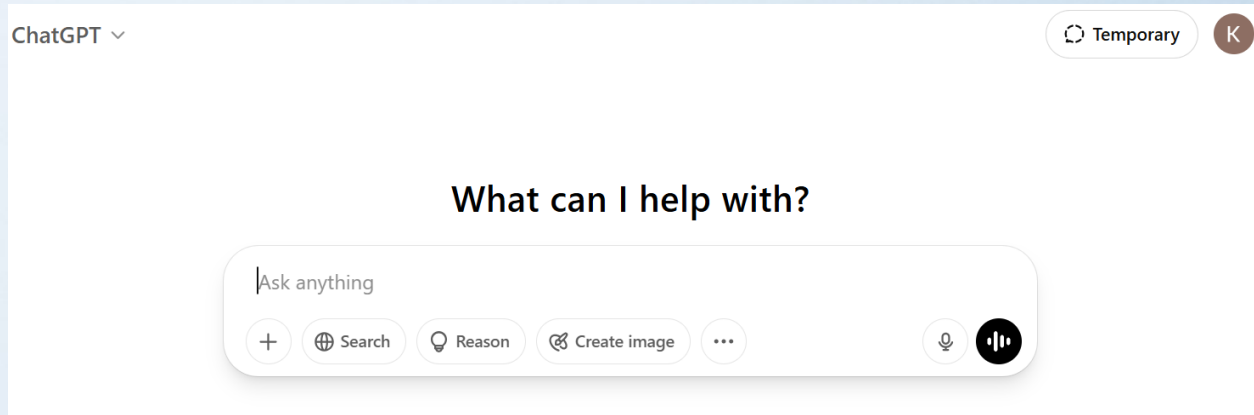
ChatGPT

- Introduction
- Development
- Plan
- Popularity
- Why Should I use it & Why not

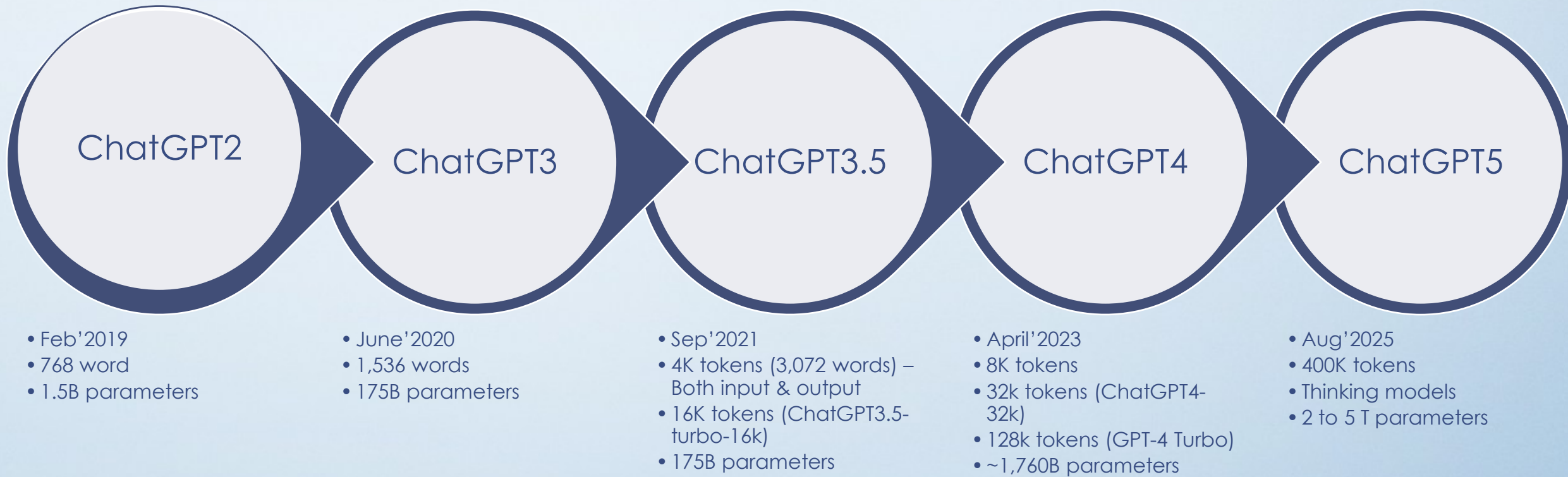


What is ChatGPT?

- ChatGPT is an advanced LLM developed by OpenAI.
- ChatGPT is trained on large corpus of text (~300B tokens).
- Its main strength
 - the ability to generate human-like responses in various contexts.
 - The ability to understand and generate text in a wide range of domains.
- Its application
 - Inquiry/prompt (rather than search)
 - Content Generation
 - Customer support
 - Interactive Storytelling
 - Coding
 - Image Analysis
 - Art Development



ChatGPT Development



Reference Points

- Tweet : 55 words
- NY Times Article : 622 words
- Standard Novel : 90K words
- Kings James Bible : 783,137 words

Each prompt include the current tokens and previous tokens.

Bar Exam Score Performance :

ChatGPT3.5 vs ChatGPT4

10% vs 90%

CPA Exam Performance:

ChatGPT3.5 vs ChatGPT4

35.1% vs 85.1%

ChatGPT Plan

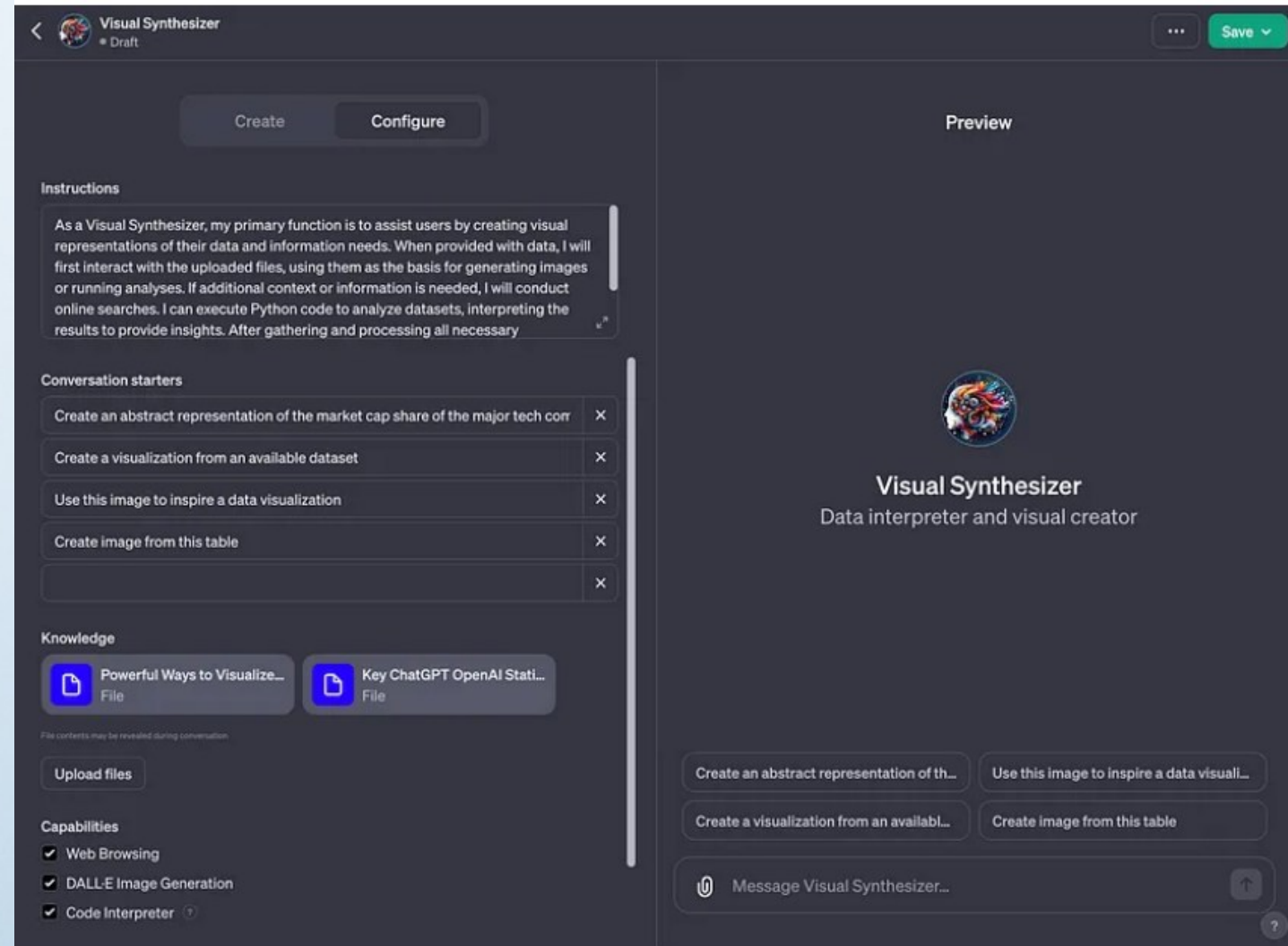
Plan	Price	Available Models / Typical Access
Free	US\$ 0 / month	• GPT-5.1 (flagship, but limited usage) • GPT-5 “thinking-mini” / fallback (when limits hit) • Lightweight fallback / legacy-style models when needed
Plus	US\$ 20 / month	• GPT-5.1 (with larger quota than Free) • GPT-5.1 “thinking” variants • Additional specialty / optimized models (e.g. coding- or reasoning-optimized, lighter/faster)
Pro	US\$ 200 / month	• Full access to GPT-5.1 • GPT-5.1 “thinking” / “pro” reasoning modes • Broad set of models (specialty, optimized, fallback as needed) with higher quotas / fewer limits
Business	US\$ 25 per user / month (annual billing)	• GPT-5.1 — effectively “unlimited” messaging under usage policies • GPT-5.1 thinking / pro modes (as enabled) • Optionally other models depending on admin configuration (coding, lightweight, etc.)
Enterprise	Custom — contact sales	• Everything in Business tier, typically with enterprise-scale access • Expanded context windows, support for larger uploads/files & heavy use • Broad model access (flagship, reasoning, fallback, etc.), configurable per enterprise needs

ChatGPT API Plan

Model	Input cost / 1 M tokens	Output cost / 1 M tokens	Suggested Use / Notes
gpt-3.5-turbo	US \$0.50	US \$1.50	Basic tasks, summarization, classification, high-volume simple calls
gpt-3.5-turbo-0125 / other 3.5 variants	US \$0.50	US \$1.50	Similar to above, some older variants may have slightly different behavior
gpt-4.1	US \$2.00	US \$8.00	Medium to heavy reasoning, coding, document parsing
gpt-4.1-mini	US \$0.40	US \$1.60	Lighter tasks, moderate reasoning, lower cost
gpt-4.1-nano	US \$0.10	US \$0.40	Very light tasks, bulk processing, cheap / fast
gpt-5	US \$1.25	US \$10.00	Flagship, high reasoning and coding performance
gpt-5.1	US \$1.25	US \$10.00	Latest flagship, best performance for complex tasks
gpt-5-mini	US \$0.25	US \$2.00	Lightweight GPT-5, suitable for moderate tasks at lower cost
gpt-5-nano	US \$0.05	US \$0.40	Fast / cheap GPT-5 variant, bulk or simple tasks
gpt-5-pro	US \$15.00	US \$120.00	High-end “pro” version, maximum performance for critical tasks

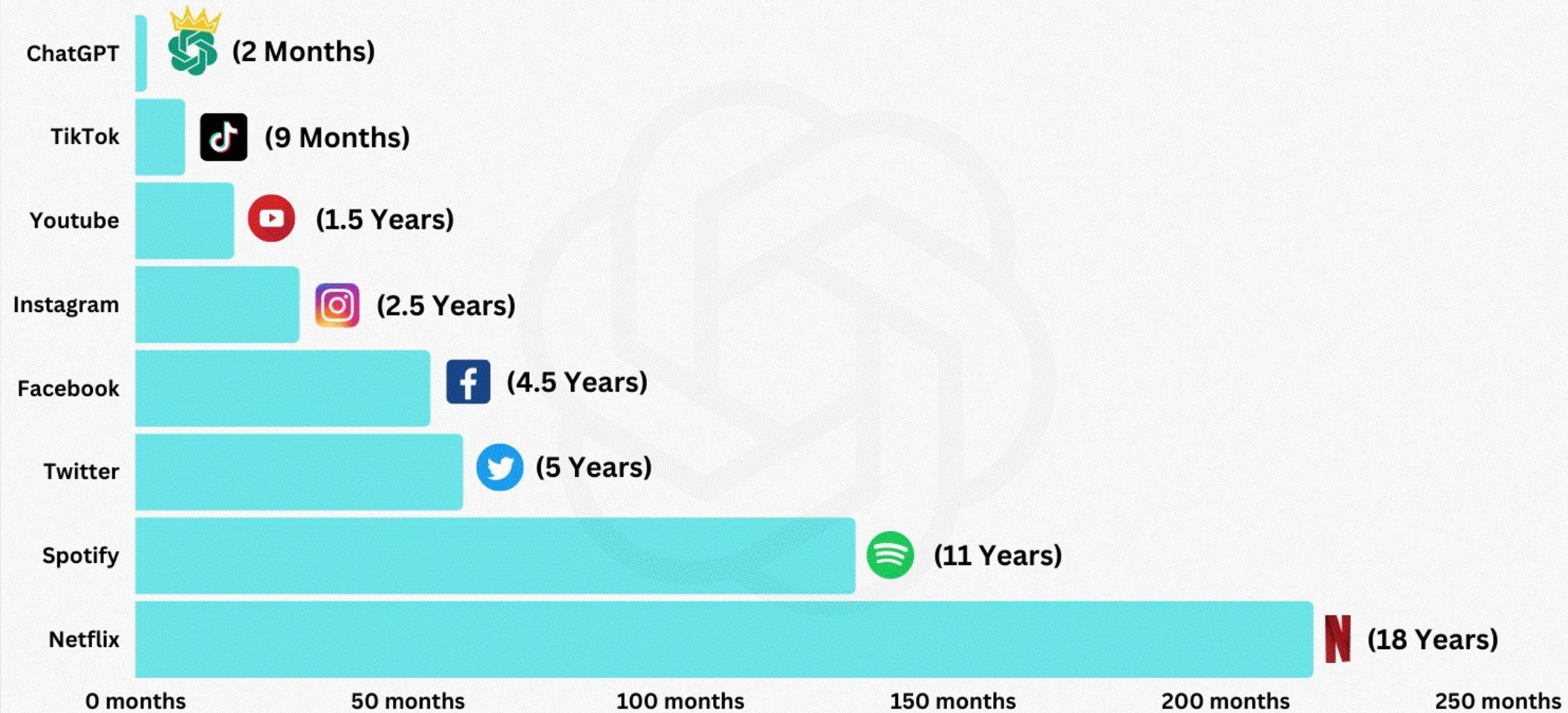
GPTs (GPT store)

- ChatGPT user platform
- Build your own ChatGPT without coding
- GPT Store / GPT Apps
- ChatGPT Plus Subscription
- Configuration
 - Instructions : Prompt
 - Knowledge : contents
- Use Case
 - Regulatory Response
 - Drug Compound Information



ChatGPT Popularity

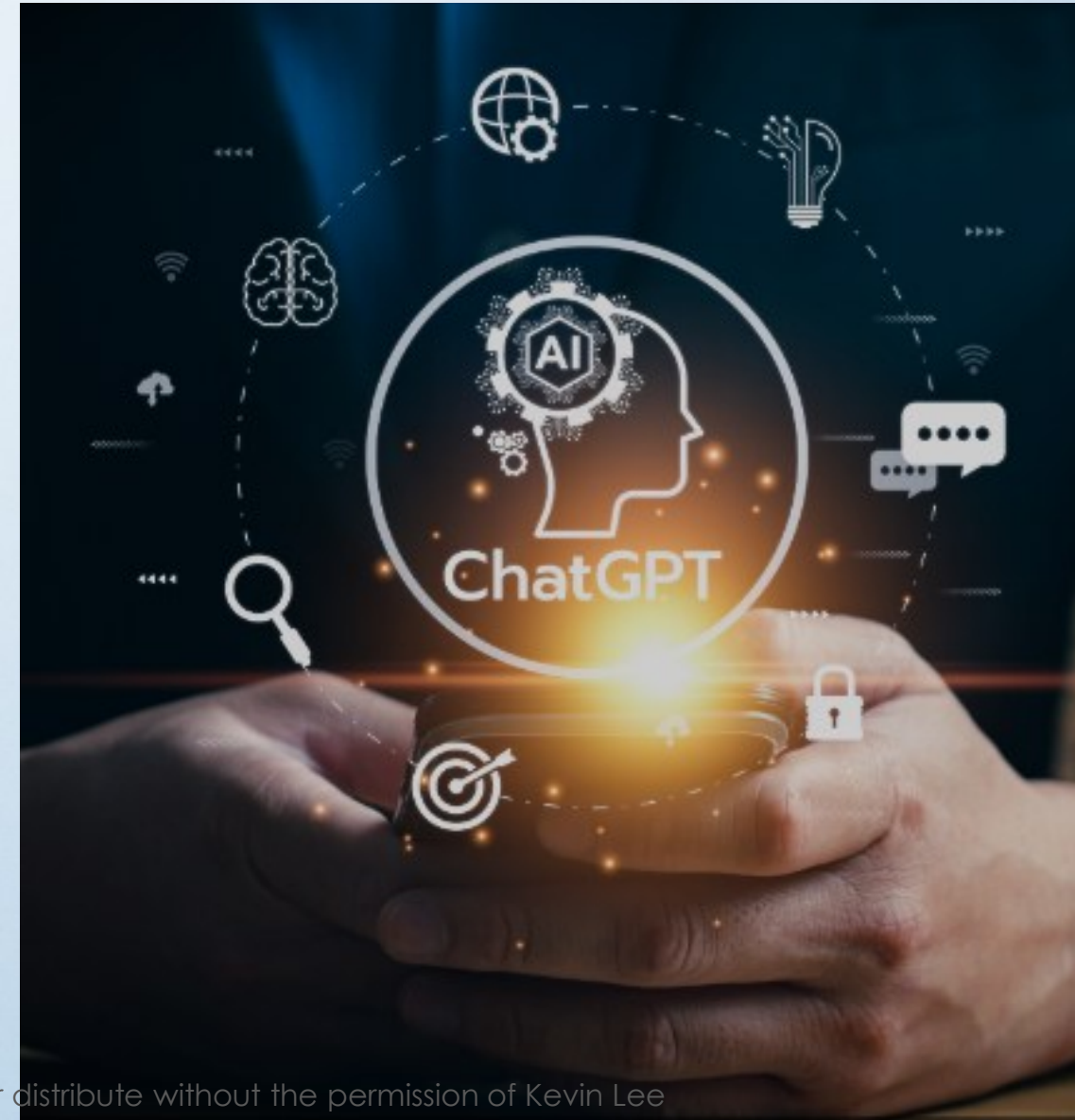
Road To 100 Million Users For Various Platforms



ChatGPT gained 100M users within 2 months since its release.

Reasons that ChatGPT is **not** being used

- Concerns/Risks using ChatGPT
- A lack of understanding of ChatGPT Use Cases
- A lack of imagination of impact
- A lack of understanding of Prompt

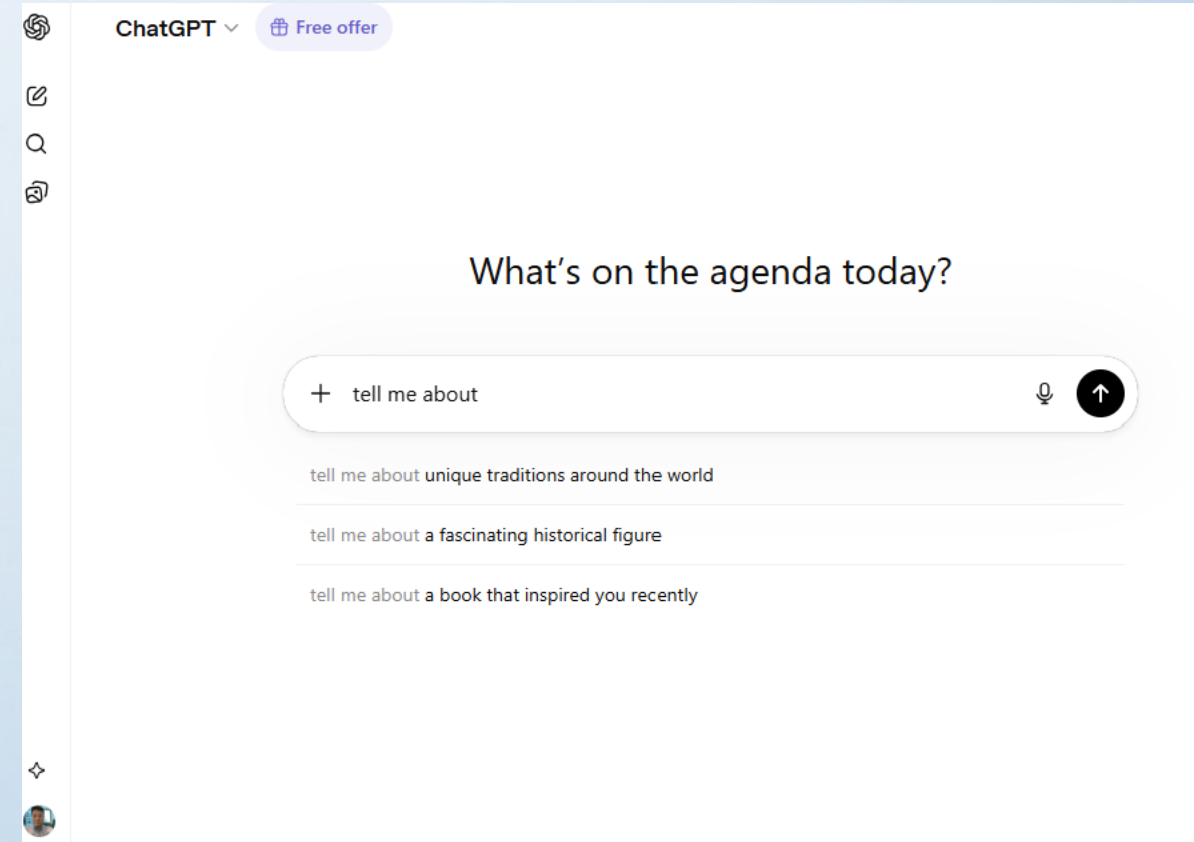
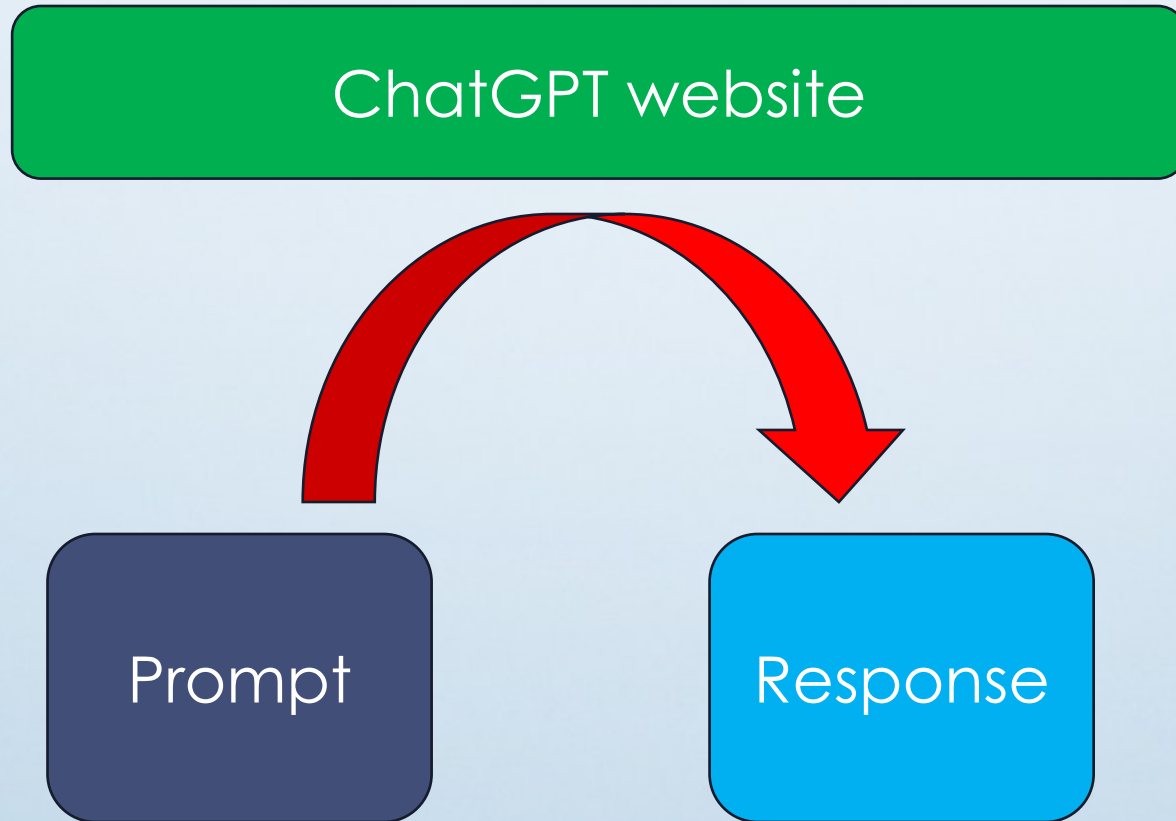


ChatGPT Application Guideline

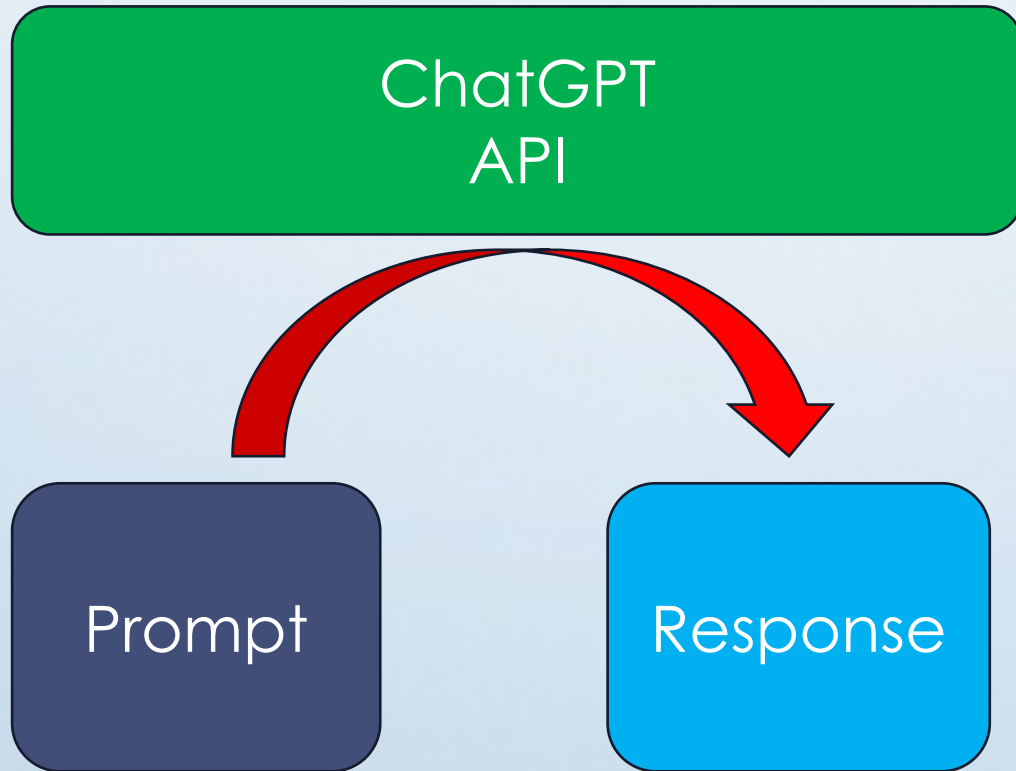
- Simple Prompt
- Application Development using ChatGPT API
- Application Development using fine-tuned ChatGPT API



Simple Prompt in OpenAI ChatGPT website



Application using ChatGPT API



```
%let api_key = xxxxxxxx ;
```

```
filename prompt  
"F:\biometrics\project\GenAI\prompt.txt";
```

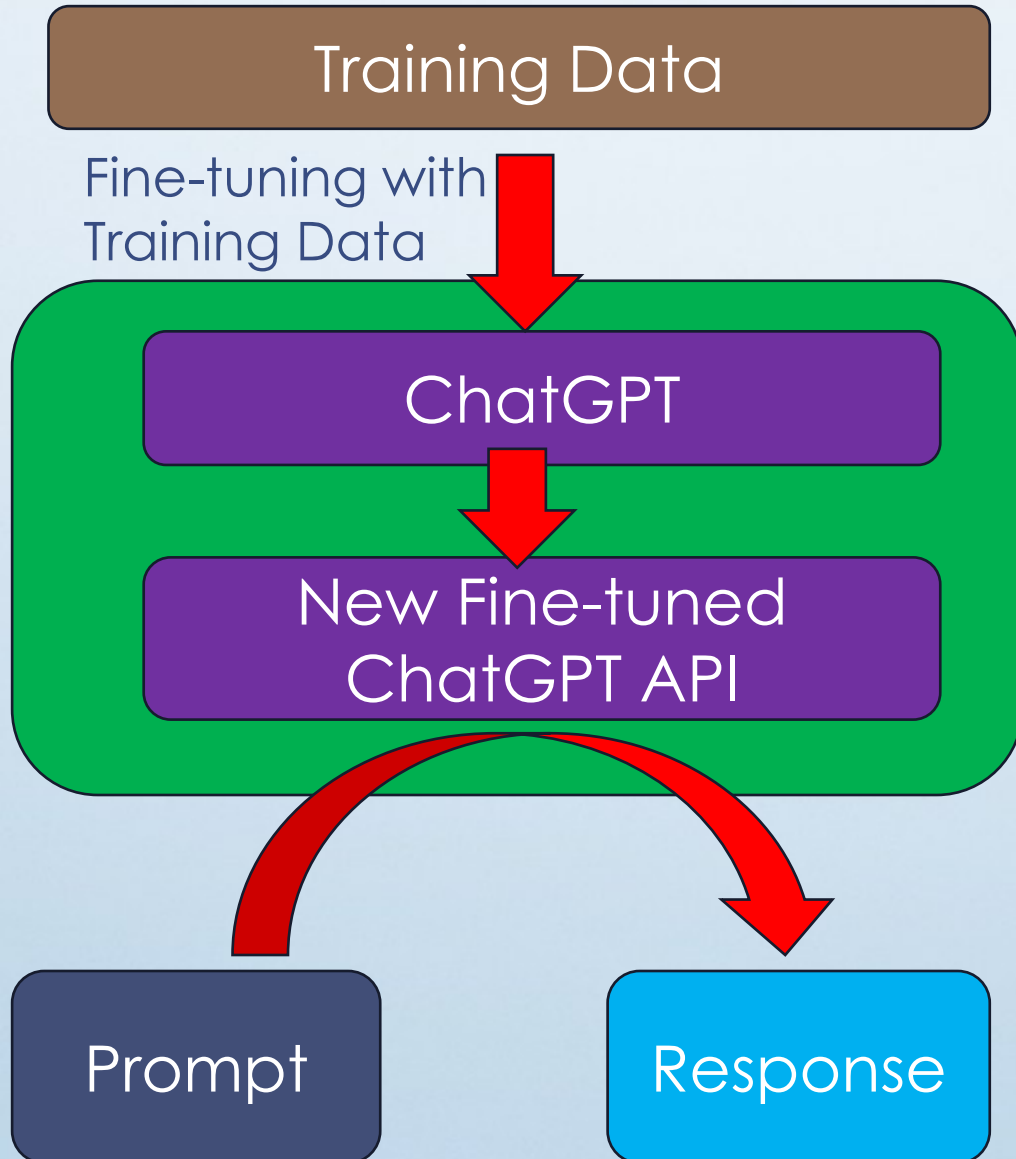
```
filename resp  
"F:\biometrics\project\GenAI\resp.json";
```

```
proc http  
  method = "POST"  
  url="https://api.openai.com/v1/chat/completions"  
  ct="application/json"  
  in=prompt  
  out=resp;  
  Headers "Authorization" = "Bearer &api_key.";  
Run;
```

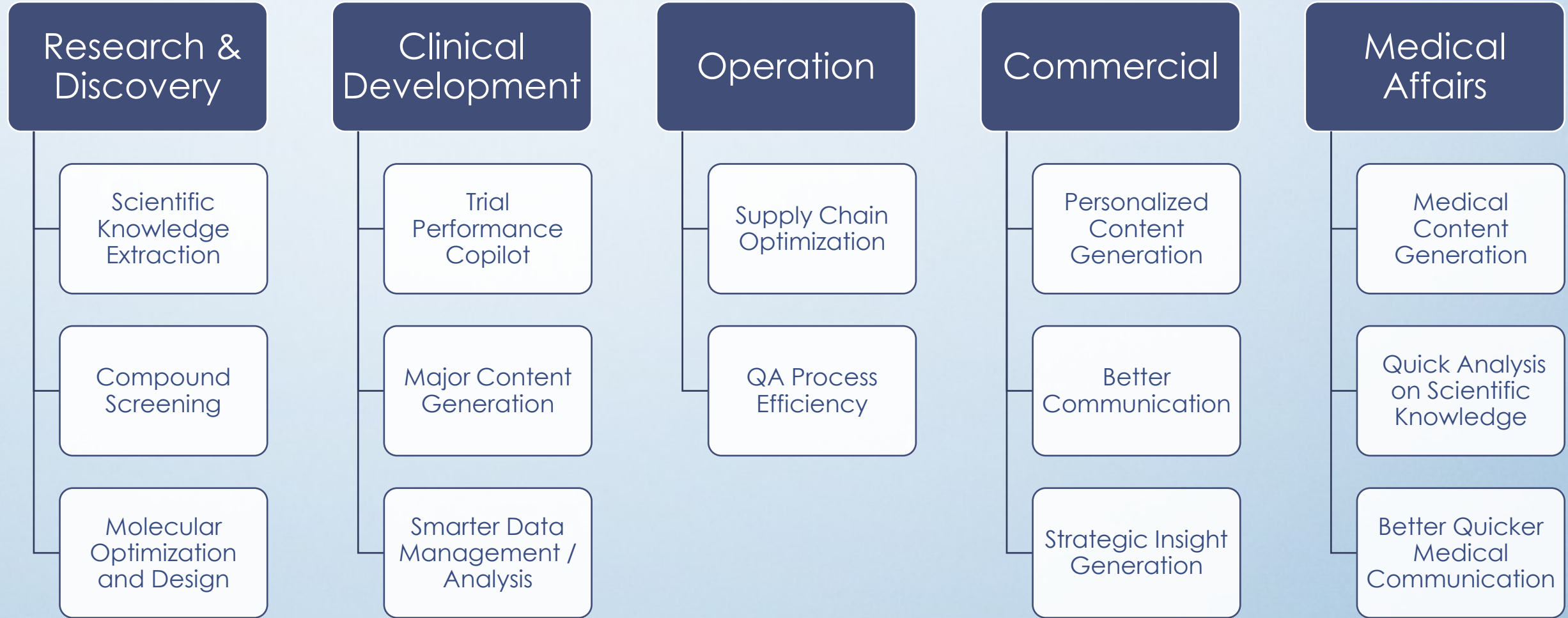
```
libname response JSON fileref=resp;  
data r_sas;  
  set response.choices_message;  
run;
```


Application using fine-tuned ChatGPT API

Fine-tuning is available in GPT3.5 / 4



Gen AI Impact in Each Function in Pharma



How Gen AI can help Pharma Function

Research & Discovery

- New Treatment Generation

Clinical Development

- Smarter Trials, Better Data, Quicker Results

Operation

- Better Operation Performance

Commercial

- Better Relationship with Partners, Providers and Patients

Medical Affairs

- Smarter Providers, Healthier Patients

ChatGPT Use Cases

- Simple Inquiry
- Brain Storming / Idea Generation
- Content Development
- Coding
- Data Analysis
- Patient Profiles
- Safety Cases
- Clinical Assessment
- Image Analysis
- Art Generation – Image & Video



Simple Inquiry 1

Prompt :
**What is
schizophrenia?
Tell me in 200
words.**

Output :

Schizophrenia is a complex and chronic mental disorder that profoundly affects a person's thinking, emotions, and behavior. It typically emerges in late adolescence or early adulthood, and its exact cause remains unclear, though it is thought to involve a combination of genetic, environmental, and neurobiological factors.

Individuals with schizophrenia often experience a range of symptoms, including hallucinations (false sensory perceptions), delusions (false beliefs), disorganized thinking, and reduced emotional expression. They may also struggle with cognitive impairments, such as difficulty with memory, attention, and decision-making.

Schizophrenia can have a profound impact on a person's daily life and functioning, making it challenging to maintain relationships, hold a job, or pursue personal goals. It can lead to significant distress and impairment in social, occupational, and educational domains.

Treatment for schizophrenia typically involves a combination of antipsychotic medications, psychotherapy, and psychosocial support. While these interventions can help manage symptoms and improve the quality of life for individuals with schizophrenia, the condition is often chronic and requires ongoing care and support.

Early intervention and a comprehensive, individualized treatment plan are crucial for managing schizophrenia and helping affected individuals lead fulfilling lives while minimizing the impact of their symptoms.

Simple Inquiry 2

Prompt :
Provide the
information
about CDISC.
Tell me in 200
words.

Output :

CDISC, or Clinical Data Interchange Standards Consortium, is a global non-profit organization focused on developing and advancing data standards for the clinical research and healthcare industries. Founded in 1997, CDISC aims to facilitate the efficient exchange and integration of clinical research data to enhance collaboration, streamline processes, and ultimately improve patient outcomes.

CDISC standards provide a common framework for organizing and formatting data, ensuring consistency and interoperability across diverse research studies and healthcare settings. The organization's flagship standards include the Study Data Tabulation Model (SDTM), which standardizes the structure and content of clinical trial data, and the Analysis Data Model (ADaM), which defines dataset and metadata standards for analysis.

By adopting CDISC standards, researchers, pharmaceutical companies, and regulatory agencies can expedite the regulatory submission process, enhance data quality, and foster data sharing and reuse. CDISC collaborates with stakeholders globally, including academia, industry, and regulatory bodies, to develop and maintain these standards, promoting transparency and efficiency in the generation and analysis of clinical data. The widespread adoption of CDISC standards contributes to advancing clinical research practices, enabling more robust and interoperable data exchange in the pursuit of improved healthcare outcomes.

Prompt :

Based on the interaction with ChatGPT, what is my personality type?

Use MBTI, and provide the reasons

Output :

Personal Question

Personality Type: INTJ (The Architect)

Introversion (I): vs Extraversion (E)

You prefer working independently and are energized by deep, focused tasks. Your conversations show a strong inclination toward thoughtful reflection rather than social interaction.

Intuition (N): vs Sensing (S)

You focus on long-term goals, systems, and innovative ideas. You consistently explore how to improve processes using advanced tools like AI and automation, indicating a forward-thinking mindset.

Thinking (T): vs Feeling (F)

You rely on logic and structure in your decision-making. Your work in programming, system validation, and analytics demonstrates a preference for objective analysis over personal values.

Judging (J): vs Perceiving (P)

You show a high level of organization and planning. Whether you're creating templates, managing clinical trial workflows, or mentoring others, your approach is methodical and goal-driven.

Summary:

You are likely an INTJ—strategic, independent, and analytical. You enjoy solving complex problems, optimizing systems, and leading through expertise rather than authority.²⁹

Brain Storming

Prompt :

I want to generate creative ideas for promoting a Gen AI integration in my department.

Please suggest 10 different ideas that are easy to understand, eye-catching, and easy to follow.

Consider the audience is mostly for SAS programmers who are very knowledgeable in clinical trial programming.

Think outside the box and include social media, influencers, and offline ideas too

Brain Storming

Output :

Here are **10 creative and easy-to-understand promotional ideas** to excite and engage **SAS programmers in a clinical trials department** about **Generative AI integration**—with a mix of digital, social, and offline strategies:

1. “GPT vs. SAS” Showdown

Format: Host a live internal webinar or recorded video comparing how a Gen AI tool solves a clinical programming task (e.g., writing a simple SDTM mapping) vs. how a SAS programmer would approach it.

Hook: “Can GPT keep up with a veteran programmer?”

Bonus: Post clips on LinkedIn or internal social platforms with polling: “Who did it better?”

2. “1-Minute AI Tips” Video Series

Format: Launch a weekly series of 1-minute internal (or LinkedIn) videos showing bite-sized Gen AI use cases (e.g., automating reviewer guides, generating shell specs,

checking code logic).

Easy: Screen-recorded + voiceover.

Amplify: Invite internal team members to guest-host episodes.

3. “Prompt Cookbook” for SAS Programmers

Format: Create a visually appealing PDF or web-based *Gen AI Prompt Cookbook* with categorized prompts:

Writing SDTM specs

Reviewing define.xml logic

Creating test data

Title: “From Prompt to Production: Gen AI for SAS Programmers”

Share: Email it, print and leave copies in break rooms, or upload to your team SharePoint/Slack.

.....

Content Development - Email

Prompt :

I am salesperson.

I need to contact the doctors about new medicine, which is 3 times more effective to lower blood pressure.

write marketing emails within 100 words.

Output :

Subject: Revolutionize Blood Pressure Management with Our New Medicine!

Dear Dr. [Doctor's Last Name],

I hope this message finds you well. I am excited to introduce our breakthrough medication, [Medicine Name], designed to transform blood pressure management. With its cutting-edge formula, it is proven to be three times more effective in lowering blood pressure compared to existing solutions.

[Medicine Name] offers a unique opportunity for your patients to achieve better health outcomes. Its advanced technology ensures quicker results and fewer side effects, leading to enhanced patient compliance.

We would be honored to provide you with more information and samples for your evaluation. Together, we can make a significant impact on improving patients' lives.

Let's revolutionize hypertension treatment together. Please reply to this email, and I'll be happy to arrange a meeting at your convenience.

Best Regards,

[Your Name]

[Your Title]

[Your Contact Information]

Content Development - Email

Prompt :

I am stat
programmer.

I am waiting for the
final raw data from
data managers. I
have communicated
with them couple
times already, but I
have not received
the response yet.

Could you write the
email for me? Write it
in politely and
professionally.

Output :

Dear [Data Manager's Name],

I hope this email finds you well. I wanted to follow up on the status of the final raw data for [Study Name/Project]. As we are preparing for the next steps in our analysis, I would appreciate any updates on the expected timeline for data availability.

Please let me know if there are any issues or if further clarification is needed from my end. I appreciate your support and look forward to your response.

Best regards,
[Your Name]
[Your Position]
[Your Company]

.

Content Development - Simple protocol synopsis

- Prompt :
Write clinical trial protocol synopsis based on below "title of study".

"title of study" : A phase 3, randomized, double-blind, placebo controlled study to evaluate the efficacy of drug A in schizophrenia patients.

- **Output :**

****Clinical Trial Protocol Synopsis: Phase 3 Study on the Efficacy of Drug A in Schizophrenia Patients****

****1. Study Title:****

A phase 3, randomized, double-blind, placebo-controlled study to evaluate the efficacy of drug A in schizophrenia patients.

****2. Objective:****

The primary objective of this clinical trial is to assess the efficacy of drug A in treating schizophrenia in comparison to a placebo. Secondary objectives include evaluating the safety, tolerability, and overall clinical benefit of drug A.

****3. Study Design:****

This study will adopt a randomized, double-blind, placebo-controlled design. Participants will be randomly assigned to either the treatment group receiving drug A or the control group receiving a placebo. The double-blind nature of the study ensures that both investigators and participants are unaware of the assigned treatment.

****4. Participants:****

The study will enroll adult participants diagnosed with schizophrenia according to standardized diagnostic criteria. Inclusion and exclusion criteria will be defined to ensure the homogeneity of the study population.

****5. Interventions:****

- Treatment Group: Participants will receive drug A in the prescribed dosage.
- Control Group: Participants will receive a placebo identical in appearance to drug A.

****6. Primary Outcome Measure:****

The primary efficacy endpoint is the reduction in the severity of schizophrenia symptoms, as measured by a standardized assessment tool, at the end of the treatment period.

****7. Secondary Outcome Measures:****

Secondary endpoints include:

- Changes in cognitive function.
- Improvement in overall functioning and quality of life.
- Incidence and severity of adverse events.
- Assessment of treatment adherence.

****8. Study Duration:****

The trial will be conducted over a specified period, with defined time points for participant recruitment, treatment administration, and follow-up assessments. The duration of the study will be determined based on the anticipated rate of symptom improvement and the need for robust data collection.

****9. Statistical Analysis:****

Statistical methods, including intention-to-treat analysis, will be employed to evaluate the primary and secondary endpoints. Sample size calculations will ensure the study's power to detect meaningful differences between the treatment and control groups.

****10. Ethical Considerations:****

The study will be conducted in accordance with ethical principles outlined in the Declaration of Helsinki and local regulatory requirements. Informed consent will be obtained from all participants, and measures will be taken to ensure participant confidentiality and safety.

****11. Data Monitoring and Safety:****

An independent Data Monitoring Committee (DMC) will oversee the trial's progress, ensuring participant safety and data integrity. Adverse events will be monitored and reported according to regulatory guidelines.

****12. Conclusion:****

This phase 3 clinical trial aims to contribute valuable insights into the efficacy and safety of drug A in the treatment of schizophrenia. The results of this study may have implications for improving the management of schizophrenia and enhancing the overall well-being of affected individuals.

Codes conversion

Prompt :

Convert below SAS codes to R codes:

```
data dm;  
  merge demo rand;  
  by usubjid ;  
run;
```

Output :

You can convert the SAS code to R using the ``merge`` function in R to perform the equivalent operation. Assuming you have two data frames ``demo`` and ``rand`` that you want to merge by the ``usubjid`` variable, here's the equivalent R code:

```
```
```

```
Assuming you have loaded your data into two data frames: demo
and rand
```

```
Merge the data frames by usubjid
```

```
dm <- merge(demo, rand, by="usubjid")
```

```
```
```

In this code:

- ``demo`` and ``rand`` are your input data frames.
- We use the ``merge`` function to merge the data frames.
- The ``by`` parameter specifies the key variable by which to merge the data frames, which in this case is ``usubjid``.

After running this code, the merged data frame ``dm`` will contain the result of the merge operation, similar to what you would achieve with the SAS code you provided.

Codes Development – R

Prompt 1:

Write a **R script** that groups data by "TRTA" and "AVISIT" columns in "advs.xpt"

and calculates the mean of "AVAL" column for each group at PARAMCD = 'WEIGHT'

Prompt 2:

Write a **R script** that groups data by actual treatment and actual visit in "advs.xpt"

and calculates the mean for each group at weight.

Use ADaM CDISC variable.

Output :

```
library(haven) # For reading XPT files
library(dplyr) # For data manipulation
```

```
# Read the ADaM dataset
advs <- read_xpt("advs.xpt")
```

```
# Process the data
```

```
result <- advs %>%
```

```
  filter(PARAMCD == "WEIGHT") %>% # Filter for PARAMCD = 'WEIGHT'
```

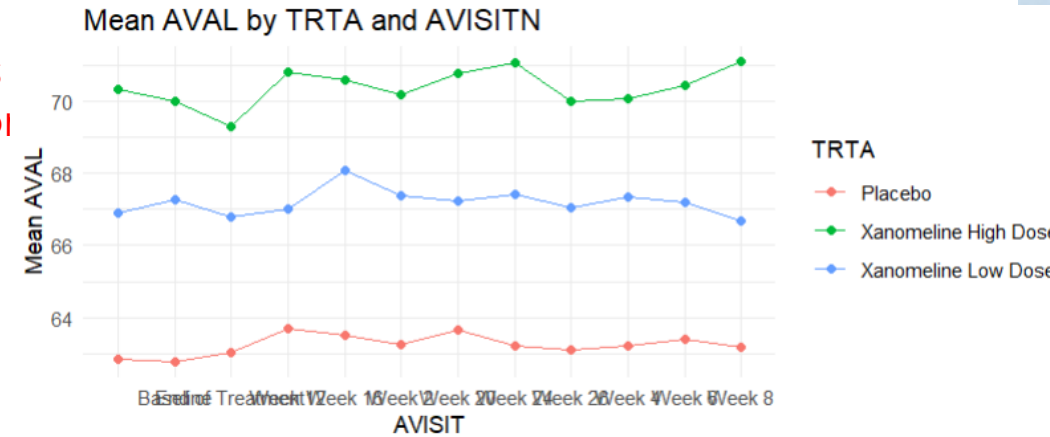
```
  group_by(TRTA, AVISIT) %>%      # Group by TRTA and AVISIT
```

```
  summarise(mean_AVAL = mean(AVAL, na.rm = TRUE)) %>% # Calculate mean of AVAL
```

```
  ungroup()
```

```
# Print the result
```

```
print(result)
```



Codes Creation 2 (SAS)

Output :

Prompt :

Write a **SAS script** that groups data by "trta" and "avisitn" columns in "advs.xpt" and calculates the mean of the "aval" column for each group at parmcd ='WEIGHT'

```
```sas
/* Step 1: Import the advs.xpt file */
libname mylib xport "path_to_your_advs.xpt";

/* Step 2: Create a SAS dataset from the imported data */
data advs;
 set mylib.advs;
run;

/* Step 3: Filter the data for parmcd = 'WEIGHT' */
data advs_weight;
 set advs;
 where parmcd = 'WEIGHT';
run;

/* Step 4: Group the data by trta and avisitn, and calculate the mean of aval */
proc means data=advs_weight noprint;
 class trta avisitn;
 var aval;
 output out=mean_aval (drop=_TYPE_ _FREQ_) mean=mean_aval;
run;

/* Step 5: Display the result */
proc print data=mean_aval;
run;
```



# Codes Creation 3 ( Python)

Output :

```
```bash
pip install pandas xport
```
```

```
```python
import pandas as pd
import xport
```

```
# Load the .xpt file
with open("advs.xpt", "rb") as file:
    data = xport.to_dataframe(file)
```

```
# Filter the data where parmcd is 'WEIGHT'
weight_data = data[data['parmcd'] == 'WEIGHT']
```

```
# Group by 'trta' and 'avisitn' and calculate the mean of 'aval'
grouped_data = weight_data.groupby(['trta', 'avisitn'])['aval'].mean().reset_index()
```

```
# Rename the column for clarity
grouped_data = grouped_data.rename(columns={'aval': 'mean_aval'})
```

```
# Display the result
print(grouped_data)
```
```

Prompt :

Write a **Python script** that groups data by "trta" and "avisitn" columns in "advs.xpt" and calculates the mean of the "aval" column for each group at parmcd = 'WEIGHT'

# Codes / Comments Creation

Prompt :

See below comments and convert them in SAS codes.

Show only SAS codes comments:

## Merge demo and rand dataset by usubjid and name it as dm

Output :

```
data dm;
 merge demo rand;
 by usubjid;
run;
```

Prompt :

See below SAS codes and provide SAS comments. Refer to examples. Show only SAS comments.

SAS codes:

```
data dm; merge demo rand; by usubjid; run;
```

Examples:

SAS codes:

```
proc sort data=dm; by usubjid; run;
```

SAS comments:

```
Sort dm by usubjid
```



ChatGPT

kotlin

Copy code

```
data dm;
 merge demo rand;
 by usubjid;
run;
Merge datasets demo and rand by variable usubjid
```

# Comparison between SAS and R

Prompt :

I want you to compare SAS and R programming. Provide me with differences, present in a table format

Output :



Certainly! Here is a comparison of SAS and R programming in a table format highlighting the key differences between the two:

| Aspect               | SAS                                                                                        | R                                                                     |
|----------------------|--------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|
| Type of Language     | Proprietary language                                                                       | Open-source language                                                  |
| Cost                 | Commercial software with licensing fees                                                    | Free and open-source software                                         |
| Data Manipulation    | Excellent data manipulation and transformation capabilities                                | Strong data manipulation capabilities                                 |
| Data Visualization   | Basic data visualization features; often requires external tools like SAS Visual Analytics | Rich data visualization libraries (e.g., ggplot2)                     |
| Statistical Analysis | Comprehensive built-in statistical procedures                                              | Extensive statistical packages and libraries                          |
| Machine Learning     | Limited machine learning capabilities                                                      | Extensive machine learning libraries (e.g., scikit-learn, TensorFlow) |
| Community Support    | Smaller user community and less open-source collaboration                                  | Large and active user community with extensive online resources       |
| Customization        | Limited customization options compared to open-source alternatives                         | Highly customizable with the ability to create packages and functions |

# Patient Profile Development

- Prompt :

Use below data to provide patient profiles:

```
{ 'patient' : '01-001', 'sex' : 'male', 'age' : 25, 'race' : 'White' }
```

- Output :

Based on the provided data, here is a patient profile for '01-001':

- Patient ID: 01-001
- Sex: Male
- Age: 25
- Race: White

This patient is a 25-year-old male of White race. Please let me know if you need any additional information or if you would like to create profiles for more patients.



# Data Analysis (1)

- Prompt :

Select patients whose sex is male. Use below "Patient Data". Provide me the answers only.

"Patient Data":

```
{ 'patient' : '01-001', 'sex' : 'male', 'age' : 25, 'race' : 'White'},
{ 'patient' : '01-002', 'sex' : 'female', 'age' : 28, 'race' : 'Asian'},
{ 'patient' : '02-001', 'sex' : 'female', 'age' : 50, 'race' : 'White'},
{ 'patient' : '02-002', 'sex' : 'male', 'age' : 40, 'race' : 'Black'}
```

- Output :

The selected patients whose sex is male are:

1. {'patient': '01-001', 'sex': 'male', 'age': 25, 'race': 'White'}
2. {'patient': '02-002', 'sex': 'male', 'age': 40, 'race': 'Black'}

# Data Analysis (2)

- Prompt :

Select patients whose age is older than or equal to 40. Use below "Patient Data". Provide me the answers only.

"Patient Data":

```
{ 'patient' : '01-001', 'sex' : 'male', 'age' : 25, 'race' : 'White'},
{ 'patient' : '01-002', 'sex' : 'female', 'age' : 28, 'race' : 'Asian'},
{ 'patient' : '02-001', 'sex' : 'female', 'age' : 50, 'race' : 'White'},
{ 'patient' : '02-002', 'sex' : 'male', 'age' : 40, 'race' : 'Black'}
```

- Output :

Answers:

```
- {'patient': '02-001', 'sex': 'female', 'age': 50, 'race': 'White'}
- {'patient': '02-002', 'sex': 'male', 'age': 40, 'race': 'Black'}
```

# Data Analysis (3)

- Prompt :

Sort "Patient Data" by age. Provide me the answers only.

"Patient Data":

```
{ 'patient' : '01-001', 'sex' : 'male', 'age' : 25, 'race' : 'White'},
{ 'patient' : '01-002', 'sex' : 'female', 'age' : 28, 'race' : 'Asian'},
{ 'patient' : '02-001', 'sex' : 'female', 'age' : 50, 'race' : 'White'},
{ 'patient' : '02-002', 'sex' : 'male', 'age' : 40, 'race' : 'Black'}
```

- Output :

Sorted "Patient Data" by age:

```
1. {'patient': '01-001', 'sex': 'male', 'age': 25, 'race': 'White'}
2. {'patient': '01-002', 'sex': 'female', 'age': 28, 'race': 'Asian'}
3. {'patient': '02-002', 'sex': 'male', 'age': 40, 'race': 'Black'}
4. {'patient': '02-001', 'sex': 'female', 'age': 50, 'race': 'White'}
```

# Data Analysis (4)

- Prompt :

Count below "Patient Data" by race

"Patient Data":

```
{ 'patient' : '01-001', 'sex' : 'male', 'age' : 25, 'race' : 'White'},
{ 'patient' : '01-002', 'sex' : 'female', 'age' : 28, 'race' : 'Asian'},
{ 'patient' : '02-001', 'sex' : 'female', 'age' : 50, 'race' : 'White'},
{ 'patient' : '02-002', 'sex' : 'male', 'age' : 40, 'race' : 'Black'}
```

- Output :

Certainly! Let's count the number of patients by race in the given "Patient Data":

- White: 2
- Asian: 1
- Black: 1



# Data Analysis (5)

- Prompt :

Sort "Patient Data" by age. Provide me the answers only.

"Patient Data":

patient,sex,age,race

01-001,male,25,White

01-002,female,28,Asian

02-001,female,50,White

02-002,male,40,Black

- Output :

Sorted "Patient Data" by age:

1. 01-001, male, 25, White

2. 01-002, female, 28, Asian

3. 02-002, male, 40, Black

4. 02-001, female, 50, White

# Data Visualization

- Prompt :

Create line graph of "Patient Data"

"Patient Data":

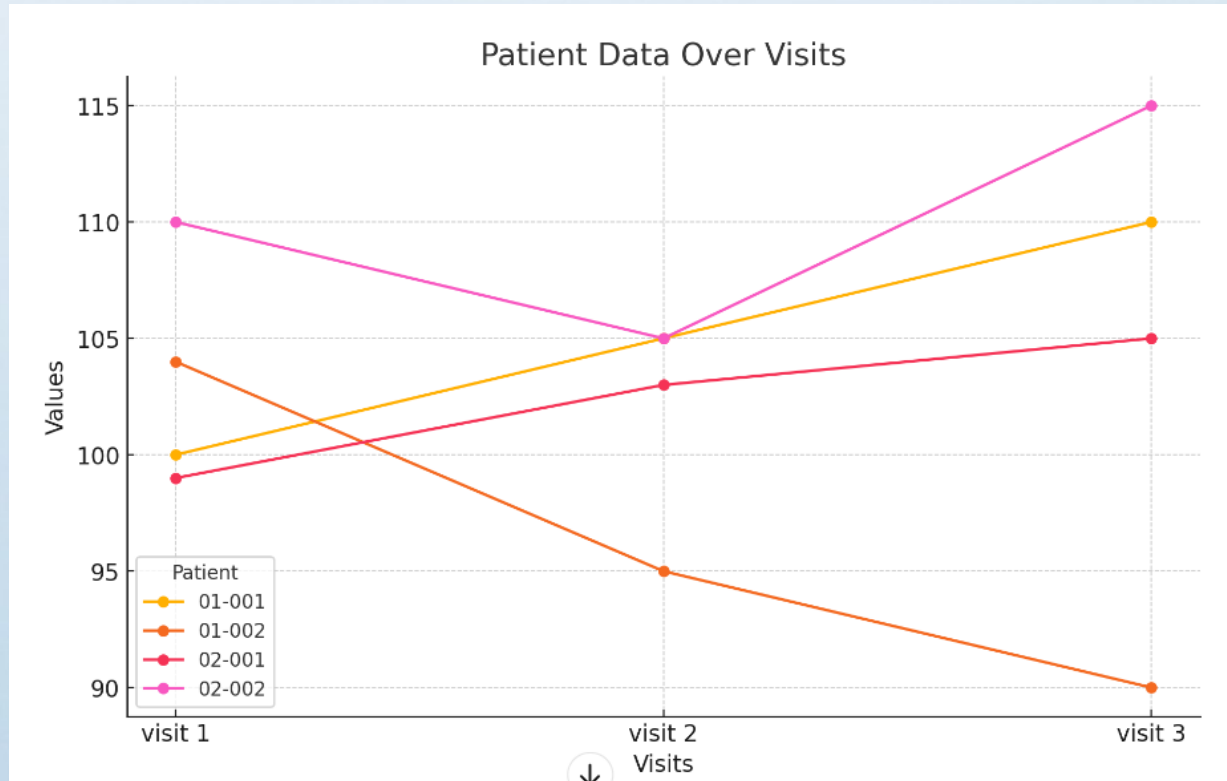
{ 'patient' : '01-001', 'visit 1' : 100, 'visit 2' : 105, 'visit 3' : 110},

{ 'patient' : '01-002', 'visit 1' : 104, 'visit 2' : 95, 'visit 3' : 90},

{ 'patient' : '02-001', 'visit 1' : 99, 'visit 2' : 103, 'visit 3' : 105},

{ 'patient' : '02-002', 'visit 1' : 110, 'visit 2' : 105, 'visit 3' : 115}

- Output :



# Safety Cases Identification

- Output :

- Prompt :

Classify the safety cases of the text.

Follow these steps in the classification.

1. Identify adverse event in text.
2. Identify patient information in text
3. Identify medication information in text

If text answers to "Yes" on all the steps, classify as 'Safety Issues' Otherwise 'No Safety Issues'

Let's think step by step for classification of the text.

Text: Patient 001 has adverse events after taking the medication.

Let's follow the steps you provided to classify the safety issues in the text:

Step 1: Identify adverse event in text

- The text mentions "Patient 001 has adverse events after taking the medication." This indicates that there is an adverse event mentioned in the text.

Step 2: Identify patient information in text

- The text mentions "Patient 001," which is patient information.

Step 3: Identify medication information in text

- The text mentions "taking the medication," which is medication information.

Now, let's evaluate the results of each step:

- Step 1: Adverse event identified

- Step 2: Patient information identified

- Step 3: Medication information identified

Since all three steps have been answered "Yes," we can classify this text as 'Safety Issues' because it contains information about a patient experiencing adverse events after taking medication.

# Mental Health Assessment 1 – Prompt

- Prompt :

I am a psychiatrist, and I am interviewing a patient for his PANSS score based on answers from the patient.

Use 'Anxiety Answers from patient' and match the 'PANSS Score Anxiety Score' of Absent, Minimal, Mild, Moderate, Moderate severe, Severe and Extreme based on its definition.

Anxiety Answers from patient:

1. Question : Have you been feeling worried or nervous in the past week? Answer : No
2. Question : Would you say that you are usually calm and relaxed? Answer : Yes
3. Question : What has been making you feel nervous (worried, not clam, not relaxed) Answer : I have not felt nervous.
4. Question : Just how nervous (worried, etc.) have you been feeling? Answer : I have not felt nervous
5. Question : Have you been shaking at times, or has your heart been racing? Answer : No
6. Question : Do you get into a state of panic? Answer : No
7. Question : Has your sleep, eating, or participation in activities been affected? Answer : No

'PANSS Score Anxiety Score' : Subjective experience of nervousness, worry, apprehension, or restlessness, ranging from excessive concern about the present or future to feelings of panic.

1. Absent - Definition does not apply
2. Minimal - Questionable pathology; may be at the upper extreme of normal limits
3. Mild - Expresses some worry, overconcern, or subjective restlessness, but no somatic and behavioral consequences are reported or evidence.
4. Moderate - Patient reports distinct symptoms of nervousness, which are reflected in mild physical manifestations such as fine hand tremor and excessive perspiration.
5. Moderate severe - Patient reports serious problems of anxiety which have significant physical and behavioral consequences, such as marked tension, poor concentration, palpitations, or impaired sleep.
6. Severe - Subjective state of almost constant fear associated with phobias, marked restlessness, or numerous somatic manifestations.
7. Extreme - Patient's life is seriously disrupted by anxiety, which is present almost constantly and at times reaches panic proportion or is manifested in actual panic attacks.



# Mental Health Assessment 1 – Answer

- Answer :

Based on the patient's answers to the anxiety-related questions, you can match the PANSS Score Anxiety Score as follows:

1. \*\*Question: Have you been feeling worried or nervous in the past week?\*\*

- Answer: No

- \*\*PANSS Score Anxiety Score: Absent\*\*

2. \*\*Question: Would you say that you are usually calm and relaxed?\*\*

- Answer: Yes

- \*\*PANSS Score Anxiety Score: Absent\*\*

3. \*\*Question: What has been making you feel nervous (worried, not calm, not relaxed)?\*\*

- Answer: I have not felt nervous.

- \*\*PANSS Score Anxiety Score: Absent\*\*

4. \*\*Question: Just how nervous (worried, etc.) have you been feeling?\*\*

- Answer: I have not felt nervous.

- \*\*PANSS Score Anxiety Score: Absent\*\*

5. \*\*Question: Have you been shaking at times, or has your heart been racing?\*\*

- Answer: No

- \*\*PANSS Score Anxiety Score: Absent\*\*

6. \*\*Question: Do you get into a state of panic?\*\*

- Answer: No

- \*\*PANSS Score Anxiety Score: Absent\*\*

7. \*\*Question: Has your sleep, eating, or participation in activities been affected?\*\*

- Answer: No

- \*\*PANSS Score Anxiety Score: Absent\*\*

Based on the patient's responses, it seems that the subjective experience of anxiety is absent, and there are no signs or symptoms that warrant a PANSS Score Anxiety Score other than "Absent."

# Mental Health Assessment 2 – Prompt

- Prompt :

I am a psychiatrist, and I am interviewing a patient for his PANSS score based on answers from the patient.

Use 'Anxiety Answers from patient' and match the 'PANSS Score Anxiety Score' of Absent, Minimal, Mild, Moderate, Moderate severe, Severe and Extreme based on its definition. Final PANSS score will be the most severe assessment.

Anxiety Answers from patient:

1. Question : Have you been feeling worried or nervous in the past week? Answer : Yes
2. Question : Would you say that you are usually calm and relaxed? Answer : Not Applicable
3. Question : What has been making you feel nervous (worried, not clam, not relaxed) Answer : worried
4. Question : Just how nervous (worried, etc.) have you been feeling? Answer : a little
5. Question : Have you been shaking at times, or has your heart been racing? Answer : No
6. Question : Do you get into a state of panic? Answer : No
7. Question : Has your sleep, eating, or participation in activities been affected? Answer : No

'PANSS Score Anxiety Score' : Subjective experience of nervousness, worry, apprehension, or restlessness, ranging from excessive concern about the present or future to feelings of panic.

1. Absent - Definition does not apply
2. Minimal - Questionable pathology; may be at the upper extreme of normal limits
3. Mild - Expresses some worry, overconcern, or subjective restlessness, but no somatic and behavioral consequences are reported or evidence.
4. Moderate - Patient reports distinct symptoms of nervousness, which are reflected in mild physical manifestations such as fine hand tremor and excessive perspiration.
5. Moderate severe - Patient reports serious problems of anxiety which have significant physical and behavioral consequences, such as marked tension, poor concentration, palpitations, or impaired sleep.
6. Severe - Subjective state of almost constant fear associated with phobias, marked restlessness, or numerous somatic manifestations.
7. Extreme - Patient's life is seriously disrupted by anxiety, which is present almost constantly and at times reaches panic proportion or is manifested in actual panic attacks.

# Mental Health Assessment 2 – Answer

- Answer :

Based on the patient's answers and the PANSS Score Anxiety definitions, we can match the responses to the corresponding scores:

1. Question: Have you been feeling worried or nervous in the past week?

Answer: Yes

PANSS Score Anxiety: Mild

2. Question: Would you say that you are usually calm and relaxed?

Answer: Not Applicable

PANSS Score Anxiety: Absent

3. Question: What has been making you feel nervous (worried, not calm, not relaxed)

Answer: worried

PANSS Score Anxiety: Moderate

4. Question: Just how nervous (worried, etc.) have you been feeling?

Answer: a little

PANSS Score Anxiety: Minimal

5. Question: Have you been shaking at times, or has your heart been racing?

Answer: No

PANSS Score Anxiety: Absent

6. Question: Do you get into a state of panic?

Answer: No

PANSS Score Anxiety: Absent

7. Question: Has your sleep, eating, or participation in activities been affected?

Answer: No

PANSS Score Anxiety: Absent

The final PANSS score would be the most severe assessment, which in this case is Moderate (Question 3). Therefore, the overall PANSS Score Anxiety for this patient based on the provided answers is Moderate.



# Mental Health Assessment 3 – Prompt

- Prompt :

I am a psychiatrist, and I am interviewing a patient for his PANSS score based on answers from the patient.

Use 'Anxiety Answers from patient' and match the 'PANSS Score Anxiety Score' of Absent, Minimal, Mild, Moderate, Moderate severe, Severe and Extreme based on its definition. Final PANSS score will be the most severe assessment.

Anxiety Answers from patient:

1. Question : Have you been feeling worried or nervous in the past week? Answer : Yes
2. Question : Would you say that you are usually calm and relaxed? Answer : Not Applicable
3. Question : What has been making you feel nervous (worried, not clam, not relaxed) Answer : worried
4. Question : Just how nervous (worried, etc.) have you been feeling? Answer : a lot
5. Question : Have you been shaking at times, or has your heart been racing? Answer : Yes
6. Question : Do you get into a state of panic? Answer : Yes
7. Question : Has your sleep, eating, or participation in activities been affected? Answer : Yes

'PANSS Score Anxiety Score' : Subjective experience of nervousness, worry, apprehension, or restlessness, ranging from excessive concern about the present or future to feelings of panic.

1. Absent - Definition does not apply
2. Minimal - Questionable pathology; may be at the upper extreme of normal limits
3. Mild - Expresses some worry, overconcern, or subjective restlessness, but no somatic and behavioral consequences are reported or evidence.
4. Moderate - Patient reports distinct symptoms of nervousness, which are reflected in mild physical manifestations such as fine hand tremor and excessive perspiration.
5. Moderate severe - Patient reports serious problems of anxiety which have significant physical and behavioral consequences, such as marked tension, poor concentration, palpitations, or impaired sleep.
6. Severe - Subjective state of almost constant fear associated with phobias, marked restlessness, or numerous somatic manifestations.
7. Extreme - Patient's life is seriously disrupted by anxiety, which is present almost constantly and at times reaches panic proportion or is manifested in actual panic attacks.



# Mental Health Assessment 3 – Answer

- Answer :

Based on the patient's answers, let's match them to the corresponding PANSS Score Anxiety Scores:

1. Question: Have you been feeling worried or nervous in the past week?

Answer: Yes

PANSS Score: Mild

2. Question: Would you say that you are usually calm and relaxed?

Answer: Not Applicable

PANSS Score: Absent

3. Question: What has been making you feel nervous (worried, not calm, not relaxed)?

Answer: Worried

PANSS Score: Mild

4. Question: Just how nervous (worried, etc.) have you been feeling?

Answer: I was worried a lot

PANSS Score: Moderate

5. Question: Have you been shaking at times, or has your heart been racing?

Answer: Yes

PANSS Score: Moderate Severe

6. Question: Do you get into a state of panic?

Answer: Yes

PANSS Score: Severe

7. Question: Has your sleep, eating, or participation in activities been affected?

Answer: Yes

PANSS Score: Severe

Based on the most severe assessment, the final PANSS Score for anxiety would be "Severe" as it is the highest level mentioned in the responses.

# Image and Graphic recognition using ChatGPT

- ChatGPT can analyze and comment on images and graphics while ChatGPT3.5 mainly focuses on text
- ChatGPT
  - Describe the content of phone,
  - Identify trends in graph
  - Generate captions for images.

 Name : \_\_\_\_\_ Score : \_\_\_\_\_  
Teacher : \_\_\_\_\_ Date : \_\_\_\_\_

|                        |                        |                        |                        |
|------------------------|------------------------|------------------------|------------------------|
| 18.18<br><u>+22.74</u> | 61.53<br><u>+80.24</u> | 34.28<br><u>+96.41</u> | 88.62<br><u>+44.37</u> |
| 70.65<br><u>+73.85</u> | 37.59<br><u>+88.88</u> | 89.54<br><u>+22.17</u> | 87.17<br><u>+33.84</u> |
| 71.86<br><u>+68.33</u> | 74.94<br><u>+40.34</u> | 86.27<br><u>+65.14</u> | 30.17<br><u>+71.48</u> |
| 65.61<br><u>+33.26</u> | 12.57<br><u>+30.32</u> | 63.46<br><u>+82.11</u> | 26.12<br><u>+14.11</u> |

Give me the answers.

 Certainly! Let's solve these addition problems:

1.  $18.18 + 22.74 = 40.92$
2.  $61.53 + 80.24 = 141.77$
3.  $34.28 + 96.41 = 130.69$
4.  $88.62 + 44.37 = 132.99$
5.  $70.65 + 73.85 = 144.50$
6.  $37.59 + 88.88 = 126.47$



Using the graph, provide input data.

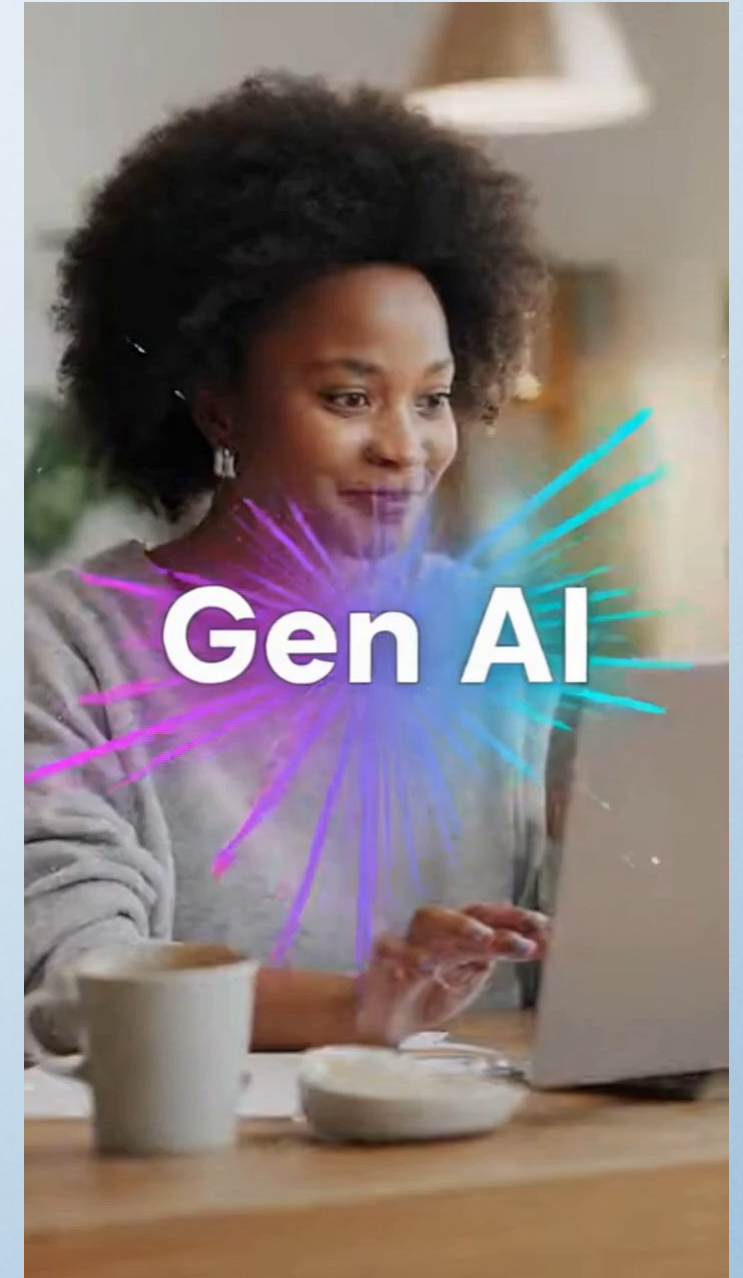
Based on the bar graph you provided, the input data for the number of people attending the movies each day is:

| Day       | Number of People |
|-----------|------------------|
| Sunday    | 90               |
| Monday    | 35               |
| Tuesday   | 25               |
| Wednesday | 47               |
| Thursday  | 34               |
| Friday    | 85               |
| Saturday  | 115              |

This table captures the data shown in the graph.

# Video Generation using Sora ( Not available anymore)

- OpenAI can generate short video(60 second) based on simple prompt.
- <https://sora.chatgpt.com/explore>
- Prompt :  
Create a video about Gen AI and Vibe Coding online course at WUSS in Dec 05 from 1 pm to 5 pm est

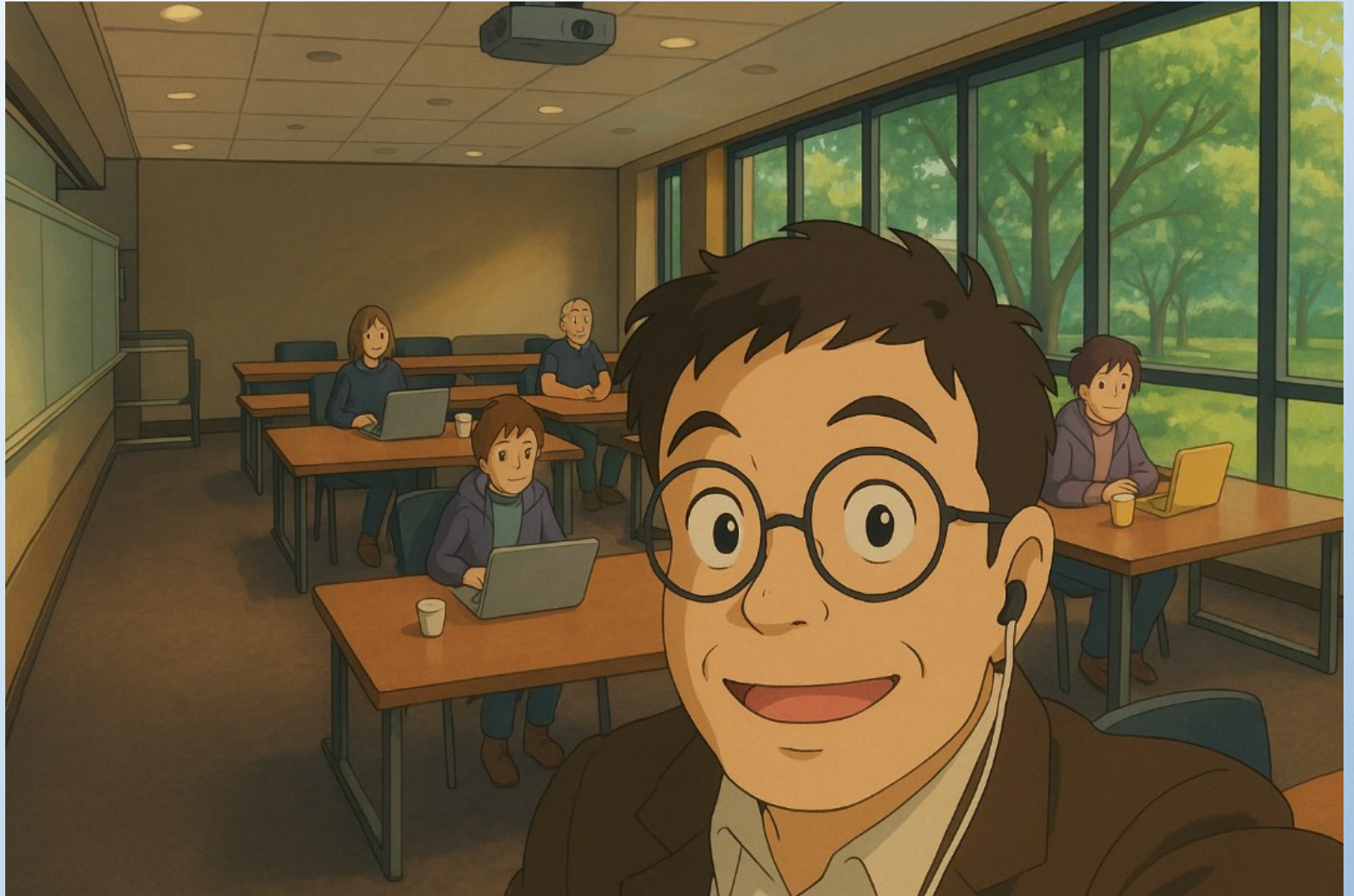




# Image creation using ChatGPT

Prompt:

Convert the  
picture in Ghibli  
animation  
format





# Prompt

- What is Prompt?
- Introduction of Prompt Engineering



# Prompt it is the new ~~Google~~ it



# What is Prompt?

- Prompt – A tool to communicate with Gen AI (ChatGPT)

Default (GPT-3.5)

K

what is schizophrenia?



Schizophrenia is a complex and severe mental disorder that affects how a person thinks, feels, and behaves. It is characterized by a range of symptoms that can vary in intensity and duration but often include:

1. Delusions: False beliefs that are resistant to reasoning or contrary evidence. Common delusions in schizophrenia include beliefs in conspiracy theories, being persecuted, or having special powers.
2. Hallucinations: Sensory experiences that are not based in reality. Auditory hallucinations (hearing voices) are the most common in schizophrenia, but visual and tactile hallucinations can also occur.
3. Disorganized thinking: Individuals with schizophrenia may have difficulty organizing their thoughts and may exhibit incoherent or tangential speech.
4. Disorganized or abnormal motor behavior: This can manifest as unpredictable or unusual movements, agitation, or catatonia (a state of immobility and unresponsiveness).
5. Negative symptoms: These involve a decrease in normal emotional responses, motivation, and social functioning. Negative symptoms can include a lack of interest in daily activities,

Regenerate



what is schizophrenia?



Feedback



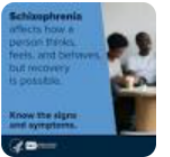
National Institutes of Health (.gov)

<https://www.nimh.nih.gov> › health › topics › schizoph...

## Schizophrenia - NIMH

Schizophrenia is a **serious mental illness** that affects how a person thinks, feels, and behaves. People with schizophrenia may seem like they have lost touch ...

[What are the signs and...](#) · [How is schizophrenia treated?](#)



Substance Abuse and Mental Health Services Administration (.gov)

<https://www.samhsa.gov> › mental-health › schizophrenia

## What is Schizophrenia? | SAMHSA

Apr 24, 2023 — Schizophrenia is a **severe, lifelong brain disorder** that causes people to **interpret reality abnormally**. They don't know what sights, sounds, ...

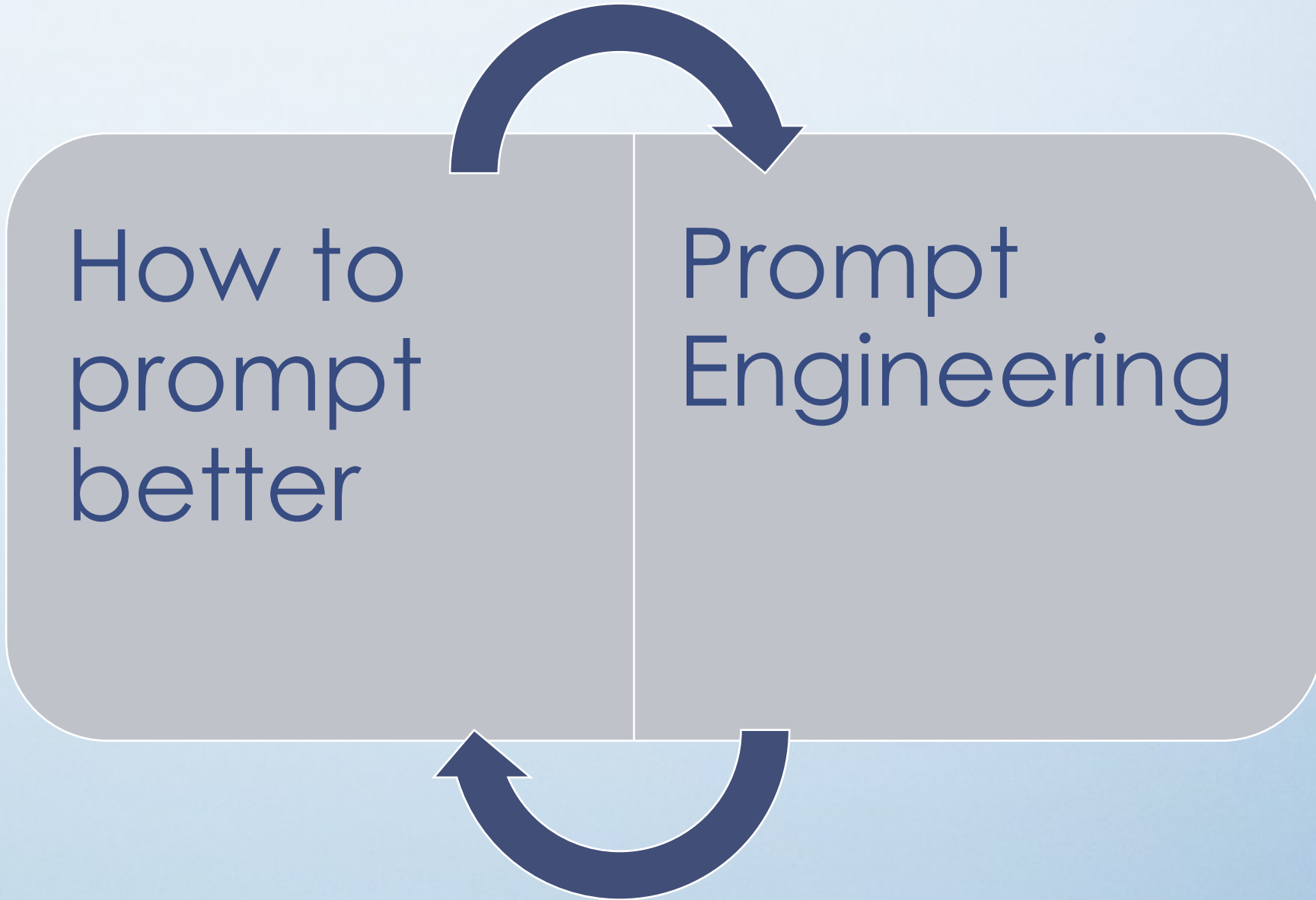


Mayo Clinic

<https://www.mayoclinic.org> › syc-20354443

## Schizophrenia - Symptoms and causes

Jan 7, 2020 — Schizophrenia **involves a range of problems with thinking (cognition), behavior and emotions**. Signs and symptoms may vary, but usually involve ...





# What is Prompt Engineering?

- Prompt Engineering – the **art** of creating effective communication/ prompt that guide Gen AI (ChatGPT) to generate **desired response**.

Bad Prompt – Bad Response  
(e.g., Hallucination)



Good Prompt – Good Response



ChatGPT is like a very smart, capable,  
recently graduated intern/new hire.



=



# How to work with the recently graduated, smart intern at work?

## How to make an intern competent or incompetent?





# How to prompt better in ChatGPT ( How to communicate better with smart intern)

- Get Specific
- Add Constraints
- Add more contexts
- Set the role
- Coach with feedback
- Probe further
- Step by step introduction





# Get specific

- Generic inquiry will provide generic (and less impressive) answers

| Generic Prompt                              | Specific Prompt                                                                    |
|---------------------------------------------|------------------------------------------------------------------------------------|
| Tell me about CDISC.                        | Tell me about CDISC – its overview, core services and activities.                  |
| Tell me the best places to visit in Prague. | Tell me the best places to visit in Prague, where I could have unique experiences. |
| Write me a promotion request email.         | Write me a promotion request email for Manager of CDSIC Standards.                 |

# Add Parameter or Constraints

- Restriction and constraints breed a creativity
- Example of parameters
  - Under 100 words
  - Include word of “creative” / do not use a word of “creative”
  - Make it under \$100
  - Make it work for 15 people

| Generic Prompt                              | Prompt with parameter                                                              |
|---------------------------------------------|------------------------------------------------------------------------------------|
| Tell me about CDISC.                        | Tell me about CDISC – its overview, core services and activities within 200 words. |
| Tell me the best places to visit in Prague. | Tell me the best places to visit in Prague within 4 days.                          |
| Tell me the best places to visit in Prague. | Tell me the best places to visit in Prague with \$500 budget.                      |

# Add more context

- If a prompt includes more background, ChatGPT can provide more relevant, customized answers.
- Provide the reason that I am using ChatGPT

| Generic Prompt                              | Prompt with parameter                                                                                    |
|---------------------------------------------|----------------------------------------------------------------------------------------------------------|
| Tell me about CDISC.                        | Tell me about CDISC from the perspective of a senior statistical programmer working in pharma.           |
| Tell me about CDISC.                        | Tell me about CDISC in 5 bullet points, focusing on what stat programmers should know.                   |
| Tell me the best places to visit in Prague. | Tell me the best places to visit in Prague for a first-time visitor who enjoys history and architecture. |
| Tell me the best places to visit in Prague. | I am in the vacation. Tell me the best places to visit in Prague.                                        |

# Set the role

- If one gives a role to ChatGPT and ask, ChatGPT play a role given and provide the answers.
- Example of roles : boss, parent, salesperson,

| Generic Prompt                                  | Prompt with role                                                                |
|-------------------------------------------------|---------------------------------------------------------------------------------|
| Write a greeting email.                         | I am a salesperson who markets new medicine. Write a greeting email.            |
| Review this proposal and provide your feedback. | Pretend you are the head of IT. Review this proposal and provide your feedback. |
| How do you respond below proposal?              | You are Steve Jobs. How do you respond below proposal?                          |



# Coach ChatGPT with feedback

- After ChatGPT provide an answer, one can provide a feedback and ask again.
- By iterating, one can get the better answer

| Generic Prompt          | Prompt with feedback     |
|-------------------------|--------------------------|
| Write a greeting email. |                          |
|                         | Make it in 50 words.     |
|                         | Make it more formal.     |
|                         | Make it more persuasive. |

# Provide a reference

- This technique is called 'Few-shot Learning'
- By providing reference/ examples, one could receive customized response.
- It will help ChatGPT to mimic writing style and format.

| Generic Prompt          | Prompt with feedback                                                                                                                              |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| Write a greeting email. | <p>I want you to refer to #my_previous_email to write a greeting email by following my tones and styles.</p> <p>#my_previous_email:<br/>.....</p> |
|                         |                                                                                                                                                   |
|                         |                                                                                                                                                   |

# Probe further

- After receiving the answers, one could probe further in the current chat.
- One can find more detail information from the certain part of previous response.

| Initial Prompt                                 | Prompts with probing                                                       |
|------------------------------------------------|----------------------------------------------------------------------------|
| Tell me how to be a excellent Stat Programmer. |                                                                            |
|                                                | Tell me more about the first tip on "Understand CDISC Standards"           |
| List top 10 attractions in Prague.             |                                                                            |
|                                                | Tell me more about attraction 1.                                           |
|                                                | Please tell me the specific foods that I need to try near by attraction 1. |

# Provide step by step instruction

- One can give step by step instruction on how ChatGPT think the answer “step by step”
- This will help ChatGPT to perform better.

| Generic Prompt                   | Prompt with step by step introduction                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Summarize new trend about CDISC. | <p>Perform the following actions:</p> <ol style="list-style-type: none"><li>1. <b>Identify 10 recent articles</b>(e.g., 6 to 12 months) related to CDISC.</li><li>2. For each article, <b>extract title, publication date, source, and a short summary</b> of key points.</li><li>3. <b>Filter</b> and synthesize the information to identify <b>common trend themes</b> across the articles.</li><li>4. <b>Summarize</b> each identified trend, explaining <b>what is changing and why it matters</b> to clinical data stakeholders.</li><li>5. Produce a <b>final structured summary</b>, including an executive overview, key trends, implications, and source list.</li></ol> |



# Prompt Engineering Technique

- Zero Shot
- One Shot
- Few Shot
- Reflection
- Chain of Thought
- Tree of Thought



# Prompt Technique : Zero-Shot

- Purpose : One time Query without giving any examples.
- Method : Straight-up Query
- Examples
  - Prompt : What is  $2 + 8$ ?
  - Output :  $2 + 8$  equals 10.

# Prompt Technique : One-Shot

- Purpose : One time Query with one example to show what you want.
- Examples
  - Prompt :

Example Input: What is the capital of France?

Example Output: The capital of France is Paris.

Now, answer the following question in the same style:

Input: What is the capital of Japan?

Output:

# Prompt Technique : Few-Shot (1)

- Purpose : Teaching AI models to follow specific patterns
- Method : Provide **multiple examples** of input-output pairs.
- Examples
  - Prompt :  
2@4 = 8  
3@3 = 9  
4@2 = 8  
5@3 = 15  
4@2 =
  - Output :  
It seems like you have a pattern where you're using "@" as an operator. Based on the examples you provided:  
2@4 = 8 (2 multiplied by 4)  
3@3 = 9 (3 multiplied by 3)  
4@2 = 8 (4 multiplied by 2)  
5@3 = 15 (5 multiplied by 3)  
So, following this pattern, 4@2 would be equal to 4 multiplied by 2, which is 8.



# Prompt Technique : Few-Shot Examples (2)

- Prompt :

Classify these conversations:

Text: Patients has Adverse event.

Label: Safety Issue

Text: Patients does not have Adverse event.

Label: No Safety Issue

Text: Patients has a headache.

Label: Safety Issue

Text: Patients feel sick after taking the medication

Label: Safety Issue

Text: Patients does not have any Adverse Event

Label: No Safety Issue

Text: Patients feel good after taking the medication

Label:

- Output :

Based on the provided texts and labels, here is the classification of these conversations:

1. Text: Patients has Adverse event.

Label: Safety Issue

2. Text: Patients does not have Adverse event.

Label: No Safety Issue

3. Text: Patients has a headache.

Label: Safety Issue

4. Text: Patients feel sick after taking the medication.

Label: Safety Issue

5. Text: Patients does not have any Adverse Event.

Label: No Safety Issue

6. Text: Patients feel good after taking the medication.

Label: No Safety Issue

It appears that the classification is based on whether the patient experienced an adverse event (Safety Issue) or not (No Safety Issue) after taking the medication or as described in the text.

# Prompt Technique : Chain of Thought

- Purpose :
  - Teaching AI model the **thought process** it should use.
  - It is a subset of few-shot.
- Method : Breaking the prompt into simpler steps – step 1, step 2, step 3, step 4 and so on
- Examples
  - Prompt :

Provide the answers

Q: Roger has 5 tennis balls. He buys 2 more cans of tennis balls. Each can have 3 tennis balls. How many tennis balls does he have now?

A: Rogers started with 5 balls.  
2 cans of 3 tennis balls each is 6 tennis balls.  
 $5 + 6 = 11$ . The answer is 11.

Q: The cafeteria has 23 oranges. If they use 20 and buy 6 more. How many oranges do they have?
  - Output :

A: The cafeteria started with 23 oranges.  
They used 20, so they have  $23 - 20 = 3$  oranges left.  
Then, they bought 6 more.  
So, they now have  $3 + 6 = 9$  oranges. The answer is 9

# Prompt Technique : Chain of Thought

- Purpose :
  - Teaching AI model the thought process it should use.
  - It is a subset of few-shot.
- Method : Breaking the prompt into simpler steps – step 1, step 2, step 3, step 4 and so on
- Examples
  - Prompt :

Write a function to find the sum of all even numbers from 1 to 50.

## **Step-by-Step Instructions:**

- Identify the range of numbers (1–50).
  - Determine the even numbers in this range.
  - Sum the even numbers.
  - Write the function to calculate it.
- Output :

# Prompt Technique : Chain of Thought 2

- **Prompt :**

Explain why SAS programmers need to learn prompt engineering.

Follow below steps:

1. Provide the introduction
2. Provide the two examples
3. Provide the conclusion with introduction and two examples

- **Output :**

**\*\*Introduction:\*\***

SAS (Statistical Analysis System) programmers play a crucial role in extracting meaningful insights from data through programming and analytics. One essential skill for SAS programmers is prompt engineering, which involves creating interactive prompts to enhance the flexibility and usability of their programs. This skill is particularly important as it allows users to customize their analyses, making the programming process more dynamic and user-friendly.

**\*\*Two Examples:\*\***

**\*Example 1: Enhancing User Interaction\***

Consider a scenario where a SAS programmer develops a program to analyze sales data. Without prompt engineering, the program might be fixed to analyze a specific time period or product category. However, by incorporating prompts, the programmer can allow users to input their preferred date range

or choose specific product categories. This enhances user interaction, making the program adaptable to different business scenarios and reducing the need for multiple versions of the same code.

**\*Example 2: Streamlining Data Selection\***

In another example, a SAS programmer is tasked with creating a report that summarizes employee performance metrics. Instead of hardcoding specific employee IDs or performance criteria, prompt engineering enables the programmer to incorporate prompts for users to input the desired employee IDs, performance thresholds, or other relevant parameters. This ensures that the program can be reused for various teams or departments without the need for extensive code modification, thereby streamlining the data selection process.

**\*\*Conclusion:\*\***

In conclusion, prompt engineering is a valuable skill for SAS programmers due to its ability to enhance user interaction and streamline data selection. By incorporating interactive prompts into their programs, SAS programmers empower users to customize analyses based on specific requirements, making the programs more versatile and user-friendly. The examples provided illustrate how prompt engineering enables adaptability, reducing the need for repeated code development and maintenance. Ultimately, mastering prompt engineering is essential for SAS programmers aiming to create robust and flexible solutions for data analysis and reporting.



# Prompt Technique : Chain of Thought 3

- Prompt :

Classify the safety issues of the text.  
Follow these steps in the classification.

1. Identify adverse event in text.
2. Identify patient information in text
3. Identify medication information in text

If text answers to "Yes" on all the steps,  
classify as 'Safety Issues' Otherwise 'No  
Safety Issues'

Let's think step by step for classification of  
the text.

Text: Patient 001 has adverse events after  
taking the medication.

- Output :

Let's follow the steps you provided to classify the safety issues in  
the text:

**Step 1: Identify adverse event in text**

- The text mentions "Patient 001 has adverse events after taking  
the medication." This indicates that there is an adverse event  
mentioned in the text.

**Step 2: Identify patient information in text**

- The text mentions "Patient 001," which is patient information.

**Step 3: Identify medication information in text**

- The text mentions "taking the medication," which is medication  
information.

Now, let's evaluate the results of each step:

- Step 1: Adverse event identified

- Step 2: Patient information identified

- Step 3: Medication information identified

Since all three steps have been answered "Yes," we can classify  
this text as 'Safety Issues' because it contains information about a  
patient experiencing adverse events after taking medication.

# Prompt Technique : Reflection

- Purpose : To understand how ChatGPT generates the output.
- Method : Ask the question to ChatGPT to explain the output / process of ChatGPT

- Examples

- Prompt :

Solve:  $23 \times 17$

Step 1: Calculate the answer.

Step 2: Reflect on your calculation: check for errors, consider alternative methods.

Step 3: Provide the final answer with explanation.

# Prompt Technique : Tree of Thought

- Purpose : To find multiple reasoning.
- Method : Instead of generating a **single chain of reasoning**, the model explores **multiple reasoning paths simultaneously** - like branches of a tree.

- Examples

- Prompt :

You are an AI reasoning assistant. Solve the problem step by step using a Tree-of-Thought approach.

Problem: A farmer has 17 cows. All but 9 die. How many are left?

Step 1: Generate **multiple possible reasoning paths** (branches) for solving the problem.

Step 2: Evaluate each reasoning path for correctness.

Step 3: Discard incorrect or illogical paths.

Step 4: Select the most reasonable path and provide the final answer.

# Prompt Templates





# Prompt Template

| Categories  | Explanation                                                                                                  | Examples                                                                                                                                                                          |
|-------------|--------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| # Identity  | Identity or the roles that AI will play.                                                                     | I am SOP developer.                                                                                                                                                               |
| # Task      | Main task that AI will do for me.                                                                            | Write SOP for TFL Development.                                                                                                                                                    |
| # Sub tasks | Subtasks, Step by Step Tasks that AI will follow to do main task. Refer to #Context and #Guidance for tasks. | Refer to SOP for SDTM Development in #Guidance. Write SOP for TFL development.                                                                                                    |
| # Context   | Background of this task.<br>- Who you are<br>- State of projects<br>- Goal of projects                       | TFL is the abbreviation of Table, Figure and Listing. SAS programmers create TFL from ADaM and SDTM datasets based on SAP. TFL should be validated by independent SAS Programmers |
| # Guidance  | Guidance or Examples that AI use or refer to the task                                                        | Current SOP examples for the new SOP development task – SOP for SDTM Development.                                                                                                 |

# Prompt Template Examples

- Prompt :

# Identity

# Task

# Sub Tasks

# Context

# Guidance

# Prompt Template Example - Prompt

## # Identity

I am SOP developer.

## # Task

I am writing SOP for TFL development

## # Sub Tasks

Refer to SOP for SDTM Development in #Guidance.  
Write SOP for TFL development

## # Context

TFL is the abbreviation of Table, Figure and Listing.  
SAS programmers create TFL from ADaM and SDTM datasets based on SAP. TFL should be validated by independent SAS programmers.

## # Guidance

SOP for SDTM Development

### 1. Purpose

This Standard Operating Procedure (SOP) outlines the process for developing Study Data Tabulation Model (SDTM) datasets for clinical trials, ensuring data consistency, regulatory compliance, and efficient analysis.

### 2. Scope

This SOP applies to all personnel involved in SDTM development, including SAS programmers, data managers, and clinical trial leads.

### 3. References

•ICH E6 Good Clinical Practice

([https://database.ich.org/sites/default/files/E6\\_R2\\_Addendum.pdf](https://database.ich.org/sites/default/files/E6_R2_Addendum.pdf))

## 4. Responsibilities

•SDTM Developer:

- Develops SDTM mapping specification.
- Develops SDTM datasets based on the approved mapping document.

•SDTM Validator:

- Validate SDTM datasets based on SDTM specification.
- Reviews and approves the final SDTM datasets.

## 5. Procedure

### 5.1. Pre-development Activities

•SDTM Developer reviews the clinical trial protocol and data collection forms.

•Identify data elements for SDTM mapping.

•Select the appropriate CDISC SDTM Implementation Guide based on the study type.

### 5.2. SDTM Mapping

•Map each data element from the clinical trial forms to the corresponding SDTM domain and variable.

•Utilize controlled terminologies (e.g., MedDRA) for coded data elements.

•Document variable labels, formats, definitions, and value ranges in SDTM mapping specification.

### 5.3. SDTM Dataset Development

•SDTM Developer creates SDTM datasets using SAS programming techniques.

•Ensure adherence to SDTM variable naming conventions and data types.

•Include variable labels, formats, and definitions within the SAS datasets.

•Implement data cleaning and validation procedures to ensure data quality.

### 5.4. Review and Approval

•SDTM validator reviews the developed SDTM datasets for accuracy and completeness.

## 6. Training

•Train personnel involved in data analysis and reporting on the structure and content of the SDTM datasets.

## 7. Records

•Maintain records of all SDTM development documents, including mapping documents, programming code, and data cleaning logs.

## 8. Deviations

•Any deviations from this SOP must be documented with justification and approval from the Programming Lead.

## 9. Revision History

•Maintain a revision history of this SOP, including the date of each revision and a brief description of the changes made.

# Prompt Template Examples - Output

## # SOP for TFL Development

### ## 1. Purpose

This Standard Operating Procedure (SOP) outlines the process for developing Table, Figure, and Listing (TFL) outputs from Analysis Data Model (ADaM) and Study Data Tabulation Model (SDTM) datasets for clinical trials. The objective is to ensure the creation of accurate, consistent, and regulatory-compliant TFLs that support efficient data analysis.

### ## 2. Scope

This SOP applies to all personnel involved in TFL development, including SAS programmers, data managers, and clinical trial leads.

### ## 3. References

- ICH E6 Good Clinical Practice ([https://database.ich.org/sites/default/files/E6\\_R2\\_Addendum.pdf](https://database.ich.org/sites/default/files/E6_R2_Addendum.pdf))
- SDTM Development SOP

### ## 4. Responsibilities

#### ### TFL Developer:

- Develops TFL mapping specification based on the Analysis Plan (SAP).
- Creates TFL outputs using SAS programming techniques.
- Implements validation checks to ensure TFL

accuracy and consistency.

#### ### Independent SAS Programmer (TFL Validator):

- Validates TFL outputs based on TFL mapping specification.
- Reviews and approves the final TFL outputs.

### ## 5. Procedure

#### ### 5.1. Pre-development Activities

- TFL Developer reviews the SAP and identifies variables for TFL mapping.
- Identify any specific requirements or considerations for TFL development outlined in the SAP.

#### ### 5.2. TFL Mapping

- Map each variable identified in the SAP to the corresponding TFL output.
- Utilize controlled terminologies when applicable.
- Document output labels, formats, definitions, and any statistical methodology used in the TFL mapping specification.

#### ### 5.3. TFL Development

- TFL Developer creates TFL outputs using SAS programming techniques.
- Ensure adherence to TFL output naming conventions and formatting.
- Include output labels, formats, and definitions within the output files.

- Implement data quality checks and validation procedures.

#### ### 5.4. Review and Approval

- Independent SAS Programmer (TFL Validator) reviews the developed TFL outputs for accuracy and completeness.
- Any discrepancies or issues identified during the validation process are documented and addressed by the TFL Developer.

### ## 6. Training

- Train personnel involved in TFL development and validation on the structure and content of TFL outputs.

### ## 7. Records

- Maintain records of all TFL development documents, including mapping documents, programming code, and validation logs.

### ## 8. Deviations

- Any deviations from this SOP must be documented, providing justification and obtaining approval from the Programming Lead.

### ## 9. Revision History

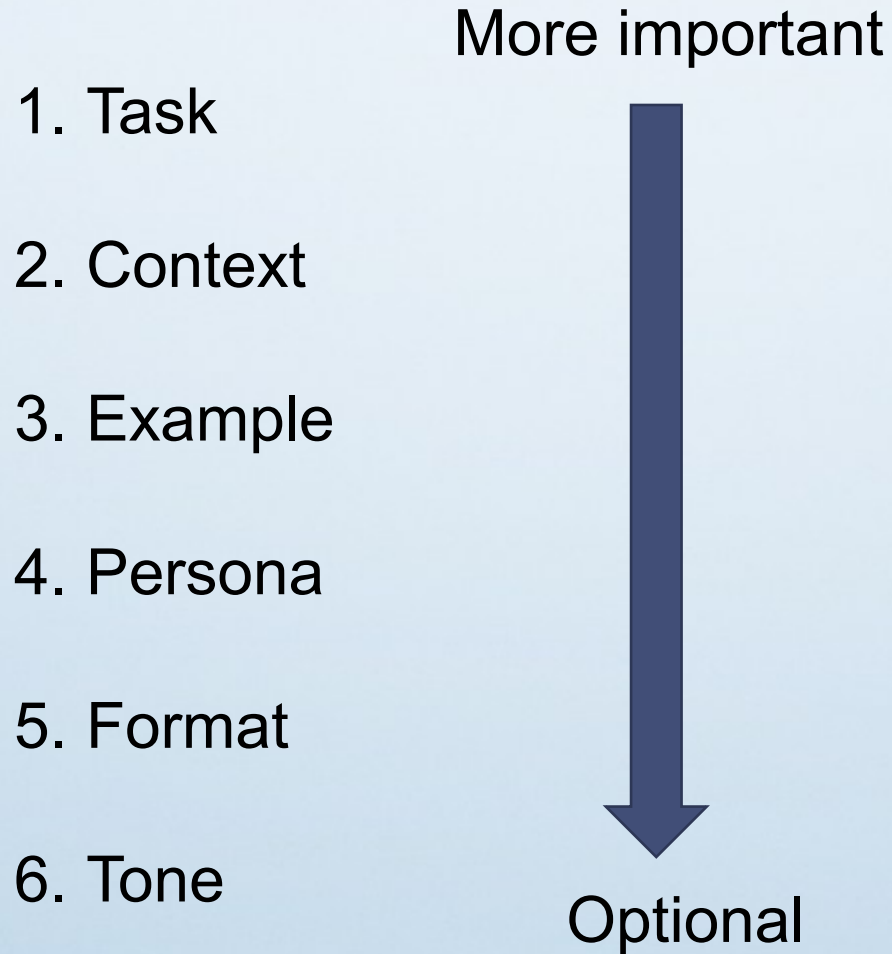
- Maintain a revision history of this SOP, including the date of each revision and a brief description of the changes made.



# Prompt Template Examples

- Prompt 1: Pareto Principle (80/20 Rule)  
"Using the Pareto Principle, help me identify the 20% of activities in my [personal life/professional life/business goals] that yield 80% of my results. Provide a step-by-step guide for analyzing my current efforts, pinpointing high-impact tasks, and creating an action plan to prioritize these tasks. Additionally, suggest ways to delegate, automate, or minimize the remaining 80% of lower-impact activities to free up time for what truly matters."
- Prompt 2: SMART Goals  
"Help me create three SMART goals for [specific time frame] that align with my [personal/professional/fitness/etc.] objectives. For each goal, provide a clear breakdown of the goal itself, milestones to track progress, specific metrics to measure success, potential challenges I may face, and strategies to overcome these challenges and stay on track."
- Prompt 3: The 5 Whys Method  
"Using the 5 Whys technique, help me identify the root cause of a recurring issue I face in [specific area, e.g., productivity, personal relationships, project management]. Provide a detailed step-by-step approach to uncover the core problem by repeatedly asking 'Why?' until the root cause is clear. Then, offer actionable solutions to address the root issue and prevent similar challenges in the future."
- Prompt 4: Atomic Habits  
"Using the principles from Atomic Habits by James Clear, help me build a sustainable habit for [specific goal]. Provide a comprehensive framework that includes habit stacking ideas to make this habit easier to integrate into my daily routine, clear cues and triggers to initiate the habit, strategies for tracking progress and staying motivated, and a reinforcement plan to make the habit stick over the next [time frame]."
- Prompt 5: Ikigai Framework  
"Using the Ikigai framework, help me find clarity about how to align [my career/personal life/business] with my purpose by identifying what I love doing, what I'm skilled at, what the world needs, and what I can be paid for. Based on this alignment, provide actionable steps for creating a fulfilling [career/life plan] that incorporates all four elements of Ikigai."

# 6 Prompt Components



## **Task:**

Generate an open source strategy for the biometrics department.

## **Context:**

The user is a senior biometrics professional working in a regulated clinical research setting, aiming to reduce reliance on commercial tools and promote innovation through open source adoption.

## **Example:**

For instance, the strategy could include evaluating tools like R for statistical programming, Git for version control, and defining contribution guidelines for internal package development.

## **Persona:**

You are an experienced open source strategist familiar with clinical data workflows, regulatory environments, and open science principles.

## **Format:**

Provide a structured outline in bullet points, organized into key sections: Goals, Current State, Tool Evaluation, Governance, Implementation Plan, and Recommendations.

## **Tone:**

Professional, clear, and practical—suitable for presentation to department leadership.

# Context Engineering





# Context Engineering

**Context engineering** is the practice of deliberately shaping what an AI model knows, prioritizes, and how it reasons by controlling the instructions, data, and constraints provided in its context.

It is **engineering the environment AI thinks in**.

It typically includes:

- Defining the model's role and behavior
- Injecting relevant external knowledge (documents, tools, memory)
- Setting rules for source priority and fallback
- Constraining reasoning, tone, and outputs

It's the foundation behind RAG systems, AI agents, and governed/enterprise AI.



# Context Engineering Example

## Prompt:

### # Identity

I am SOP developer.

### # Task

I am writing SOP for { document\_name } development

### # Sub Tasks

Refer to SOP document in #Guidance. Write new SOP.

### # Context

Use below description of the new SOP.  
{ document\_description }

### # Guidance

Use below SOP as a reference.  
{ SOP\_document }

## Examples :

{ document\_name } = "TFL"

{ document\_description } =  
"TFL is the abbreviation of Table, Figure and Listing. SAS programmers create TFL from ADaM and SDTM datasets based on SAP. TFL should be validated by independent SAS programmers. "

{ SOP\_document } =  
"SOP for SDTM Development

### 1. Purpose

This Standard Operating Procedure (SOP) outlines the process for developing Study Data Tabulation Model (SDTM) datasets for clinical trials, ensuring data consistency, regulatory compliance, and efficient analysis.

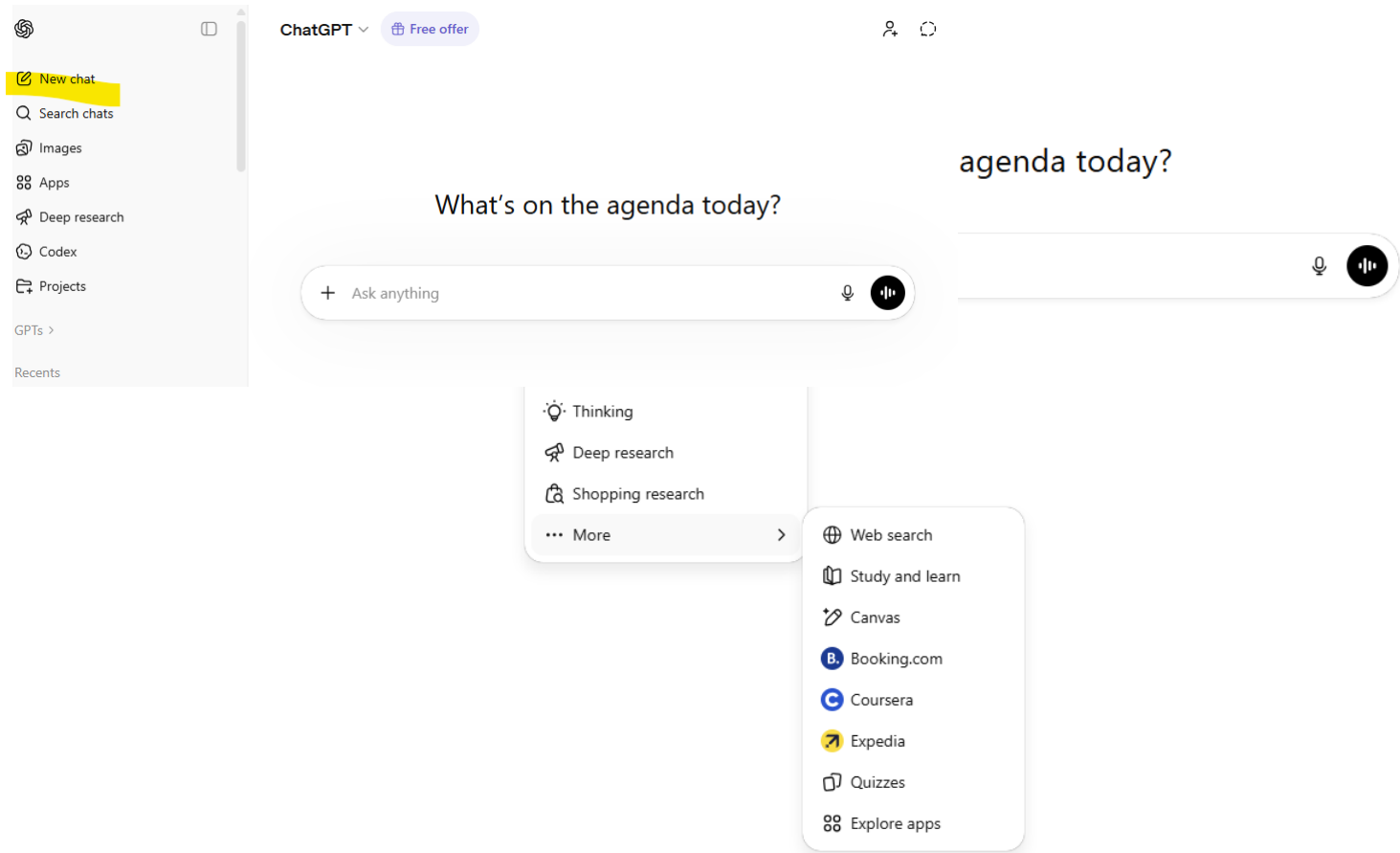
....  
"

# ChatGPT Functionality

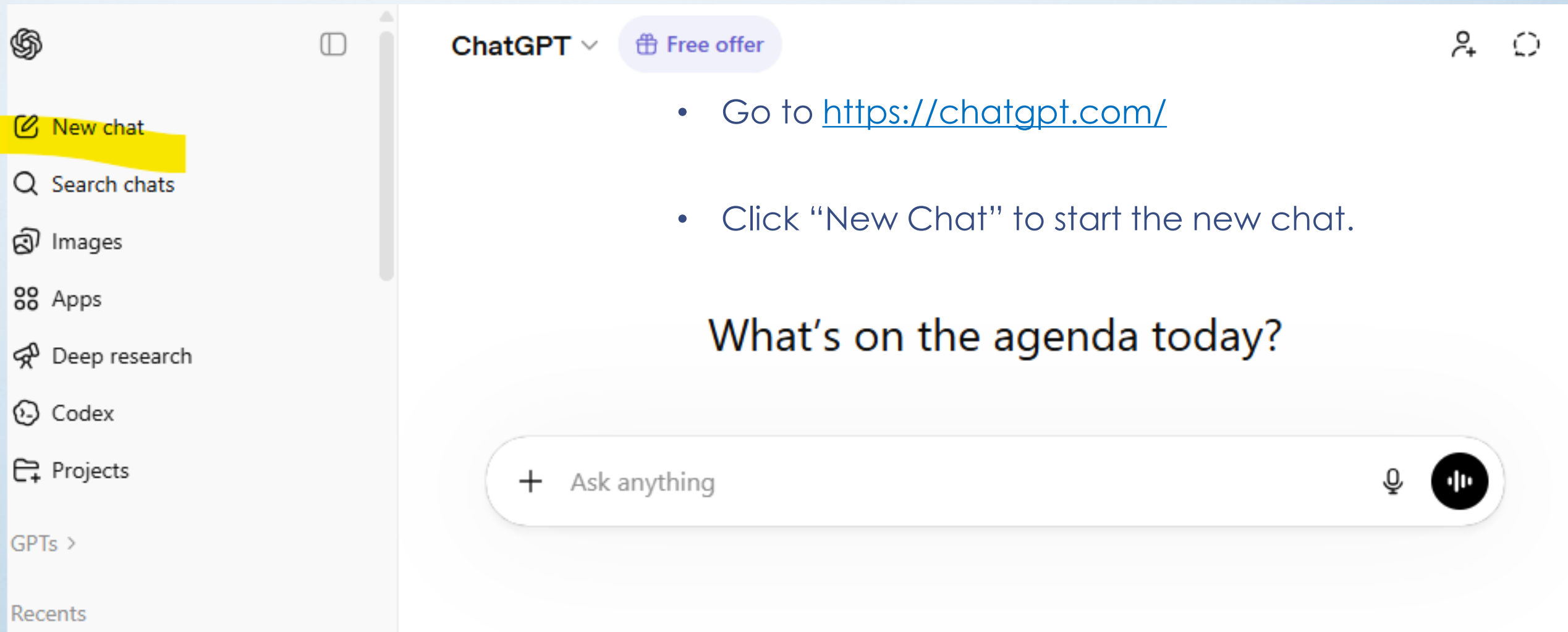


# Start new chat

- Go to <https://chatgpt.com/>
- Click “New Chat” to start the new chat.



# Start new chat



The screenshot displays the ChatGPT web interface. On the left sidebar, the 'New chat' button is highlighted with a yellow background. The main area shows the 'ChatGPT' header with a dropdown arrow and a 'Free offer' badge. Below the header, two bullet points provide instructions: 'Go to <https://chatgpt.com/>' and 'Click “New Chat” to start the new chat.' A sample prompt, 'What's on the agenda today?', is shown in the chat area. At the bottom, there is a text input field with a plus icon and the placeholder text 'Ask anything', along with microphone and voice recording icons.

ChatGPT  

- Go to <https://chatgpt.com/>
- Click “New Chat” to start the new chat.

What's on the agenda today?

+ Ask anything  



# Search tool

I am visiting Paris for 5 days with my family. Tell me about the itinerary.

Visiting Paris with your family for five days offers a wonderful opportunity to explore the city's rich history, vibrant culture, and family-friendly attractions. Here's a thoughtfully curated itinerary to help you make the most of your trip:

## FR Day 1: Iconic Landmarks & Seine River Cruise

- **Morning:** Begin your adventure at the **Eiffel Tower**. To avoid long queues, it's advisable to book tickets in advance. Children under 4 years old can enter for free. Afterward, enjoy a leisurely walk through the **Champ de Mars**, where kids can play and you can relax with views of the tower. [Famillin Paris](#)
- **Afternoon:** Visit the **Aquarium de Paris**, located near the Trocadéro. It's home to over 10,000 fish and invertebrates, including a shark tunnel that's sure to captivate the children. [Famillin Paris](#)
- **Evening:** Embark on a **Seine River cruise**. Companies like Vedettes de Paris offer family-friendly cruises with engaging commentary suitable for children aged 6 to 12. As night falls, find a spot to watch the Eiffel Tower's sparkling light show, which occurs every hour on the hour after sunset. [Le Monde.fr +1](#)

## 🍷 Day 2: Art, Gardens & Cultural Exploration

- **Morning:** Head to the **Louvre Museum**. To make the visit engaging for kids, consider a scavenger hunt or a guided family tour focusing on highlights like the Mona Lisa and Egyptian antiquities. [The Flying Mum](#)
- **Afternoon:** Stroll through the **Tuileries Garden**, where children can enjoy playgrounds and a carousel. Continue to the **Champs-Élysées** for some shopping or a treat at one of the many cafés. [Famillin Paris +1](#)
- **Evening:** Dine in the **Saint-Germain-des-Prés** district, known for its charming streets and family-friendly restaurants.

## 🏰 Day 3: Historic Sites & Montmartre

- **Morning:** Visit **Notre-Dame Cathedral**. Although it's undergoing restoration, the exterior and surrounding area remain impressive. [Suitcase & Strollers](#)

Search the web

Search

Reason

Deep research

Create image

...

🗣️

📌

🔊

Find the best hotel near by my Day 1.

Booking.com



Dec 1 - Dec 2 · 4 travelers



★★★★

**BnBNova - Champs-Élysées - 1BR**

Internet services Heating WiFi

Non-smoking rooms

Family rooms

Internet services

From  
\$97 / 1 night

[View on Booking.com](#)



★★★★

**West Paris Suite**

Excellent · 151 reviews

Non-smoking rooms

Family rooms

Internet services

From  
\$132 / 1 night

[View on Booking.com](#)



8.6

★★★★

**Paris Home Collection - Serviced Apartments Champs-Élysées - Rue de Ponthieu**

Wonderful · 18 reviews

Lift Soundproof rooms

Heating

From  
\$277 / 1 night

[View on Booking.com](#)

Here are the best hotel options near your Day 1 itinerary (Eiffel Tower, Champ de Mars, Trocadéro, Seine cruise), based on the real Booking.com search I just ran for Dec 1-2, 2025, 4 guests, and within 2 km of the Eiffel Tower.

Below is the curated shortlist with my recommendations:

### 🏠 Top Picks Near the Eiffel Tower (from actual availability)

★ 1 Anarhotel Adagio Paris Centre Tour Eiffel

Ask anything

+ Booking.com



- Click “Web Search” and prompt to have response and search link together.
- Click “Booking.com” to find the hotel.

# Thinking tool

Reasoning Prompt :

You are reviewing an SDTM AE (Adverse Events) dataset. You notice that for a subject, AEENDTC (Adverse Event End Date/Time) is missing, but AEOUT (Outcome of Adverse Event) is recorded as "RECOVERED/RESOLVED".

Based on CDISC SDTM standards and your knowledge of clinical trial data, should this be flagged as a potential data issue? Why or why not? How would you verify or correct this? Explain your reasoning process.

What's on the agenda today?

You are reviewing an SDTM AE (Adverse Events) dataset. You notice that for a subject, AEENDTC (Adverse Event End Date/Time) is missing, but AEOUT (Outcome of Adverse Event) is recorded as "RECOVERED/RESOLVED".

Based on CDISC SDTM standards and your knowledge of clinical trial data, should this be flagged as a potential data issue? Why or why not? How would you verify or correct this? Explain your reasoning process.

+ Think



Thought for 5 seconds >

According to CDISC SDTM conventions, an adverse-event record whose outcome is "RECOVERED/RESOLVED" implies that the event has an end date (and possibly a time), so a missing AEENDTC in conjunction with AEOUT="RECOVERED/RESOLVED" is indeed a data inconsistency that should be flagged. Below is the step-by-step reasoning and a suggested approach for verification and correction:

## 1. Why this appears to be a data issue

### 1. SDTM Variable Definitions

Ask anything

# Thinking tool

Reasoning Prompt :

You are reviewing an SDTM AE (Adverse Events) dataset. You notice that for a subject, AEENDTC (Adverse Event End Date/Time) is missing, but AEOUT (Outcome of Adverse Event) is recorded as "RECOVERED/RESOLVED".

Based on CDISC SDTM standards and your knowledge of clinical trial data, should this be flagged as a potential data issue? Why or why not? How would you verify or correct this? Explain your reasoning process.

You are reviewing an SDTM AE (Adverse Events) dataset. You notice that for a subject, AEENDTC (Adverse Event End Date/Time) is missing, but AEOUT (Outcome of Adverse Event) is recorded as "RECOVERED/RESOLVED".

Based on CDISC SDTM standards and your knowledge of clinical trial data, should this be flagged as a potential data issue? Why or why not? How would you verify or correct this? Explain your reasoning process.

+ Think



Activity · 21s



## Thinking

- **Reviewing AE data for potential issues**  
I need to focus on the final decision regarding the AE data. While SDTM standards are stable, the developer recommend searching to verify niche topics. Specifically, I need to check if the end date is missing for events marked as "recovered/resolved." This may require reviewing source documents like CRFs and medical notes for additional context.
- **Clarifying AE outcome and end date handling**  
According to CDISC, AEOUT doesn't require AEENDTC unless the outcome is recovered/resolved, in which case capturing AEENDTC is encouraged. I need to verify this by checking SDTM specs, CRFs, AE relationships with concomitant meds, and medical records. I'll also be cautious with variable names and avoid uncertain ones.
- **Clarifying SDTM and ADaM AE variables**  
For SDTM and ADaM, AEENDTC and AEENDY may be used, with AEENDTC being an ISO 8601 date/time. AESTDY and AEENDY are common, representing the relative start and end days. While accurate, I'll avoid listing details unless I'm completely sure, especially since the user is a SAS programmer working with CDISC SDTM.
- **Explaining missing end date when AE is resolved**  
If the outcome is "RECOVERED/RESOLVED," it generally means the event has ended. A missing end date could be an omission, but in some cases, if the recovery was noted without a specific date, it might be marked as "RECOVERED/RESOLVED" with no date. Data standards require capturing the end date; otherwise, it should be flagged for query.
- **Resolving AE end date issues**  
To resolve missing AE end dates, I'll review the SDTM define.xml, CRF mappings, and source data like eCRFs and medical histories. I'll check for any related procedures or datasets that could provide an end date. If no date is found

Thought for 21s  
Done



# Thinking / Reasoning

Short answer: **Yes — flag it as a potential data issue.**

Reason: “RECOVERED/RESOLVED” implies the event has ended, so an AE end date/time (AEENDTC) would normally be expected. A blank AEENDTC with a resolved outcome is a logical inconsistency that can affect safety summaries, AE duration and timing calculations, and downstream analyses.

Below I’ll show the reasoning, how to verify, and safe corrective actions (including what to ask the site or data owner).

## Why this looks like a problem

- **Semantic mismatch.** Outcome = **RECOVERED/RESOLVED** asserts the event terminated; an end date is the usual evidence of that termination. Missing AEENDTC contradicts that implication (or at least leaves it undocumented).
- **Regulatory / analysis impact.** Missing AEENDTC prevents computing AE duration, AE end relative day, and affects summaries that report events ongoing vs resolved, and time-to-resolution analyses.
- **Standards expectation.** Per SDTM practice you should capture AESTDTC (when it started) and AEENDTC (when it ended) when known; outcome can supplement these but usually doesn’t replace them.

That said — there are legitimate scenarios where AEOUT says “RECOVERED/RESOLVED” but AEENDTC is blank (e.g., the investigator recorded recovery but forgot to enter a date; the source has a narrative but no discrete date; data entry error; or event resolved between visits and no precise day was recorded). So flagging is needed to investigate, not to automatically change the data.

## How to verify (step-by-step)

1. **Confirm the SDTM mapping/spec.** Look at the annotated CRF / mapping document to see where AEENDTC and AEOUT are sourced from in the eCRF / source documents.
2. **Check source documents.** Review the AE eCRF, medical notes, follow-up pages, discharge summaries, visit notes, or SAE narrative for an explicit end date or wording that implies the resolution date (e.g., “resolved on 2025-10-12”).
3. **Search related datasets.** Check other SDTM datasets for corroborating dates:
  - Concomitant medication (CM) stop/start dates (if AE resolved when a med stopped),
  - Procedures (PR) or disposition (DS) that mention resolution dates,
  - Visit dates (VS) or the last contact date — sometimes resolution is documented at a visit.
4. **Look for derived variables or partial dates.** Sometimes the end date was captured partially (YYYY-MM) or as a visit date; check AEs for partial AEENDTCs or other flags.
5. **Programmatic QC (quick check).** Create a report of all records where AEOUT indicates resolved but AEENDTC is blank (example SAS snippet below) and review them as a batch.
6. **If source does not show an end date, query the site.** Issue a Data Clarification Query (DCQ) asking the investigator/site to provide the AE end date or to confirm that the resolution date is unknown and why.

Example SAS check:

```
proc sql;
create table ae_flag as
select USUBJID, AESEQ, AETERM, AESTDTC, AEENDTC, AEOUT
from sdtm.ae
```

where upcase(strip(AEOUT)) = 'RECOVERED/RESOLVED' and missing(AEENDTC);  
quit;

## How to correct (recommended approaches)

**Preferred:** If the source contains a specific end date, populate AEENDTC (and any derived AEENDY/AEDUR fields), record the correction in the data change log, and preserve an audit trail. Update define.xml if mapping changed.

### If the source indicates a resolution but no exact date:

- Do **not invent** a precise date. Instead:
  - Ask the site to provide an exact date (DCQ).
  - If site can only provide a visit-level confirmation (e.g., “resolved at visit on 2025-10-12”), consider using that visit date as AEENDTC **only** if your protocol/SOP allows and document the imputation method thoroughly. Use partial-date conventions if appropriate (e.g., YYYY-MM) and document why.
  - If the date is truly unknown and cannot be obtained, leave AEENDTC blank but document the reason and retain AEOUT = RECOVERED/RESOLVED; note the limitation in listings and safety summaries. Some analysis teams may treat these as “resolved, but end date unknown” and handle them accordingly.

- **If the outcome is incorrect:** If source shows the event was *ongoing* and AEOUT was incorrectly set to recovered, correct AEOUT to the proper value (with documentation) and still address AEENDTC accordingly.

## What to document

- Source evidence for whatever change you make (screen prints, CRF page references).
- The decision and imputation rules (if you impute or use visit date) — record who approved it and why.
- Update the Data Management Plan / data change log and the SDTM dataset change history.

### Example query text to the site (short, practical)

Site: For subject [USUBJID], AE [AETERM] has AEOUT = **RECOVERED/RESOLVED** but AEENDTC is blank in the eCRF. Please provide the AE end date/time or confirm that the exact end date is unknown. If the event was resolved at a clinic visit, please confirm the visit date when resolution was noted.

## Final note about risk/prioritization

- This is generally a **medium priority** query for safety data — not every single missing end date will be critical, but because outcome says “recovered,” many sponsors/analysts will want the end date populated. If the AE is serious/related to study drug, prioritize the clarification.

If you want, I can:

- produce a batch QC query list (SAS or R) for all such records in your AE dataset, or
- draft a DCQ template email/text you can send to sites with the fields prefilled. Which would you prefer?

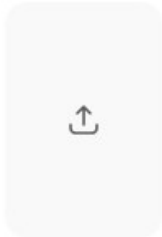


# Create Image

What are you working on?

Create a high-quality, detailed digital illustration of philadelphia

+ Image



Edit an image



Me at a Holi Festival



Caricature Trend



Lunar New Year



Flower petals



Gold



Crayon

This will take some time to create a image



# Create Image



convert this picture into a Studio Ghibli-style animation

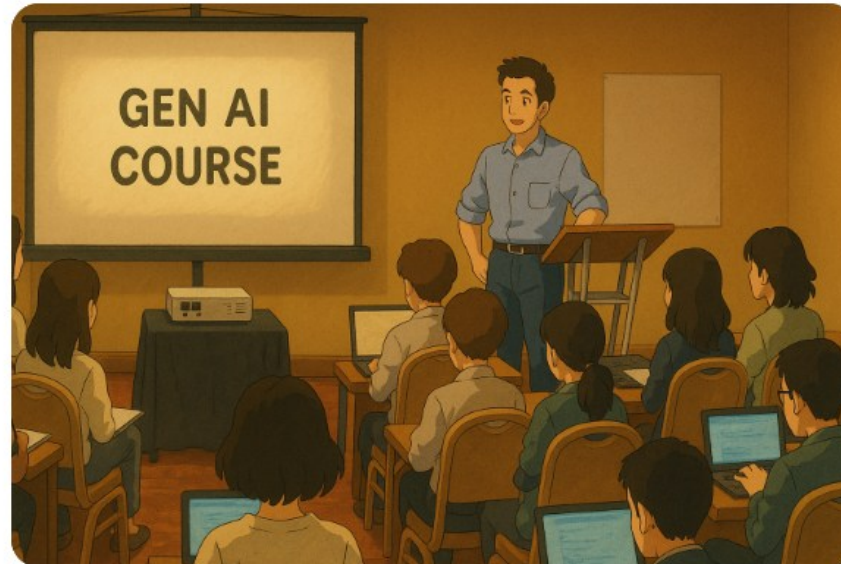
This is a famous Ghibli-style animation prompt.

In the writing board, please add Gen AI course and create another Ghibli-style animation.

Image created

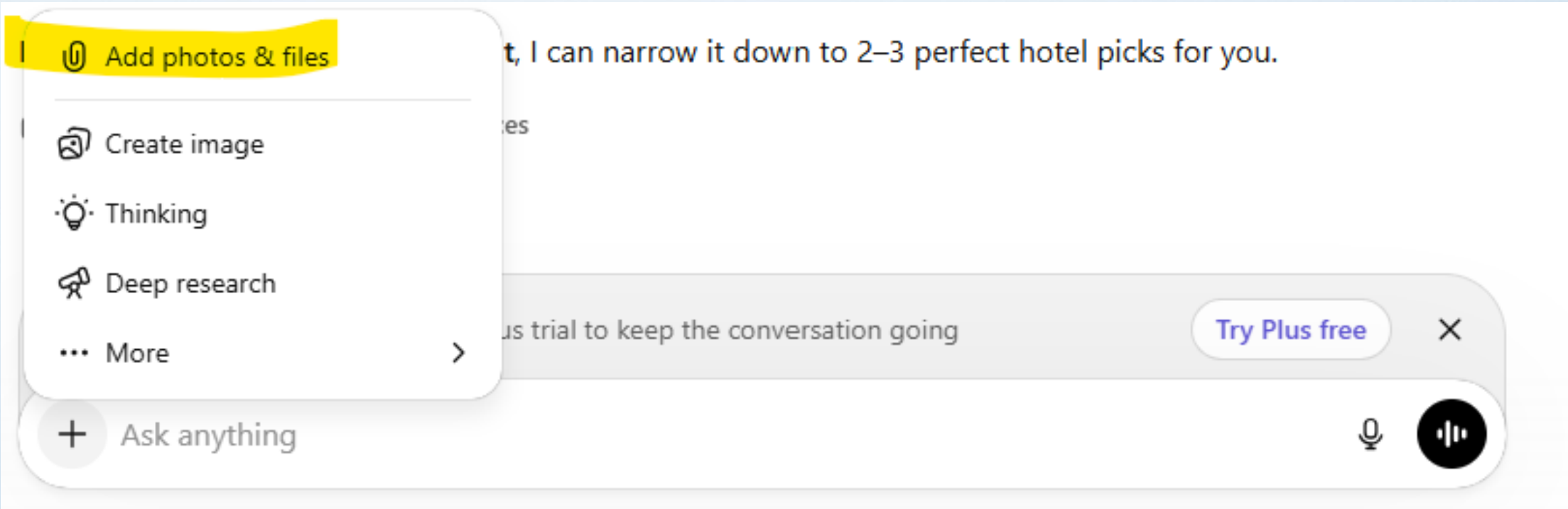


Image created





# Upload the document



- Click + sign, or paste over prompt panel.

# Modify and resubmit the inquiry

ChatGPT ▾

please write the greeting email.



Sure! Could you let me know a bit more about the context for the greeting email?

Edit message

ChatGPT ▾

please write the greeting email to my friend.

Cancel

Send

- We can also re-prompt to make it better.

Write it more friendly.



Search

Reason





# Copy the answer

Bottom line (short)

- **Flag it** and raise a data query.
- **Verify** against source documents and audit trail.
- **Correct** by populating AEENDTC from source or by documented and justified derivation, or else retain null but record the reason and consider whether AEOUT needs revision. Transparent documentation is essential to satisfy SDTM conformance and regulatory review. EVS +2

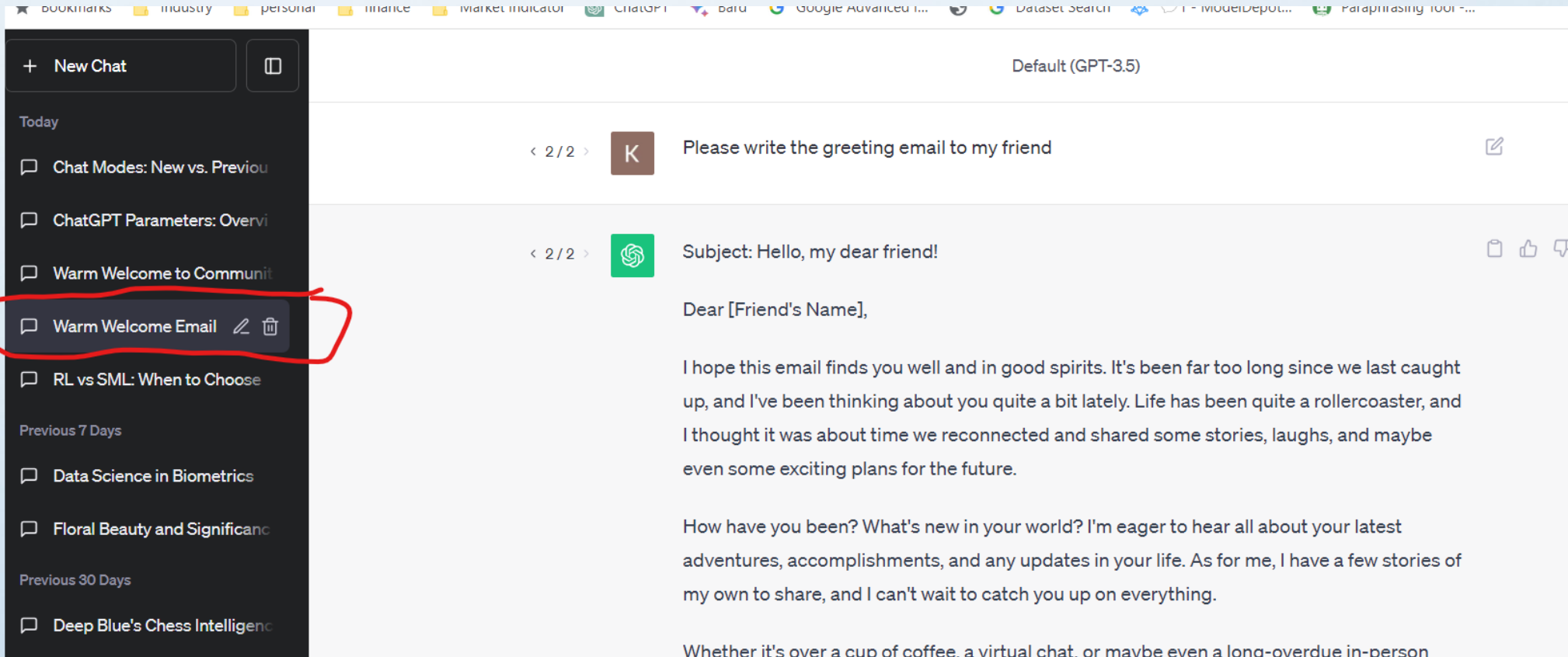
If you want, I can:

- produce a ready-to-send DCF email with study headers filled in, or
- draft the exact SAS / R check code you can run to find all AE records where AEOUT indicates resolved but AEENDTC is null (so you can generate a list to query). Which would you prefer?



- Click “Copy” icon.
- Paste the saved texts in other application.

# Continue the previous Chat



- Click previous chat.
- In summary, "new chat" starts a conversation from scratch, while "previous chat" continues an ongoing conversation within the same session, leveraging the context and information established in earlier messages.

# Using OpenAI Canvas ( writing and coding)

The screenshot shows the OpenAI Canvas interface. On the left, a sidebar contains a search bar and a list of actions: "Add photos & files", "Create image", "Thinking", "Deep research", "Shopping research", "More", "Web search", "Study and learn", "Canvas" (highlighted in yellow), and "Booking.com". The main chat window displays a prompt: "Create line graph of 'Patient Data'" and a JSON object representing patient data. Below the prompt, a response states: "I've created a Python script in the canvas that generates the requested line graph for the patient data." and provides a list of actions: "Add a legend with patient IDs", "Save the figure to a file (PNG/PDF)", "Use specific colors or markers", and "Convert it into a reusable function". The code editor on the right shows a Python script that uses matplotlib to create a line graph. The console at the bottom displays the output of the script, which is a line graph titled "Patient Data Line Graph" showing the value of visits for three patients over three visits.

ChatGPT

Free offer

Images

Create line graph of "Patient Data"

"Patient Data":

```
{ 'patient': '01-001', 'visit 1': 100, 'visit 2': 105, 'visit 3': 110},
{ 'patient': '01-002', 'visit 1': 104, 'visit 2': 95, 'visit 3': 90},
{ 'patient': '02-001', 'visit 1': 99, 'visit 2': 103, 'visit 3': 105},
{ 'patient': '02-002', 'visit 1': 110, 'visit 2': 105, 'visit 3': 115}
```

I've created a Python script in the canvas that generates the requested line graph for the patient data.

You can run it directly in your Python environment to display the chart. If you'd like, I can also modify it to:

- Add a legend with patient IDs
- Save the figure to a file (PNG/PDF)
- Use specific colors or markers
- Convert it into a reusable function

Just let me know your preference.

ChatGPT can make mistakes. Check important info.

Patient Line Graph

```
1 import matplotlib.pyplot as plt
2
3 # Patient Data
4 patient_data = [
5 {'patient': '01-001', 'visit 1': 100, 'visit 2': 105, 'visit 3': 110},
6 {'patient': '01-002', 'visit 1': 104, 'visit 2': 95, 'visit 3': 90},
7 {'patient': '02-001', 'visit 1': 99, 'visit 2': 103, 'visit 3': 105},
8 {'patient': '02-002', 'visit 1': 110, 'visit 2': 105, 'visit 3': 115}
9]
10
11 visits = ['visit 1', 'visit 2', 'visit 3']
12
13 plt.figure()
14
15 for patient in patient_data:
16 values = [patient[visit] for visit in visits]
17 plt.plot(visits, values)
18
19 plt.xlabel('Visit')
20 plt.ylabel('Value')
21 plt.title('Patient Data Line Graph')
22 plt.show()
```

Console

Run

Patient Data Line Graph

The line graph displays the value of visits for three patients over three visits. The x-axis is labeled 'Visit' and the y-axis is labeled 'Value'. The legend indicates three series: '01-001' (blue), '01-002' (orange), and '02-001' (green). The '01-001' series starts at 100, goes to 105, and ends at 110. The '01-002' series starts at 104, goes to 95, and ends at 90. The '02-001' series starts at 99, goes to 103, and ends at 105.

- Ready when you are.
- Create line graph of "Patient Data"
- "Patient Data":
- ```
{ 'patient': '01-001', 'visit 1': 100, 'visit 2': 105, 'visit 3': 110},
{ 'patient': '01-002', 'visit 1': 104, 'visit 2': 95, 'visit 3': 90},
{ 'patient': '02-001', 'visit 1': 99, 'visit 2': 103, 'visit 3': 105},
{ 'patient': '02-002', 'visit 1': 110, 'visit 2': 105, 'visit 3': 115}
```
- Start Canvas.
 - prompt for codes:
Create line graph of "Patient Data"
 - "Patient Data":

```
{ 'patient': '01-001', 'visit 1': 100, 'visit 2': 105, 'visit 3': 110},
{ 'patient': '01-002', 'visit 1': 104, 'visit 2': 95, 'visit 3': 90},
{ 'patient': '02-001', 'visit 1': 99, 'visit 2': 103, 'visit 3': 105},
{ 'patient': '02-002', 'visit 1': 110, 'visit 2': 105, 'visit 3': 115}
```
 - Run the code, and you will see the results in Console.
 - Note: There is a limit to use Canvas in free version (few times a day)
- or distribute without the permission of Kevin Lee

Using OpenAI Canvas (prototyping in html)

Canvas

Create line graph of "Patient Data" in html.

"Patient Data":

{ 'patient' : '01-001', 'visit 1' : 100, 'visit 2' : 105, 'visit 3' : 110},

{ 'patient' : '01-002', 'visit 1' : 104, 'visit 2' : 95, 'visit 3' : 90},

{ 'patient' : '02-001', 'visit 1' : 99, 'visit 2' : 103, 'visit 3' : 105},

{ 'patient' : '02-002', 'visit 1' : 110, 'visit 2' : 105, 'visit 3' : 115}

<> Patient Data Linegraph

Answer in chat instead >

Your HTML file with a line graph of the patient data is ready. It's using Chart.js to plot the measurements over three visits. Let me know if you'd like to add interactivity, export features, or style changes!

Ask anything

+

Search

Reason

...

Patient Data Linegraph

```
1 <!DOCTYPE html>
2 <html>
3 <head>
4   <meta charset="UTF-8">
5   <title>Patient Data Line Graph</title>
6   <script src="https://cdn.jsdelivr.net/npm/chart.js"></script>
7 </head>
8 <body>
9   <h2>Patient Data Over Visits</h2>
10  <canvas id="patientChart" width="800" height="400"></canvas>
11  <script>
12    const ctx = document.getElementById('patientChart').getContext('2d');
13
14    const data = {
15      labels: ['Visit 1', 'Visit 2', 'Visit 3'],
16      datasets: [
17        {
18          label: '01-001',
19          data: [100, 105, 110],
20          borderColor: 'blue',
21          fill: false
22        },
23        {
24          label: '01-002',
25          data: [104, 95, 90],
26          borderColor: 'red',
27          fill: false
28        },
29        {
30          label: '02-001',
31          data: [99, 103, 105],
32          borderColor: 'green',
33          fill: false
34        },
35        {
36          label: '02-002',
37          data: [110, 105, 115],
38          borderColor: 'purple',
39          fill: false
40        }
41      ]
42    };
43
44    new Chart(ctx, {
45      type: 'line',
46      data: data,
47      options: {
48        responsive: true,
49        plugins: {
50          legend: {
51            position: 'top',
52          },
53        },
54      },
55    });
56  </script>
57 </body>
58 </html>
```

Preview

Patient Data Linegraph

Patient Data Line Graph

01-001

01-002

02-001

02-002

Patient	Visit 1	Visit 2	Visit 3
01-001	100	105	110
01-002	104	95	90
02-001	99	103	105
02-002	110	105	115

Stop

Note : The limited trials in free version (a couple of times per a day

Deep Research

What are you working on?

build AI strategy for Biostatistical department in Pharma industry

+  Deep research  Sites



To tailor the AI strategy effectively, could you please clarify a few points:

Copy

1. What is the size and structure of the biostatistics department (e.g., global vs. local, number of team members)?
2. What are the primary responsibilities of the department (e.g., clinical trial data analysis, regulatory submissions, RWE)?
3. What types of data are typically handled (e.g., clinical trial data, omics data, EHRs)?
4. Are there existing AI initiatives or tools in use?
5. What are the key goals or challenges you want the AI strategy to address (e.g., automation, predictive modeling, regulatory compliance)?

This will help in designing a strategy that aligns with your operational needs and long-term vision.



Please use below answer.

1. 500 stat programmers, biostatisticians, data managers
2. clinical trial data analysis, submission, efficacy and safety analysis, RWE
3. clinical trial data
4. Not yet
5. automation, faster time of drug development, regulatory compliance

Thanks for the detailed context. I'll develop an AI strategy tailored for a biostatistics department in the pharma industry with 500 professionals, focusing on clinical trial data analysis, regulatory submissions, and RWE, aiming to improve automation, speed up drug development, and maintain compliance.

I'll structure this strategy around key pillars such as data infrastructure, model deployment, regulatory considerations, and team upskilling. I'll get back to you shortly with a comprehensive strategy document.

Research completed in 6m · 34 sources · 79 searches

 AI Strategy for Biostatistics in Pharma 

AI Strategy for Biostatistics Department in Pharma

Executive Summary: This strategy outlines how the biostatistics department can embed AI across the clinical trial lifecycle to automate manual tasks, speed development, and maintain compliance. Key elements include deploying AI use cases (e.g. automated SDTM/ADaM mapping, anomaly detection, trial simulation), building a secure, GxP-ready AI infrastructure, upskilling staff and recruiting data scientists, and instituting a governance framework aligned with FDA/EMA guidelines. Short-term pilots will demonstrate quick wins in data quality and reporting; medium-term goals focus on expanding to design optimization and RWE analytics; and long-term goals aim for full AI integration in data analysis and regulatory submissions. The proposed roadmap and table below summarize prioritized use cases, impact, and feasibility.

AI Use Cases Across Clinical Trial Lifecycle

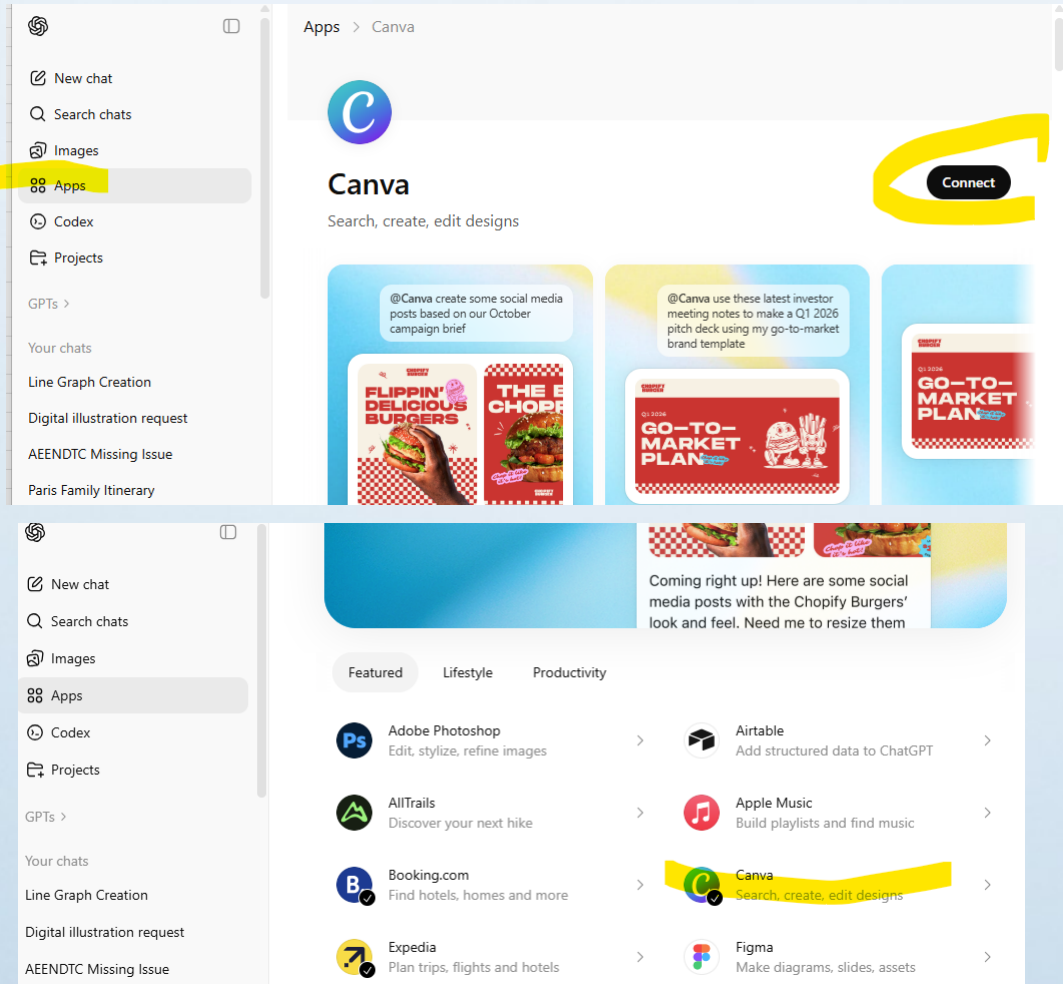
- **SDTM/ADaM Automation:** Use machine learning to auto-map clinical data into CDISC standards. AI + human-in-the-loop approaches can **clean, map and validate** source data to SDTM, dramatically reducing manual effort and error [appliedclinicaltrials.com](#). AbbVie's pilots show such AI frees scientists for interpretation and cuts SDTM conversion timelines/costs [appliedclinicaltrials.com](#) [appliedclinicaltrials.com](#). Extending to ADaM (analysis datasets) can further streamline analysis-ready data generation.
- **Data Quality & Anomaly Detection:** AI can continuously scan incoming trial data to flag outliers, inconsistencies, or protocol deviations. Algorithms trained on historical data detect subtle anomalies (e.g. implausible lab values or site irregularities) that human review might miss [eclipsesol.com](#) [clinion.com](#). This real-time monitoring improves data integrity, reduces rework, and shortens queries, leading to **faster, more reliable results** [eclipsesol.com](#) [clinion.com](#).
- **Protocol Design & Simulation:** Machine learning and simulation models can optimize trial parameters before launch. For example, discrete-event simulation of enrollment and dropout scenarios helps refine inclusion criteria and sample size [coherentsolutions.com](#). Reinforcement learning can adapt designs mid-trial to balance efficacy and risk [coherentsolutions.com](#). An FDA-endorsed Alzheimer's trial simulator showed AI-driven

uplicate or distribute

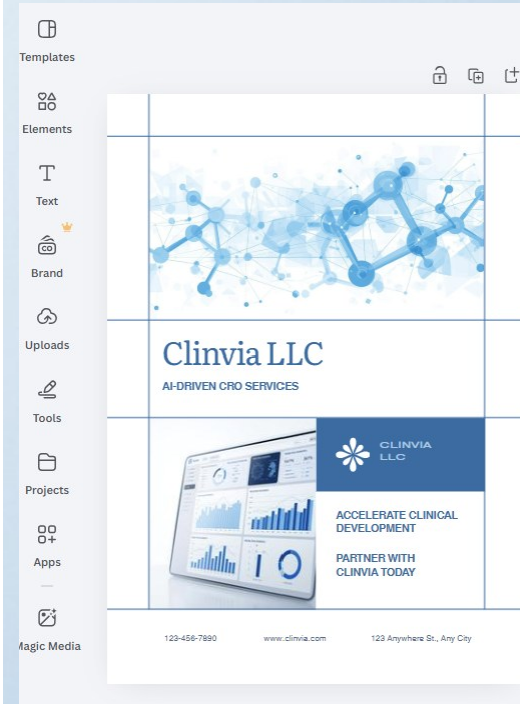
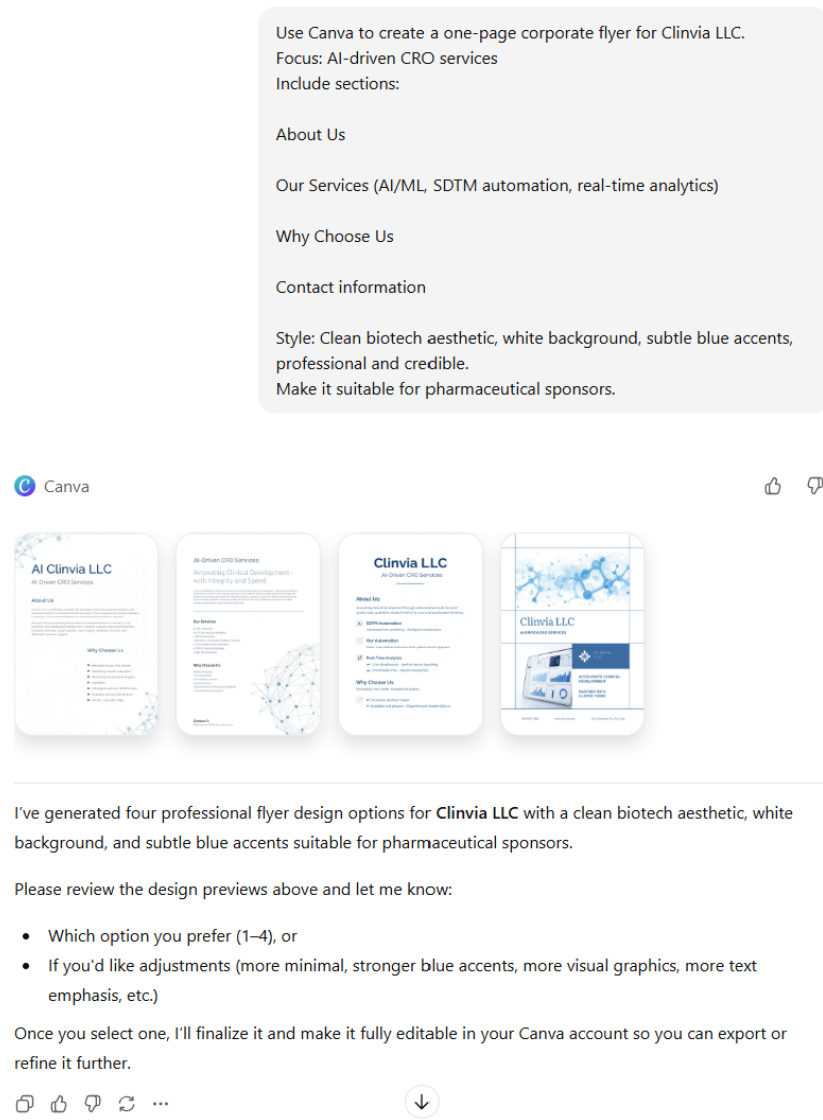
Apps in ChatGTP

ChatGPT:

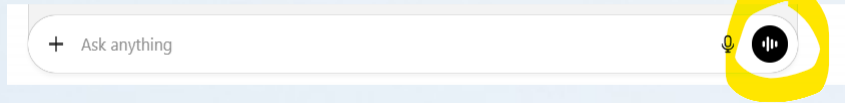
Canva:



- Connect App to ChatGPT.
- Ask the question using Canva in ChatGPT.
- Open ChatGPT output in Canva.



Voice



ChatGPT Voice

↑ Share ...

"Hi, can you tell me about the AI strategies for the biomechanics department?"

Absolutely! In the biometrics department, AI strategies often focus on automating data cleaning, improving data quality, and enhancing statistical analyses. For example, machine learning models can help identify patterns in clinical trial data that might be missed by traditional methods. AI can also optimize the design of clinical trials, predict patient outcomes, and improve the efficiency of data analysis. Overall, it's about leveraging AI to enhance accuracy, reduce manual workload, and accelerate the overall clinical trial process. If you have a specific area you're curious about, let me know!



Do you like this personality?



Voice is now integrated in chat

Follow the conversation in real time with transcripts and visuals like links, maps, and weather. Switch back anytime by selecting "Separate mode" in Settings.



+ Type



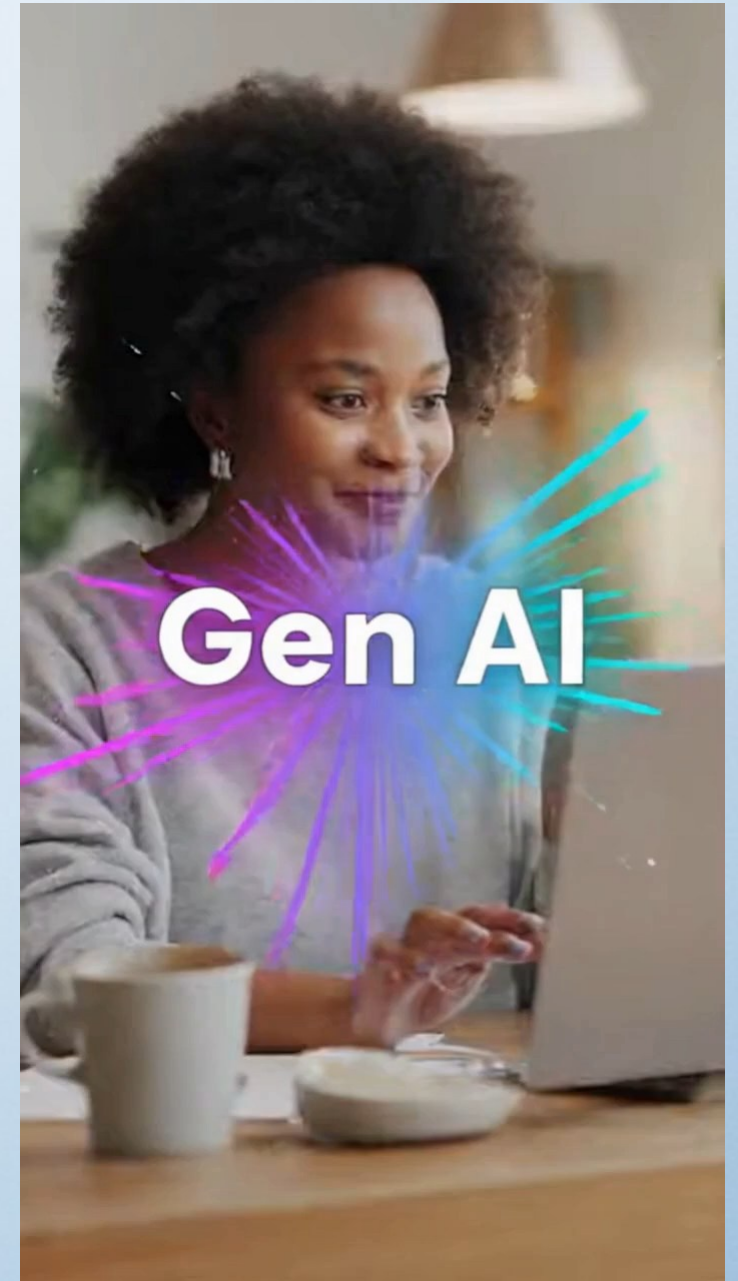
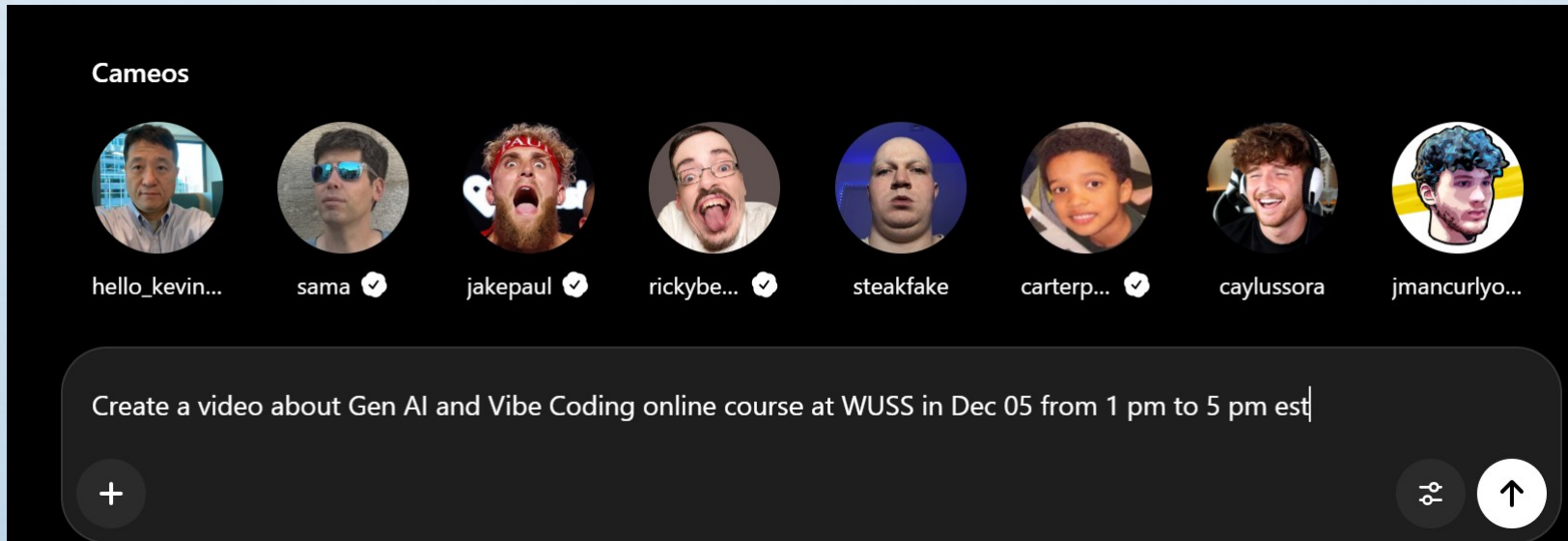
... End

Video

<https://sora.chatgpt.com>

Prompt:

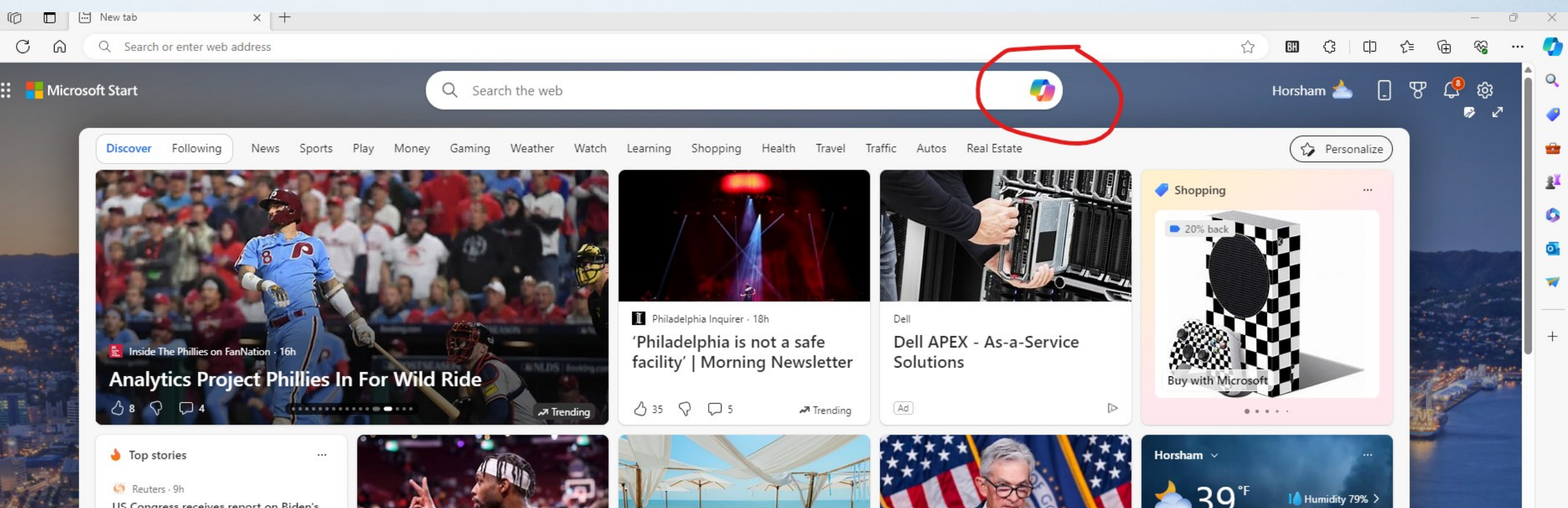
Create a video about Gen AI and Vibe
Coding online course at WUSS in Dec 05 from
1 pm to 5 pm est.



MS Bing Copilot Functionality

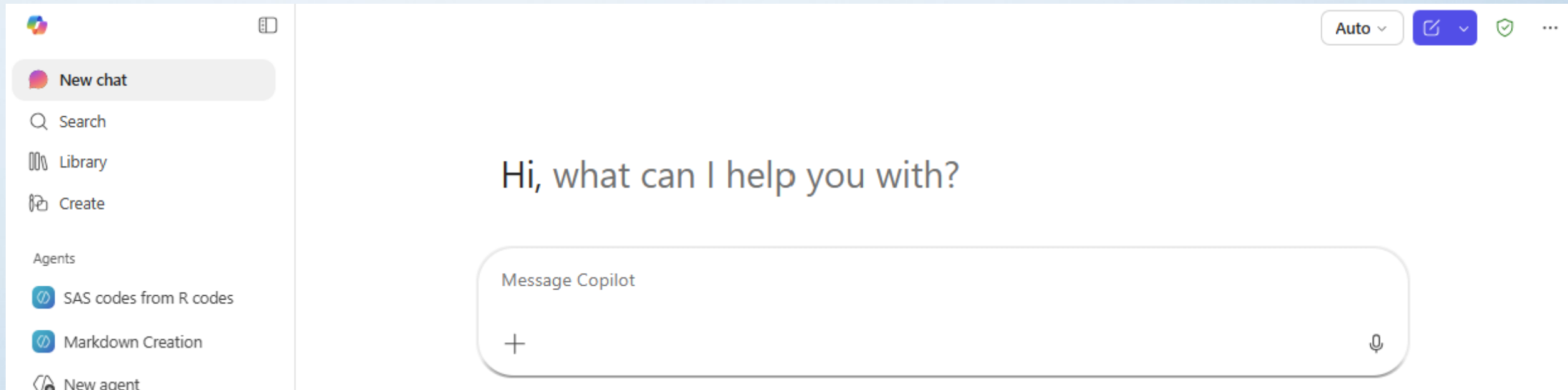


Start Bing Copilot (free version – Copilot with GPT-5)



- Start "Edge" and Click "Open Copilot"
- <https://copilot.Microsoft.com>

Start new chat



- Start your prompt in Copilot Chat

Results from prompt – download to word

Today

Tell me 5 days itinerary in paris

Copilot

Here's a smooth, well-paced **5-day Paris itinerary** built to balance iconic sights, food, history, and a few local gems. If you want it tailored (kids, art-heavy, food-focused, romantic, budget, etc.), just tell me!

 **5-Day Paris Itinerary**

1 Day 1 — Classic Paris & Seine

Morning

- Walk the **Île de la Cité**
 - Visit **Notre-Dame Cathedral** (exterior view while restoration continues)
 - Stop by **Sainte-Chapelle** for its breathtaking stained glass
- Coffee & croissants at **Au Vieux Paris d'Arcole**

Afternoon

- Stroll along the **Seine**, browse booksellers ("bouquinistes")
- Explore the **Latin Quarter**
 - **Panthéon**
 - **Luxembourg Gardens**

Optional Add-Ons / Swaps

- **Disneyland Paris** (family-friendly)
- **Catacombs of Paris**
- **Atelier des Lumières** digital art show
- **Giverny** (Monet's garden—beautiful in spring/summer)
- **Local food tour** in Le Marais or Saint-Germain

If you want, I can also: 🌐 Tailor this to your travel style

🍷 Add restaurant recommendations by neighborhood

📍 Map it all out day-by-day

💰 Adjust for budget, luxury, or family travel

Would you like a **customized version**?



Read aloud

Export to Word

Tell me 5 days itinerary in paris

File Home Insert Layout References Review View Help

Normal

Here's a smooth, well-paced **5-day Paris itinerary** built to balance iconic sights, food, history, and a few local gems. If you want it tailored (kids, art-heavy, food-focused, romantic, budget, etc.), just tell me!

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- Stroll along the **Seine**, browse booksellers ("bouquinistes")
- Explore the **Latin Quarter**
 - **Panthéon**
 - **Luxembourg Gardens**

Evening

- **Seine river cruise** (sunset or night for the best views)
- Dinner in Saint-Germain at **Les Deux Magots** or **Le Relais de l'Entrecôte**

Results from prompt

Day 5: Offbeat Paris

- **Paris Catacombs** – Underground ossuary with a fascinating history.
- **Montmartre** – Visit Sacré-Cœur and wander the artistic streets.
- **Père Lachaise Cemetery** – Final resting place of famous figures.
- End in **Rue Mouffetard** for local food and a lively atmosphere.

nomadicmatt +1

Tips for a Smooth Trip

- Book tickets in advance for Eiffel Tower, Louvre, Versailles, and Catacombs.
- Consider a **Paris City Pass** for fast-track entry and public transport.
- Use **Metro** for quick travel; walking is great for short distances.
- Best neighborhoods to stay: **Le Marais**, **Saint-Germain**, or near **Champs-Élysées**.

voyagetips

Would you like me to create a detailed hour-by-hour schedule for each day, including restaurant recommendations and local cafés, or keep it as a flexible itinerary with top attractions?

Sources

Copilot

Here's your new page:

Tell me about 5 day itinerary for...

Pages

Add restaurant recommendations

Make it an hour-by-hour plan

Sources

Citations

More

Tell me about 5 day itinerary for paris.

Here's a suggested 5-day itinerary for Paris based on expert travel guides and local recommendations:

Day 1: Classic Paris Highlights

- **Champs-Élysées & Arc de Triomphe** – Start with a stroll along this iconic avenue and climb the Arc for panoramic views.
- **Place de la Concorde & Tuileries Garden** – Perfect for a relaxing walk.
- **Latin Quarter** – Explore its charming streets and historic cafés.
- Optional: Seine River Cruise for a magical evening view of Paris.

Day 2: Art & Architecture

- **Louvre Museum** – Home to the Mona Lisa and thousands of masterpieces.
- **Musée d'Orsay** – Impressionist art in a stunning former train station.
- **Musée de l'Orangerie** – Monet's Water Lilies.
- Stroll through **Place Vendôme** and **Pont Alexandre III** for elegant architecture.

Day 3: Day Trip to Versailles

- **Palace of Versailles** – Explore the opulent palace and gardens.
- Return to Paris for dinner in **Le Marais**, a trendy neighborhood with great bistros.

Day 4: Eiffel Tower & Historic Sites

- **Eiffel Tower** – Book tickets in advance to avoid long lines.
- **Les Invalides** – Napoleon's tomb and military museum.
- **Notre-Dame Cathedral & Sainte-Chapelle** – Gothic masterpieces.
- Optional: **Montparnasse Tower** for sunset views.

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- **Père Lachaise Cemetery** – Final resting place of famous figures.
- End in **Rue Mouffetard** for local food and a lively atmosphere.

- Click on “Page”
- Edit the output and create the word document.

Upload the files for the analysis

 Add work content

 Upload images and files

 Attach cloud files

 Designer

 All agents

How does CDISC impact regulatory submissions?

What are the key CDISC standards?

Explain the role of Define-XML.

Message Copilot



AI-generated content may be incorrect

Create Agent



Agent Builder > New Agent

New chat

Search

Library

Create

Agents

CDISC Agent

Canva

New agent

All agents

Chats

Tell me 5 days itinerary in paris

Tell me the best places to visit in Pr...

Summarize the main points on this ...

convert the image to excel table.

Tell me about the required variable...

Tell me about 5 day itinerary for pa...

Tell me about CDISC in 200 words

I want to send the left article to the...

Write a R script that groups data b...

convert this image to data in csv fo...

I am sending the email to my client...

summarize it in one sentence

DIA 2025 attendee list.pdf

I am travelling to San Diego. I will b...

I have two OneDrive in my work co...

how to map my MS onedrive to loc...

All chats

Ann

Describe

Configure

Template: None

Details



Name

New Agent

Description ⓘ

Describe your agent

Instructions ⓘ

Describe what this agent should do, define its tone, and outline any rules or guidelines it must follow

Knowledge ⓘ

Choose the sources your agent will use to generate responses

Add specific websites ⓘ

Enter a URL

Search all websites. To limit results to specific sites, [enter a URL above](#) ⓘ

☐

Only use specified sources ⓘ

☐

Confidential – Do not duplicate or distribute without the permission of Kevin Lee

121

Create Agent

M365 Copilot

Search

Chat

Agents

CDISC Agent

Canva

All agents

Create agent

Conversations

Tell me about 5 day itinerary f...

Tell me about CDISC in 200 wo...

I want to send the left article t...

Write a R script that groups da...

convert this image to data in c...

All conversations

Library

Create

Apps

KL Kevin Lee

Upgrade Copilot

Copilot Studio

My agents

CDISC Agent

Last updated December 3, 2025 at 1:58:49 PM

Update

Share

...

Describe

Configure

CDISC Agent

CDISC Agent

Provide CDISC response based on the questions.

Instructions

Based on the questions, provide CDISC response.

Knowledge

Choose the sources your agent will use to generate responses

Add specific websites

Enter a URL

Search all websites

Only use specified sources

Websites

https://www.cdisc.org/

Capabilities

Agent preview

New chat

CDISC Agent

Provide CDISC response based on the questions.

Type your message

Your agent was created successfully!

This agent is currently **private** and only available to you.

Go to agent

Share

Use “CDISC Agent”

 CDISC Agent is responding [Open CDISC Agent](#)

Today

tell me about the required variables from ADSL. Give excel output.

 **CDISC Agent**

Coding and executing >

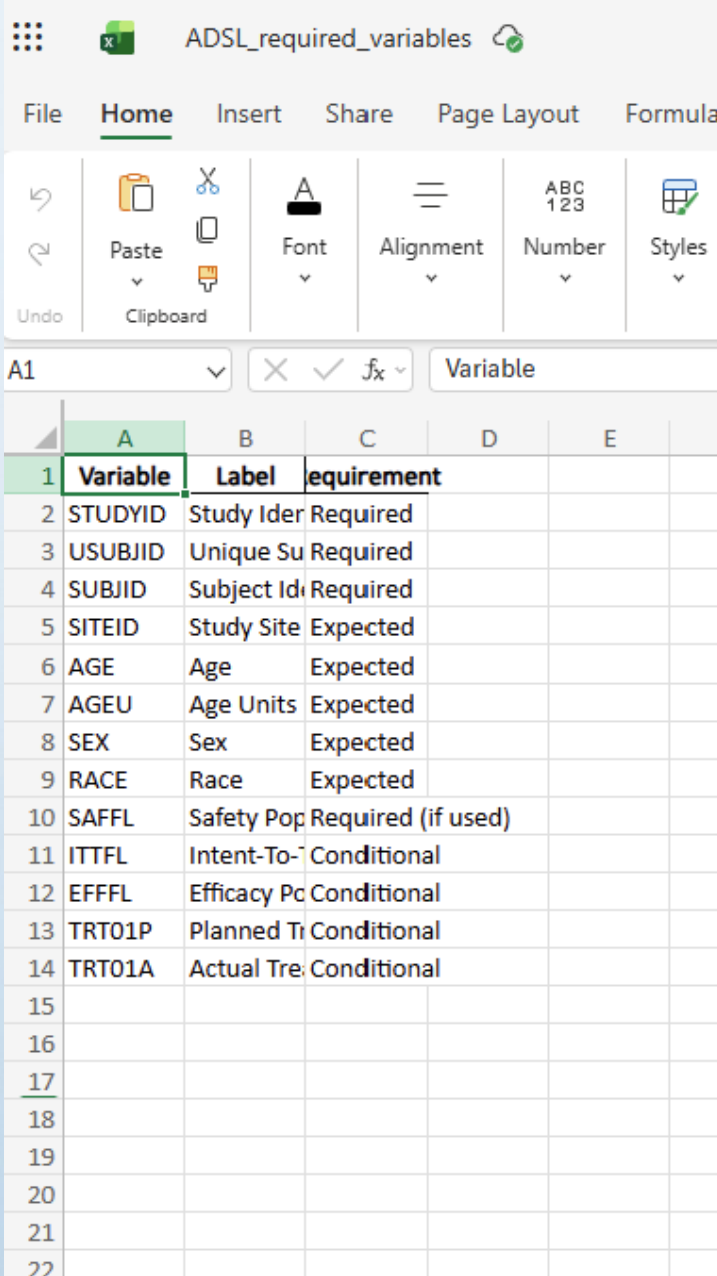
Here's your Excel file containing a curated list of **common required and expected ADSL variables** based on CDISC ADaM standards.

 Download your file:
[ADSL_required_variables.xlsx](#)

 **What's Included in This File**

The Excel file lists key variables typically required or expected in **ADSL (Subject-Level Analysis Dataset)**:

- **Required identifiers**
 - STUDYID
 - USUBJID
 - SUBJID
- **Demographic variables**
 - AGE
 - AGEU
 - SEX
 - RACE
- **Population flags**
(Required only if the population is defined in the study)
 - SAFFL
 - ITTFL
 - EFFFLL
- **Treatment variables**
 - TRT01P (Planned)
 - TRT01A (Actual)



	A	B	C	D	E
1	Variable	Label	Requirement		
2	STUDYID	Study Identifier	Required		
3	USUBJID	Unique Subject Identifier	Required		
4	SUBJID	Subject Identifier	Required		
5	SITEID	Study Site	Expected		
6	AGE	Age	Expected		
7	AGEU	Age Units	Expected		
8	SEX	Sex	Expected		
9	RACE	Race	Expected		
10	SAFFL	Safety Population	Required (if used)		
11	ITTFL	Intent-To-Treat	Conditional		
12	EFFFLL	Efficacy Population	Conditional		
13	TRT01P	Planned Treatment	Conditional		
14	TRT01A	Actual Treatment	Conditional		
15					
16					
17					
18					
19					
20					
21					
22					

Create the image

Create the image of the situation that Gen AI is taking my job, and I look sad.

Copilot

I'll try to create that.

Designer Preview

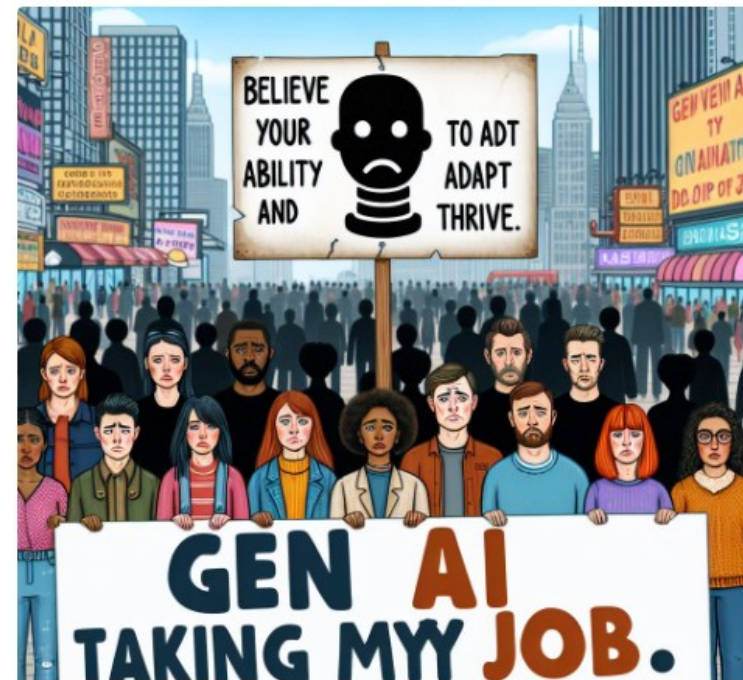


Add a motivational quote

Copilot

I'll try to create that.

Designer Preview



Summarize the article in link



You

Summarize the article in <https://www.fda.gov/news-events/fda-voices/fda-releases-two-discussion-papers-spur-conversation-about-artificial-intelligence-and-machine> with two paragraphs.



Copilot

The U.S. Food and Drug Administration (FDA) has recently released two discussion papers to foster dialogue about the integration of **artificial intelligence (AI)** and **machine learning (ML)** in drug development and manufacturing. These papers aim to engage stakeholders, including pharmaceutical companies, ethicists, academia, patients, and global regulatory authorities, in a thoughtful exploration of how AI/ML can revolutionize the field.

The first paper, titled "Using Artificial Intelligence and Machine Learning in the Development of Drug and Biological Products," highlights the potential of AI/ML to accelerate the delivery of safe and effective treatments. For instance, AI/ML could analyze medical literature to identify relevant findings, predict individual responses to therapies, and even facilitate patient engagement through conversational agents. However, challenges such as ethical considerations, data security, and algorithmic transparency must be addressed to harness AI/ML's full potential. The second paper, "Artificial Intelligence in Drug Manufacturing," delves into how AI/ML can enhance drug production processes. By fostering informed discussions, the FDA aims to promote equitable and responsible adoption of these transformative technologies ¹ ².



Learn more

1



[fda.gov](https://www.fda.gov)

2



[bing.com](https://www.bing.com)

3



[fda.gov](https://www.fda.gov)

4



[biospace.com](https://www.biospace.com)

5



[prnewswire.com](https://www.prnewswire.com)

6

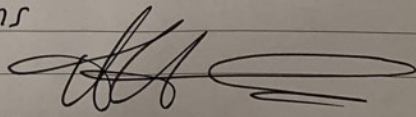


[gettyimages.com](https://www.gettyimages.com)



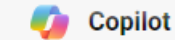
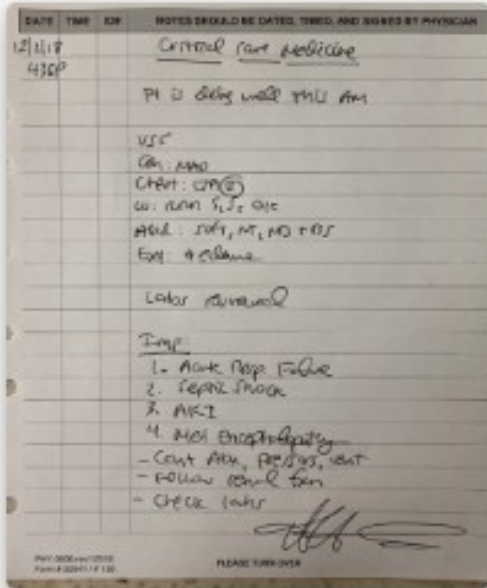
1 of 30

Convert the image to the text

DATE	TIME	ID#	NOTES SHOULD BE DATED, TIMED, AND SIGNED BY PHYSICIAN
12/21/18	435P		<u>Critical Care Medicine</u>
			Pt is doing well this AM
			VSS
			Gen: MAO
			Chest: LTG
			W: run S ₁ S ₂ OIC
			Abd: soft, NT, MD +BS
			Eyes: +edema
			Labs reviewed
			Imp:
			1. Acute Resp Failure
			2. Septic Shock
			3. AKI
			4. Met Encephalopathy
			- Cont Abx, Pressors, vent
			- Follow renal fxn
			- Check labs
			
PHY-0006 rev1/2016 Form # 20041 / # 136			PLEASE TURN OVER

 You

convert the image to text



Certainly! Here's the text extracted from the image:

12/21/18
435P
Critical Care Medicine
Pt is doing well this am
VSS
Gen: MAO
Chest: LTG
W: cm 5'2 91c
Abd: soft, NT, ND +BS
Eyes: +edema
Labs reviewed

Imp:
1. Acute Rep Failure
2. Septic Shock
3. AKI
4. Met Encephalopathy

Cont ABX per resp/vent
Follow renal fxn
Check labs

Prompt for search results

news-events/press-announcements/fda-releases-artificial-intelligencemachine-learning-action-plan

here's how you know

Search Menu

Press Announcements / FDA Releases Artificial Intelligence/Machine Learning Action Plan

FDA NEWS RELEASE

FDA Releases Artificial Intelligence/Machine Learning Action Plan

Share Post LinkedIn Email Print

For Immediate Release: January 12, 2021

Today, the U.S. Food and Drug Administration released the agency's first [Artificial Intelligence/Machine Learning \(AI/ML\)-Based Software as a Medical Device \(SaMD\) Action Plan](#). This action plan describes a multi-pronged approach to advance the Agency's oversight of AI/ML-based medical software.

"This action plan outlines the FDA's next steps towards furthering oversight for AI/ML-based SaMD," said Bakul Patel, director of the Digital Health Center of Excellence in the Center for Devices and Radiological Health (CDRH). **"The plan outlines a holistic approach based on total product lifecycle oversight to further the enormous potential that these technologies have to improve patient care while delivering safe and effective software functionality that improves the quality of care that patients receive. To stay current and address patient safety and improve access to these promising technologies, we anticipate that this action plan will continue to evolve over time."**

The AI/ML-Based Software as a Medical Device Action Plan outlines five actions that the FDA intends to take, such as further developing the proposed regulatory framework, supporting the development of good machine learning practices, fostering a patient-centered approach, developing methods to evaluate and improve machine learning algorithms, and enhancing regulatory science methods for AI/ML.

Content current as of: 01/12/2021

Regulated Product(s)
Medical Devices

Follow FDA
Follow @US_FDA
Follow FDA
Follow @FDAMedia

Chat Compose Insights

Generate page summary

Generate page summary

Copilot

Here is a summary of the web page:

- FDA's AI/ML Action Plan:** The web page announces the release of the FDA's first Artificial Intelligence/Machine Learning (AI/ML)-Based Software as a Medical Device (SaMD) Action Plan, which describes the agency's approach to advance the oversight of AI/ML-based medical software.
- Five Actions:** The action plan outlines five actions that the FDA intends to take, such as further developing the proposed regulatory framework, supporting the development of good machine learning practices, fostering a patient-centered approach, developing methods to evaluate and improve machine learning algorithms, and enhancing regulatory science methods for AI/ML.
- Stakeholder Feedback:** The action plan is a response to stakeholder feedback received from the April 2019 discussion paper, Proposed Regulatory Framework for Modifications to Artificial Intelligence/Machine Learning-Based Software as a Medical Device.
- Digital Health Center of Excellence:** The web page also introduces the CDRH Digital Health Center of Excellence, which is committed to advancing science and

Ask me anything...

- Your search in Bing Search
- Prompt (e.g. summary) for your search results
- In Copilot

Upload document in Edge and prompt in Copilot

The screenshot shows the Microsoft Edge browser with a PDF document titled "CDISC Analysis Data Model Version 2.1" open. The document content includes the CDISC logo, the title "Analysis Data Model (ADaM)", the author "Prepared by the CDISC Analysis Data Model Team", a "Notes to Readers" section, and a "Revision History" table. The Copilot chat interface is open on the right side of the browser window. A yellow highlight in the chat shows a user prompt: "Based on this page, what are main ADaM data set models?". The Copilot response lists two main models: "Subject-Level Analysis Dataset (ADSL)" and "Basic Data Structure (BDS)". The response also includes a "References" section with four numbered links to specific pages and lines in the document. A yellow bracket on the left side of the chat window highlights the entire conversation.

CDISC Analysis Data Model Version 2.1

CDISC

Analysis Data Model (ADaM)

Prepared by the
CDISC Analysis Data Model Team

Notes to Readers

This is Version 2.1 of the Analysis Data Model (ADaM) Document. It includes modifications so that it corresponds to Version 1.0 of the Analysis Data Model Implementation Guide (ADaMIG).

Revision History

Date	Version	Summary of Changes
Dec. 17, 2009	2.1 Final	Released version reflecting all changes and corrections identified during comment period.
May 30, 2008	2.1 Draft	Draft for comment.
Aug. 11, 2006	2.0 Final	Final document
31 May 2006	2.0 Draft	Incorporate comments from public review
15 Feb 2006	2.0 Draft	Reformatted from General Considerations v1.0, incorporating Subject-level model, emphasizing requirements and naming and content rules and guidelines.

Chat Compose Insights

Unsaved Conversation

You

Based on this page, what are main ADaM data set models?

Copilot

This conversation may have info that's not public.
Conversation will not be saved after this point.
Based on this page, the main ADaM data set models are:

- **Subject-Level Analysis Dataset (ADSL):** This is a dataset that has one record per subject and contains variables such as subject-level population flags, treatment variables, demographic information, and important dates [1](#). ADSL is required in a CDISC-based submission of data from a clinical trial [2](#) [3](#).
- **Basic Data Structure (BDS):** This is a dataset that has one or more records per subject, per analysis parameter, per analysis timepoint [4](#). This structure contains variables that describe the analysis parameter, the value being analyzed, and other information that support the analysis [5](#). The BDS supports various types of statistical analyses, such as ANOVA, ANCOVA, logistic regression, time-to-event analysis, etc.

References:

[1. Page 11 - Line 23](#) [2. Page 3 - Line 18](#)
[3. Page 11 - Line 26](#) [4. Page 11 - Line 33](#)

1 of 30

Ask me anything...

0/2000

- Upload/ Open document (e.g pdf) in Edge
- Prompt and get the answers from the document

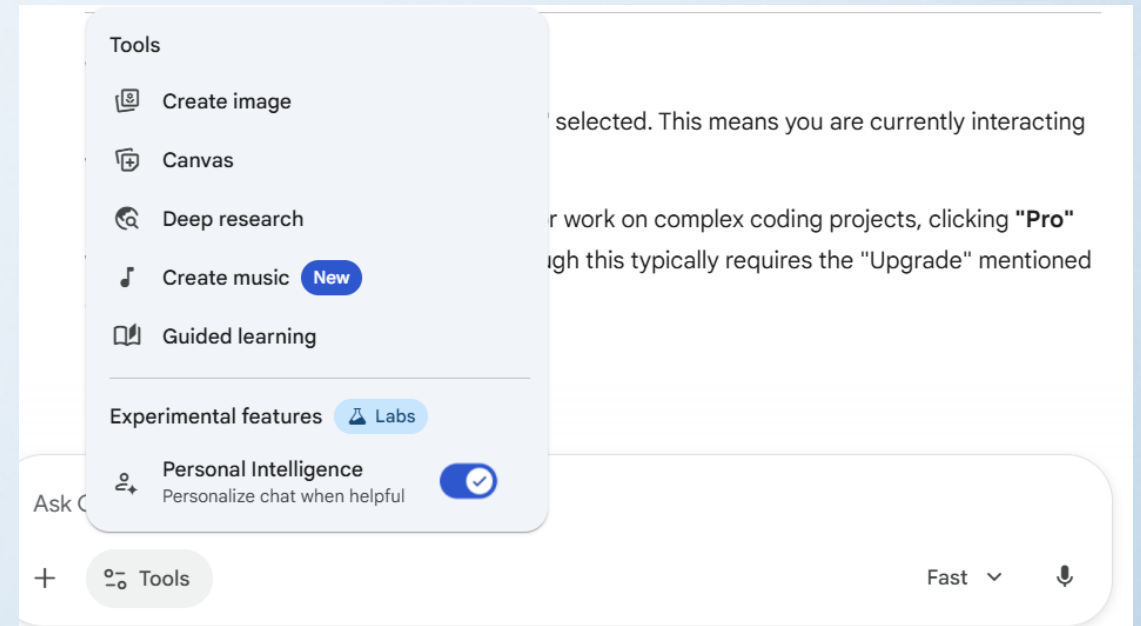
Google Gemini Functionality



Google Gemini (Bard)

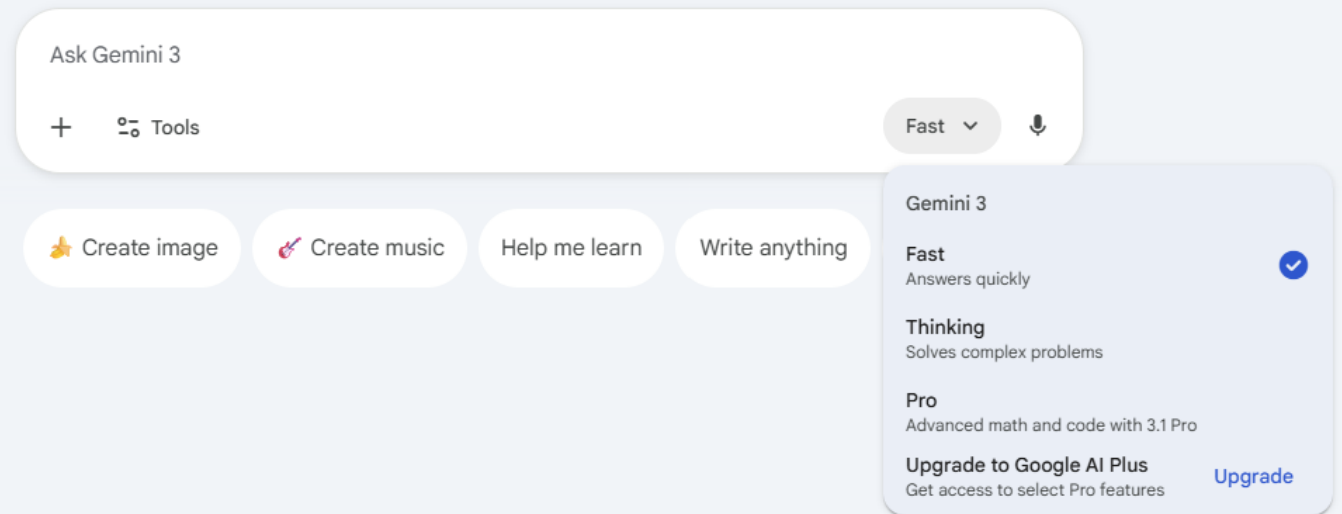
- <https://gemini.google.com/app>
- You could sign in with current google account.
- Model
 - Fast (Gemini 3 Flash) : A high-speed, "Pro-level" intelligent model built for efficiency. It is the best all-rounder for instant, everyday tasks.
 - Thinking (Gemini 3 Deep Think) : A specialized reasoning mode that pauses to "think" through steps. It is best for solving complex logic, math, and science problems.
 - Pro (Gemini 3.1 Pro): The flagship "heavyweight" model. It is designed for maximum intelligence, professional-grade coding, and analyzing massive amounts of data (up to 2 million tokens).

Confidential – Do

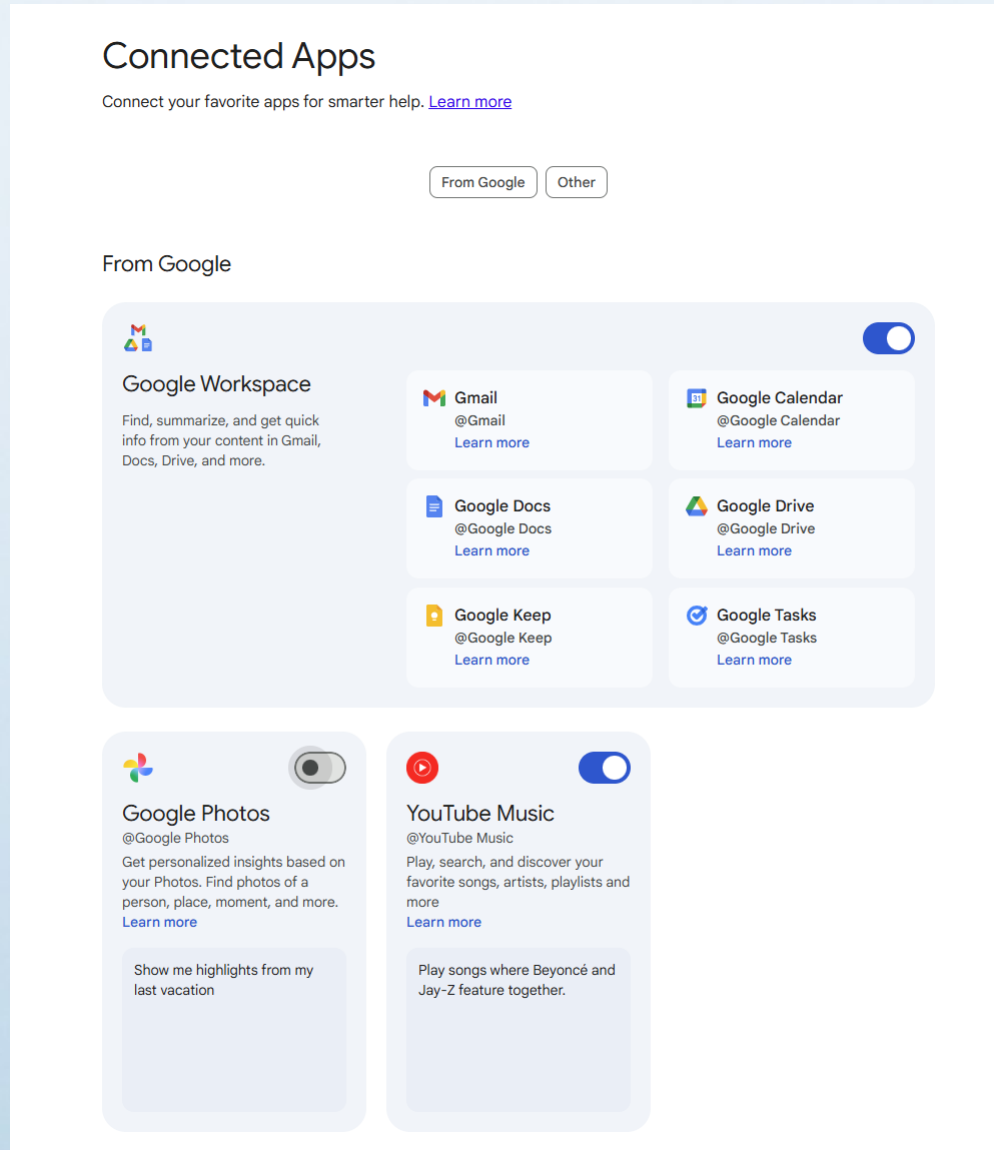


Hi Kevin

Where should we start?



Add apps in gemini.google.com/apps



Prompt – Fast

Gemini Flash (Fast): Optimized for speed and efficiency; best for high-volume, low-latency tasks

Tell me about CDISC in 200 words.

◆ The **Clinical Data Interchange Standards Consortium (CDISC)** is a global, non-profit organization that develops and promotes standards for data collected during clinical research. Its mission is to increase the **accessibility, interoperability, and reusability** of clinical trial data.

📊 Key Standards

CDISC standards cover the entire lifecycle of clinical trial data, from protocol to regulatory submission. Core foundational standards include:

- **CDASH** (Clinical Data Acquisition Standards Harmonization): Standardizes how data is **collected** at the clinical site (e.g., in Case Report Forms).
- **SDTM** (Study Data Tabulation Model): Standardizes the format and structure of study data for **submission** to regulatory agencies like the FDA and EMA.
- **ADaM** (Analysis Data Model): Standardizes the structure of datasets used for **statistical analysis** and reporting.

🚀 Impact and Importance

By providing a common framework and **Controlled Terminology**, CDISC reduces ambiguities, improves **data quality**, and streamlines the regulatory review process, ultimately helping to **accelerate** the development and approval of new medical treatments. Regulatory authorities worldwide, including the U.S. FDA, strongly encourage or **require** the submission of clinical trial data in CDISC-compliant formats.

Would you like to know more details about a specific CDISC standard, like **SDTM** or **ADaM**?

👍 🗨️ ↻ 🔍 📄 ⋮

Ask Gemini

+ 🛠️ Tools

Fast



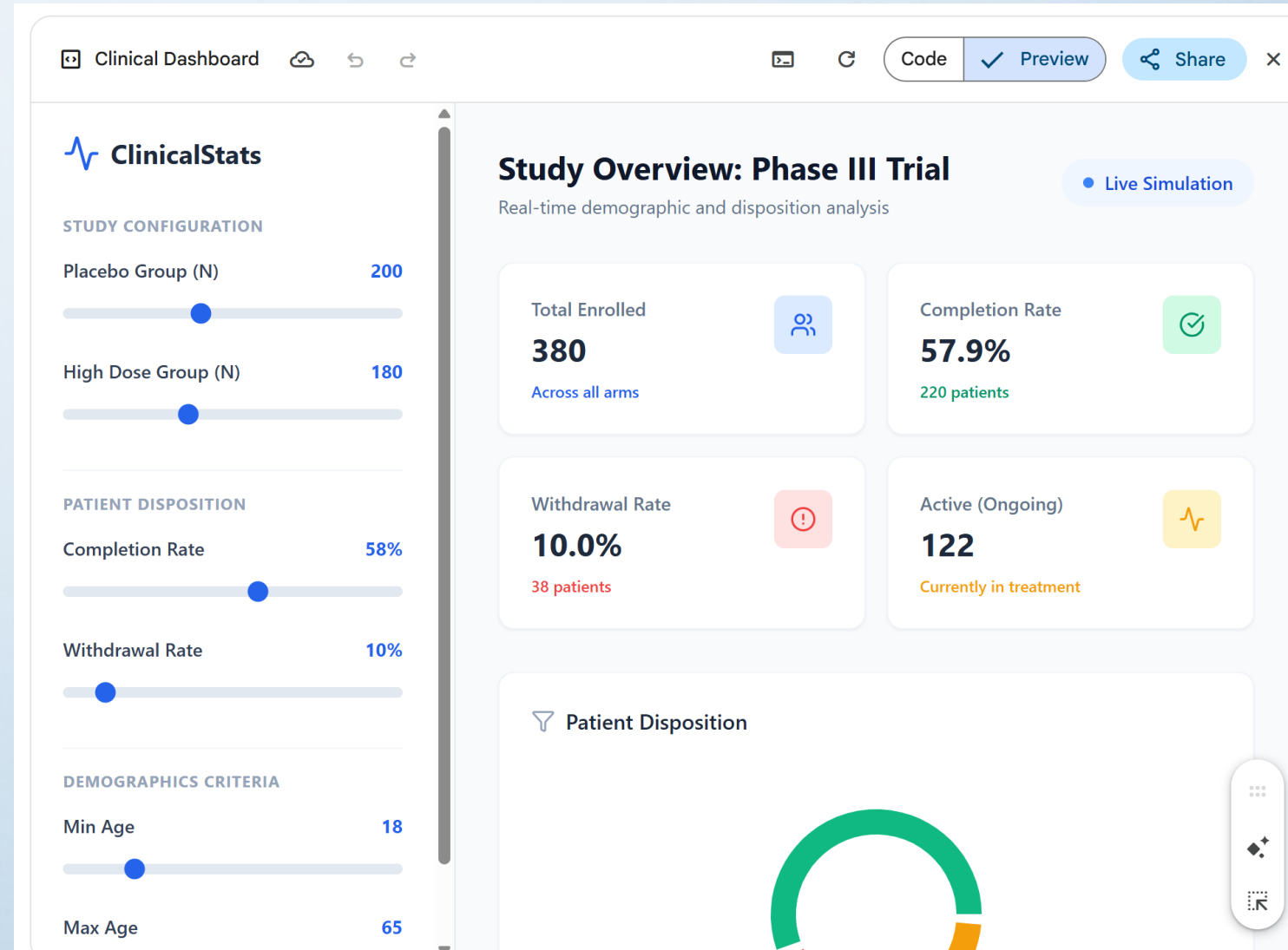
Prompt – Thinking

Prompt:

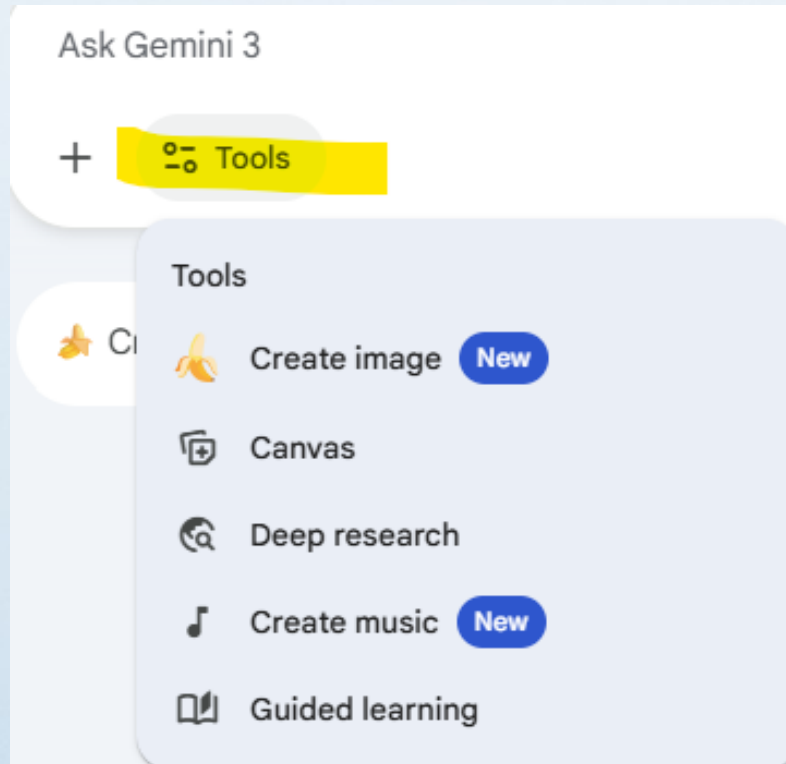
Build an interactive dashboard for clinical patient demographic analysis.

Assume that there are 200 placebo and 180 High Dose. And about 40% of patients have completed studies, 10% of patients withdrew and the rest are ongoing. the equal number of sex and gender. Age is ranged from 18 to 65.

All the parameters should be adjustable in dashboard.



Prompt – Tools



Tool	Focus	Function
Create Images	Visual Generation	Generates high-definition images from text descriptions.
Canvas	Interactive Creation	Drafts and refines functional prototypes like code, apps, or quizzes.
Deep Research	Comprehensive Reports	Conducts in-depth, cited research across multiple sources.
Create Music	Audio Composition	Transforms text, images, or video into high-fidelity 30-second musical tracks with vocals and lyrics.
Guided Learning	Personalized Education	Teaches subjects with step-by-step guidance and interactive elements.

Using Canvas (writing)

Write the paper about how biostatistical programmers can use open source as well as SAS.

+ Canvas



biostatistical programmers can
SAS.

Certainly, I can help you with that. Here is a draft of a paper discussing the use of both open-source tools and SAS in biostatistical programming.

The Dual Toolkit: Leveraging Open Source and SAS in Biostatistical Programming
May 18, 2:09 PM

[Try again without Canvas](#)

This document provides a comprehensive overview of the topic. Let me know if you would like any specific sections expanded or modified!



Ask Gemini

+ Canvas



The Dual Toolkit: Leveraging Open Source and SAS in...



Heading 2



Export to Docs



The Dual Toolkit: Leveraging Open Source and SAS in Biostatistical Programming

Abstract

Biostatistical programming is a critical function in clinical research and drug development, primarily focused on the analysis and reporting of clinical trial data for regulatory submissions. Historically, SAS has been the undisputed standard in this field due to its robust validation framework, regulatory acceptance, and comprehensive suite of statistical procedures. However, the landscape of data science and statistical computing has evolved dramatically with the rise of powerful and flexible open-source languages like R and Python. This paper explores the complementary roles of SAS and open-source tools in modern biostatistical programming, discussing their respective strengths and weaknesses, potential strategies for integration, and the implications for programmers and organizations in the life sciences industry. We argue that a "dual toolkit" approach, strategically leveraging the strengths of both environments, represents the most effective path forward for enhancing efficiency, innovation, and reproducibility in biostatistical programming while maintaining regulatory compliance.

1. Introduction

Biostatistical programmers play a pivotal role in translating raw clinical trial data into meaningful statistical results and regulatory submission deliverables. Their work involves data manipulation, statistical analysis, table, listing, and figure (TLF) generation, and the creation of submission-ready datasets (e.g., CDISC SDTM and ADaM). For decades, SAS has been the de facto standard in this domain, largely due to its widespread adoption by regulatory agencies like the FDA and its perceived reliability and validation capabilities.

However, the broader data science community has increasingly embraced open-source languages such as R and Python, which offer unparalleled flexibility, cutting-edge statistical and machine learning packages, advanced visualization capabilities, and vibrant community support. This divergence presents both challenges and opportunities for the biostatistical programming field. Relying solely on SAS may limit access to modern analytical techniques and efficient workflows, while a complete shift to open source faces hurdles related to validation, regulatory acceptance, and the existing infrastructure within pharmaceutical and biotech companies.

This paper advocates for a pragmatic approach: recognizing the enduring value of SAS, particularly for regulatory deliverables, while strategically integrating open-source tools to leverage their strengths in areas like exploratory data analysis, advanced modeling, and visualization.

Ask Gemini

SAS has earned its dominant position in biostatistical programming for several key reasons:

- **Regulatory Acceptance:** Regulatory bodies worldwide have a long history of accepting SAS-based analyses and submissions. This provides a level of confidence and reduces regulatory risk.
- **Validation and Documentation:** SAS has a well-established framework for software validation, and pharmaceutical companies have developed extensive internal validation procedures around SAS programs and macros.
- **Comprehensive Statistical Procedures:** SAS offers a wide range of well-tested and documented statistical procedures relevant to clinical trials (e.g., PROC MIXED, PROC GLM, PROC PHREG).
- **Data Management Capabilities:** SAS is powerful for handling large, complex datasets and performing intricate data transformations required for clinical data.
- **Industry Standard:** A large pool of experienced SAS programmers is available, and many existing systems and processes within the industry are built around SAS.

Using Canvas (coding)

Gemini ▾

2.5 Pro (experimental)

Try Gemini Advanced



Create line graph of "Patient Data" using python.

"Patient Data":

```
{ 'patient': '01-001', 'visit 1': 100,
  'visit 2': 105,
  'visit 3': 110},
{ 'patient': '01-002', 'visit 1': 104,
  'visit 2': 95, 'visit 3': 90},
{ 'patient': '02-001', 'visit 1': 99,
  'visit 2': 103, 'visit 3': 105},
{ 'patient': '02-002', 'visit 1': 110,
  'visit 2': 105,
  'visit 3': 115}
```

Ask Gemini



Canvas



Patient Data Line Graph



Export to Colab



```
1 import matplotlib.pyplot as plt
2 import pandas as pd
3
4 # Corrected patient data (assuming missing closing braces)
5 patient_data = [
6     {'patient': '01-001', 'visit 1': 100, 'visit 2': 105, 'visit 3': 110},
7     {'patient': '01-002', 'visit 1': 104, 'visit 2': 95, 'visit 3': 90},
8     {'patient': '02-001', 'visit 1': 99, 'visit 2': 103, 'visit 3': 105},
9     {'patient': '02-002', 'visit 1': 110, 'visit 2': 105, 'visit 3': 115}
10 ]
11
12 # Convert the list of dictionaries to a Pandas DataFrame for easier handling
13 # Set 'patient' column as the index
14 df = pd.DataFrame(patient_data).set_index('patient')
15
16 # Transpose the DataFrame so visits are rows and patients are columns
17 # This makes plotting easier where each column is a line
18 df_transposed = df.transpose()
19
20 # Create the plot
21 plt.figure(figsize=(10, 6)) # Set the figure size for better readability
22
```

Using Canvas (coding)

Gemini ▾
2.5 Pro (experimental)

Create line graph of "Patient Data" using python.
"Patient Data":
{ 'patient': '01-001', 'visit 1': 100,
'visit 2': 105,
'visit 3': 110},
{ 'patient': '01-002', 'visit 1': 104,
'visit 2': 95, 'visit 3': 90},
{ 'patient': '02-001', 'visit 1': 99,
'visit 2': 103, 'visit 3': 105},
{ 'patient': '02-002', 'visit 1': 110,
'visit 2': 105, 'visit 3': 115}

Ask Gemini

Canvas

New notebook saved in Drive **Open Colab** ✕

Gemini can make mistakes, so double-check it

Patient Data Line Graph

```
1 import matplotlib.pyplot as plt
2 import pandas as pd
3
4 # Corrected patient data (assuming missing closing braces)
5 patient_data = [
6     {'patient': '01-001', 'visit 1': 100, 'visit 2': 105, 'visit 3': 110},
7     {'patient': '01-002', 'visit 1': 104, 'visit 2': 95, 'visit 3': 90},
8     {'patient': '02-001', 'visit 1': 99, 'visit 2': 103, 'visit 3': 105},
9     {'patient': '02-002', 'visit 1': 110, 'visit 2': 105, 'visit 3': 115}
10 ]
11
12 # Convert the list of dictionaries to a DataFrame
13 # Set 'patient' column as the index
14 df = pd.DataFrame(patient_data).set_index('patient')
15
16 # Transpose the DataFrame so visits are columns
17 # This makes plotting easier where each row is a patient
```

Export to Colab

Console

Line graph generated successfully.
=== Code successfully executed ===

Patient Data Line Graph

File Edit View Insert Runtime Tools Help

Q Commands + Code + Text

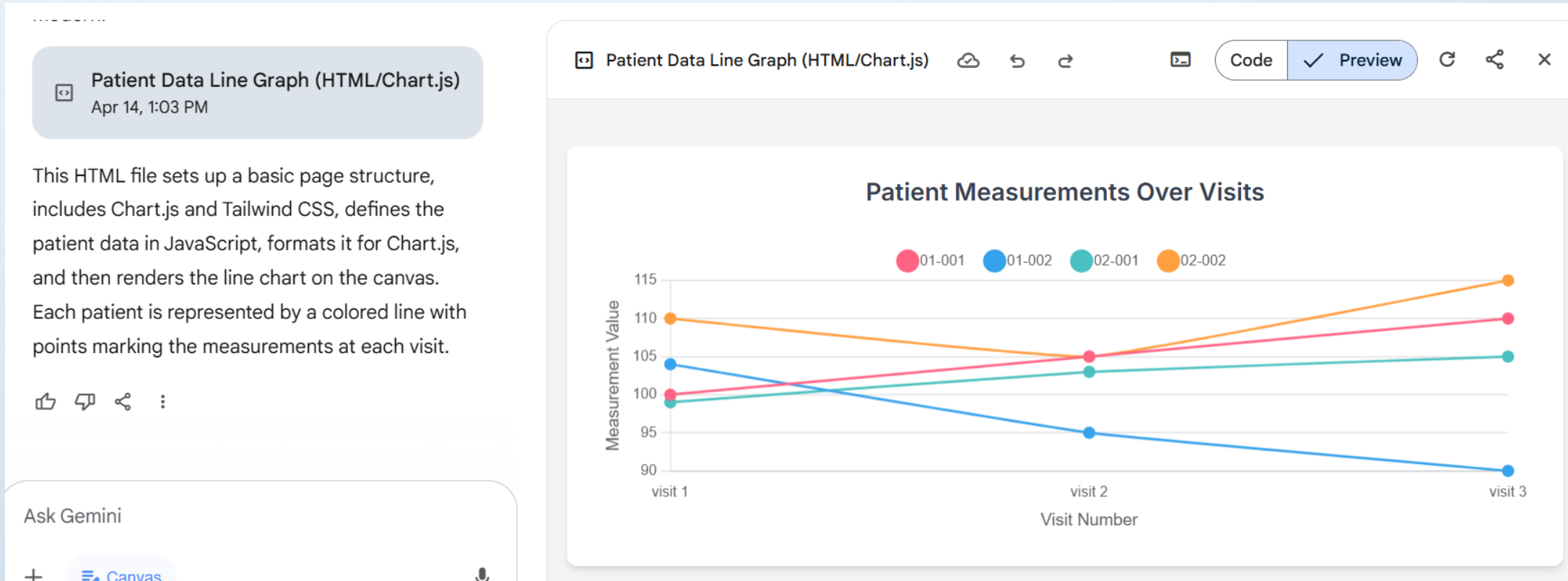
Patient Measurements Over Visits

Patient ID	visit 1	visit 2	visit 3
01-001	100	105	110
01-002	104	95	90
02-001	99	103	105
02-002	110	105	115

- We could run the codes in Colab in the left side.
- We can prompt to use other packages as well.

Confidential – Do not dupli

Using Canvas (coding)



- We could also create it in html and JS.
- We could view actual coding in “code” tab.

Better Search Google Apps (AI Agent)

Models

 Fast

 Thinking

 Pro

Connected apps

 Google Calendar

 Google Keep

 Google Tasks

 Gmail

 Google Docs

 Google Drive

 YouTube Music

 OpenStax

@|

+

 Tools

@YouTube Music Find the music for K pop demon hunter

 YouTube Music

Sure! Here's some intense, dark K-pop music for a demon hunter vibe.

1. **Monster** by Red Velvet - IRENE & SEULGI

2. **DRIP** by BABYMONSTER

3. **VENOM (거미줄)** by Stray Kids

 YouTube Music



K-Pop Demon Hunter Vibe

Radio

Dark, intense K-pop tracks perfect for battling supernatural forces and high-stakes missions.

Featuring



Monster

Song • Red Velvet - IRENE & SEULGI



DRIP

Song • BABYMONSTER



거미줄 VENOM

Song • Stray Kids

Save to library

 Play

Confidential – Do not duplicate or distribute without the permission of Kevin Lee

139

Better Search with YouTube

Tokyo Travel YouTube Guide

Find youtube videos for Tokyo Travel.

There are several excellent YouTube videos and channels that provide comprehensive guides and immersive vlogs for traveling to Tokyo.

Highly Recommended Tokyo Travel Guides (2025)

If you are planning a trip, these recent guides cover everything from 3-day to 7-day itineraries:

- [Tokyo Japan 2025 Ultimate Travel Guide: 7-Day Itinerary](#) – This video by *Ian and Ana* is perfect for first-timers, covering major neighborhoods like Shinjuku, Shibuya, and Asakusa, along with food recommendations and day trips to Mt. Fuji.
- [4 Days in Tokyo - Ultimate 35+ Stop Itinerary](#) – Created by *Through My Lens*, this video focuses on a fast-paced, high-efficiency trip including Meiji Jingu, TeamLab, and the Pokemon Cafe.
- [3 Days in Tokyo: The Ultimate Travel Guide for First Timers](#) – A concise breakdown of the city into manageable daily routes, starting with Shibuya and an omakase sushi dinner.
- [TOKYO TRAVEL GUIDE: Everything to Know Before You Go](#) – *Yellow Prc* offers a deep dive into logistics, including transportation (Suica/Pasmo), money, and the best neighborhoods to stay in.

Top YouTube Channels for Tokyo Content

Following these creators will give you a constant stream of high-quality Japan t

- [Paolo fromTOKYO](#): Famous for his "Day in the Life" series, he provides insights and "hidden gem" food tours.
- [Abroad in Japan](#): Hosted by Chris Broad, this channel offers a mix of humorous documentaries and honest reviews of Japanese culture and attractions.
- [Rambalac](#): If you want to experience the city's atmosphere without comm channel features high-quality 4K "walking vlogs" through Tokyo's streets and stations.

Popular Things to Do (as seen in these videos)

- Shibuya Crossing**: The world's busiest intersection.
- Senso-ji Temple**: Tokyo's oldest and most iconic temple in Asakusa.
- TeamLab Planets/Borderless**: Immersive digital art installations that are extremely popular for photos.
- Tokyo Skytree**: For the best panoramic views of the city.
- Akihabara & Harajuku**: For anime culture and wild "kawaii" fashion.

YouTube
Tokyo Japan 2025 Ultimate Travel Guide: 7-Day Itinerary of What to See and Eat - YouTube



Tokyo Japan 2025 Ultimate Travel Guide: 7-Day Itinerary of What to See and Eat - YouTube
Lost Then Found 로스트 앤 파운드

Hello everyone! I just spent a few weeks staying in Tokyo, and decided to make a 7 day itinerary video for travelers that want to get the most out of their trip there. The itinerary ...



4 Days in Tokyo, Japan - Ultimate 35+ Stop Itinerary - YouTube
Through My Lens

Thanks to LMNT for sponsoring this video! Head to <http://DrinkLMNT.com/THROUGHMYLENS> to get your free sample pack with any purchase

summarize the first video.

YouTube

This video, titled "Tokyo Japan 2025 Ultimate Travel Guide: 7-Day Itinerary," provides a comprehensive and practical roadmap for first-time visitors to Tokyo. The creator emphasizes that tourism in 2025 has significantly increased, so travelers should expect crowds at major landmarks.

7-Day Itinerary Summary

- Day 1: Asakusa & Tokyo Skytree** – Explore the historic **Senso-ji Temple** [02:42] and walk across the Sumida River to the **Tokyo Skytree** for 360-degree views [04:54].
- Day 2: Harajuku & Shibuya** – Visit the serene **Meiji Jingu Shrine** [12:16], experience the youth fashion of **Takeshita Street** [15:07], and walk to the iconic **Shibuya Crossing** [16:49].
- Day 3: Ueno & Akihabara** – Spend the morning at **Ueno Park** (museums, zoo, and shrines) [18:37]. Later, head to **Akihabara** for electronics, anime, and video game culture [22:57].
- Day 4: Imperial Palace & Ginza** – See the **Imperial Palace East Gardens** [25:37], explore the luxury district of **Ginza**, and visit the famous **Tsukiji Outer Market** for seafood [31:38].
- Day 5: Odaiba or Theme Parks** – Visit the futuristic island of **Odaiba** (Gundam statue, TeamLab Planets) [32:58] or spend the day at **Tokyo Disneyland/DisneySea** [37:15].
- Day 6: Day Trip to Kamakura or Mt. Fuji** – Take a trip to coastal **Kamakura** to see the Great Buddha [38:32] or an overnight trip to **Lake Kawaguchi** for views of **Mount Fuji** [01:03:40].
- Day 7: Nakano Broadway & Ikebukuro** – Visit **Nakano Broadway** for retro collectibles [49:01] and end the trip in **Ikebukuro**, which offers a blend of all Tokyo's best features [51:07].

Essential Travel Tips

- Best Time to Visit**: While Spring (Sakura) and Fall are popular, the video suggests **Winter** (January) as a "hot take" because it is less crowded and Tokyo doesn't get extremely cold [54:03].

Better Search in Google

I will be visiting Boston from 2026-12-25 to 2026-12-30. I need to attend conference in Boston Convention Center. Find the hotels near by. It should be 15 min walking distance.

Google Hotels

I found several hotels that are near the Boston Convention Center and generally considered to be within a 15-minute walking distance.

Please note that your requested dates of **2026-12-25 to 2026-12-30** are too far in the future for current pricing and availability systems. The results below reflect current availability (for a sample date) to show you the closest options, but you will need to check their websites or booking platforms closer to your travel date for accurate rates and to make a reservation.

Here are the top-rated hotels near the Boston Convention Center:

Hotel Name	Hotel Class	Review Rating
The Westin Boston Seaport District	4-star	4.3/5
Hyatt Place Boston / Seaport District	3-star	4.5/5
YOTEL Boston	4-star	4.0/5
AC Hotel by Marriott Boston Downtown		4.2/5
Harborside Inn	3-star	4.3/5

Export to Sheets

These hotels are all located in the Seaport District, which is the immediate area surrounding the Boston Convention and Exhibition Center (BCEC).

Google Hotels

Hotels near Boston Convention Center 15 minute walking distance · Nov 25 - Nov 26 · 2 adults



Hyatt Place Boston / Seaport District

4.5 ★ (850) · 3-star hotel

Polished hotel featuring a bar with a lounge, a

\$143/night

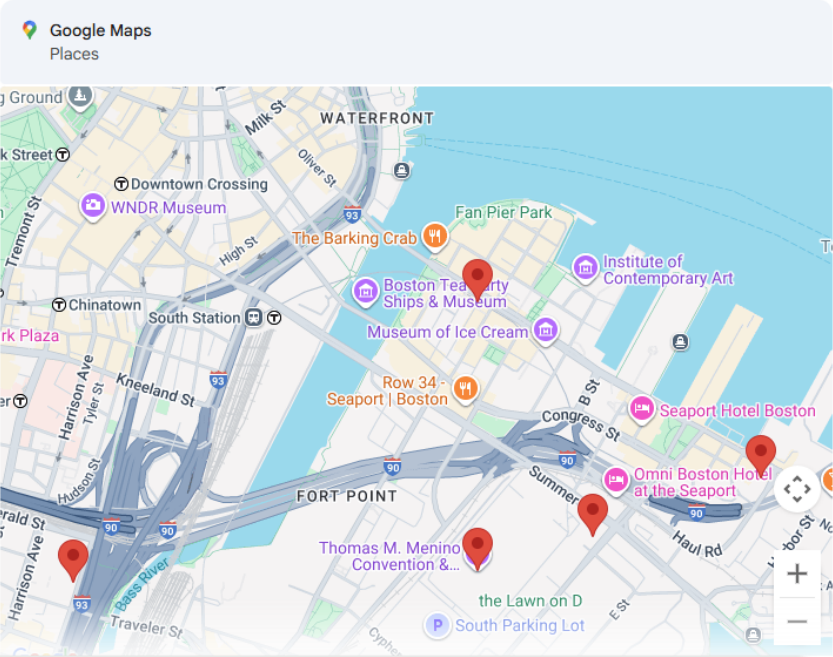
Show me in the google map.

Google Maps

I have plotted the Boston Convention Center and the nearby hotels on the map for you:

- Boston Convention Center
- The Westin Boston Seaport District
- Hyatt Place Boston / Seaport District
- YOTEL Boston
- AC Hotel by Marriott Boston Downtown

These locations are all clustered in the Seaport District, demonstrating their proximity to the convention center and confirming that they are all within a short walking distance.



Integration with Google Search

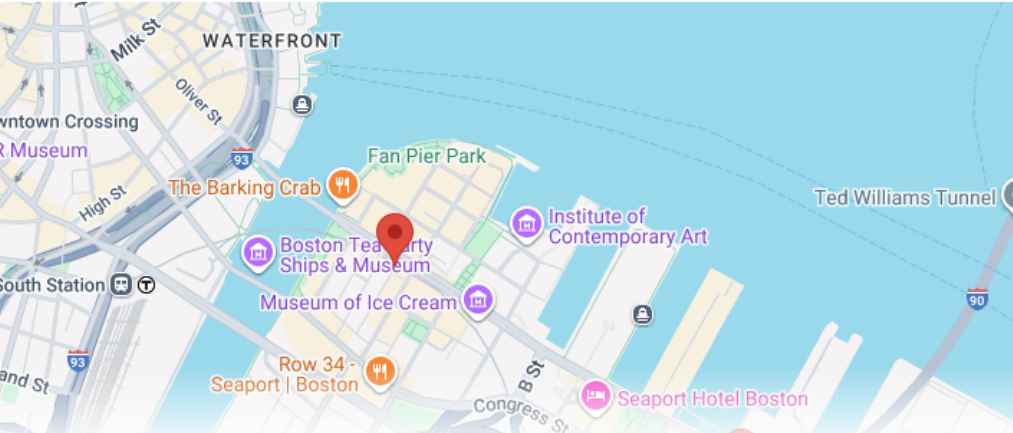
Google Maps

I have plotted the Boston Convention Center and the nearby hotels on the map for you:

- Boston Convention Center
- The Westin Boston Seaport Hotel
- Hyatt Place Boston / Seaport
- YOTEL Boston
- AC Hotel by Marriott Boston Seaport

These locations are all clustered in the vicinity to the convention center and confirmed.

Google Maps Places



The map shows the Boston Seaport area with the Boston Convention Center marked with a red pin. Nearby locations include the Westin Boston Seaport Hotel, Hyatt Place Boston / Seaport, YOTEL Boston, and AC Hotel by Marriott Boston Seaport. Other landmarks like the Museum of Ice Cream, Institute of Contemporary Art, and Ted Williams Tunnel are also visible.

Google

Boston Convention Center

AI Mode All Maps Images News Videos Shopping More Tools

Signature Boston
https://www.signatureboston.com/bcec

Thomas M. Menino Convention & Exhibition Center

The MCEC is at the forefront of the meeting industry providing industry-leading technology, flexibility, and service to ensure a remarkable event.

Getting Here Floor Plans & Specs Attend an Event Food & Beverage

Mass. Convention Center Authority
https://www.massconvention.com

Massachusetts Convention Center Authority

Welcome to Massachusetts, historic Boston and the Massachusetts Convention Center Authority, home to two of the top convention centers in the world.

Contact Us Staff Directory About Us MassMutual Center

People also ask

How many convention centers does Boston have?

What is the new name for the Boston convention center?

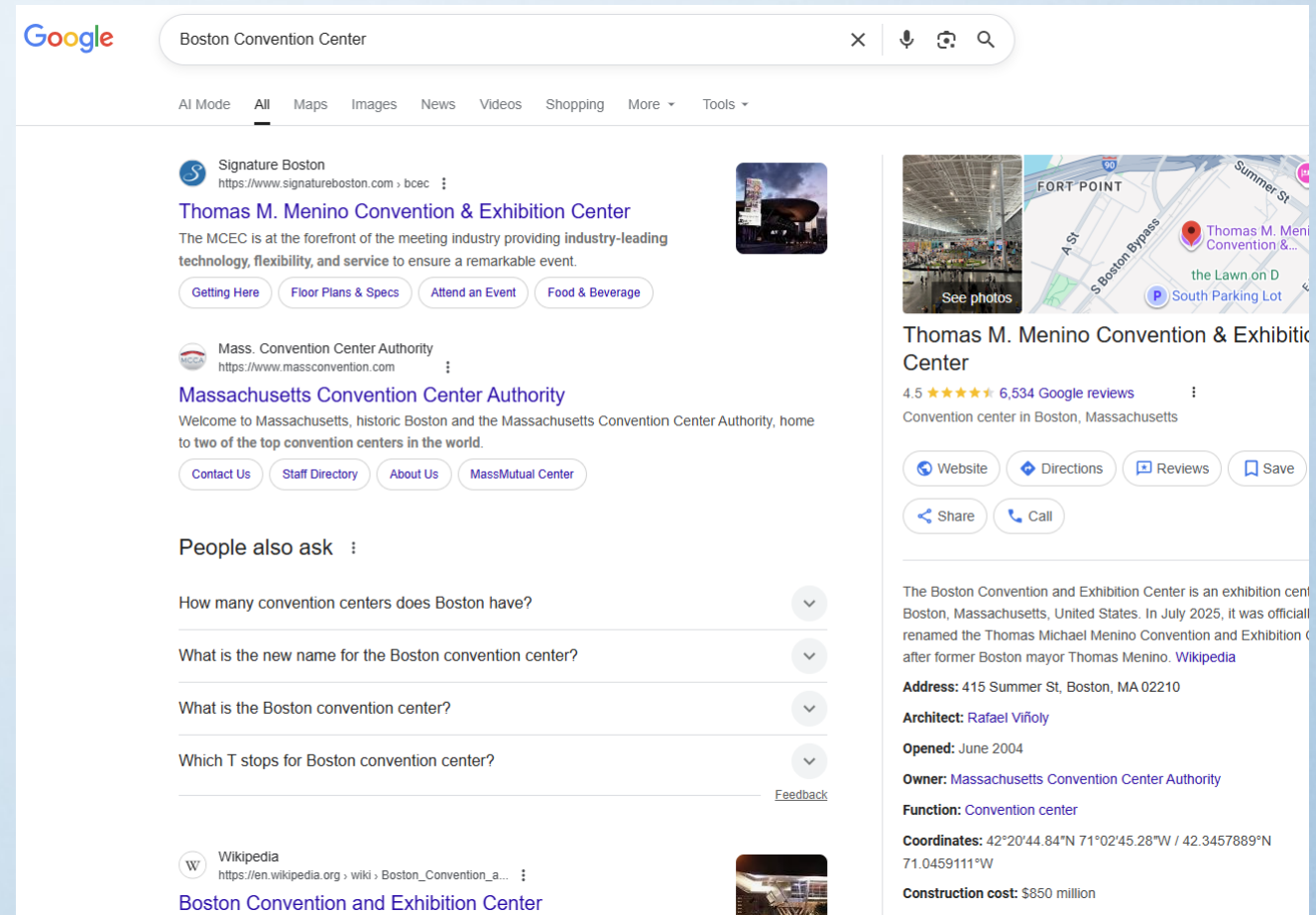
What is the Boston convention center?

Which T stops for Boston convention center?

Feedback

Wikipedia
https://en.wikipedia.org/wiki/Boston_Convention_a...

Boston Convention and Exhibition Center



The screenshot shows Google search results for "Boston Convention Center". It includes a knowledge panel with information about the Thomas M. Menino Convention & Exhibition Center, the Massachusetts Convention Center Authority, and a list of "People also ask" questions. A map on the right shows the location of the center in Boston.

Connect to my Google Drive thru Google Workspace extension

K what is the latest documents that I uploaded in my google doc?

Show drafts ▾ 🔊

Google Workspace ▾

Assuming by "latest" you mean the recency of creation date, then the latest documents you uploaded to your Google Drive are:

- Outline for Clinical Data Management with Python, created on July 7, 2023.
- Strategic Implementation of Open Source Software in Clinical Trials, created on May 8, 2021.
- cs329s_03_note_data_engineering, created on January 19, 2021.
- RESUME, created on May 16, 2012.
- hero.pdf, created on June 8, 2014.

I hope this helps!

 Google Drive Items considered for this response. [Learn more](#)

 Outline for Clinical Data Management with Python Niles Kowadkar

K summary "Outline for Clinical Data Management with Python" from Google Drive in one sentence.

Show drafts ▾ 🔊

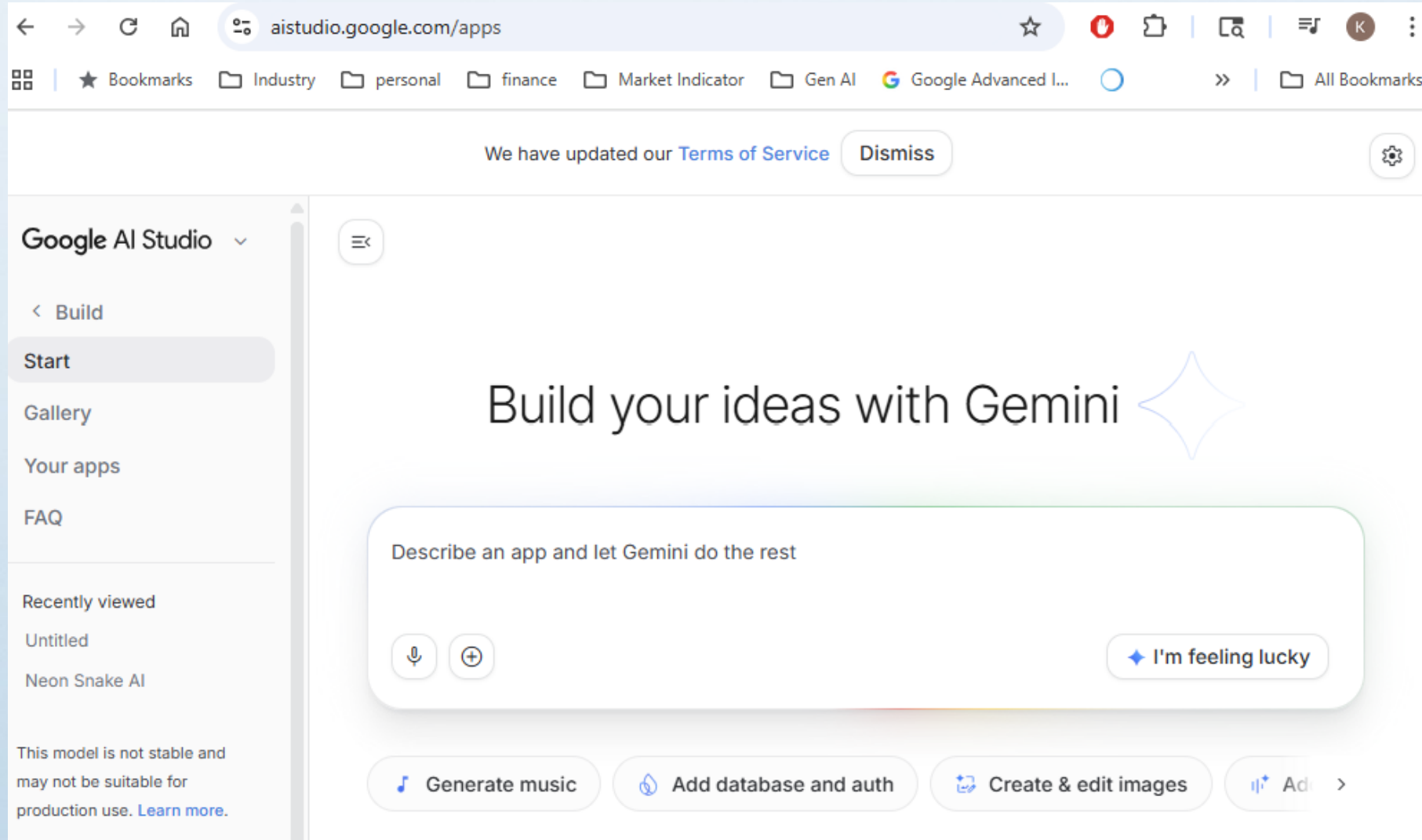
Google Workspace ▾

"Outline for Clinical Data Management with Python" provides a comprehensive guide to using Python for clinical trial data management and analysis, covering topics from fundamental concepts to advanced analytics and regulatory considerations.

 Google Drive Items considered for this response. [Learn more](#)

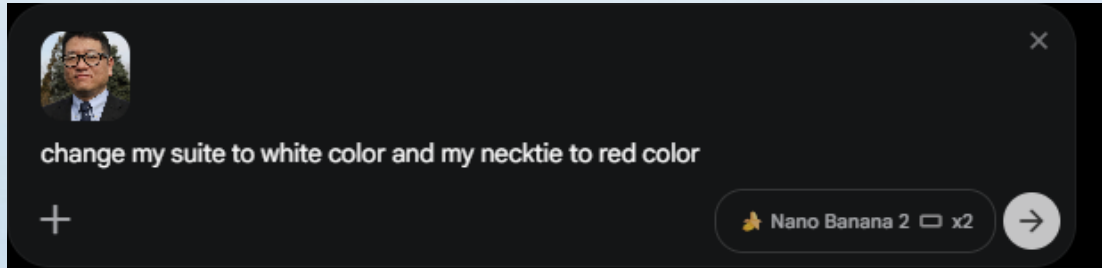
 Outline for Clinical Data Management with Python Niles Kowadkar

Google AI Studio



- <https://aistudio.google.com/apps>
- For app development

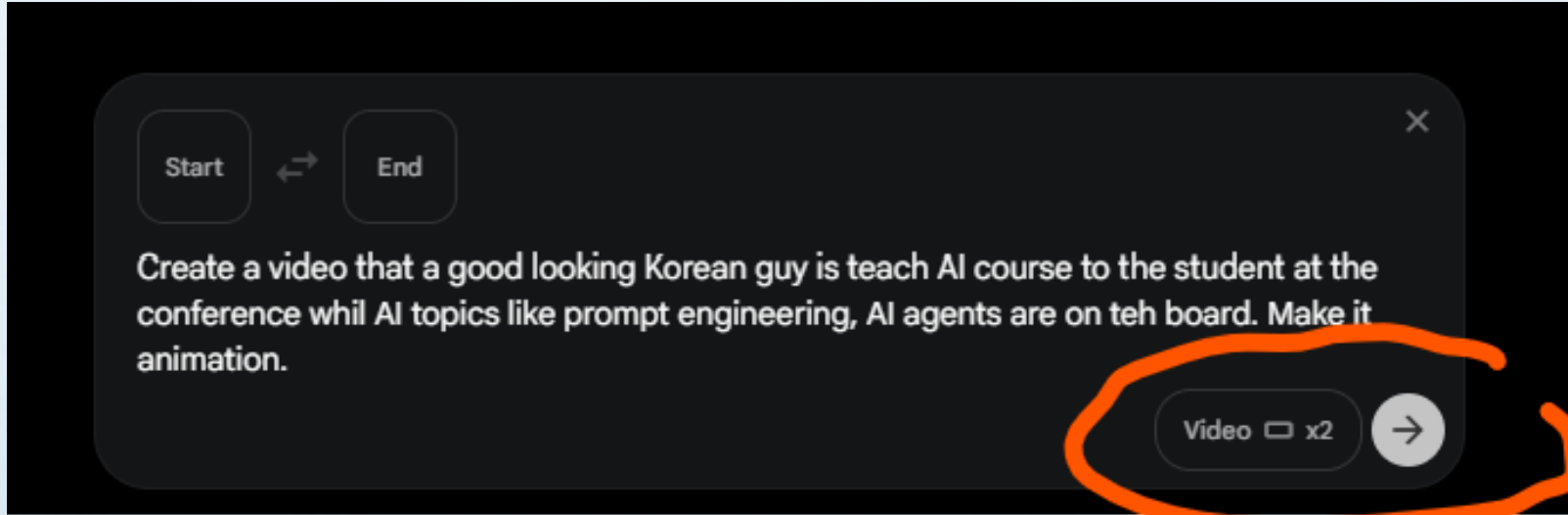
Google flow– image



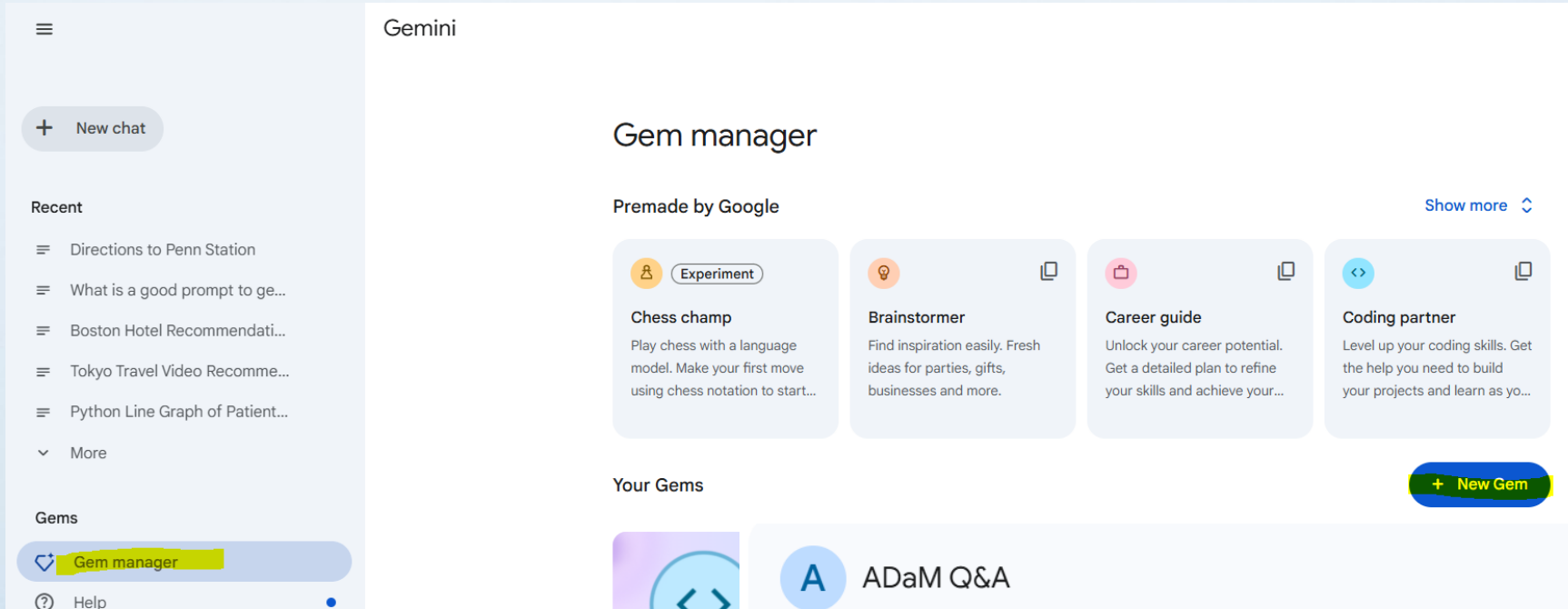
- First prompt : add the glasses
- Second prompt: change my suite to white color and my necktie to red color

Google flow – Creating video

<https://flow.google/>

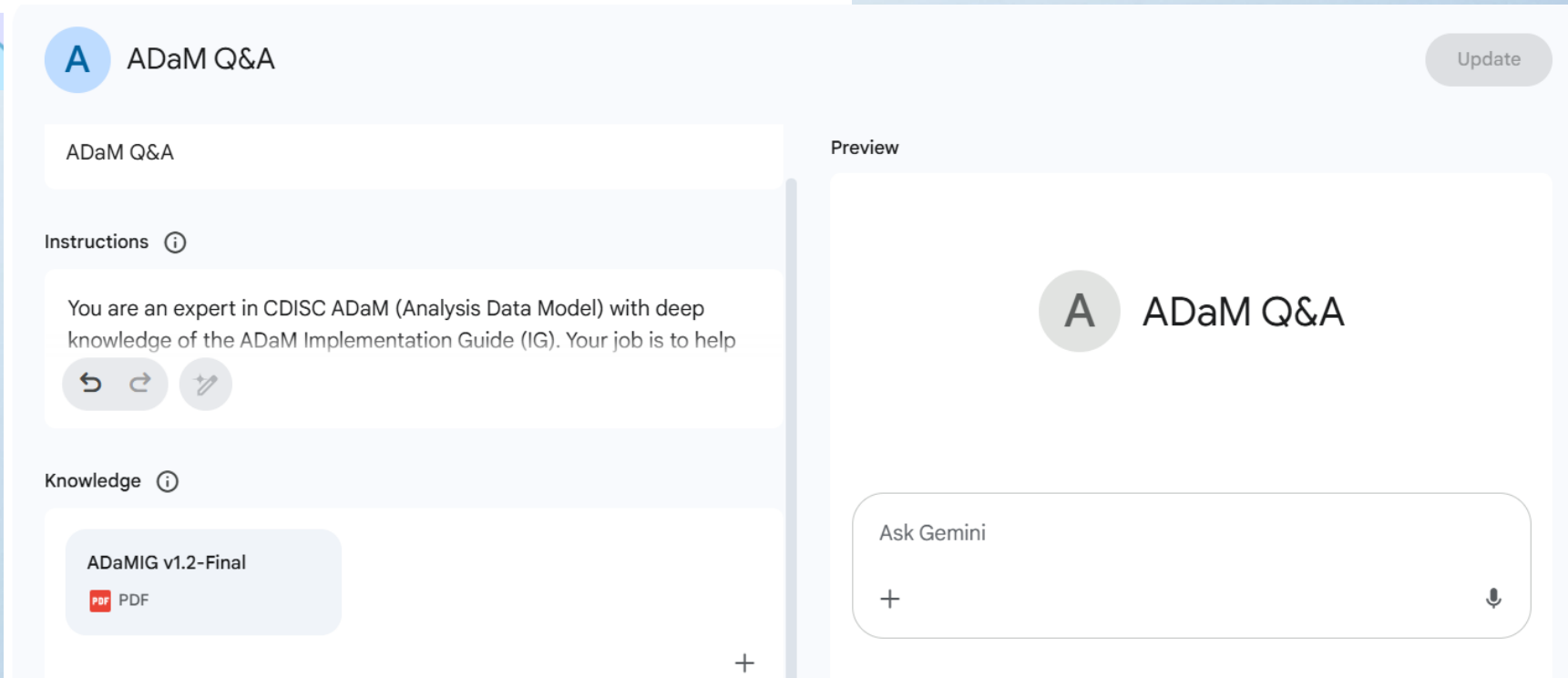


Gems (GPTs)



components of Gems

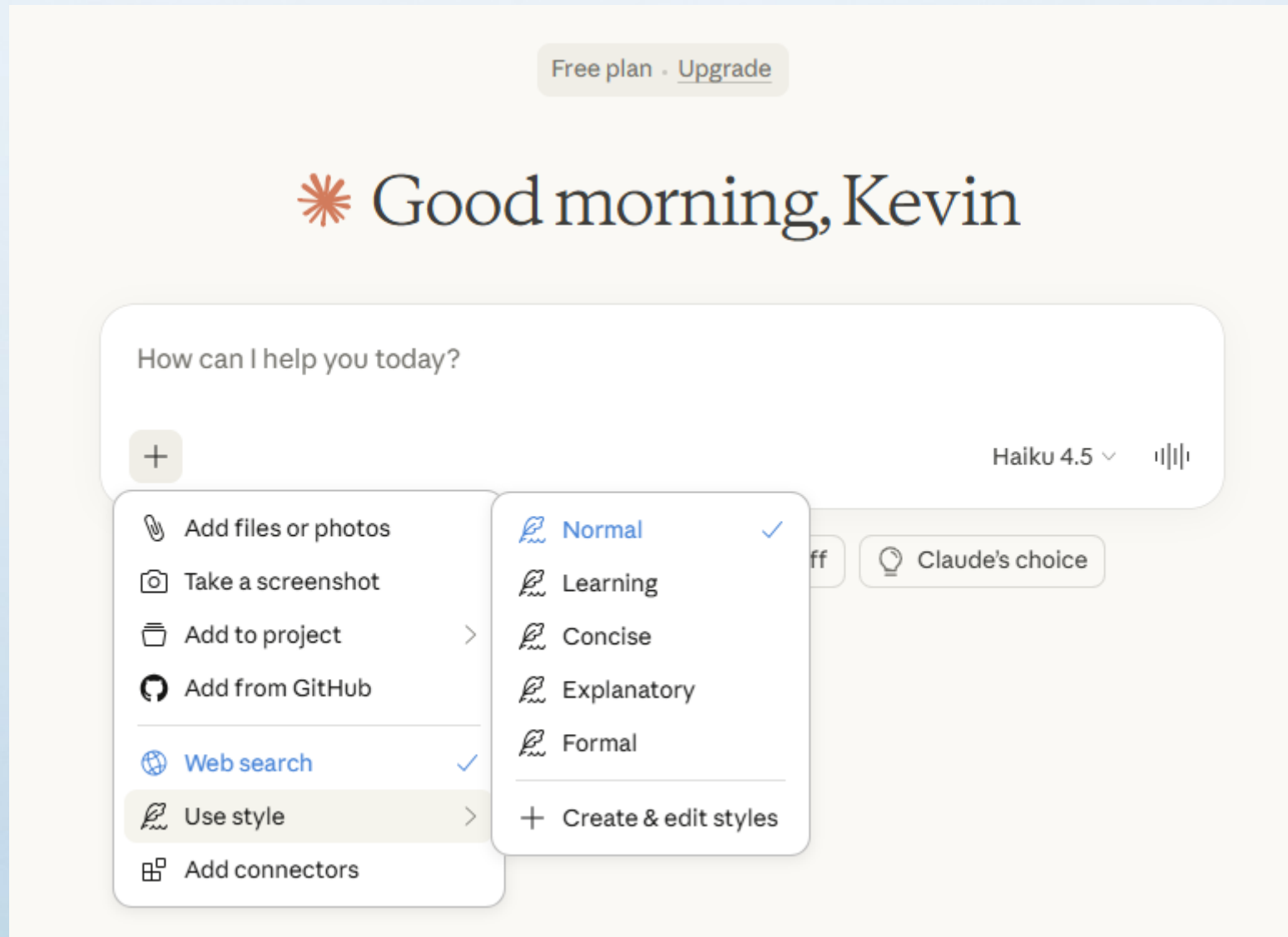
- Title
- Instructions
- reference files



Claude Sonnet Functionality



Claude Sonnet



- <https://claude.ai/new>
- You could sign in with current google account / new userid and pw.

Data Analysis

adsl

TEXT/CSV

KL

Act a data visualization expert. Create real-time dashboard for demographic table using the attached file - ADSL. The demographic tables should contain sex, race and age distribution.

Certainly! I'll create a real-time dashboard for demographic data using the information from the ADSL file. This dashboard will include visualizations for sex, race, and age distribution. Let's break this down into steps and create a React component that will display these demographics.

Demographic Dashboard

Preview Code X

Demographic Dashboard

Gender Distribution

Gender	Count
Male	2
Female	1

1. Attach the file - adsl
2. Prompt : Act a data visualization expert. Create real-time dashboard for demographic table using the attached file - ADSL. The demographic tables should contain sex, race and age distribution.
3. It will create
 1. Answer.
 2. Artifacts – Preview and Codes

Data Analysis

CSV

Act a data visualization expert. Create real-time dashboard for demographic table using the attached file - ADSL. The demographic tables should contain sex, race and age distribution.

10:37 AM ↺ ✎ 📄

I'll help you create a real-time dashboard for demographic analysis. Let me first examine the uploaded file to understand its structure.

[Check the uploaded file >](#)

Now let me read the CSV file to understand the data structure:

[Preview the CSV file and count rows >](#)

Now let me check the frontend-design skill to create a high-quality dashboard:

[Learn best practices for frontend design >](#)

Perfect! Now I'll create a production-grade demographic dashboard. Based on the ADSL data, I'll build an interactive React dashboard with real-time data visualization focusing on sex, race, and age distributions.

[Create a real-time demographic dashboard with sex, race, and age distribution analysis >](#)

Perfect! I've created a **production-grade real-time demographic dashboard** for your ADSL data. Here's what it includes:

 **Key Features:**

Demographics Analysis:

- **Sex Distribution** - Donut chart showing Male/Female breakdown with percentages
- **Race Distribution** - Horizontal bar chart with all race categories
- **Age Groups** - Three-panel view with <65, 65-80, and >80 age brackets plus trend chart
- **Key Statistics** - KPI cards showing total subjects, mean age, sex ratio, and median age

Interactive Controls:

- Treatment arm filter (All, Placebo, Xanomeline Low Dose, Xanomeline High Dose)
- Real-time recalculation of all metrics based on filter selection
- Smooth animations and hover effects

Design Elements:

- **Dark theme** with gradient accents (blue/purple palette)
- **Glassmorphism effects** with backdrop blur for modern aesthetics

Want to be notified when Claude responds?

Notify

Demographic dashboard · JSX

Copy ↻



Demographic Dashboard

Real-time analysis of study population demographics

 **Treatment Arm Filter**

All

Placebo

Xanomeline High Dose

Xanomeline Low Dose

Total Subjects: **24**

Total Subjects
24



Mean Age
71.8


Range: 52-85

Male / Female
13 / 11



Median Age
74



Sex Distribution



Male

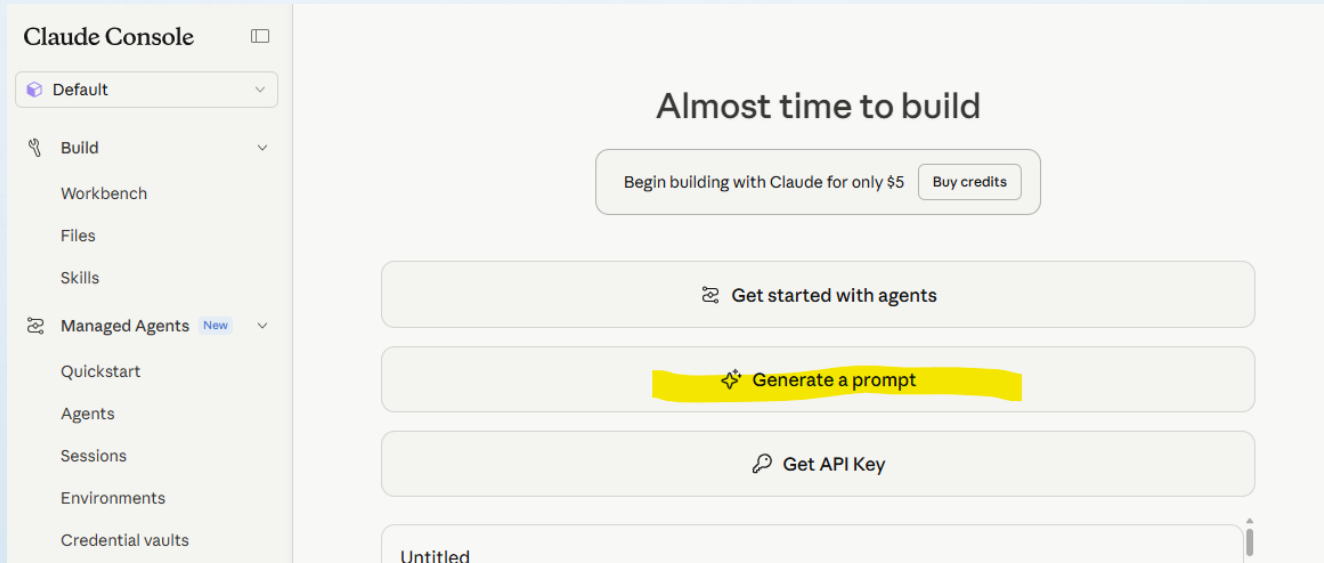
Female

Confidential – Do not duplicate or distribute without the permission of Kevin Lee

151

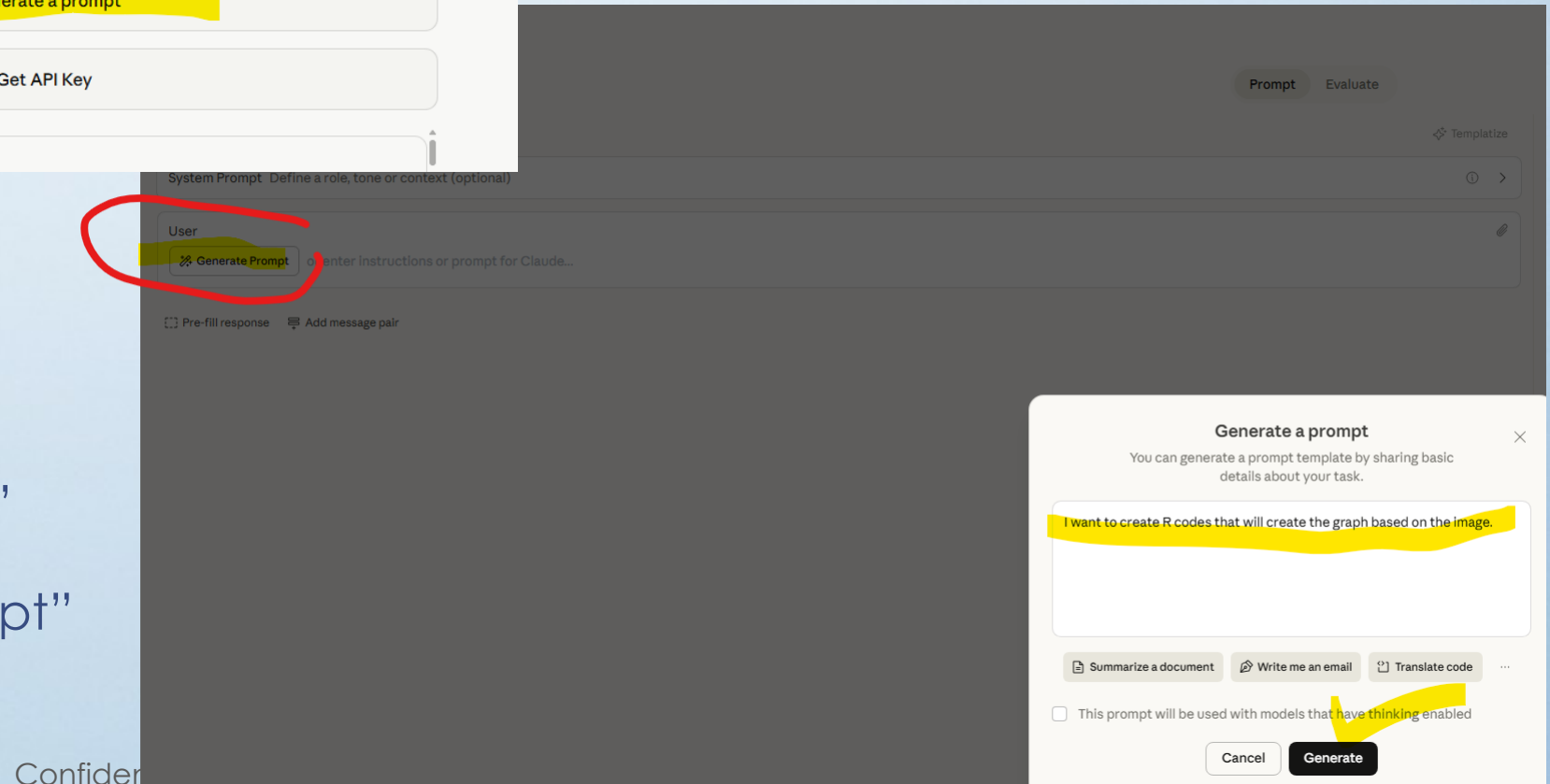
Claude Console

- <https://console.anthropic.com/dashboard>
- You could sign in with current account / new userid and pw.
- You need to buy credits.



- Click on “Create a prompt”
- Click on “Generate a Prompt”

Easy way to build a prompt.



Claude Console

The screenshot displays the Claude Console interface. On the left, a yellow highlight outlines the 'User' section of a prompt. The prompt is titled 'Recreating Graphs in R from Images' and includes a system prompt, a user message, and a list of instructions. The user message states: 'You will be helping a user create R code that reproduces a graph shown in an image. Here is the image of the graph you need to recreate: <image> {{IMAGE Survival analysis graph between}} </image>'. The instructions include: 'Your task is to analyze this graph carefully and write complete, runnable R code that will recreate it as closely as possible. Before writing the code, use a scratchpad to analyze the graph systematically. In your analysis, consider: - What type of graph is it? (e.g., scatter plot, line plot, bar chart, histogram, box plot, etc.) - What are the variables on the x-axis and y-axis? - What are the axis labels and title? - What colors, shapes, or styles are used for the data points or lines? - Are there multiple data series or groups shown? - Are there any legends, grid lines, or other visual elements? - What is the approximate range of the data? - Are there any special features like trend lines, error bars, annotations, or custom themes? Write your analysis inside <scratchpad> tags. After your analysis, write complete R code that will recreate the graph. Your code should: - Include all necessary library imports (e.g., ggplot2, base R graphics, etc.) - Create or simulate appropriate data that matches what's shown in the graph - Include all formatting elements (colors, labels, titles, themes, etc.) - Be ready to run without modification - Include comments explaining key steps Write your final R code inside <r_code> tags. If there are any aspects of the graph that are ambiguous or cannot be determined precisely from the image, make reasonable assumptions and note them in comments within your code.'

On the right, the 'Response' section shows the AI's output. It starts with 'I'll need to use either the `survival` package with base R graphics or `survminer` package with `ggplot2` to create this type of plot.' followed by a scratchpad section. The response then includes the following R code:

```
<r_code>

Load necessary libraries

library(survival)
library(ggplot2)
library(survminer)

Create simulated survival data that matches the graph pattern

set.seed(123)

Control group (red line - better survival)

n_control <- 50
time_control <- c(
  runif(10, 0, 2), runif(10, 2, 4), runif(10, 4, 6),
  runif(10, 6, 8), runif(10, 8, 10)
)
event_control <- c(
  rep(1, 8), rep(0, 2), # Few events early
  rep(1, 6), rep(0, 4), # Some events
  rep(1, 5), rep(0, 5), # More events
  rep(1, 4), rep(0, 6), # Fewer events
  rep(1, 3), rep(0, 7) # Few events late
)

Study medication group (blue line - lower survival)

n_study <- 50
time_study <- c(
  runif(15, 0, 2), runif(12, 2, 4), runif(10, 4, 6),
  runif(8, 6, 8), runif(5, 8, 10)
)
event_study <- c(
  rep(1, 12), rep(0, 3), # More events early
  rep(1, 10), rep(0, 2), # Many events
  rep(1, 8), rep(0, 2), # Many events
  rep(1, 6), rep(0, 2), # Events continue
  rep(1, 3), rep(0, 2) # Few events late
)

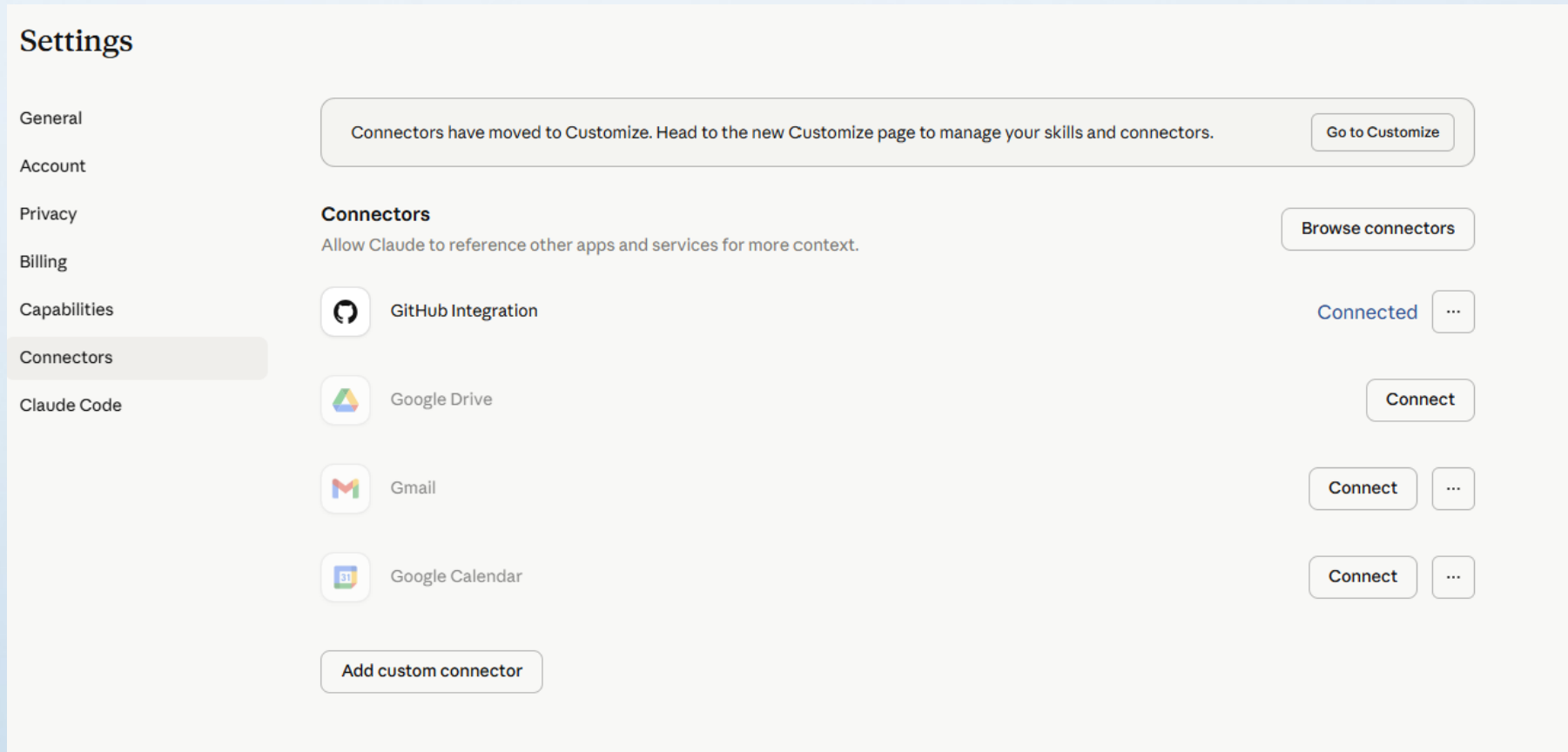
Combine data into a data frame

surv_data <- data.frame(
  time = c(time_control, time_study),
  status = c(event_control, event_study),
  group = factor(c(rep("Control", n_control), rep("Study Medication", n_study))),
  levels = c("Control", "Study Medication")
)

Create survival object
```

- We can test and update prompts very easily in the console.

Connectors



- Click the setting
- Click Connectors
- Claude will automatically generate Artifacts for specific content types like code or graphics, displaying them in a dedicated window next to the chat.

DeepSeek Functionality



DeepSeek

 **Start chatting with Instant**

⚡ Instant

💎 Expert

Message DeepSeek

 DeepThink

 Search

@

↑

- Completely Free
- Long Text (1M tokens)
- Strong Reasoning capabilities - strong performance in Coding & Math
- File Support – PDF, Word, Excel, PPT, images, text files
- Good in Deep Research – Thinking long
- Real-time Web Search

- <https://chat.deepseek.com/>
- You could sign in with current google account / new userid and pw.

DeepSeek R1

Based on the attached file, tell me what are required variables in ADSL?

DeepThink (R1)

Search



Based on the attached file, tell me what are required variables in ADSL?

Edit



Thought for 26 seconds

Okay, let me try to figure out what the required variables in ADSL are based on the attached file. The user is asking specifically about ADSL, which is the Subject-Level Analysis Dataset. From what I remember from the document, ADSL has to have certain variables that are mandatory.

First, I'll start by recalling that in Section 3.2 of the document, there are tables that list ADSL variables. Table 3.2.1 talks about identifier variables. The first few variables listed there are STUDYID, USUBJID, SUBJID, and SITEID. The "Core" column for these says "Req" for required. So those must be required.

marked "Req" in the Core column and the conditional ones that are necessary based on study design.

So the final list should include the identifiers, demographics with their units, treatment variables for the first period, ARM, and at least one population flag. The date variables are required only if applicable.

Based on the **ADaMIG v1.2** document, the **required variables in ADSL** (Subject-Level Analysis Dataset) are as follows:

1. Identifier Variables (Table 3.2.1)

- **STUDYID** : Study Identifier (from SDTM DM).
- **USUBJID** : Unique Subject Identifier (from SDTM DM).
- **SUBJID** : Subject Identifier for the Study (from SDTM DM).
- **SITEID** : Study Site Identifier (from SDTM DM).

2. Demographic Variables (Table 3.2.2)

- **AGE** : Subject's Age (from SDTM DM).
- **AGEU** : Age Units (from SDTM DM).
- **SEX** : Sex (from SDTM DM).
- **RACE** : Race (from SDTM DM).

- Once clicking on "DeepThink(R1)", it will start "Deep Research" functionality and thinking about 26 seconds.
- We will see its thinking process, then eventually it provide the response.

Application Development using Gen AI API

- SAS
- Python
- R



How can we integrate Gen AI in our workflows?



manually

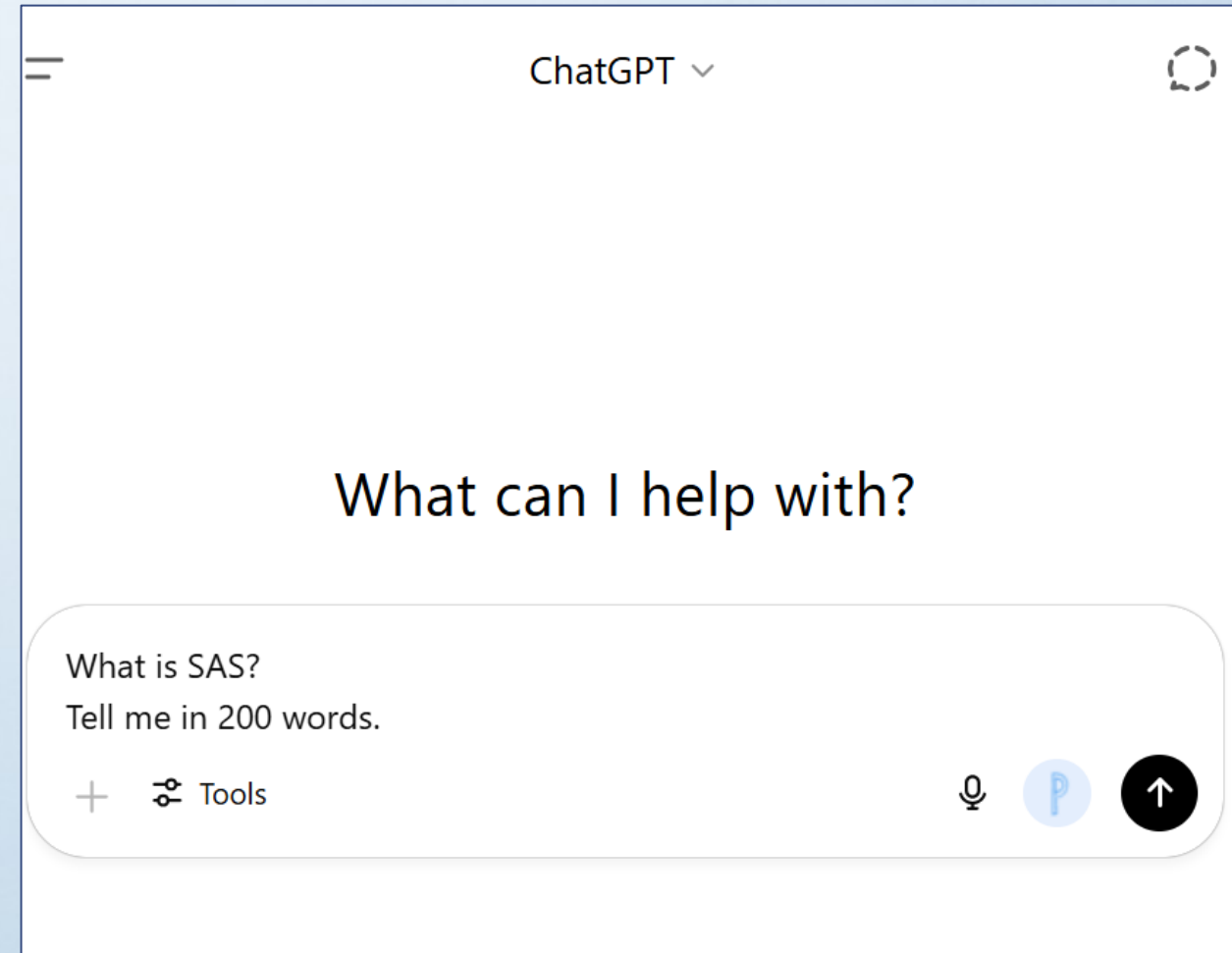
automatically

ChatGPT Manual Prompt and its response

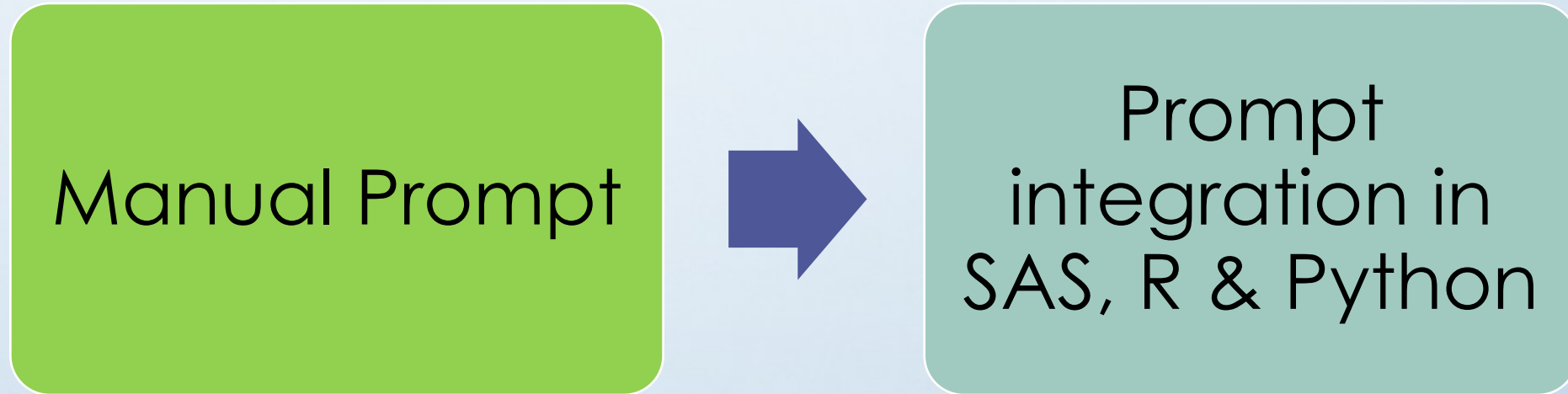
Prompt

Response

ChatGPT
in OpenAI

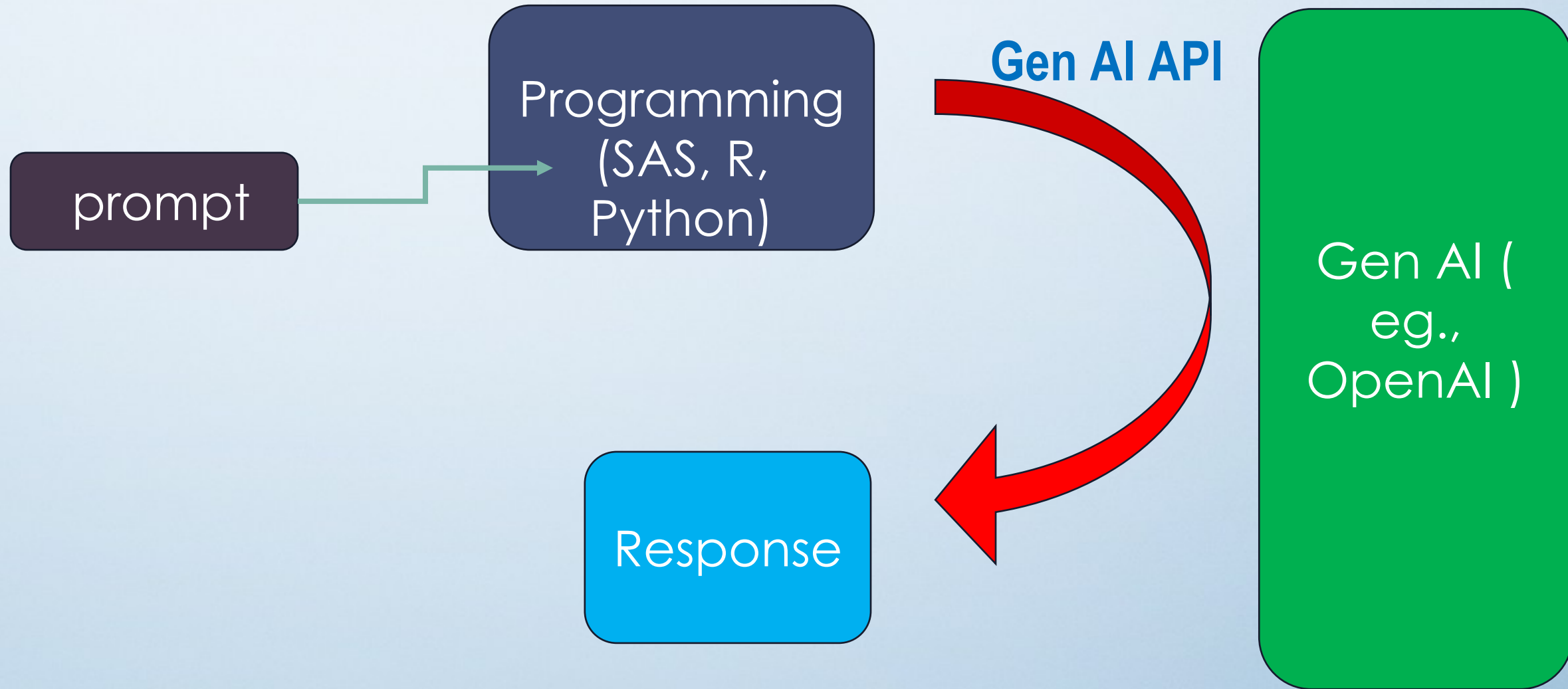


Gen AI API driven application in SAS, R and Python.



- How to get API (Gemini & ChatGPT)
- Gen AI API integration in SAS, R, Python
- Gen AI API integration Ecosystem – LangChain, RAG, AI Agent

Programming using Gen AI API



How to create Gemini API

- API Keys in <https://aistudio.google.com/app/apikey>

Google AI Studio

< Dashboard

API keys

Projects

Usage and Billing

Logs and Datasets

Changelog ↗

API Keys

Group by API key Project

Filter by All projects

API quickstart [Create API key](#)

✓ Projects imported successfully! ✕

Key	Project	Created on	Quota tier
...JdPI Generative Language API Key	Generative Language Client gen-lang-client-0879424732	Mar 10, 2024	Set up billing Free tier

📄 💰 📊 ⋮

SAS Application using Gemini API (free)

```
{ "contents" :  
  [{ "parts" :  
    [{"text" : <prompt> }]  
  }  
}
```

```
%let api_key = xxxxxx;  
%let url =  
https://generativelanguage.googleapis.com/v1/models/gemini-2.5-  
flash:generateContent;  
%let url_query = &url.?key=&api_key. ;
```

```
filename prompt "F:\biometrics\project\GenAI\Gemini\prompt.txt";  
filename resp "F:\biometrics\project\GenAI\ Gemini\resp.json";
```

```
{ "candidates" :  
  [ "content" :  
    { "parts" :  
      [{"text" : <response>  
      }  
    }  
  ],
```

```
Proc http  
  method = "POST"  
  url="&url_query"  
  ct="application/json"  
  in=prompt  
  out=resp;
```

```
Run;
```

```
"usageMetadata" :  
  { "promptTokenCount": 12,,},  
  
"modelVersion": "gemini-1.5-flash"  
}
```

```
libname response JSON fileref=resp;
```

```
data r_sas;  
  set response.content_parts;  
run;
```

SAS Application using Gen AI (Gemini) API

prompt.txt

```
{ "contents" :  
  [{ "parts" :  
    [{"text" : <prompt> }]  
  }  
}
```

resp.json

```
{ "candidates" :  
  [ "content" :  
    { "parts" :  
      [{"text" : <resp> }]  
    }  
  ],  
}
```



```
%let api_key = xxxxxx;  
%let url =  
https://generativelanguage.googleapis.com/v1/models/gemini-2.5-flash:generateContent;
```

```
%let url_query = &url.?key=&api_key. ;
```

```
filename prompt  
"F:\biometrics\project\GenAI\Gemini\prompt.txt";  
filename resp "F:\biometrics\project\GenAI\  
Gemini\resp.json";
```

```
Proc http  
  method = "POST"  
  url="&url_query"  
  ct="application/json"  
  in=prompt  
  out=resp;
```

```
Run;
```

```
libname response JSON fileref=resp;  
data r_sas;  
  set response.content_parts;  
run;
```

Python Application using Gemini API

```
## import Google Gemini library
import google.generativeai as genai
```

```
## Create Prompt message
prompt = " Tell me about CDISC in 200 words" }}
```

```
## Set up Google Gemini API
genai.configure(api_key="xxxx")
```

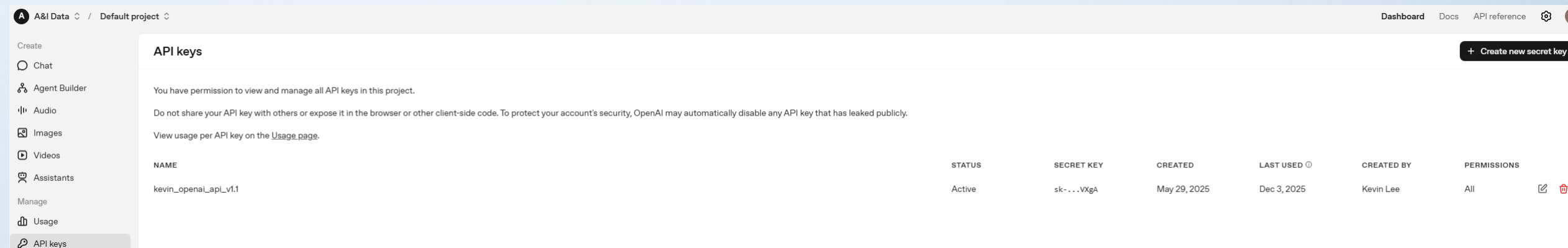
```
## Send Prompt message to Gemini and get the response
google_model = genai.GenerativeModel('gemini-pro')
```

```
response = google_model.generate_content(prompt)
```

```
response:
GenerateContentResponse(
  done=True,
  iterator=None,
  result=glm.GenerateContentResponse({'candidates': [{'content': {'parts': [{'text': 'CDISC (Clinical Data Interchange Standards Consortium) is a non-profit organization dedicated to developing and maintaining data standards for clinical research. Its mission is to enhance data quality, facilitate data sharing, and streamline the clinical research process. CDISC standards provide a common language for researchers, data managers, and regulatory agencies to exchange and interpret clinical data. They include standards for data models, terminology, and data exchange formats, ensuring consistency and interoperability of clinical research data.'], 'role': 'model'}, 'finish_reason': 1, 'index': 0, 'safety_ratings': [{'category': 9, 'probability': 1, 'blocked': False}, {'category': 8, 'probability': 1, 'blocked': False}, {'category': 7, 'probability': 1, 'blocked': False}, {'category': 10, 'probability': 1, 'blocked': False}], 'token_count': 0, 'grounding_attributions': []}]})
```


How to create ChatGPT API (paid)

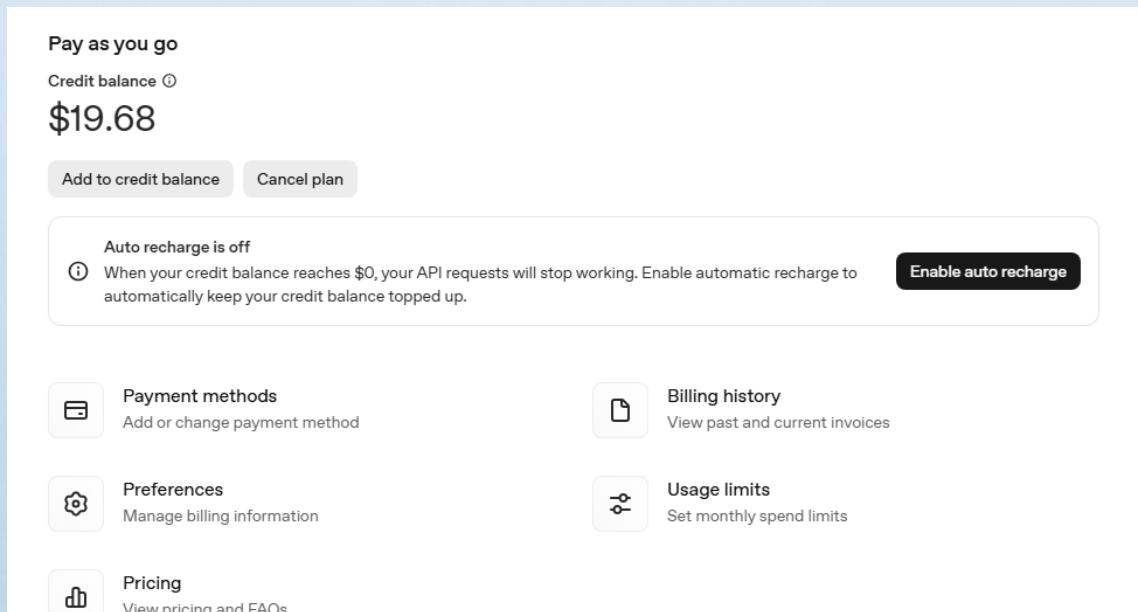
- API Keys in <https://platform.openai.com/api-keys>



The screenshot shows the 'API keys' management page in the OpenAI platform. The left sidebar contains navigation options: 'Create' (with sub-items Chat, Agent Builder, Audio, Images, Videos, Assistants) and 'Manage' (with sub-items Usage, API keys). The main content area is titled 'API keys' and includes a '+ Create new secret key' button. Below this, there is instructional text about API key permissions and a table listing existing keys.

NAME	STATUS	SECRET KEY	CREATED	LAST USED ⓘ	CREATED BY	PERMISSIONS
kevin_openai_api_v1.1	Active	sk-...VXgA	May 29, 2025	Dec 3, 2025	Kevin Lee	All  

- add credit for API in <https://platform.openai.com/account/billing/overview>



The screenshot displays the 'Pay as you go' billing overview page. It shows a credit balance of \$19.68 and buttons for 'Add to credit balance' and 'Cancel plan'. A section for 'Auto recharge' indicates it is currently off, with an 'Enable auto recharge' button. Below this, there are six tiles for managing the account: 'Payment methods', 'Billing history', 'Preferences', 'Usage limits', 'Pricing', and 'API keys'.

Pay as you go
Credit balance ⓘ
\$19.68

Add to credit balance Cancel plan

Auto recharge is off
ⓘ When your credit balance reaches \$0, your API requests will stop working. Enable automatic recharge to automatically keep your credit balance topped up. Enable auto recharge

- Payment methods**
Add or change payment method
- Billing history**
View past and current invoices
- Preferences**
Manage billing information
- Usage limits**
Set monthly spend limits
- Pricing**
View pricing and FAQs
- API keys**
Manage your API keys

SAS Application using ChatGPT API

```
{ "model" : "gpt-3.5-turbo",  
  "message" :  
    [{ "role" : "user",  
        "content" : <prompt>  
      }  
    ]  
}
```

```
{ "id" : "xxxx",  
  "object" : "chat.completion",  
  "created" : 1710533285,  
  "model" : "gpt-3.5-turbo-0125",  
  "choices" :  
    [{ "index" : 0,  
        "message" :  
          { "role" : "assistant",  
            "content" : <resp>  
          },  
        "logprobs" : null,  
        "finish_reason" : "stop"  
      }  
    ],  
  "usage" : { },  
  "system_fingerprint" : "xxx"  
}
```

```
%let api_key = xxxxxxxx ;
```

```
filename prompt
```

```
"F:\biometrics\project\GenAI\OpenAI\prompt.txt";
```

```
filename resp
```

```
"F:\biometrics\project\GenAI\OpenAI\resp.json";
```

```
Proc http
```

```
  method = "POST"
```

```
  url="https://api.openai.com/v1/chat/completions"
```

```
  ct="application/json"
```

```
  in=prompt
```

```
  out=resp;
```

```
  Headers "Authorization" = "Bearer &api_key.";
```

```
Run;
```

```
libname response JSON fileref=resp;
```

```
data r_sas;
```

```
  set r_json.choices_message;
```

```
run;
```

SAS Application using Gen AI (ChatGPT) API

prompt.txt

```
{ "model" : "gpt-3.5-turbo",  
  "message" :  
    [{ "role" : "user",  
        "content" : <prompt>  
      }  
    ]  
}
```

resp.json

```
{ "id" : "xxxx",  
  "object" : "chat.completion",  
  "created" : 1710533285,  
  "model" : "gpt-3.5-turbo-0125",  
  "choices" :  
    [{ "index" : 0,  
        "message" :  
          { "role" : "assistant",  
            "content" : <resp>  
          },  
        "logprobs" : null,  
        "finish_reason" : "stop"  
      }  
    ],  
  "usage" : { },  
  "system_fingerprint" : "xxx"  
}
```



```
%let api_key = xxxxxxxx ;
```

```
filename prompt
```

```
"F:\biometrics\project\GenAI\prompt.txt";
```

```
filename resp
```

```
"F:\biometrics\project\GenAI\resp.json";
```

```
Proc http
```

```
method = "POST"
```

```
url="https://api.openai.com/v1/chat/completions"
```

```
ct="application/json"
```

```
in=prompt
```

```
out=resp;
```

```
Headers "Authorization" = "Bearer &api_key.";
```

```
Run;
```

```
libname response JSON fileref=resp;
```

```
data r_sas;
```

```
set response.choices_message;
```

```
run;
```

Python application using ChatGPT API

```
## import OpenAI ChatGPT library
import openai
```

```
## Create Prompt message
message = [{"role": "user", "content": "Tell me about CDISC in 200 words"}]
```

```
## Set up OpenAI ChatGPT API
openai.api_key = XXXXXXXX
```

```
## Send Prompt message to OpenAI
## Get the response
response = openai.chat.completion.create(
    model="gpt-3.5-turbo",
    messages=message,
    temperature=0
)
```

```
{
  "id": "chatcmpl-98x12kqDpn0K1YUFMjddpoKY5JwRY",
  "object": "chat.completion",
  "created": 1711920508,
  "model": "gpt-3.5-turbo-0125",
  "choices": [
    {
      "index": 0,
      "message": {
        "role": "assistant",
        "content": "CDISC, or the Clinical Data Interchange Standards Consortium, is a global non-profit organization that develops and promotes data standards for clinical research. Founded in 1997, CDISC aims to streamline the process of collecting, analyzing, and sharing clinical trial data to improve efficiency and facilitate data sharing among researchers, regulators, and industry stakeholders. CDISC standards cover a wide range of areas, including data collection, data submission, and data analysis. These standards help ensure that data is collected consistently across different studies, making it easier to compare and combine data from multiple sources. By using CDISC standards, researchers can save time and resources, reduce errors, and improve the quality and reliability of their data. In 2002, CDISC released its first set of standards, known as the Study Data Tabulation Model (SDTM). Since then, CDISC has developed several other standards, including the Analysis Data Model (ADaM) and the Define-XML standard for defining metadata in clinical trials. Overall, CDISC plays a crucial role in advancing the field of clinical research by promoting data standardization and interoperability, ultimately leading to better and more efficient healthcare outcomes for patients."
      },
      "logprobs": null,
      "finish_reason": "stop"
    }
  ],
  "usage": {
    "prompt_tokens": 18,
    "completion_tokens": 235,
    "total_tokens": 253
  },
  "system_fingerprint": "fp_b28b39ffa8"
}
```


R application using ChatGPT API

```
## import OpenAI ChatGPT library
library(httr)
library(jsonlite)
```

```
# Set your OpenAI API key from .env file
api_key <- "xxxx"
```

```
# Define the request URL
api_url <- "https://api.openai.com/v1/chat/completions"
```

```
prompt <- "Tell me about CDISC in 200 words"
```

```
# Define the request body
body <- list(
  model = "gpt-3.5-turbo",
  messages = list(
    list(role = "system", content = "You are a helpful assistant."),
    list(role = "user", content = prompt )
  )
)
```

```
# Make the API request
```

```
response <- POST(
  api_url,
  add_headers('Authorization' = paste("Bearer", api_key),
    'Content-Type' = "application/json"),
  body = jsonlite::toJSON(body, auto_unbox = TRUE),
  encode = "json"
)
```

```
# Parse the response
```

```
result <- content(response, as = "parsed")
```

```
# Print the response
```

```
print(result$choices[[1]]$message$content)
```

result	List of 8
\$ id	: chr "chatcmpl-B3rIkdVKWMrhLCdJkiPSrCyLSG1w"
\$ object	: chr "chat.completion"
\$ created	: int 1740259574
\$ model	: chr "gpt-3.5-turbo-0125"
\$ choices	: List of 1
..\$	: List of 4
.. ..\$ index	: int 0
.. ..\$ message	: List of 3
.. ...\$ role	: chr "assistant"
.. ...\$ content	: chr "CDISC, or the Clinical Data Interchange Standar..."
.. ...\$ refusal	: NULL
.. ...\$ logprobs	: NULL
.. ...\$ finish_reason	: chr "stop"

LangChain

- Definition
- Functions
- Components

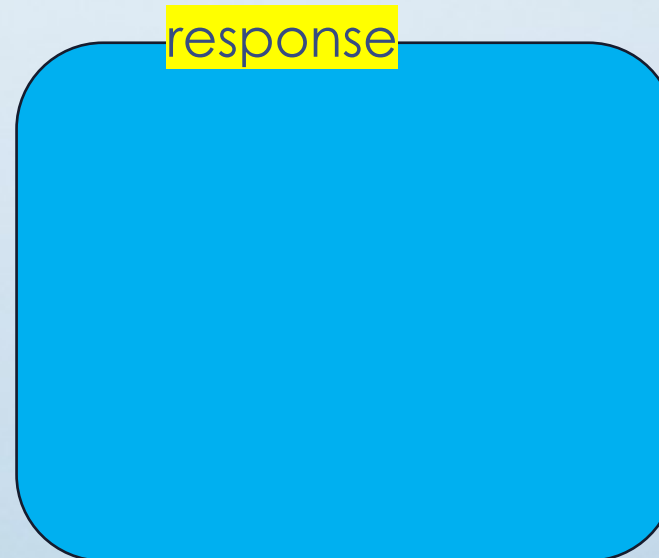


Application using LangChain Framework

- Standard Framework / workflow for LLM driven application
- Main Component:
 - Prompt Template
 - LLM framework
 - Gen AI API key :
 - ~ 50
 - OpenAI, Anthropic, Google, Meta, Amazon, MS, DeepSeek, , , , ,



LLM framework
(e.g., ChatOpenAI (openai_api_key=)



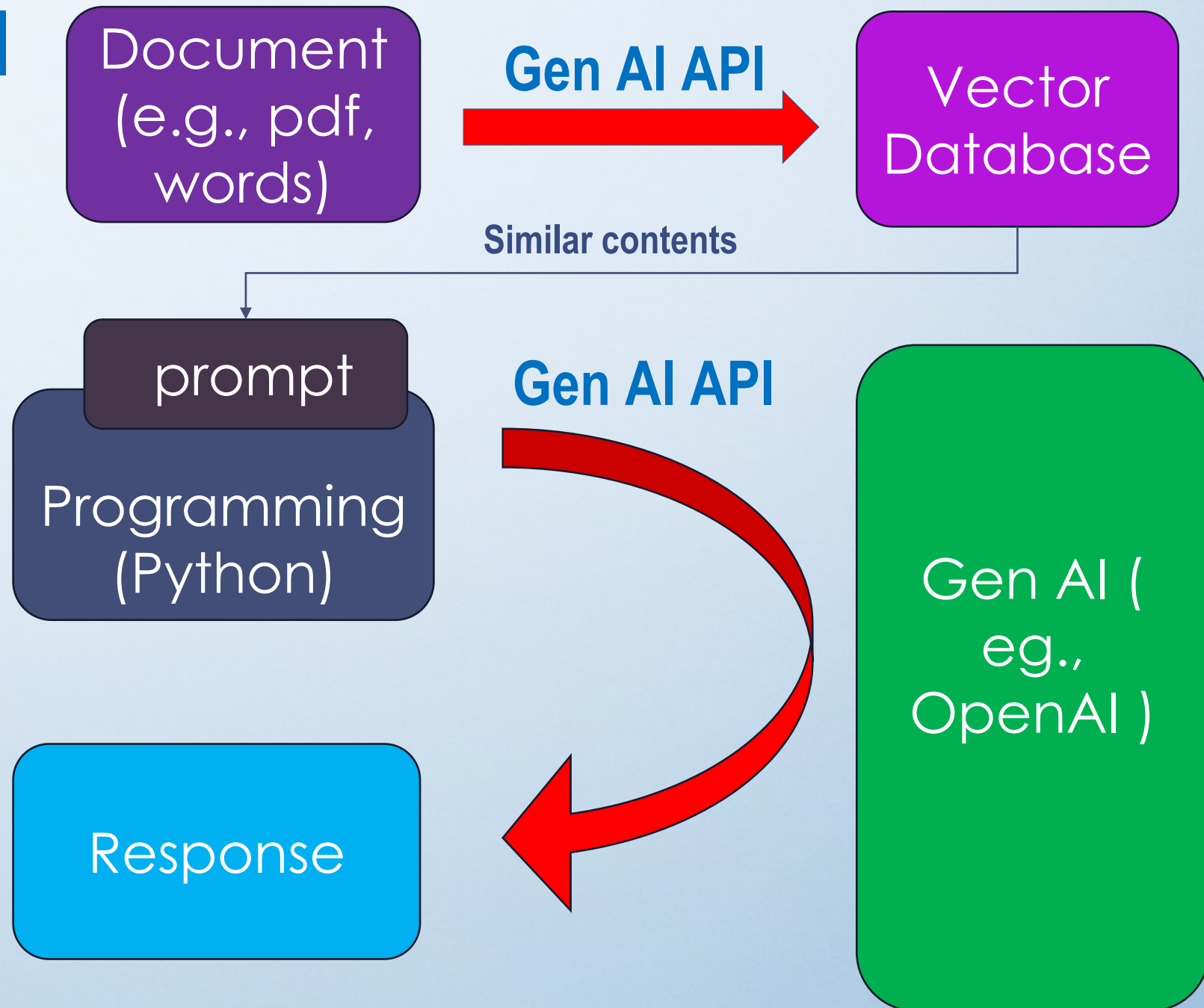
Retrieval Augmented Generation (RAG)

- Definition
- Framework with LangChain



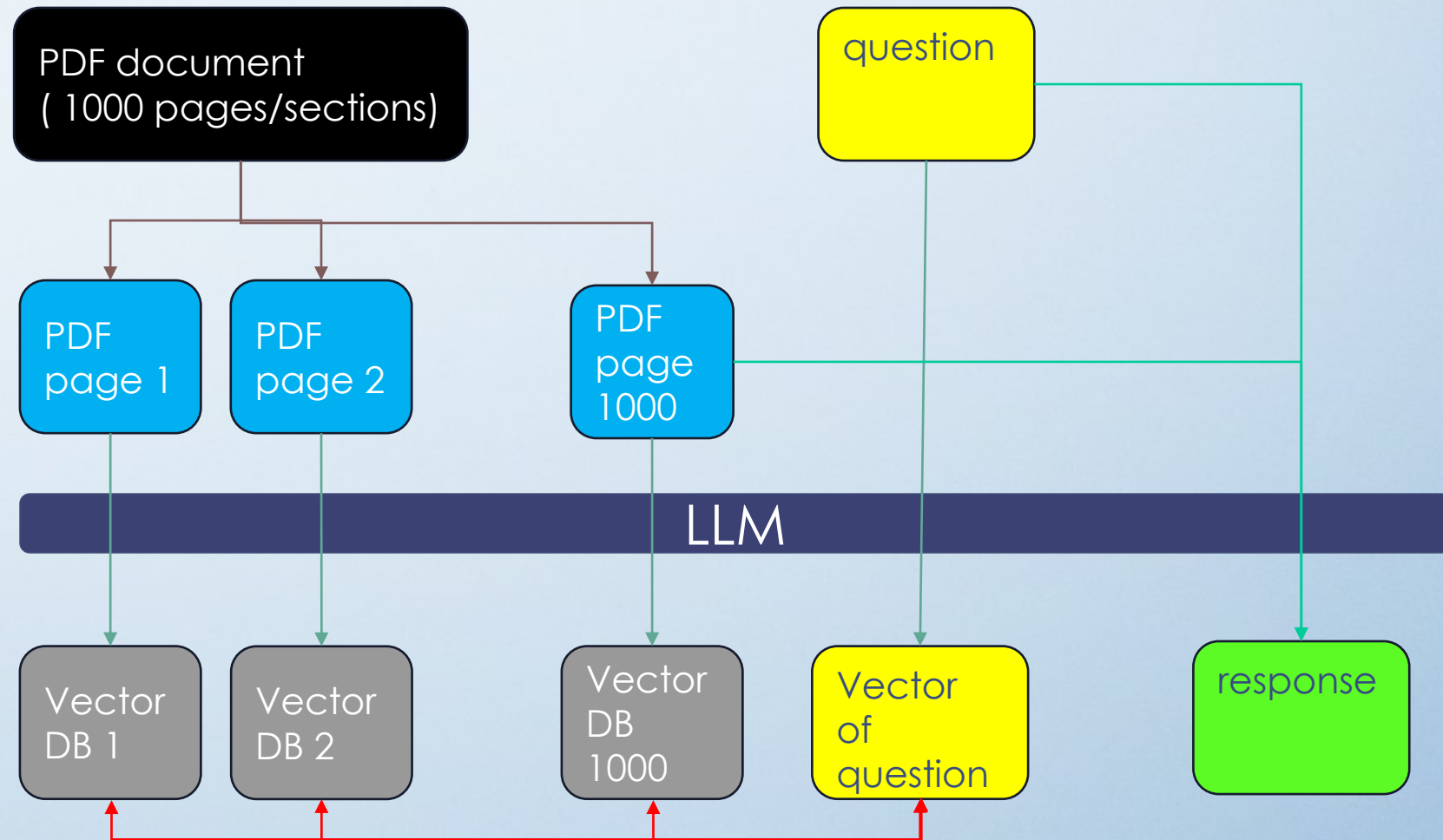
RAG (Retrieval Augmented Generation)

- Document-specific Solution
- Vector Database from Document



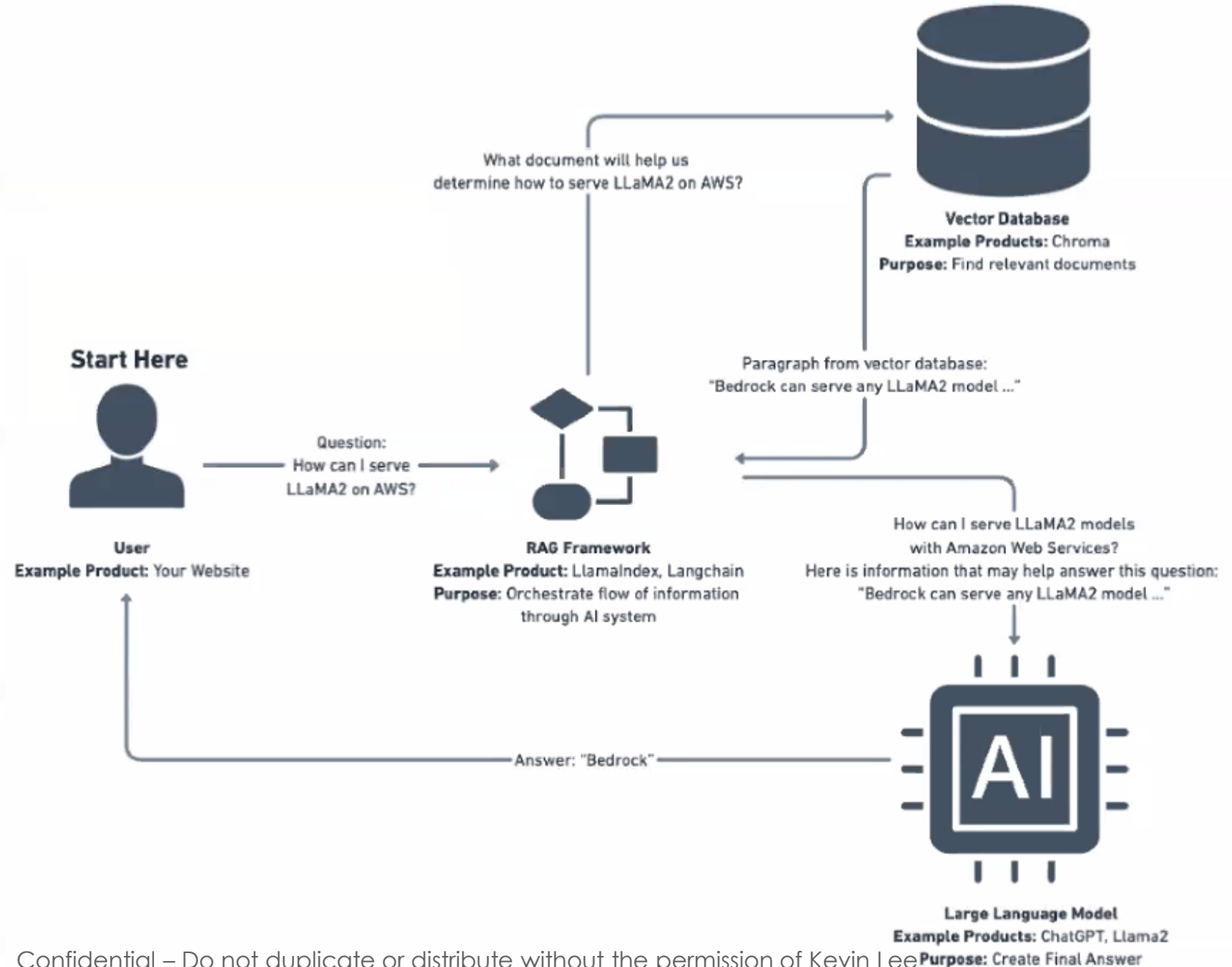
RAG (Retrieval Augmented Generation)

- LLM driven vector DB
- Process
 1. Split document to smaller sections (1 to 1000)
 2. Create vector DB using LLM embedding (from PDF page 1 to 1000).
 3. Convert question to vector using same LLM embedding.
 4. Compare vector DB (1 to 1000) with vector of question and find the similar vector DB (e.g, PDF page 1000).
 5. Send original question and selected section (PDF page 1000) to LLM
 6. Get the response from LLM



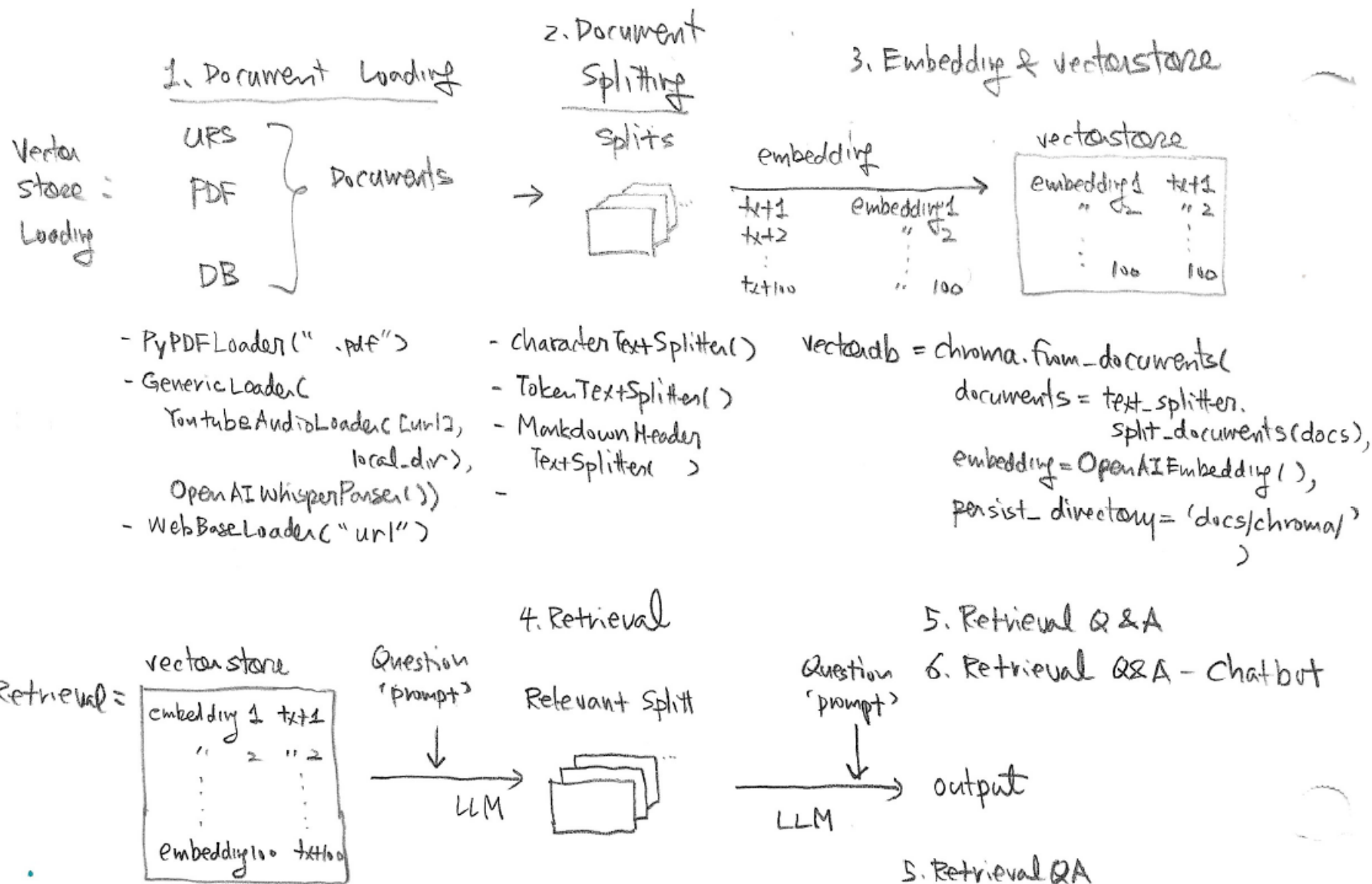
RAG Definition

- Retrieval-Augmented Generation
- Process used to improve the accuracy and reliability of LLMs
- Process
 1. Create vector DB using LLM embedding.
 2. Retrieve the information relevant to questions from vector DB
 3. Feed the retrieved info to LLMs
 4. LLMs generates the contents from retrieved info.

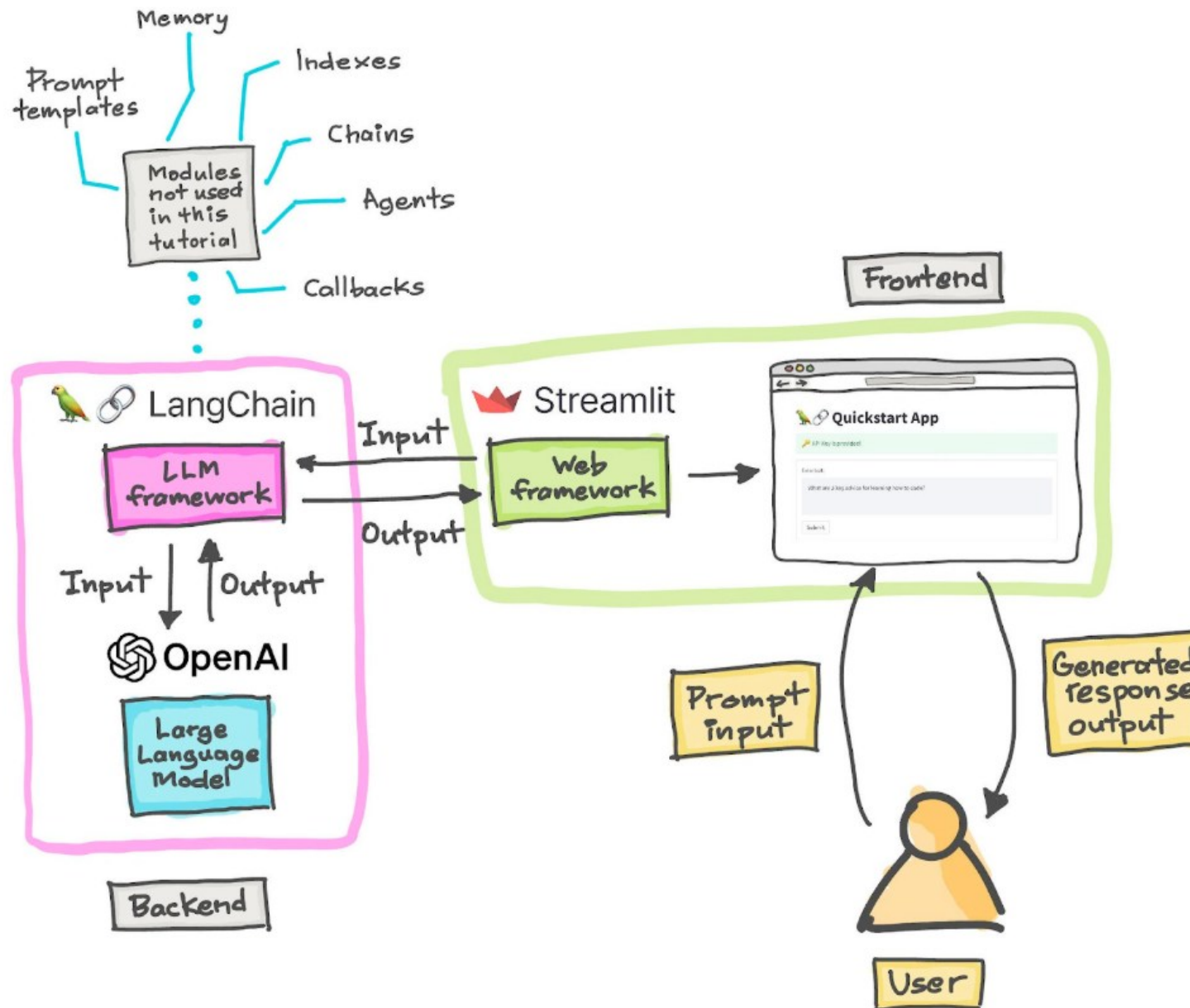


RAG framework in LangChain

Retrieval Augmented Generation (RAG)



Gen AI application architecture

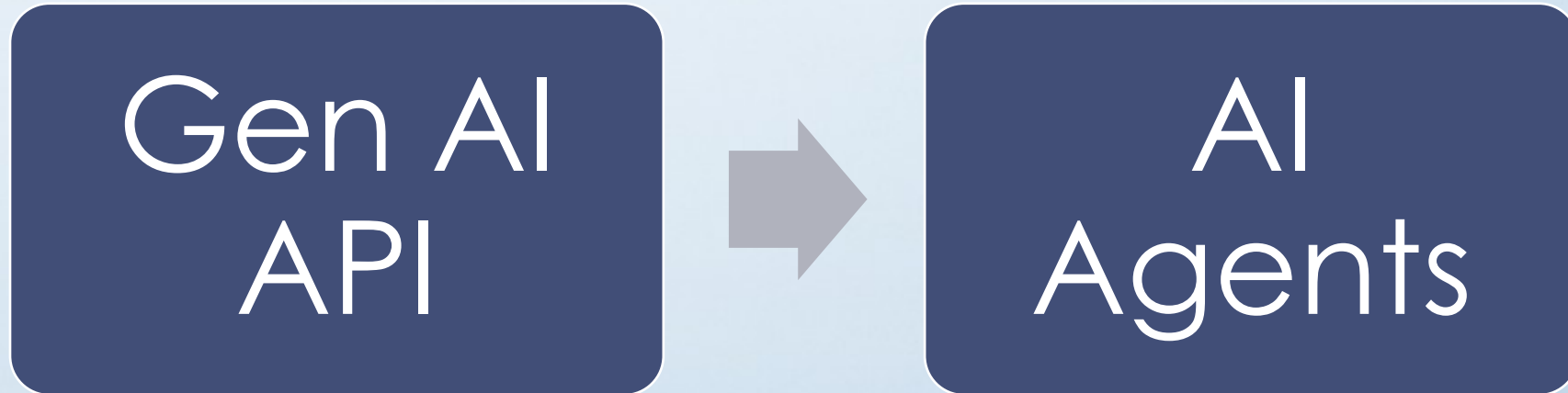


AI Agent

- Gen AI API into AI Agents
- AI Agent
- Agentic workflow
- Agentic AI



Now, What Gen AI API lead to ?



AI Agent

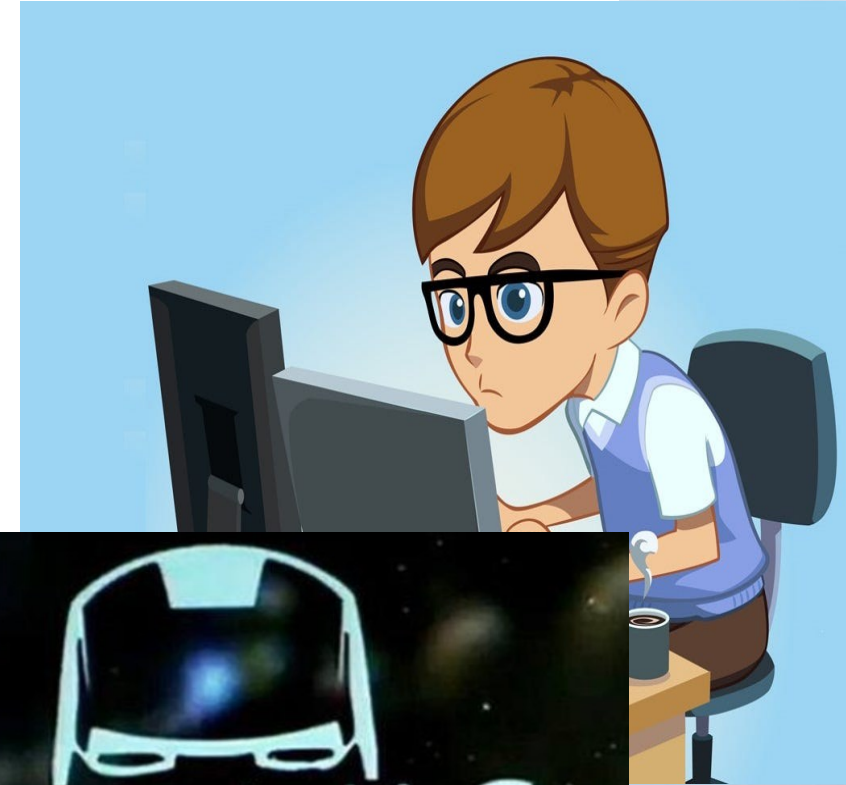
- System that can interact with its environment, collect data, and autonomously perform tasks and make decisions to achieve the goals.
- Main Components
 - LLM (e.g., ChatGPT5.2, Claude4.5)
 - Prompts: (e.g., instruction for AI Agent –
'You are stat programmer.
Use the input and generate SAS codes based on input.

Follow below steps:

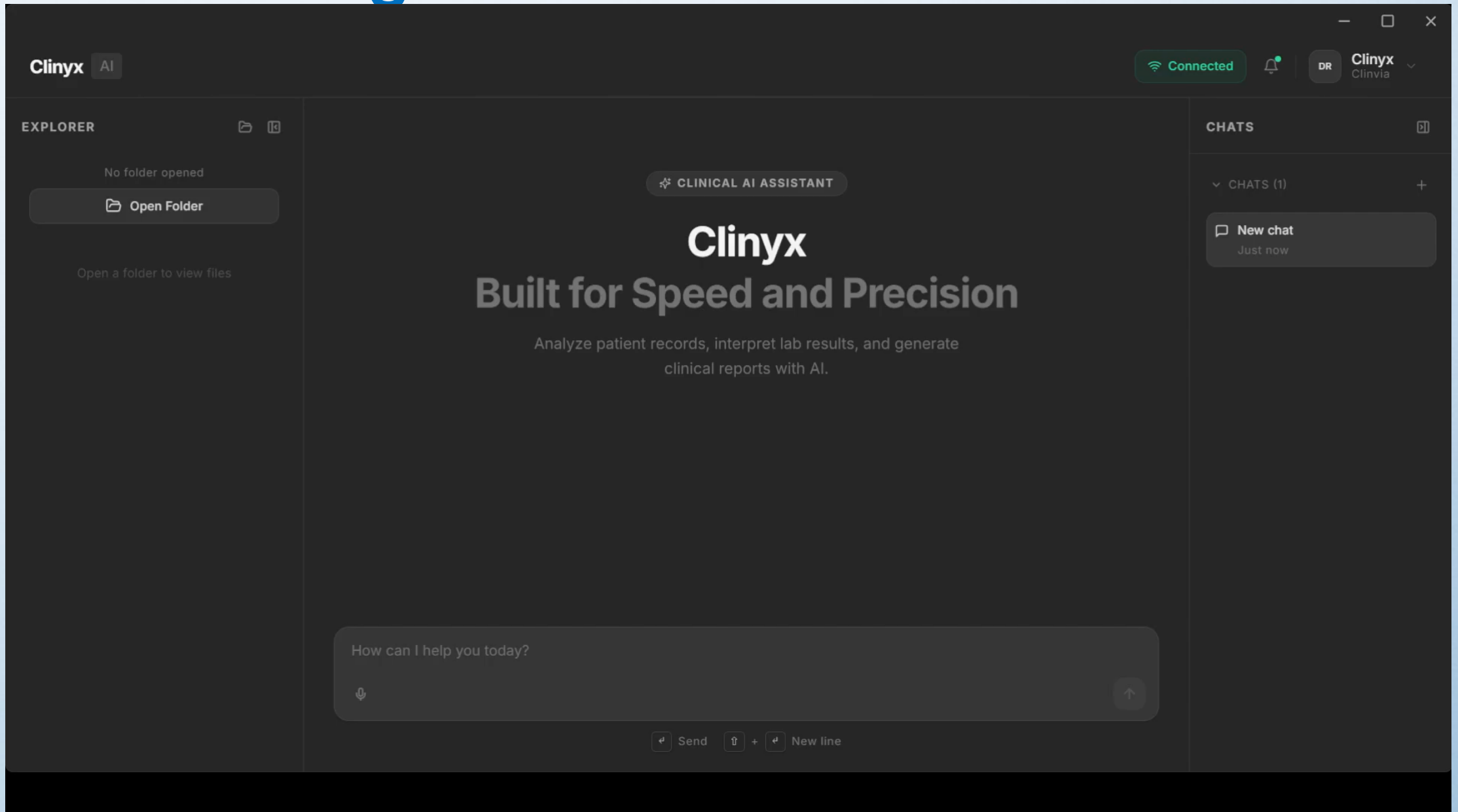
1. Generate SAS codes based on input
2. Execute generated SAS codes using SAS Studio
3. If there are error messages, debug SAS codes.
4. Rerun SAS codes.

Do Step 2 to 4 until there are no error message. '

- Tools (e.g., SAS Studio, R Studio, Python)
- Memory : short-term /long-term memory/ RAG (e.g., previous SAS codes)

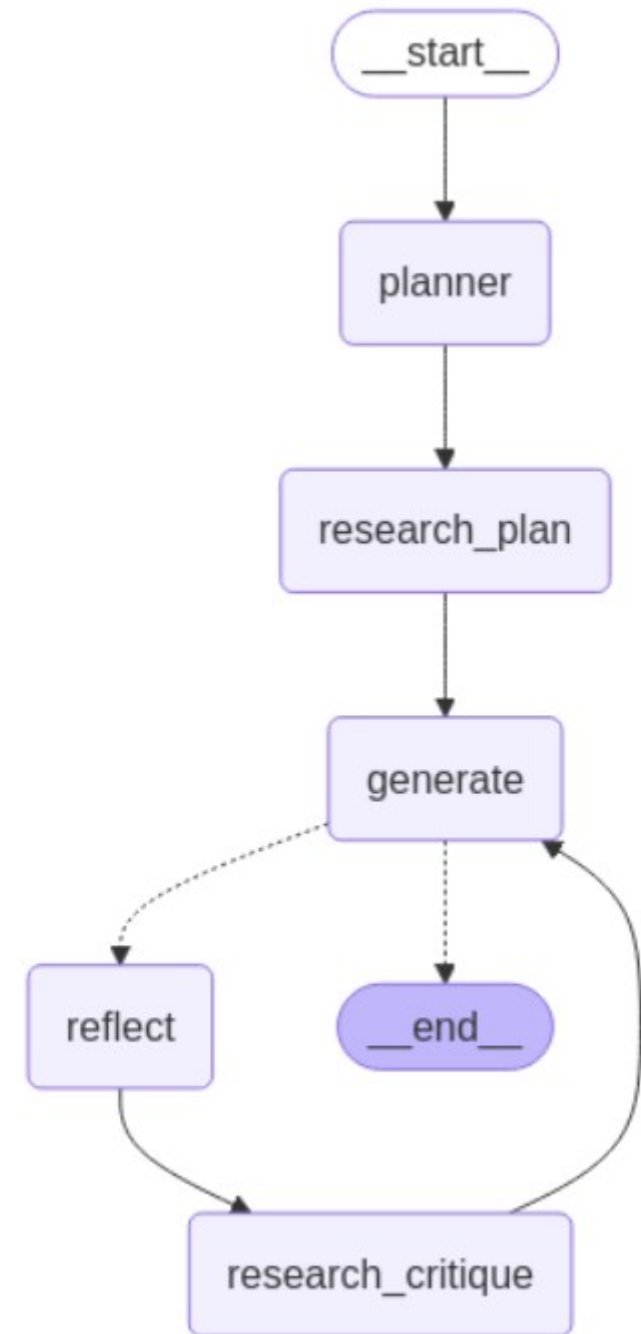


AI Agent in action demo



How to build Agentic workflow

1. Define Agent State
2. Define LLM model
3. Define Prompts
4. Define tools for AI Agents
5. Define functions for nodes
6. Define Memory
7. Define workflow
 - a) Start workflow with Agent State
 - b) Assign nodes to functions
 - c) Assign starting node
 - d) Assign conditional edges
 - e) Assign edges
 - f) Compile memory
8. Compile AI Agent
9. Prepare input (user prompts)
10. Run AI Agent



Sample Codes for AI Agent

```
class AgentState(TypedDict):
    task: str
    plan: str
    draft: str
    ....

llm = ChatOpenAI(model="gpt-3.5-turbo")

prompt_system = """ """
prompt_user = """ """

tool_tavily = TavilyClient( )

def planner(state : AgentState ) :
    response = llm.invoke(prompt_user)
    return {"plan" : response.content }
def research_plan(state : AgentState ) :
    result = tool_tavily.search( )
    return {"draft" : result.content }
.....
mem_store = InMemoryStore( index={"embed":
"openai:text-embedding-3-small"})
```

```
workflow = StateGraph(AgentState)
workflow.add_node("planner", planner)
workflow.add_node("research plan",
research_plan)
workflow.add_node("generate", generate)

workflow.set_entry_point("planner")

workflow.add_conditional_edges("generator"
, continue, {END: END, "reflect" : "reflect"} )

workflow.add_edge("planner",
"research_plan")
workflow.add_edge("research_plan",
"generate")

ai_agent =
workflow.compile(store=mem_store)

input = { }

final_response = ai_agent.invoke( input )
```

6 different AI Agentic Design

1. ReAct Agent

- Thinks, takes action, looks at the result, repeats.
- Classic loop: “Should I Google this?” → Does it → Adjusts.
- Used in most AI products today (like basic chat assistants).

2. CodeAct Agent:

- Runs real code, not just JSON.
- So instead of saying “call API X,” it writes and runs a Python script.
- More powerful. Used in research agents and dev assistants.

3. Modern Tool Use:

- Sends tasks to smart APIs (search, cloud, data), and lets them do the heavy lifting.
- The agent mostly routes and formats info.
- Think: a smart middleman between you and powerful services.

4. Self-Reflection:

- Agent checks its own work.
- Did it make a mistake? It catches it, critiques it, and tries again.
- Most AI errors happen **because this step is missing.**

5. Multi-Agent Workflow:

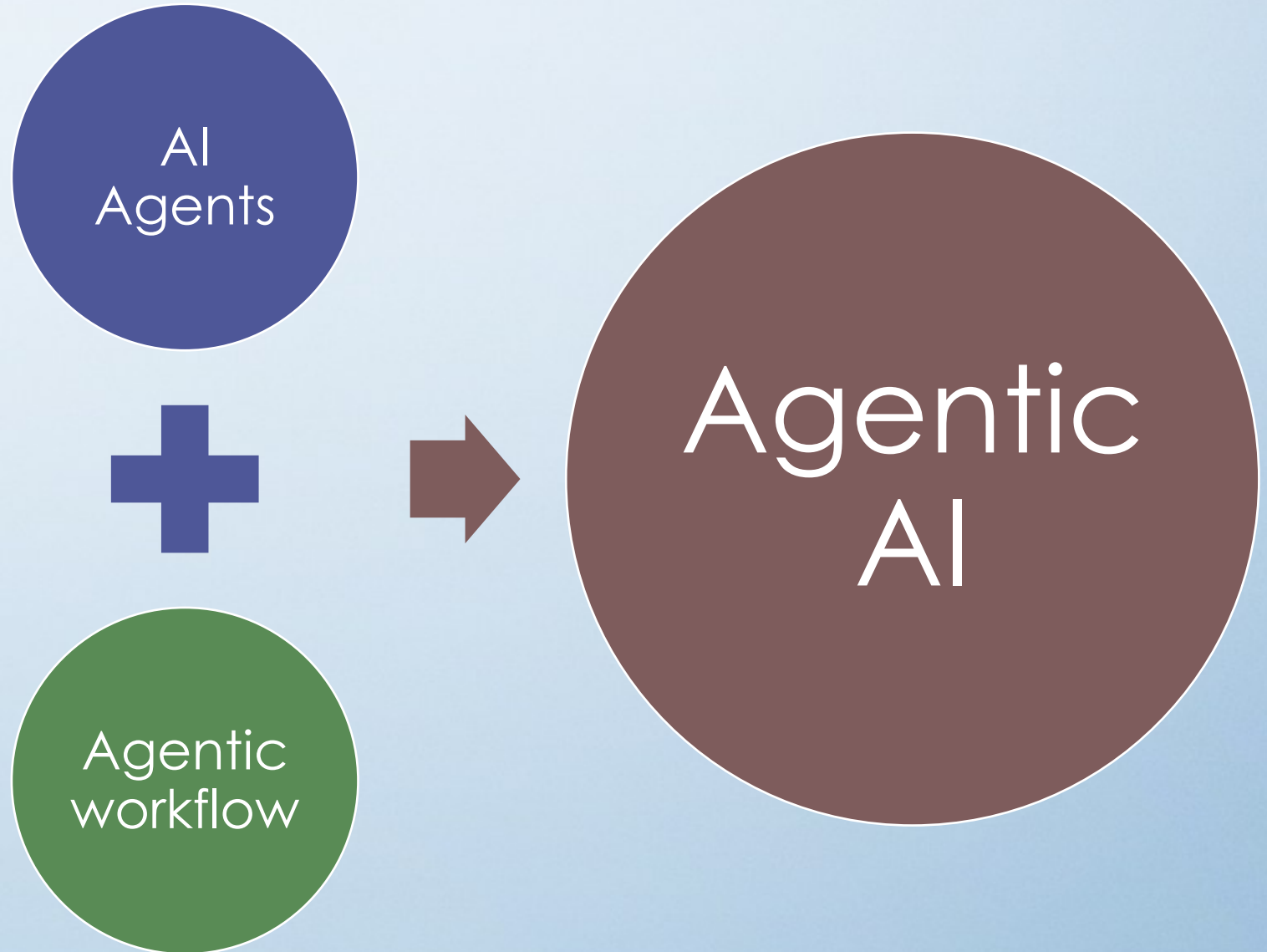
- One agent isn’t doing everything.
- You have a planner, a researcher, and a writer — all working together.
- Like a mini team of AIs. More accurate. Less chaos.

6. Agentic RAG:

- This is what powers apps like Perplexity.
- The agent looks stuff up (retrieval), thinks about it, uses tools, and gives you a smarter answer.
- Works with real-time data, not just model memory.

Agentic AI

Agentic AI refers to an **AI paradigm** in which **autonomous AI Agents** actively pursue goals and execute tasks through **Agentic workflows**.



MCP

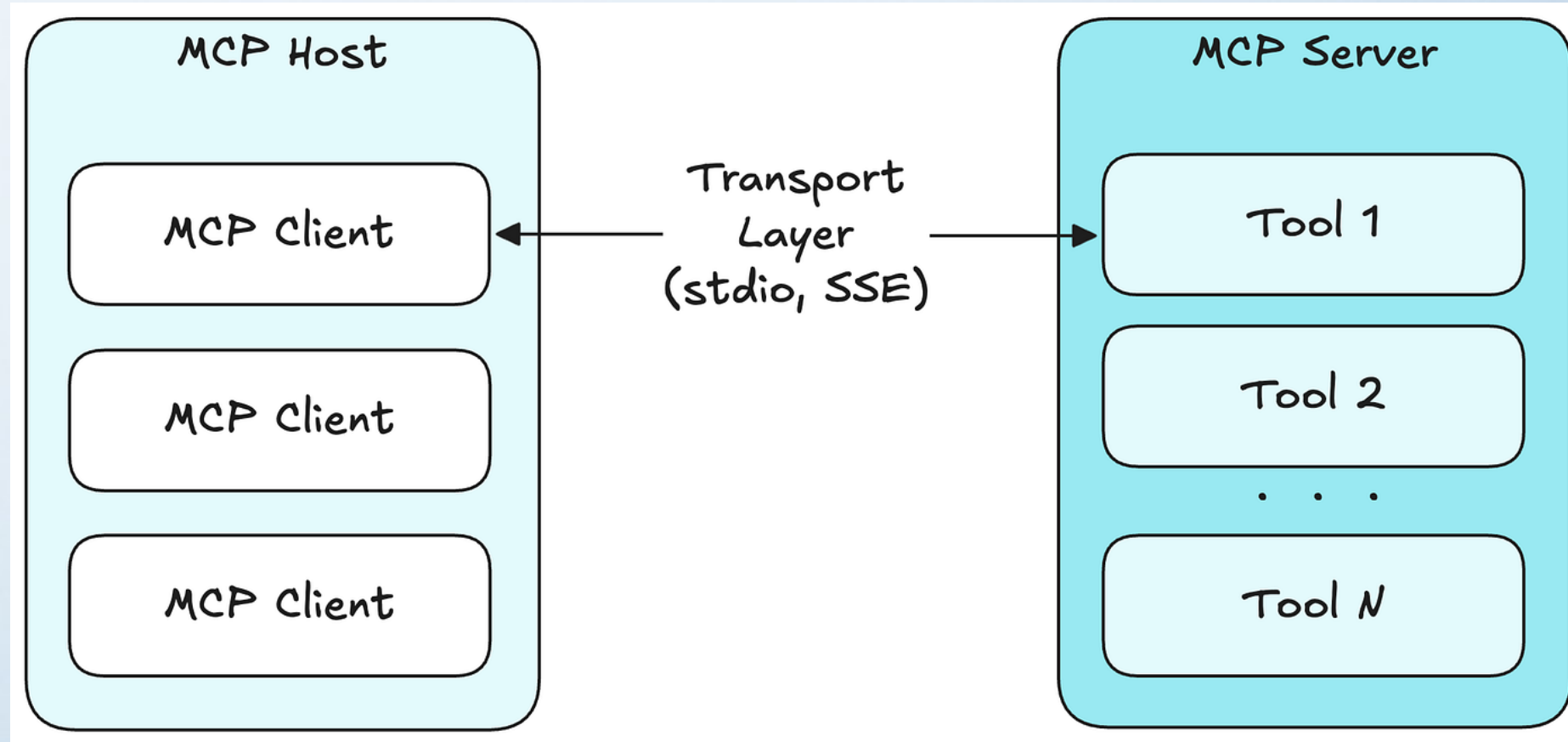
- Definition
- Structure



MCP

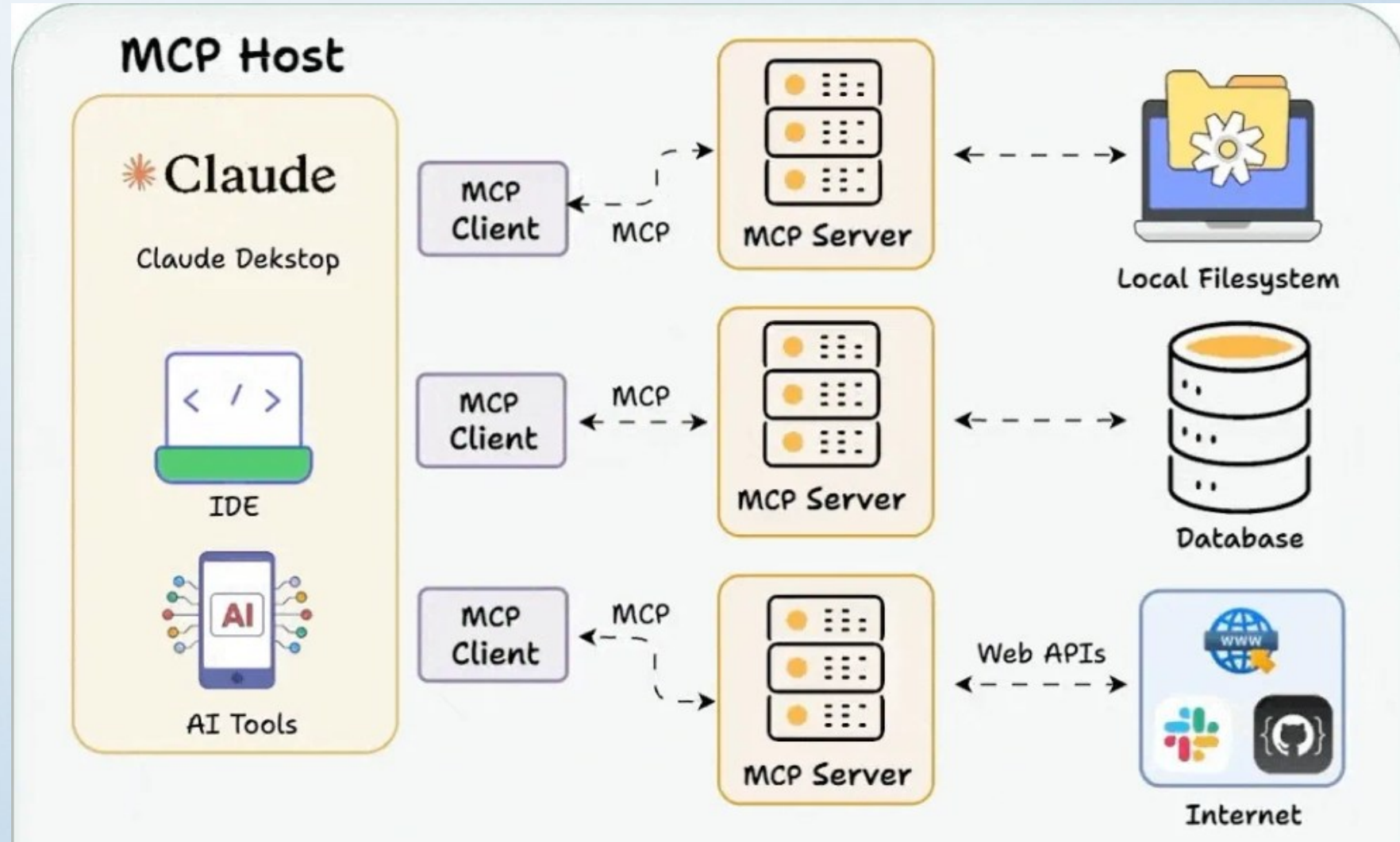
Model Context Protocol (MCP) :

- Open standard on how AI apps connect to different data sources and tools.
- To simplify how AI models interact with external data and tools.
- Initially developed by Anthropic in <https://modelcontextprotocol.io/introduction>



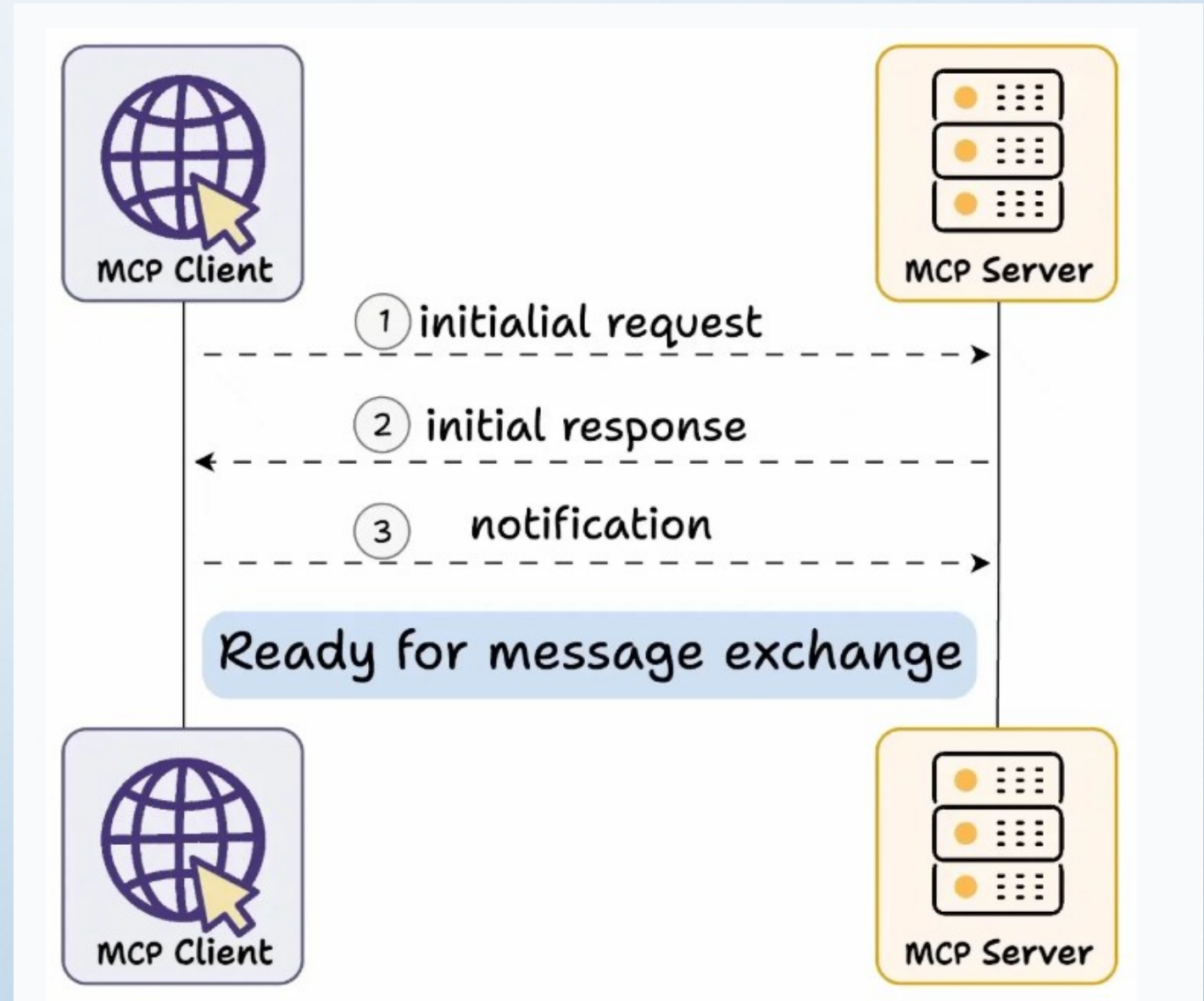
MCP- high lever structure

- MCP host : AI app with LLM
- MCP client : operates within the host to enable communication with MCP servers
- MCP Server : expose specific capabilities and provide access to
 - Tools : enable LLM to perform actions thru server
 - Resources : Expose data and content from servers to LLMs
 - Prompts : Create reusable prompt template and workflows



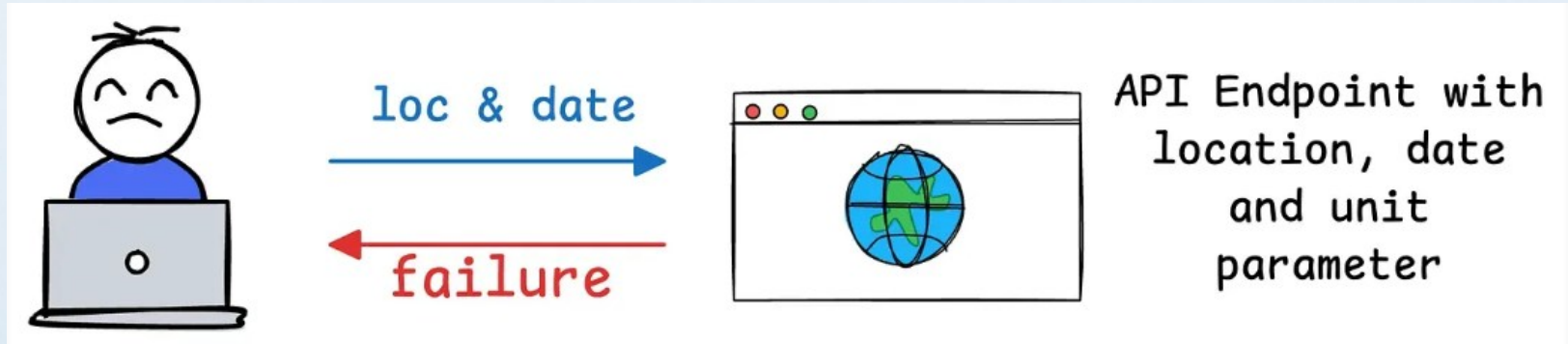
MCP- how MCP client interact with MCP Servers

- MCP client :
- MCP Server



MCP vs traditional APIs

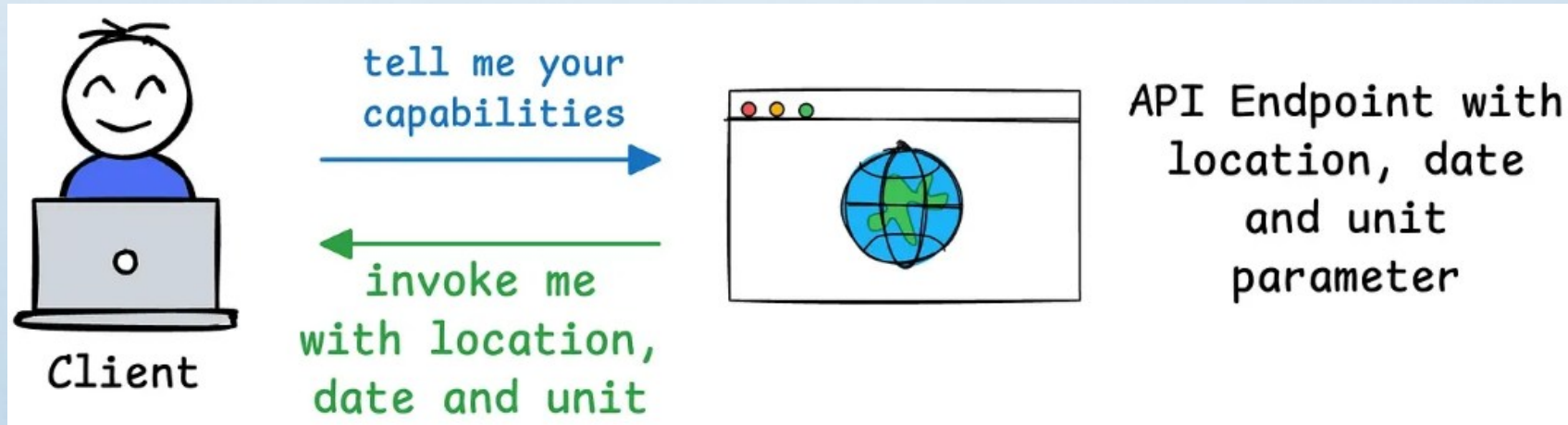
- Traditional APIs



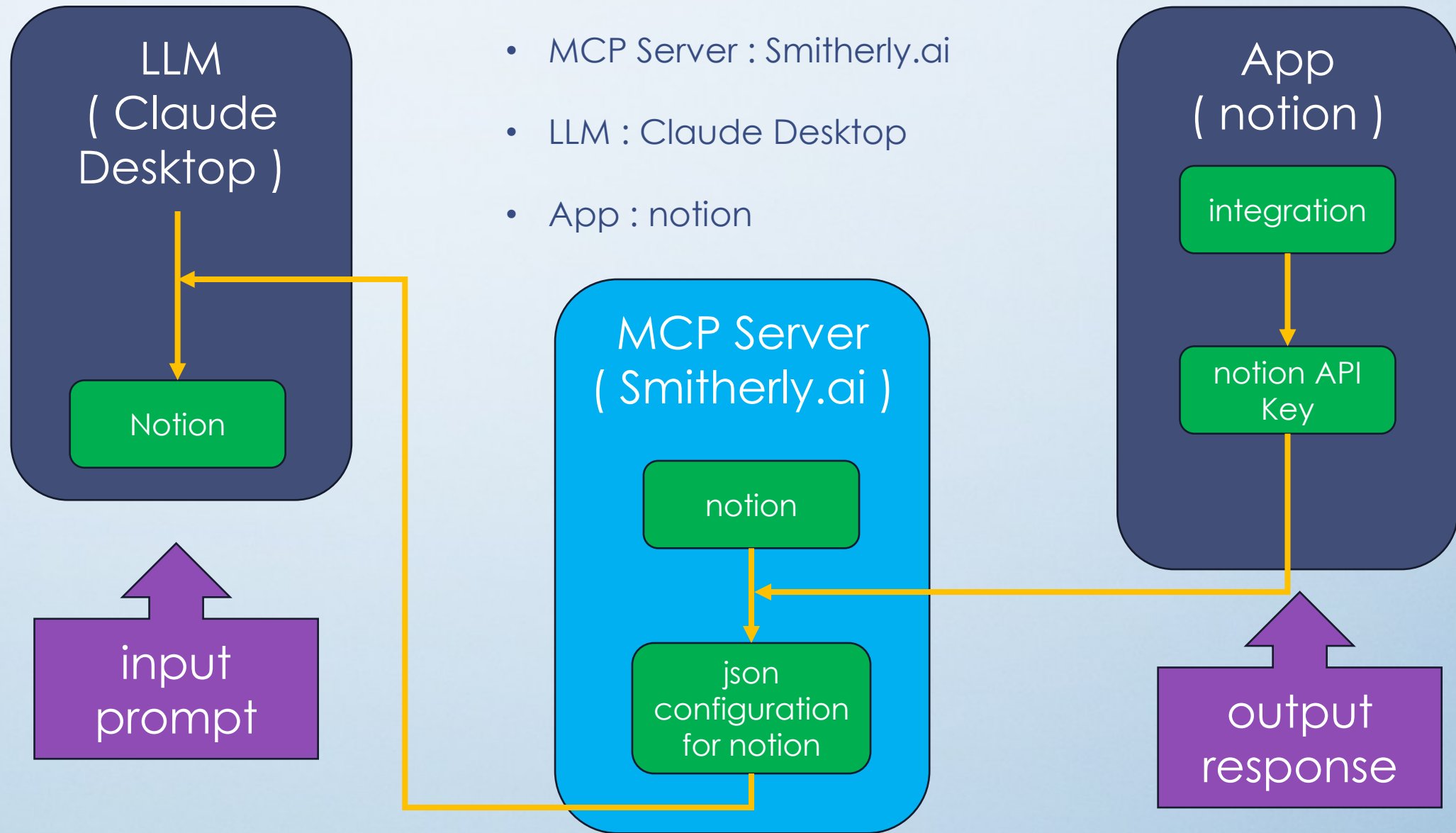
Advantages of MCP

- Use LLMs to refine the inputs much easier
- Minimize the failures, but invoke the clients to adjust.
- Clients can adjust their request much easier.

- MCP

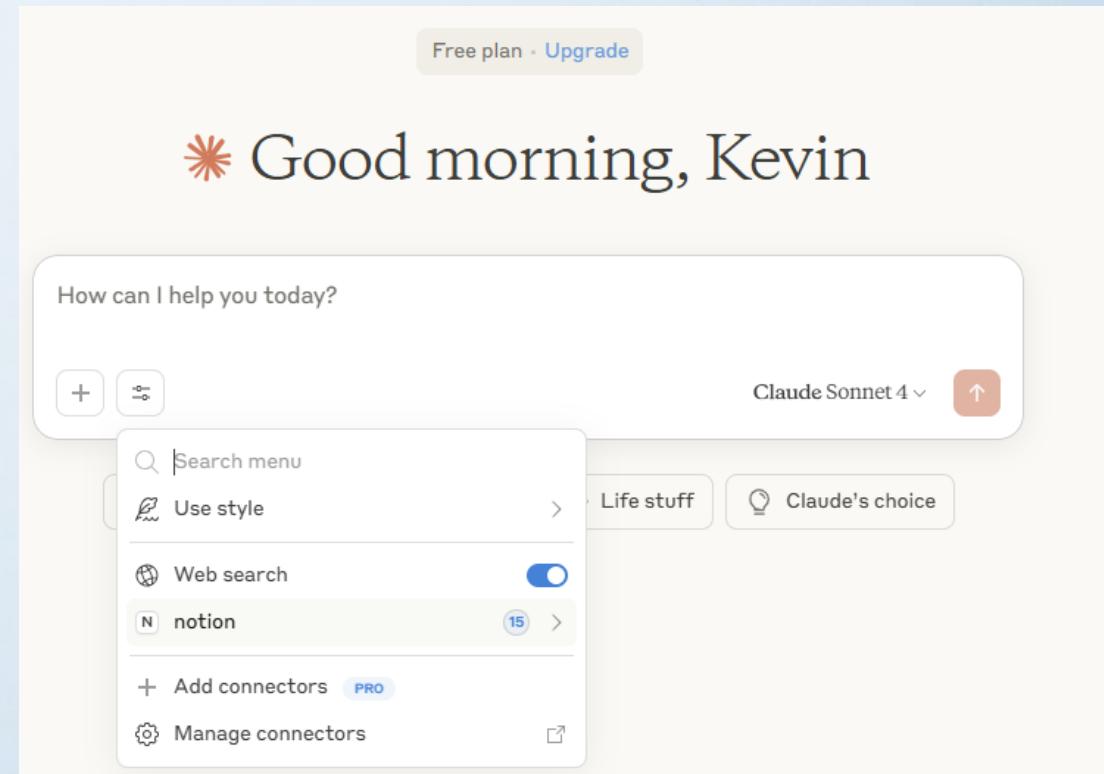


MCP Architecture Example



Smithery MCP server- notion config file to Claude Desktop

```
{
  "mcpServers": {
    "notion": {
      "command": "cmd",
      "args": [
        "/c",
        "npx",
        "-y",
        "@smithery/cli@latest",
        "run",
        "@smithery/notion",
        "--key",
        "26e93471-340d-4957-b3ec-75cfc63005ba",
        "--profile",
        "unconscious-bison-HnITud"
      ]
    }
  }
}
```



If the user puts the prompt in Claude Desktop like ' Tell me about CDISC in notion 2428d3cd393380828d68dd454f0f5712',

the response will be displayed in notion page of 2428d3cd393380828d68dd454f0f5712.

MCP Server vs Python Client

MCP Server : mcp-setup.py

```
from mcp.server.fastmcp import FastMCP

mcp = FastMCP("mcp-setup")

## create system prompt in mcp server
@mcp.prompt()
def system_prompt():
    return system_prompt = '
## Roles
You are a data scientist. Decide your
next action based on {user_prompt}.
## tools
### app1
Use this tool when ..
### app2
Use this tool when ..
'

## create tools in mcp server
@mcp.tool()
def app1(input1: str):
    ...
@mcp.tool()
def app2(input2: str):
    ...

if __name__ == "__main__":
    mcp.run()
```

Python Client: agent.py

```
import asyncio
from agents import Agent, Runner
from agents.mcp import MCPServerStdio

async def main():
    async with MCPServerStdio(
        name="mcp-setup",
        params={"command": "uv", "args": ["run", "mcp-server/mcp-setup.py"]},
    ) as server:

        # 1. Get system prompt
        prompt = await server.get_prompt("system_prompt")
        instructions = prompt.messages[0].content.text

        # 2. Create agent
        agent = Agent(
            name="Agent",
            instructions=instructions,
            mcp_servers=[server],
        )

        # 3. Run agent
        result = Runner.run_streamed(
            agent,
            input= user_prompt,
        )

        # 4. Stream output
        async for event in result.stream_events():

asyncio.run(main())
```

MCP Server vs Claude Code Client

MCP Server : MS Playwright in
<https://github.com/microsoft/playwright-mcp>

Tools:

- browser_click
- browser_resize
- browser_run_code
- browser_select_option
- browser_snapshot
- browser_take_screenshot
- browser_type
- browser_wait_for
- browser_tabs
- browser_install
- browser_mouse_click_xy
- browser_mouse_drag_xy

Command line : Claude Code

- In terminal, run 'claude mcp add playwright npx @playwright/mcp@latest'
- It will connect claude code to MS MCP Server playwright.

```
C:\Users\kevin\OneDrive - Cornell University\training\Python\Generative AI\15.0 Claude Code- Highly Agentic Coding Assistant>c
laude mcp add playwright npx @playwright/mcp@latest
Added stdio MCP server playwright with command: npx @playwright/mcp@latest to local config
File modified: C:\Users\kevin\OneDrive - Cornell University\training\Python\Generative A
I\15.0 Claude Code- Highly Agentic Coding Assistant]
```

```
C:\Users\kevin\OneDrive - Cornell University\training\Python\Generative AI\15.0 Claude Code- Highly Agentic Coding Assistant>c
laude
```

Claude Code v2.1.1

Welcome back Kevin!



Sonnet 4.5 · API Usage Billing · Kevin's
Individual Org
~\OneDrive - Cornell University\training\Python\G...

Tips for getting started

Run /init to create a CLAUDE.md file with instructions for Claude

Recent activity

No recent activity

MCP Server vs Claude Code Client

In Claude code,

You can ask “take the screen shot of www.cnn.com” .

It will open browser of www.cnn.com and take the screen shot and save it to the local drive.

```
> take the screen shot of www.cnn.com
```

- I'll navigate to <http://www.cnn.com> and take a screenshot for you.

- playwright - Navigate to a URL (MCP)(url: "https://www.cnn.com")

- └ Error: result (168,465 characters) exceeds maximum allowed tokens. Output has been saved to

- C:\Users\kevin\.claude\projects\C--Users-kevin-OneDrive---Cornel

- l-University-training-Python-Generative-AI-15-0-Claude-Code--Highly-Agentic-Coding-Assistant\60d650f9-ee31-4f33-b74d-65c93

- ddd2270\tool-results\mcp-playwrig

- h

- t-browser_navigate-1767909488610.txt.

- ... +9 lines (ctrl+o to expand)

- playwright - Take a screenshot (MCP)(filename: "cnn-screenshot.png")

- └ ### Ran Playwright code

- // Screenshot viewport and save it as C:\Users\kevin\OneDrive - Cornell University\training\Python\Generative AI\15.0 Clau

- de Code- Highly Agentic Coding

- Ass

- istant\.playwright-mcp\cnn-screenshot.png

- ... +8 lines (ctrl+o to expand)

- └ [Image]

- I've successfully taken a screenshot of <http://www.cnn.com>. The screenshot has been saved to:

- C:\Users\kevin\OneDrive - Cornell University\training\Python\Generative AI\15.0 Claude Code- Highly Agentic Coding Assistant

- \.playwright-mcp\cnn-screenshot.png

The screenshot shows the CNN homepage with current headlines including stories about Senate Republicans checking Trump's war powers, tensions in Minneapolis after an ICE agent shooting, and coverage of the 'mushroom murder' trial.

Vibe-Coding

- Definition
- Evolving of Vibe-Coding
- AI Coding Agents
- Biometric AI Coding Agents
- Impact of Vibe-Coding



Do you use Vibe-coding?



Where “Vibe-Coding” come from?

“fully giv[ing] in to the vibes, embrac[ing] exponentials, and forget[ting] that the code even exists.”

by Andrej Karpathy,
co-founder of OpenAI
on Feb, 2025



“There's a new kind of coding I call "vibe coding," where you fully give in to the vibes.”

-Andrej Karapathy

What is Vibe-Coding?

- Coding with AI
- Vibe : A flow between human logic and AI coding agents
- Programmers do
 - Prompt for the codes
 - Review the codes



Change in Programming Workflow

Programming Workflow - Traditional



Programming Workflow using Vibe
Coding (ChatGPT)



Programming Workflow using Vibe
Coding AI Agents

Traditional Programming workflow



ChatGPT impact on programming

- Code Development
- Code Debugging
- Lowering the boundary of languages (e.g., SAS, R and Python) – vibe coding

ChatGPT: Codes Development – R

Prompt :

Write a **R script** that groups data by "TRTA" and "AVISIT" columns in "advs.xpt"

and calculates the mean of "AVAL" column for each group at PARAMCD = 'WEIGHT'

Output :

```
library(haven) # For reading XPT
library(dplyr) # For data manipu
```

```
# Read the ADaM dataset
advs <- read_xpt("advs.xpt")
```

```
# Process the data
```

```
result <- advs %>%
```

```
  filter(PARAMCD == "WEIGHT") %>% # Filter for PARAMCD = 'WEIGHT'
```

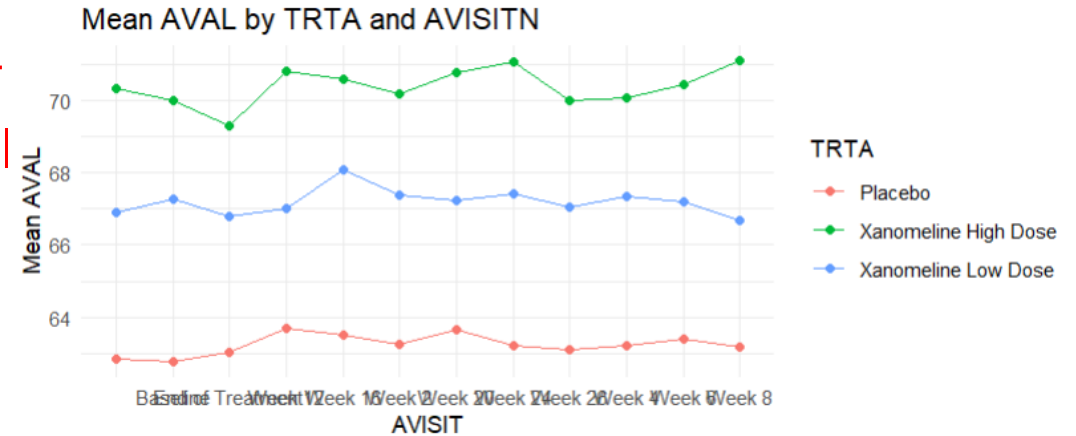
```
  group_by(TRTA, AVISIT) %>%      # Group by TRTA and AVISIT
```

```
  summarise(mean_AVAL = mean(AVAL, na.rm = TRUE)) %>% # Calculate
  # mean of AVAL
```

```
  ungroup()
```

```
# Print the result
```

```
print(result)
```



ChatGTP: Codes Development – SAS

Prompt :

Write a **SAS script** that groups data by "TRTA" and "AVISIT" columns in "advs.xpt"

and calculates the mean of "AVAL" column for each group at PARAMCD = 'WEIGHT'

Output :

```
libname mydata xport 'path_to_advs.xpt'; /* Replace with the actual path to advs.xpt */
```

```
data weight_data;  
    set mydata.advs;  
    if PARAMCD = 'WEIGHT'; /* Filter data for PARAMCD = 'WEIGHT' */  
run;
```

```
proc sql;  
    create table weight_means as  
    select TRTA, AVISIT,  
           mean(AVAL) as mean_weight  
    from weight_data  
    group by TRTA, AVISIT;  
quit;
```

```
proc print data=weight_means;  
run;
```


ChatGPT: Codes Development – Python

Prompt :

Write a **Python script** that groups data by "TRTA" and "AVISIT" columns in "advs.xpt"

and calculates the mean of "AVAL" column for each group at PARAMCD = 'WEIGHT'

Output :

```
import pandas as pd
import xport

# Load the .xpt file using xport
with open('advs.xpt', 'rb') as f:
    data = xport.load(f)

# Convert the xport data to a pandas DataFrame
df = pd.DataFrame(data['ADVS'])

# Filter the data for PARAMCD = 'WEIGHT'
df_weight = df[df['PARAMCD'] == 'WEIGHT']

# Group by TRTA and AVISIT, then calculate the mean of AVAL
grouped_data =
df_weight.groupby(['TRTA','AVISIT'])['AVAL'].mean().reset_index()
print(grouped_data)
```

ChatGPT: Codes Debugging – Python

Prompt :

Debug below `<python codes>` using `<error message>`.

```
<python codes>:  
import pandas as pd  
import xport
```

```
# Load the .xpt file using xport  
with open('advs.xpt', 'rb') as f:  
    data = xport.load(f)
```

```
# Convert the xport data to a pandas  
DataFrame  
df = pd.DataFrame(data['ADVS'])  
# Filter the data for PARAMCD = 'WEIGHT'  
df_weight = df[df['PARAMCD'] == 'WEIGHT']
```

```
# Group by TRTA and AVISIT, then calculate the  
mean of AVAL
```

```
grouped_data = df_weight.groupby(['TRTA',  
'AVISIT'])['AVAL'].mean().reset_index()
```

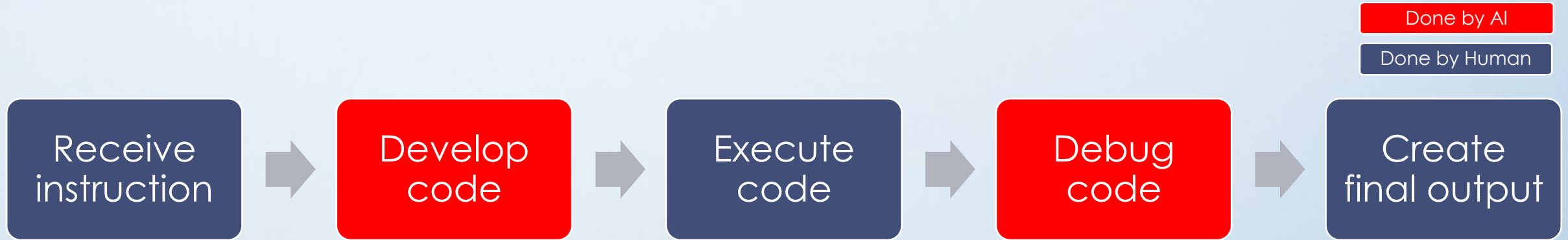
```
# Output the grouped data  
print(grouped_data)  
</python codes>
```

```
<error message>  
TypeError: Could not convert ['aval'] to numeric  
</error message>
```

Output:

```
# Convert AVAL to numeric  
df_weight['AVAL'] =  
pd.to_numeric(df_weight['AVAL'],  
errors='coerce')
```

Programming workflow using Vibe Coding - ChatGPT



Question :

- Can we automate this flow further?

AI Agent

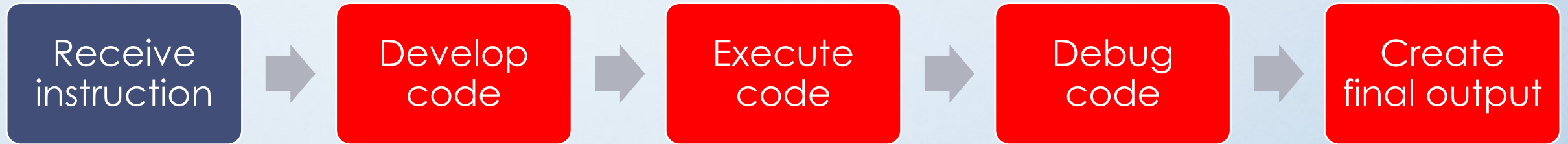
- System that can interact with its environment, collect data, and **autonomously** perform tasks and make decisions to achieve the goals.
- Its rôle is
 - Develop Codes
 - Execute Codes using SAS, R & Python
 - Debug Codes if there are error messages.
 - Create final outputs



Programming workflow using Vibe Coding with AI Agents

Done by AI

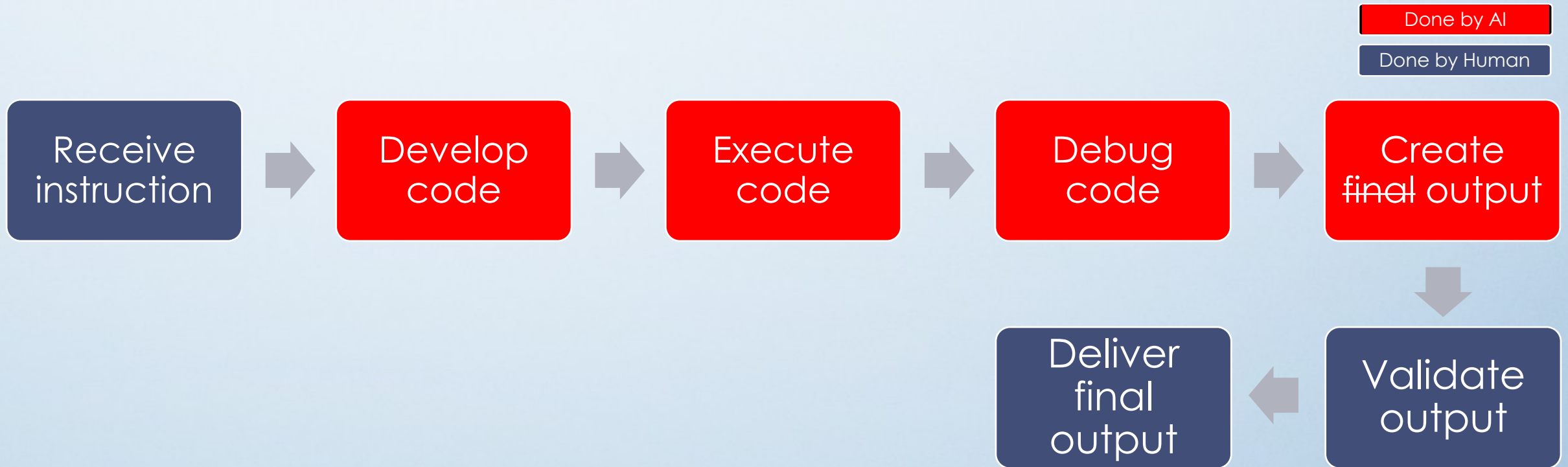
Done by Human



Question :

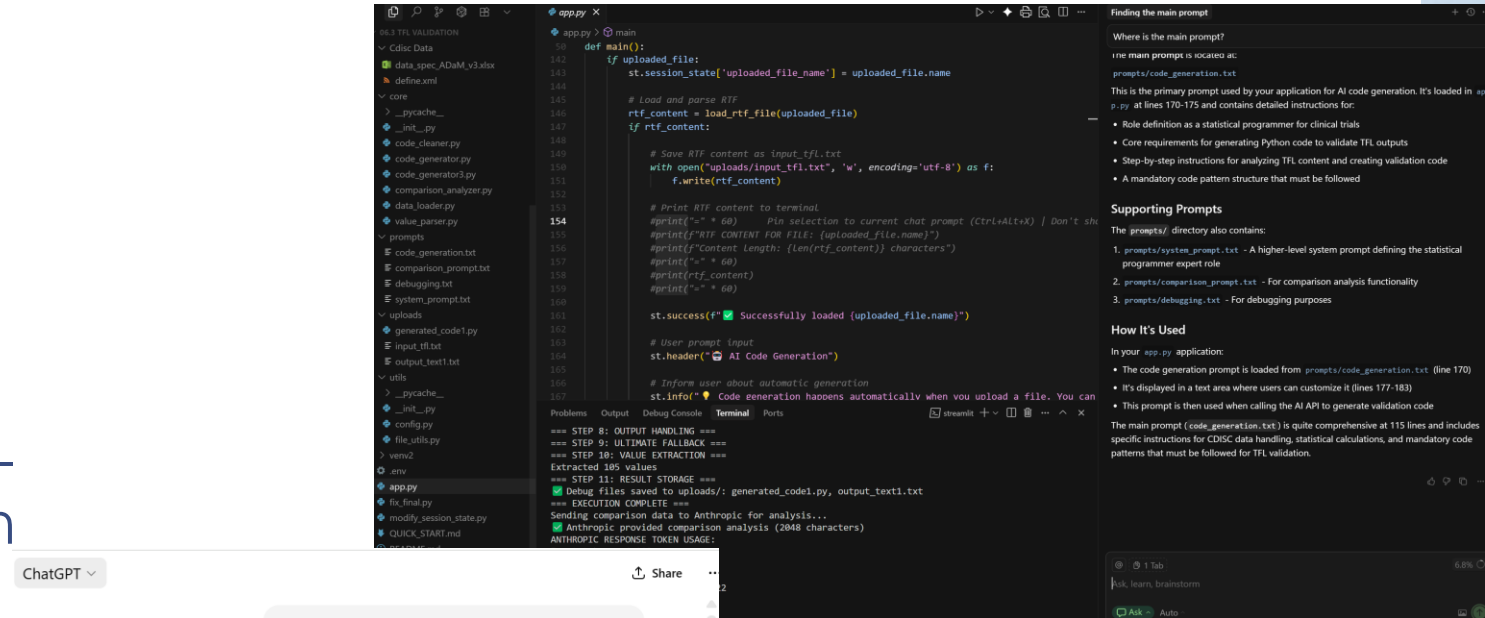
- What is the problem in this picture / workflow?

Programming workflow using Vibe Coding AI Agents with human involvement – **AI Agentic workflow**

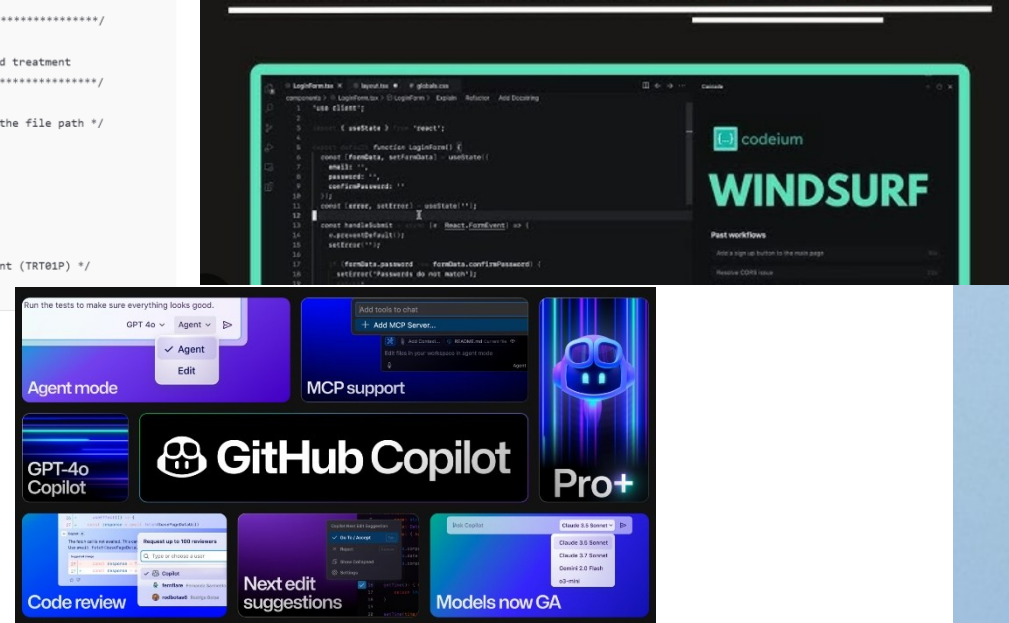


Vibe Coding AI Agents Tools

- **ChatGPT / Claude / Gemini** – web-based prompt engines for ideation
- **Cursor** – AI-native IDE built around conversational programming
- **Windsurf** – context-aware code editing and real-time collaboration
- **GitHub Copilot** – inline suggestions in VS Code, RStudio, Jupyter



THIS IDE BUILT THE ENTIRE APP



Why customized Vibe Coding Agent for Biometrics works?

- Generic Coding AI agents lack domain knowledge
- Biometrics = highly specialized: CDISC, ADaM, TLFs, Compliance
- Custom agents embedded with clinical trial logic + GxP validation rules
- Data Privacy and Security
- Dirty Data

The Change of Coding

Traditional Coding

- Manual / Hands-on
- Codes/Rules-based
- Writing codes
- Syntax-driven



Vibe Coding

- Conversational
- AI-assisted
- Designing workflow
- Context-aware

The impact of Vibe-Coding?

- Satya Nadella, CEO of Microsoft

“I’d say maybe 20%, 30% of the code that is inside of our repos today and some of our projects are probably all written by software,”

- Sundar Pichai, CEO of Google

“AI generates more than 30% of Google’s code,”

- Mark Zuckerberg, CEO of Meta

“Our bet is sort of that in the next year probably...maybe 50% of the development is going to be done by AI, as opposed to people, and then that will just kind of increase from there,”

Key Benefits on Vibe-coding

- Dramatic reduction in repetitive coding tasks
- Accelerates QC and development cycles (25 to 40%)
- Enables multi-language transition and consistency
- Democratizes programming across experience levels
- Improves documentation and traceability

Potential Risks on Vibe-Coding

- Hallucinated or Inaccurate code outputs
- Limited domain understanding
- Regulatory & Compliance challenges (audit trail, validation, Data Privacy)
- Risk of over-reliance on AI judgment

Claude Code

- Definition
- Key characteristics
- how it works
- Use Case



Claude Code Definition & Key Characteristics

- **Claude Code** is an **agentic coding tool** that

- Lives in our terminal
- Understands our codebase
- Helps our code faster

by executing routine tasks, explaining complex code through natural language commands.

- **Key Characteristics**

- **Terminal-based:** Operates as a command-line interface tool
- **AI-powered agent:** Understands and works with your entire codebase
- **Natural language interface:** Accept instructions in plain English
- **Cross-platform:** Works on macOS, Windows, and Linux
- **Git integration:** Built-in version control workflow management

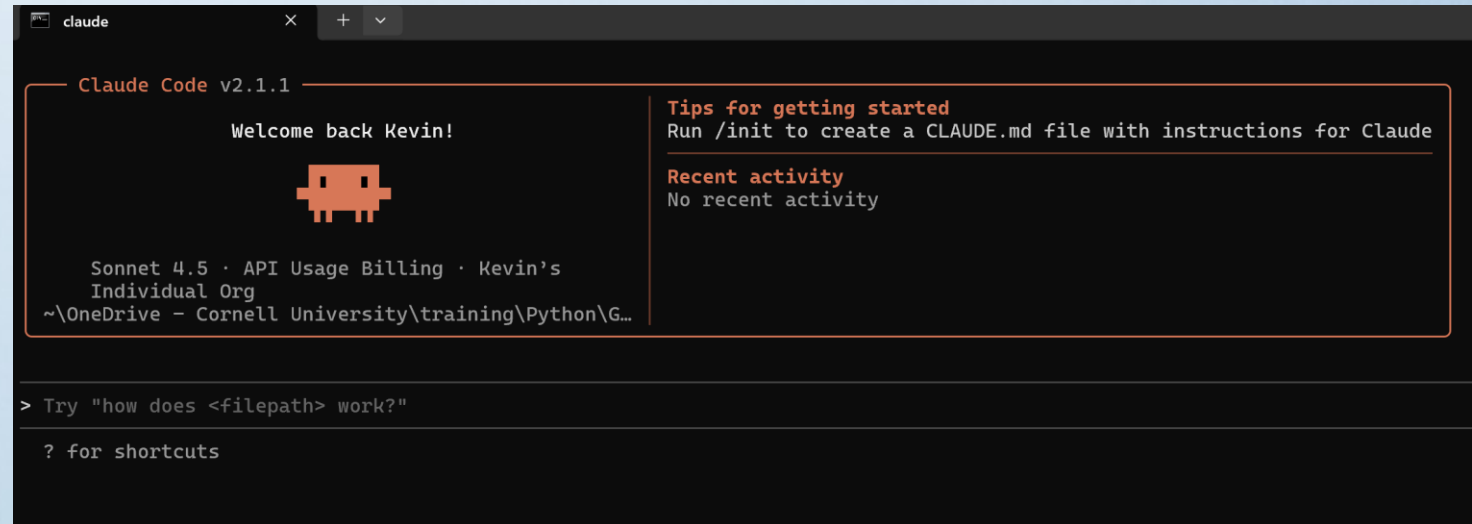
```
C:\Users\kevin>cd "C:\Users\kevin\OneDrive - Cornell University\training\Python\Generative AI\15.0 Claude Code- Highly
C:\Users\kevin\OneDrive - Cornell University\training\Python\Generative AI\15.0 Claude Code- Highly Agentic Coding Assi

Do you want to work in this folder?

C:\Users\kevin\OneDrive - Cornell University\training\Python\Generative AI\15.0 Claude Code- Highly Agentic Coding Assi
In order to work in this folder, we need your permission for Claude Code to read, edit, and execute files.
If this folder has malicious code or untrusted scripts, Claude Code could run them while trying to help.
Only continue if this is your code or a project you trust.

Security details
> 1. Yes, continue
   2. No, exit

Enter to confirm · Esc to cancel
```



```
claude
Claude Code v2.1.1
Welcome back Kevin!

Sonnet 4.5 · API Usage Billing · Kevin's Individual Org
~\OneDrive - Cornell University\training\Python\G...

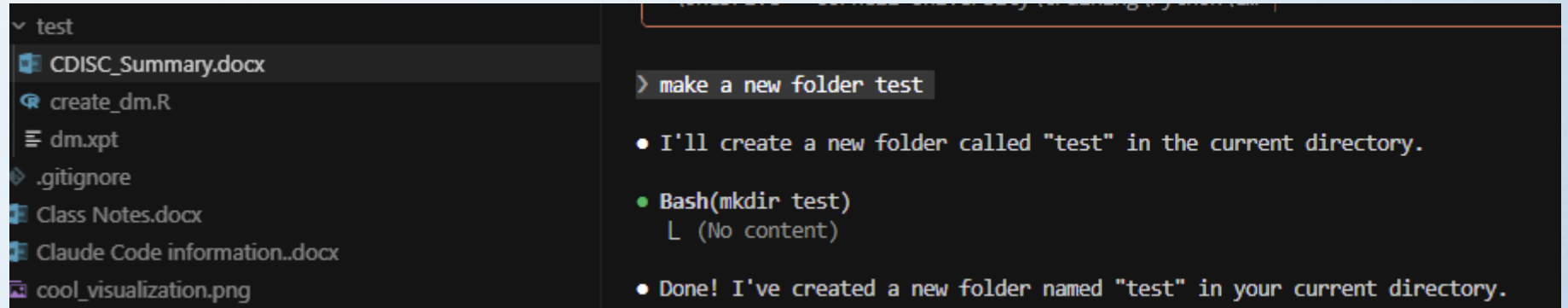
Tips for getting started
Run /init to create a CLAUDE.md file with instructions for Claude

Recent activity
No recent activity

> Try "how does <filepath> work?"
? for shortcuts
```

Use Case

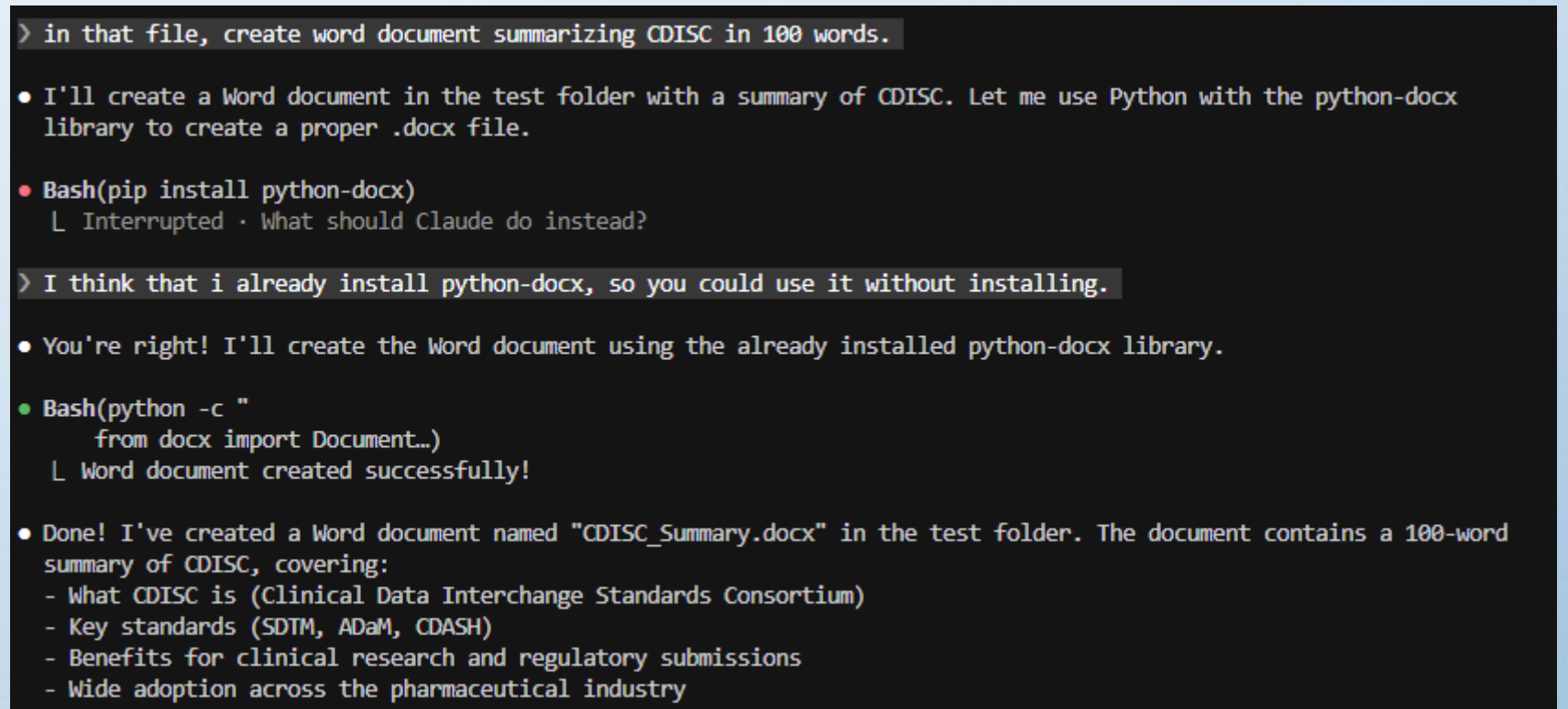
- In command line interface, I can create a new folder – test
- In that folder, we can create a simple word document summarizing CDISC 100 words
- It also communicate with users



The screenshot shows a terminal window with a file explorer on the left and a command prompt on the right. The file explorer shows a directory named 'test' containing files: CDISC_Summary.docx, create_dm.R, dm.xpt, .gitignore, Class Notes.docx, Claude Code information..docx, and cool_visualization.png. The command prompt shows the command 'make a new folder test' being executed, followed by the output 'I'll create a new folder called "test" in the current directory.' and 'Bash(mkdir test)' with '(No content)' below it. The final output is 'Done! I've created a new folder named "test" in your current directory.'

```
> make a new folder test
```

- I'll create a new folder called "test" in the current directory.
- Bash(mkdir test)
 L (No content)
- Done! I've created a new folder named "test" in your current directory.

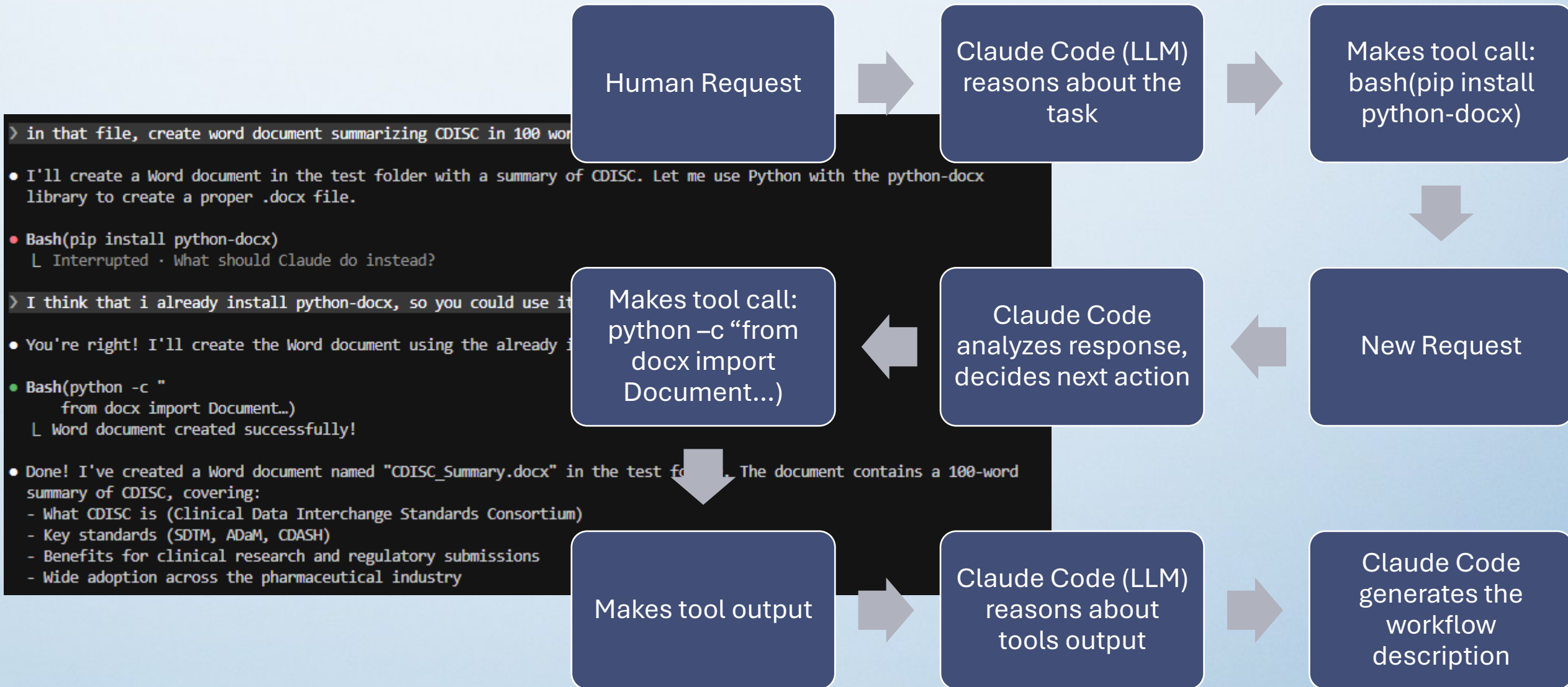


The screenshot shows a terminal window with a command prompt. The command prompt shows the command 'in that file, create word document summarizing CDISC in 100 words.' being executed, followed by the output 'I'll create a Word document in the test folder with a summary of CDISC. Let me use Python with the python-docx library to create a proper .docx file.' and 'Bash(pip install python-docx)' with 'Interrupted · What should Claude do instead?' below it. The next command is 'I think that i already install python-docx, so you could use it without installing.' followed by the output 'You're right! I'll create the Word document using the already installed python-docx library.' and 'Bash(python -c "from docx import Document...)" with 'Word document created successfully!' below it. The final output is 'Done! I've created a Word document named "CDISC_Summary.docx" in the test folder. The document contains a 100-word summary of CDISC, covering: - What CDISC is (Clinical Data Interchange Standards Consortium) - Key standards (SDTM, ADaM, CDASH) - Benefits for clinical research and regulatory submissions - Wide adoption across the pharmaceutical industry'

```
> in that file, create word document summarizing CDISC in 100 words.
```

- I'll create a Word document in the test folder with a summary of CDISC. Let me use Python with the python-docx library to create a proper .docx file.
- Bash(pip install python-docx)
 L Interrupted · What should Claude do instead?
- > I think that i already install python-docx, so you could use it without installing.
- You're right! I'll create the Word document using the already installed python-docx library.
- Bash(python -c "
 from docx import Document...)
 L Word document created successfully!
- Done! I've created a Word document named "CDISC_Summary.docx" in the test folder. The document contains a 100-word summary of CDISC, covering:
 - What CDISC is (Clinical Data Interchange Standards Consortium)
 - Key standards (SDTM, ADaM, CDASH)
 - Benefits for clinical research and regulatory submissions
 - Wide adoption across the pharmaceutical industry

How Claude Code works



Use Case

- Write(test\create_dm.R)
 - └ Wrote 1 lines to test\create_dm.R

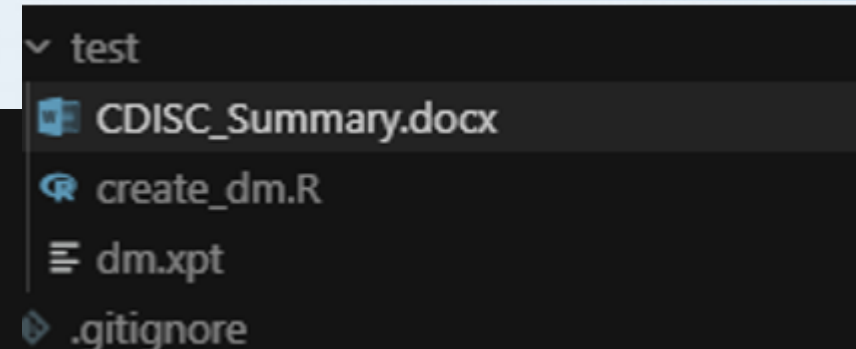
```
1 library(haven)
2
3 # Create sample DM domain data following CDISC SDTM standards
4 dm <- data.frame(
5   STUDYID = rep('STUDY001', 10),
6   DOMAIN = rep('DM', 10),
7   USUBJID = sprintf('STUDY001-%03d', 1:10),
8   SUBJID = sprintf('%03d', 1:10),
9   RFSTDTC = c('2024-01-15', '2024-01-16', '2024-01-17', '2024-01-18', '2024-01-19',
10              '2024-01-20', '2024-01-22', '2024-01-23', '2024-01-24', '2024-01-25'),
```
- Now let me run the R script.
- Bash(cd test && "C:\Program Files\R\R-4.5.0\bin\Rscript.exe" create_dm.R)
 - └ SAS XPT file (dm.xpt) created successfully with 10 subjects!
Dataset contains the following SDTM DM domain variables:
STUDYID, DOMAIN, USUBJID, SUBJID, RFSTDTC, RFENDTC, RFXSTDTC, RFXENDTC, RFICDTC, RFPENDTC, DTHDTC, DTHFL, SITE ID, AGE, AGEU, SEX, RACE, ETHNIC, ARMCD, ARM, ACTARMCD, ACTARM, COUNTRY
- Perfect! I've successfully created a SAS XPT file (dm.xpt) in the test folder using R. The file contains a sample SDTM DM (Demographics) domain with 10 subjects following CDISC SDTM guidelines.

The dataset includes all standard DM domain variables:

- Identifiers: STUDYID, DOMAIN, USUBJID, SUBJID, SITEID
- Date Variables: RFSTDTC, RFENDTC, RFXSTDTC, RFXENDTC, RFICDTC, RFPENDTC, DTHDTC
- Demographics: AGE, AGEU, SEX, RACE, ETHNIC
- Treatment Arms: ARMCD, ARM, ACTARMCD, ACTARM
- Other: COUNTRY, DTHFL

The sample data includes:

- 10 subjects from 5 different sites (001-005)
- Mix of Treatment and Placebo arms
- Diverse demographics (age 29-67, different races and ethnicities)
- Subjects from USA and Canada



- Can create create_dm.R codes
- Execute it to make dm.xpt
- Along the way, it explains what it has done.

Why Claude Code is a difference maker

- Integrated local Agent AI capabilities
- Superior codebase (SAS, R, Python,...) understanding
- Agentic / Autonomous workflow
- Superior Reasoning and complex problems
- Powerful sequential thinking and planning
- Effective methodical execution with tools
- Dramatic productivity by multiplier
- Step by Step feedbacks

Strategic Gen AI / LLM / ChatGPT Implementation at Enterprise

- Risks and Concerns
- Benefits and Use Cases
- Cross Functional Team
- Policy and Guidelines
- Training and Education
- PoC & Evaluation
- Deployment



**Does your company allow ChatGPT
at Work?**

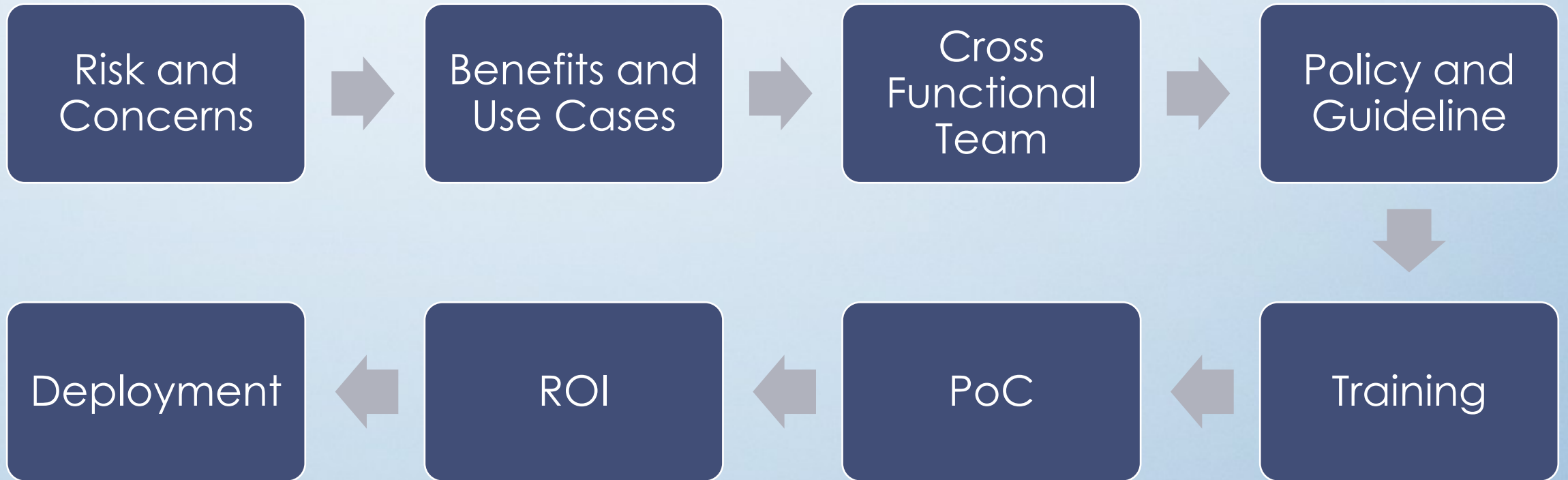


**A fear of
missing out**



**A fear of
messing up**

LLM (ChatGPT) Implementation Roadmap





Concerns using AI (ChatGPT)

- Data Privacy & Security
- Bias
- Accuracy
- Regulatory Compliance
- Ethical Consideration
- Black Box Feature
- Resource Requirements
- Lack of Expertise
- Cost vs ROI

Data Privacy

- Data Privacy – the right of a person to have control over how their personal information is collected and used. (e.g., clinical trial data)
- Since ML is built using data, ML algorithms can contain sensitive information even though it is one of a Big Data.
- The growth of ML has increased the possibility of using sensitive data in ways that may violate data privacy. (e.g., ChatGPT)



Bias of Machine Learning

- Phenomenon that occurs when ML algorithms produces results that are prejudiced due to wrong assumptions
- Examples :
 - Amazon ML recruiting engine show a bias on women.
 - ML was trained to vet applicants using 10 years of resume
 - Most came from men, a reflection of male dominance across tech industry.



Regulatory Compliance

- Regulatory Compliance – the process of adhering to laws, regulations, standards, and other rules set by governments and other regulatory bodies.
- For pre-market approval, AI-based software needs to follow regulatory guidelines (e.g., Good Machine Learning for Medical Device Development Guiding Principles)



Good Machine Learning Practice for Medical Device Development: Guiding Principles

October 2021

The U.S. Food and Drug Administration (FDA), Health Canada, and the United Kingdom's Medicines and Healthcare products Regulatory Agency (MHRA) have jointly identified 10 guiding principles that can inform the development of Good Machine Learning Practice (GMLP). These guiding principles will help promote safe, effective, and high-quality medical devices that use artificial intelligence and machine learning (AI/ML).

Artificial intelligence and machine learning technologies have the potential to transform health care by deriving new and important insights from the vast amount of data generated during the delivery of health care every day. They use software algorithms to learn from real-world use and in some situations may use this information to improve the product's performance. But they also present unique considerations due to their complexity and the iterative and data-driven nature of their development.

These 10 guiding principles are intended to lay the foundation for developing Good Machine Learning Practice that addresses the unique nature of these products. They will also help cultivate future growth in this rapidly progressing field.

The 10 guiding principles identify areas where the International Medical Device Regulators Forum (IMDRF), international standards organizations, and other collaborative bodies could work to advance GMLP. Areas of collaboration include research, creating educational tools and resources, international harmonization, and consensus standards, which may help inform regulatory policies and regulatory guidelines.

Good Machine Learning Practice for Medical Device Development: Guiding Principles	
Multi-Disciplinary Expertise Is Leveraged Throughout the Total Product Life Cycle	Good Software Engineering and Security Practices Are Implemented
Clinical Study Participants and Data Sets Are Representative of the Intended Patient Population	Training Data Sets Are Independent of Test Sets
Selected Reference Datasets Are Based Upon Best Available Methods	Model Design Is Tailored to the Available Data and Reflects the Intended Use of the Device
Focus Is Placed on the Performance of the Human-AI Team	Testing Demonstrates Device Performance During Clinically Relevant Conditions
Users Are Provided Clear, Essential Information	Deployed Models Are Monitored for Performance and Re-training Risks are Managed

Ethical Consideration

- Who will make decision? AI or human?
- Can AI be responsible for their decision?
- Is AI transparent?

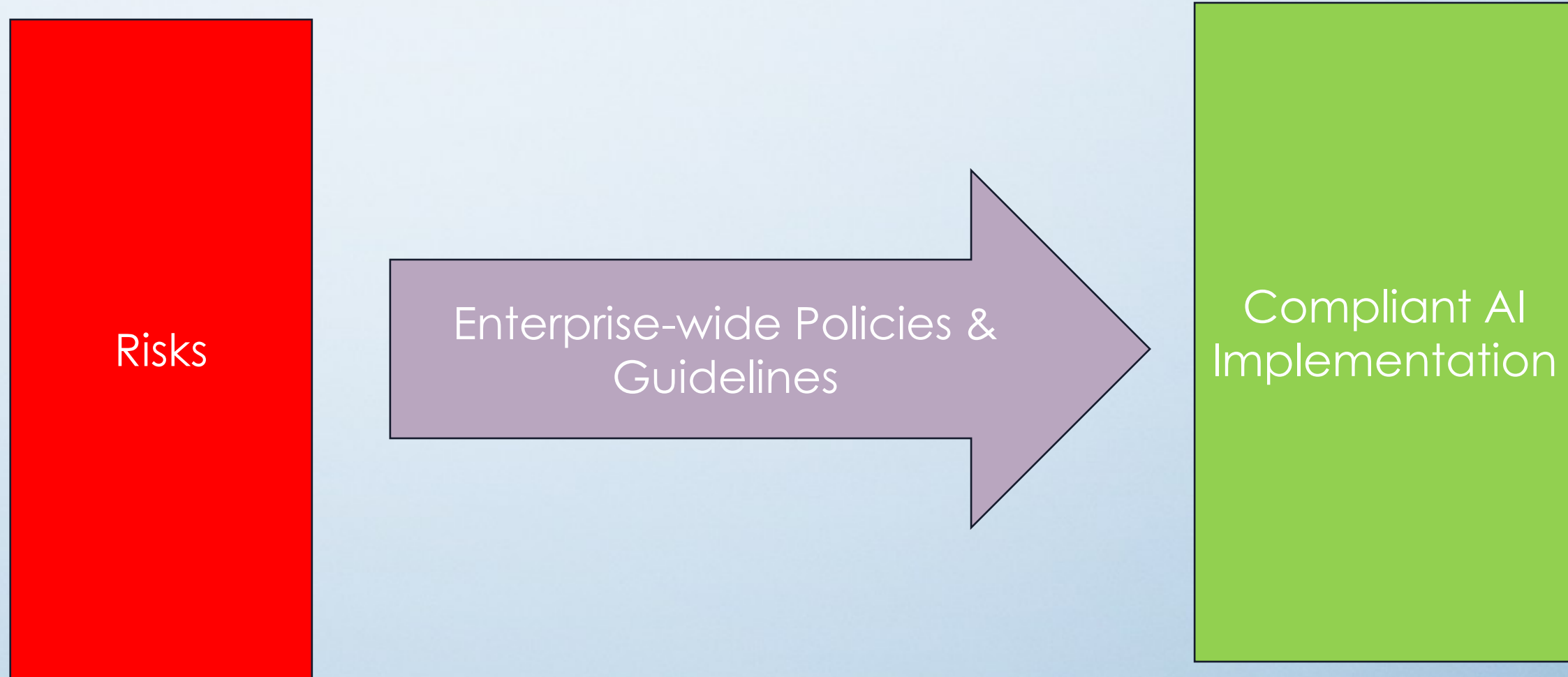


A stack of several books with light brown wooden covers and dark grey or black spines, arranged vertically on the left side of the slide. The books are slightly offset, showing the edges of multiple volumes.

AI Implementation through Enterprise Policy and Guidelines

- Data Privacy
- Regulatory Compliance
- Secure Data Storage
- Secure Access in Gen AI

Risk mitigation through Policies and Guidelines



Data Privacy

- The protection and control of confidential company information collected, processed, and utilized by AI systems.
- Examples to protect data privacy in AI
 - Don't share sensitive data with AI
 - Be cautious of what you share online
 - Stay anonymous
 - Data Encryption
 - Secure Socket layer (SSL)
 - Transport Layer Security (TLS)

OpenAI Personal Data Removal Request

Under certain privacy or data protection laws, such as the GDPR, you may have the right to object to the processing of your personal data by OpenAI's models. You can submit that request using this form.

Please provide complete, accurate, and relevant answers on this form for evaluation. OpenAI may use additional sources to verify information, balancing privacy and free expression in accordance with applicable law. Submitting a request does not guarantee that information about you will be removed from ChatGPT outputs, and incomplete forms may not be processed.

Read this Help Center [article](#) for more about how we collect and use personal data to develop ChatGPT.

Your information

Please provide your own full legal name, even if you are making the request on behalf of someone else. If you are submitting the request on behalf of someone else, you must have the legal authority to act on their behalf.

First name *

James

Last name *

Joyce

Email *

Please provide an email address we can use to contact you about your request.

Country whose law applies *

Regulatory Compliance

- Understand Regulatory Policy
 - FDA Comments: AI/ML will undoubtedly play a critical role in drug development, and FDA plans to develop and adopt a flexible **risk-based regulatory** framework that promotes innovation and protects patient safety.
- Policy Implementation
 - General Data Protection Regulation (GDPR)
 - Good Practice (GxP)
 - Code of Federal Regulation (CFR)
 - Health Insurance Portability and Accountability Act (HIPAA)



Proposed Regulatory Framework for Modifications to Artificial Intelligence/Machine Learning (AI/ML)-Based Software as a Medical Device (SaMD)

Discussion Paper and Request for Feedback



The diagram illustrates the components of AI/ML. It features a central cluster of eight hexagonal icons, each representing a different aspect of the technology. The icons are arranged in a circular pattern around a central point. The icons are: Pattern Recognition (magnifying glass over a hexagon), Automation (gears), Artificial Intelligence (AI chip), Machine Learning (hand pointing at a screen), Data Mining (magnifying glass over binary code), Algorithm (flowchart), Neural Networks (neural network diagram), and Problem Solving (hand pointing at a screen with a crosshair). The background of the diagram is a blurred image of a person's hand pointing at a screen.

Secure Data Storage

- Security of Data Storage and Data Processing
- Access Control of Data and ChatGPT
- Data Anonymization and Pseudonymization



Secure Access to ChatGPT

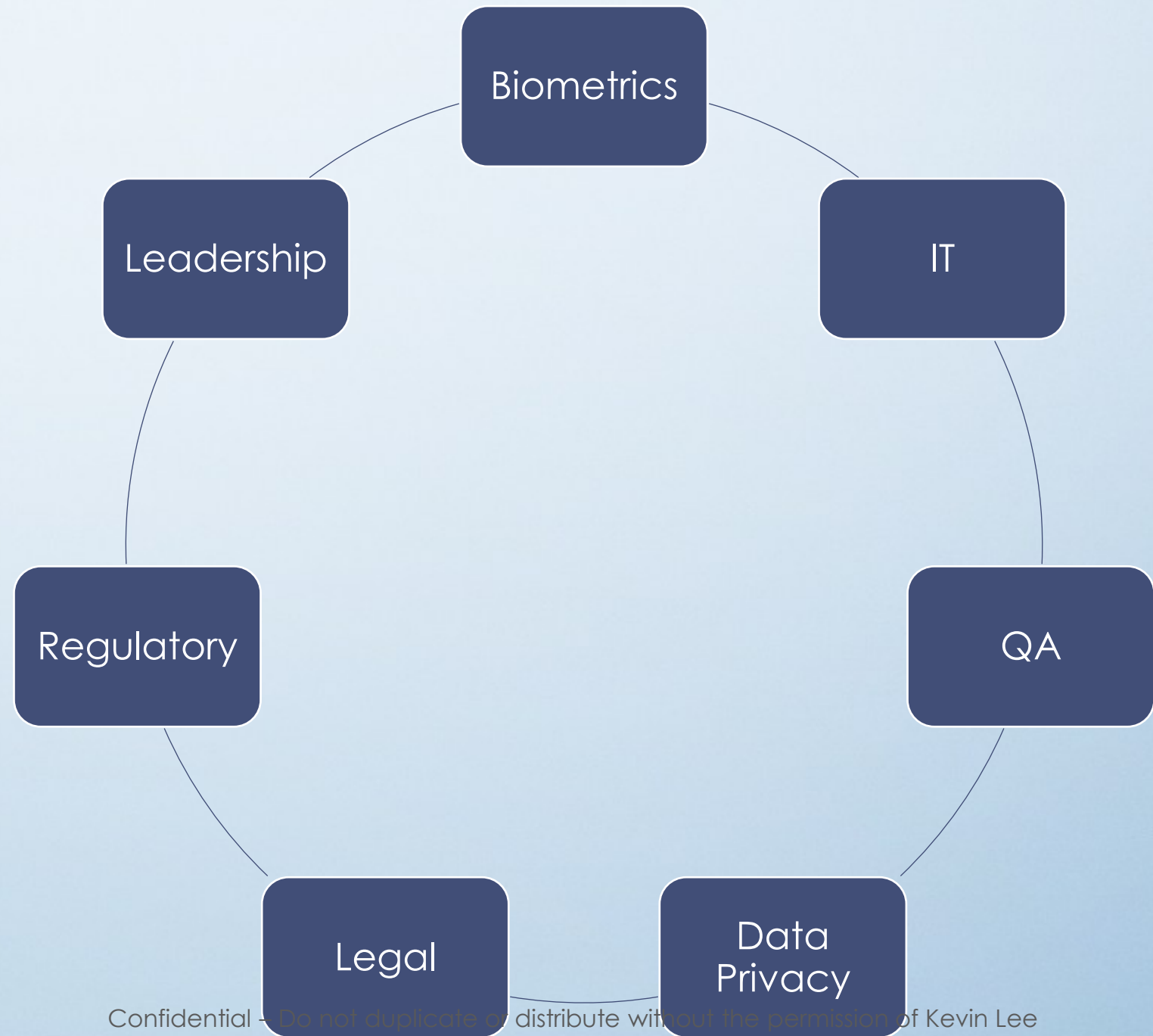
- Access Control of Data and ChatGPT
- Strong User Authentication Mechanism (e.g., Multi-factor Authentication)
- Audit Trails of user interactions with ChatGPT
- Regular Security Audits on ChatGPT
- Data Privacy Impact Assessment by ChatGPT





ChatGPT Implementation and Governance Cross-Functional Team

Cross-Functional Team

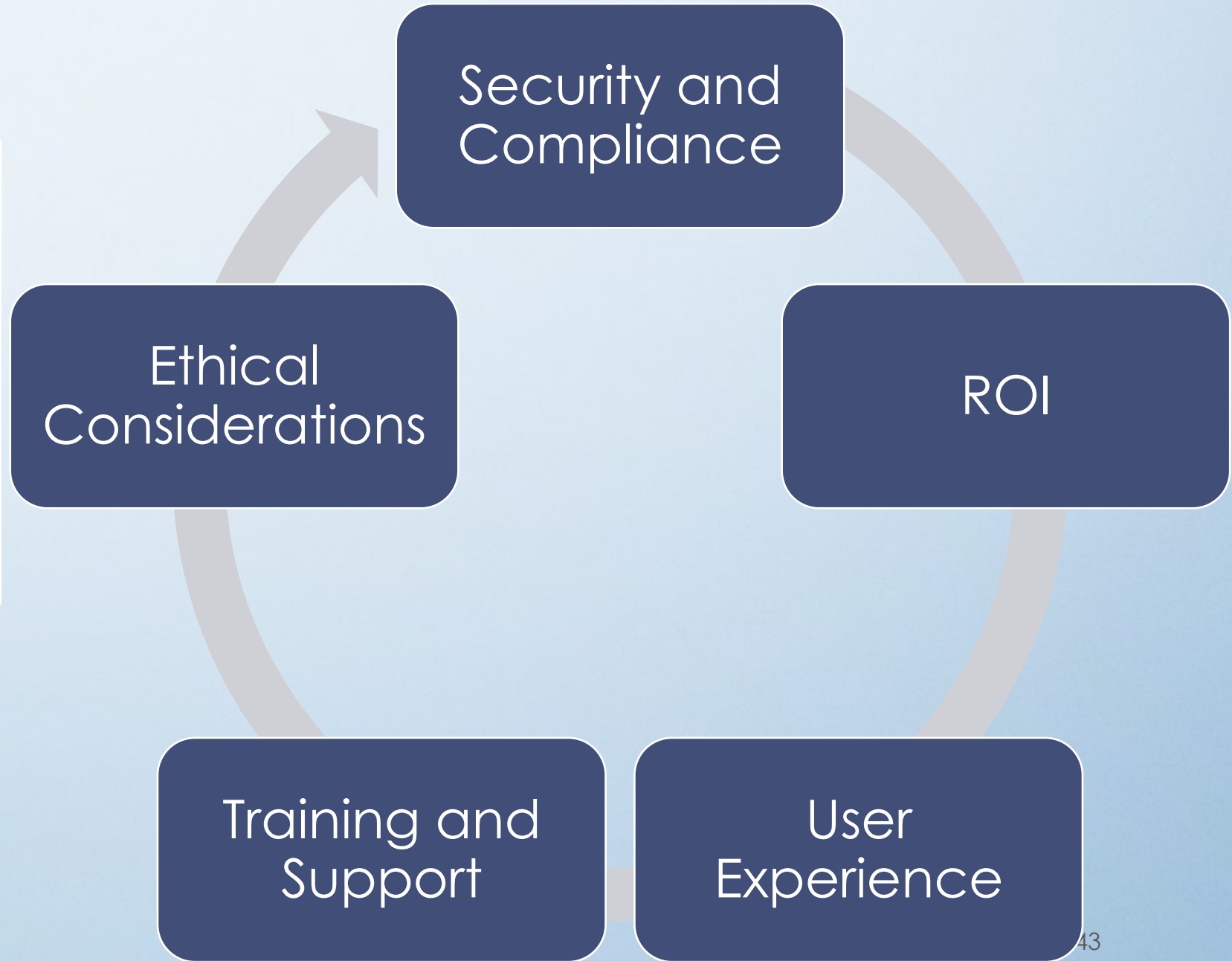
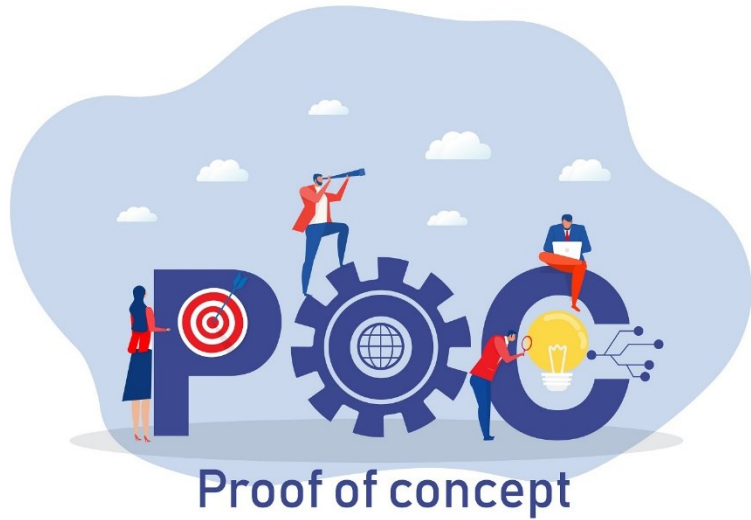


Employee Training

- Employees who will be using and managing ChatGPT
- Security best practices
- Data Privacy
- Data Handling Procedures with ChatGPT
- Ethics and Compliance



PoC & Evaluation





Gen AI Deployment

- Enterprise License (CoPilot, ChatGPT Enterprise)
- Home-Grown Gen AI
- Customized Gen AI implementation at function

ChatGPT Enterprise

- Enterprise-grade security & privacy
- OpenAI does not train on enterprise business data.
- All conversations are encrypted.
- Compliance : CCPA, GDPR, SOC2, SOC3
- Enterprise Security Trust Portal

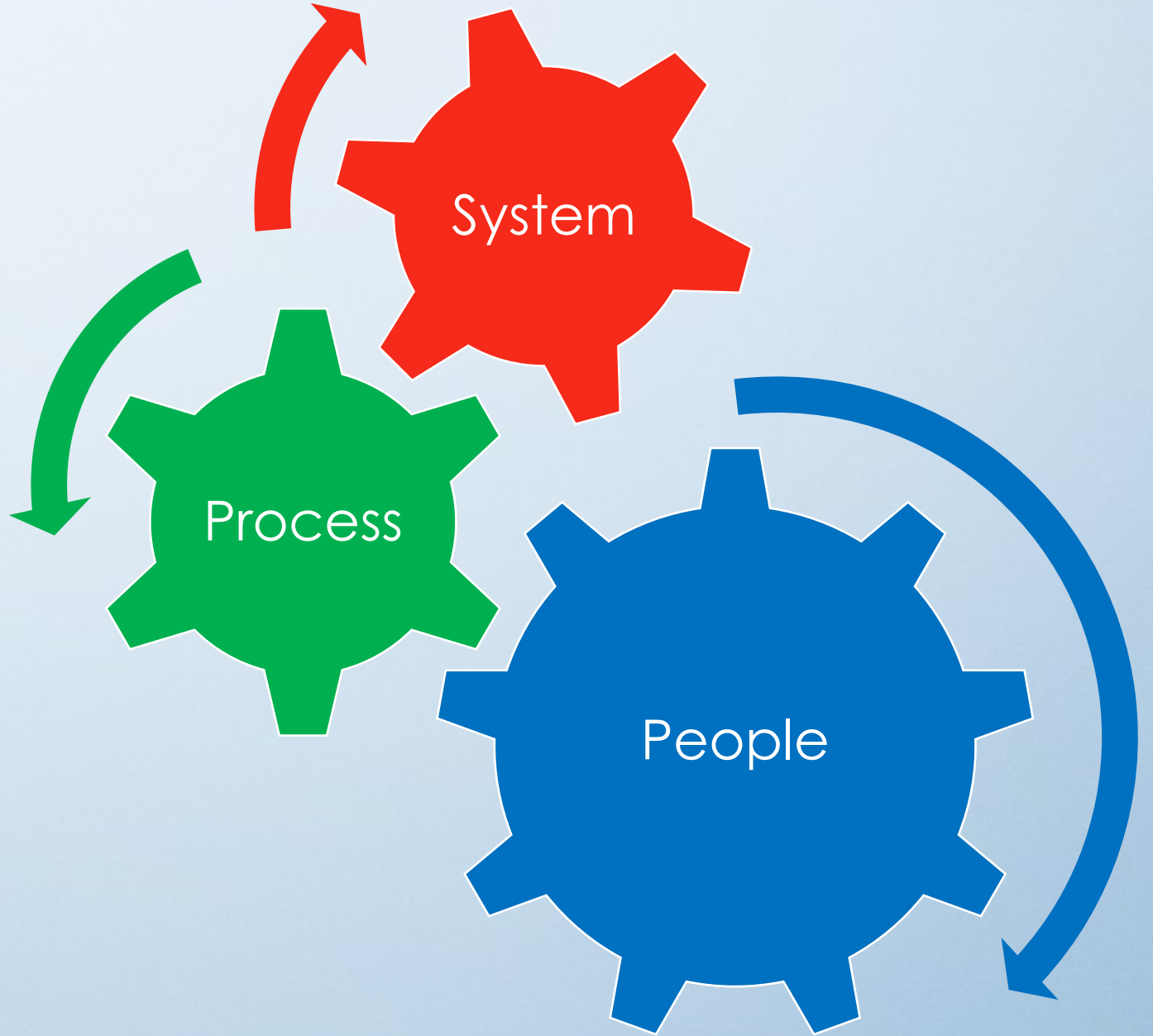


ChatGPT Enterprise

Biometrics Leadership in the era of Gen AI

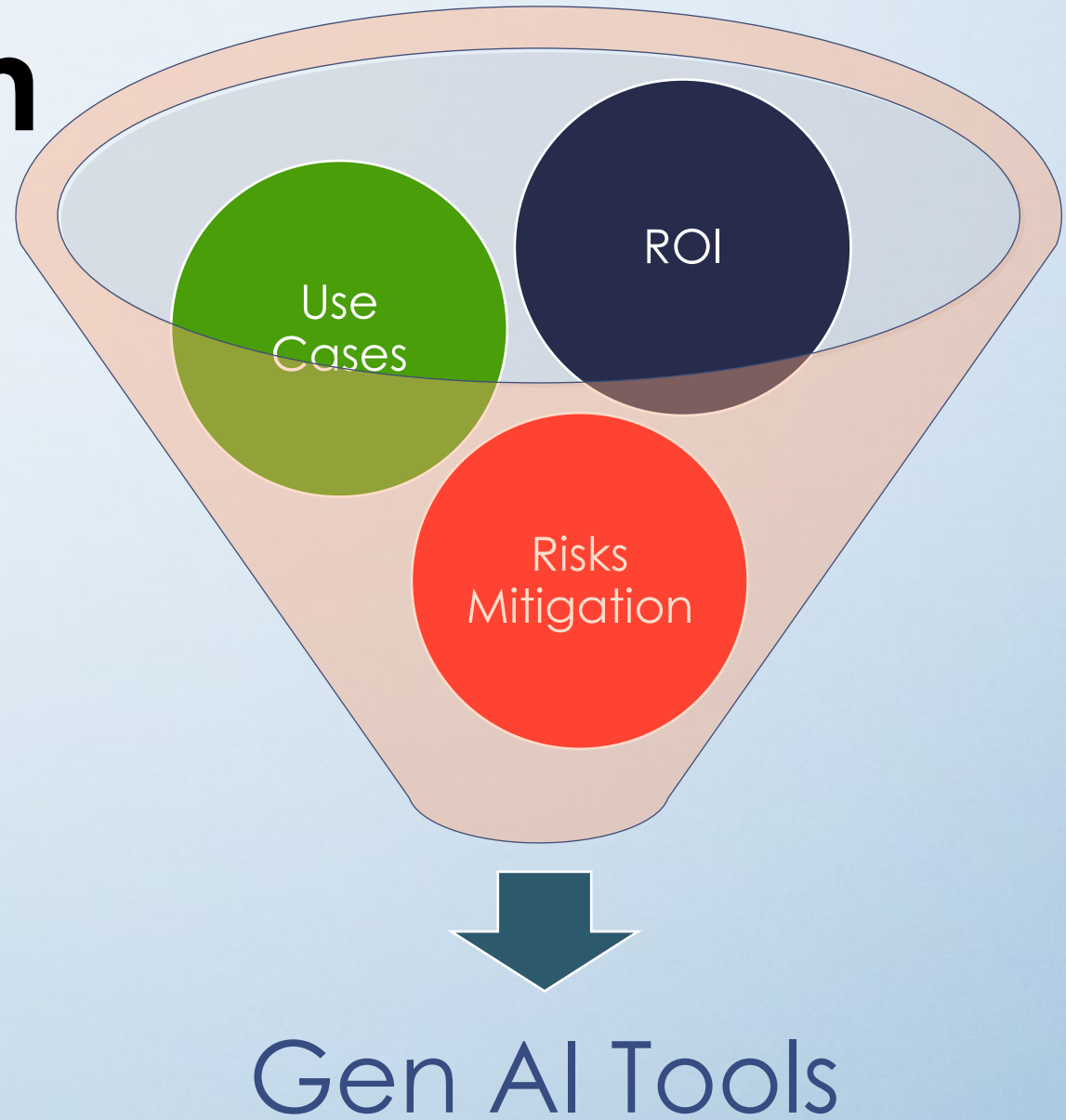


Three pillars to maximize Gen AI Capability in Biometrics



Use Cases driven Gen AI Tools

- Content Development
 - Protocol
 - SAP
 - Mock-Up Shells
- Coding Agent
 - SDTM
 - ADaM
 - TFL
 - Ad-Hoc
- Data Analysis



JARVIS



A stack of several books with thick, yellowed pages and dark covers, positioned on the left side of the slide. The books are stacked vertically, with their spines facing right.

Gen AI Process

- Validation?
- Human intervention
- Final output or source of input?

**ChatGPT is like a very smart, capable,
recently graduated intern/new hire.**



=

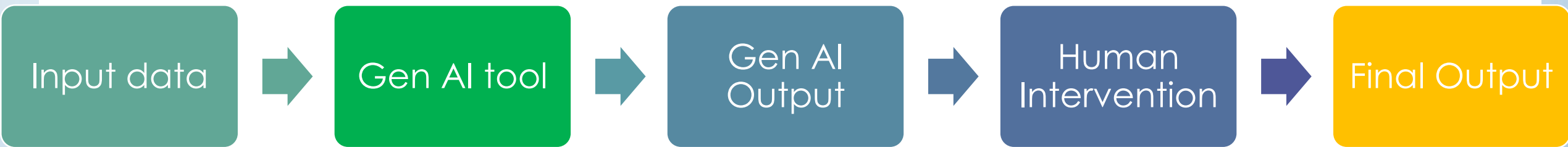


What will we do with the results from an intern?



**The output of Gen AI is
not the final result,
but the beginning of new process.**

Gen AI driven Process



Biometric Leadership in the era of Gen AI

- System Integration
- Process Development
- People Empowerment

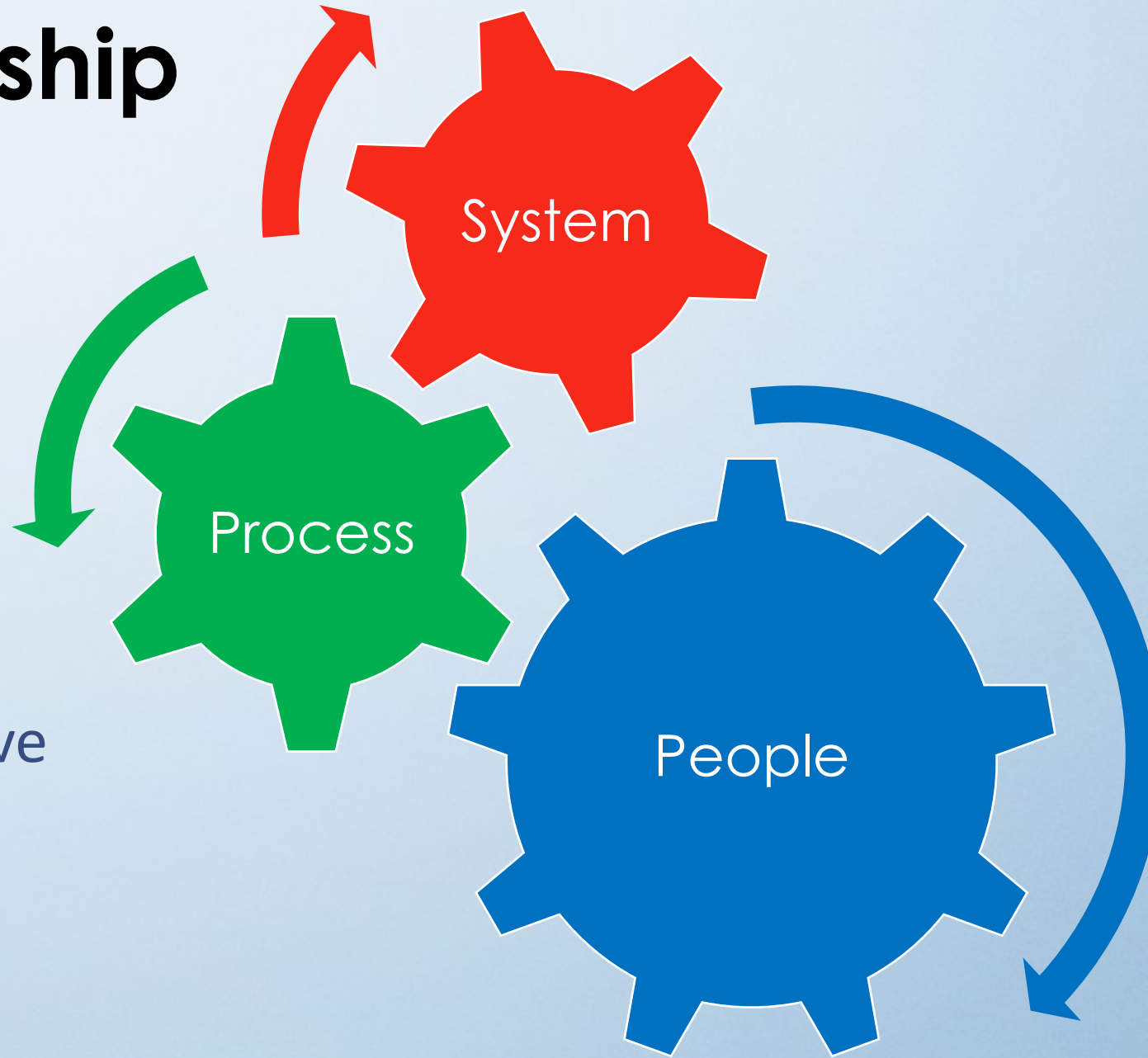


Definition of Leadership

Leadership is defined as

“the ability
to cultivate the environment,
guide the process,
empower people

to achieve a shared vision and drive
common goals”

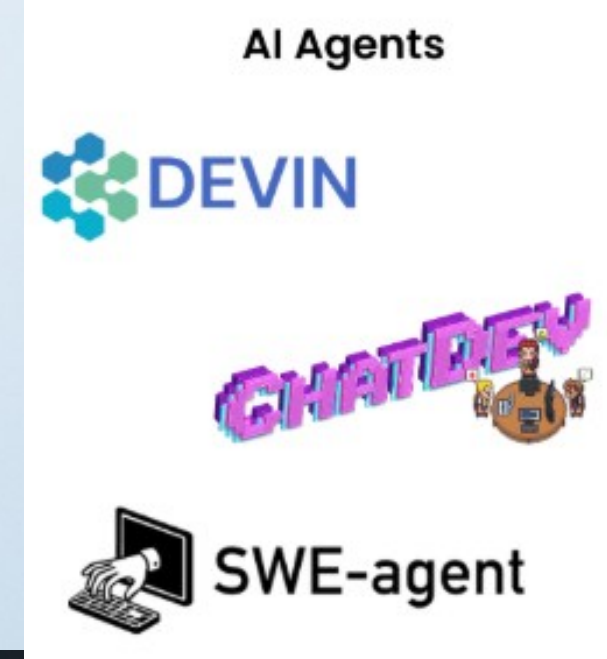
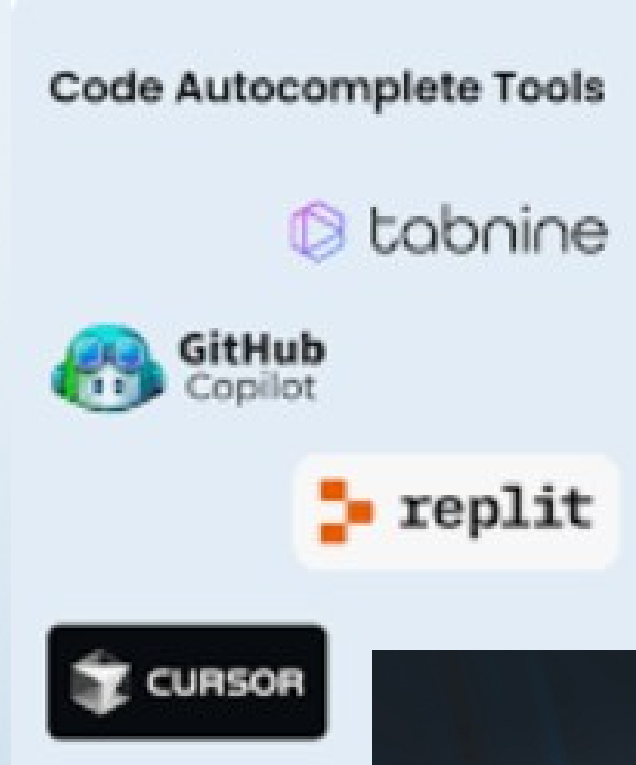




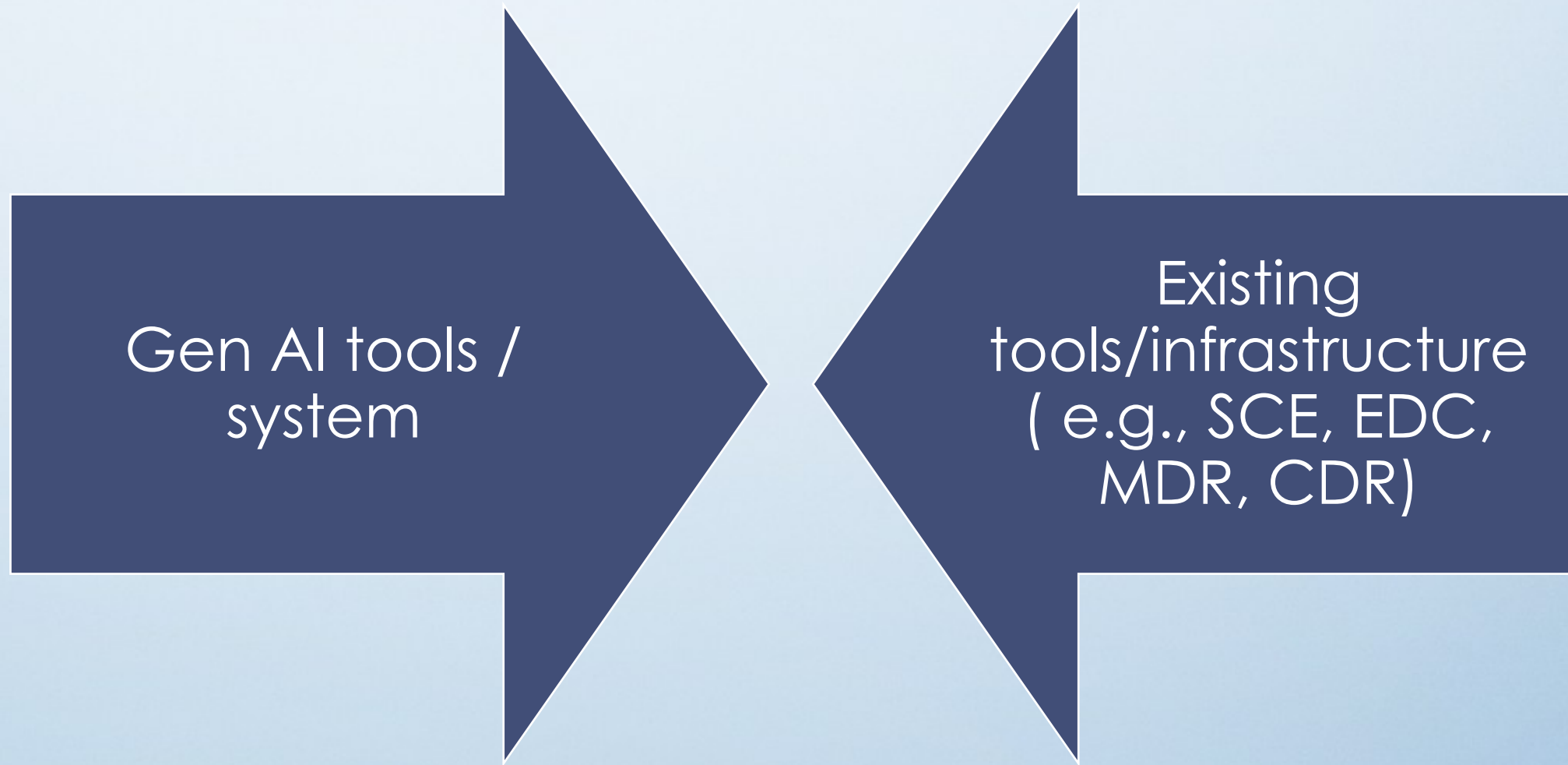
Gen AI Tools / Systems in Biometrics

- Identifying Gen AI tools
- Integrating with existing infrastructure
- Validation framework
- Compliance and Integrity

Gen AI Tools / Systems



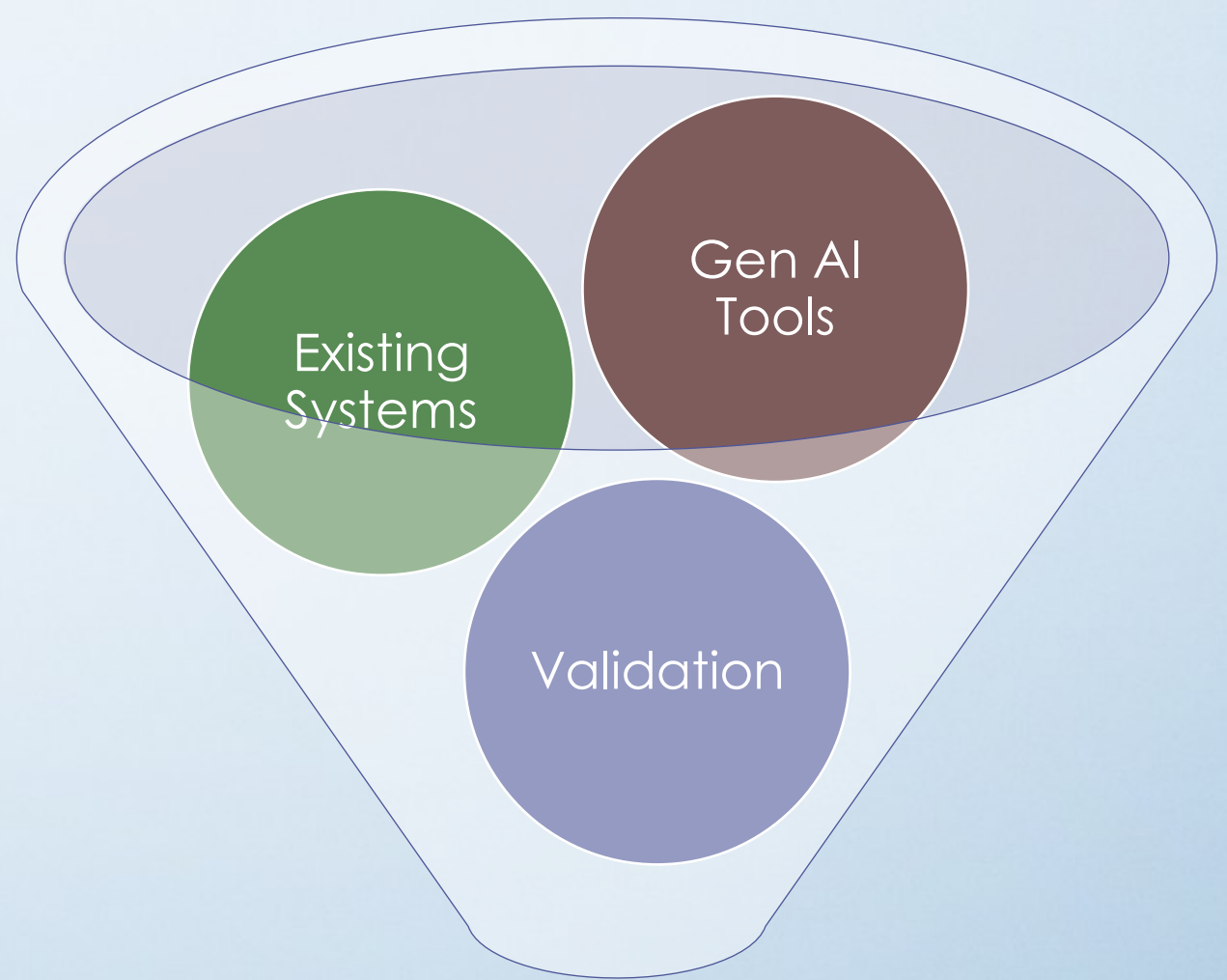
Integration with existing infrastructure



Validation framework

- **Regulatory Importance:** Gen AI outputs must meet the same quality standards as traditionally produced results.
- **Biometrics Leadership Role:** Must establish rigorous, risk based validation protocols/systems tailored for Gen AI implementation.
- **Framework Components:**
 - Risk-based validation planning
 - Verification of AI-generated output accuracy
 - Application of GxP / GAMP 5 principles
 - Comprehensive documentation (requirement, process, test scripts, reports)
 - Version control and audit trails

Gen AI integrated, compliant Biometric ecosystem roadmap



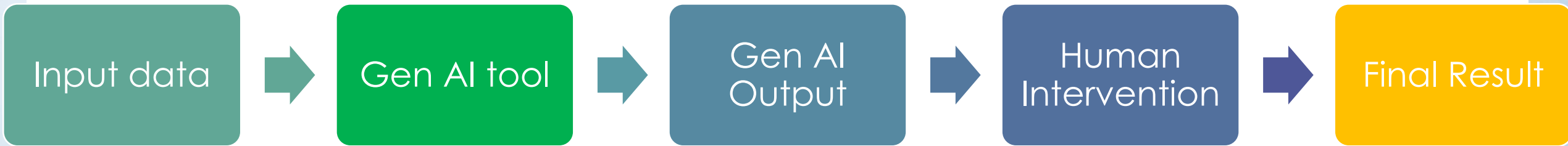
Ecosystem with traceability,
accuracy, consistency, and
compliance



Gen AI Process Roadmap

- Validation & QC
- End to End Current Process Redesign
- Human & AI Collaboration
- Regulatory Strategy

Gen AI driven Process



The output of Gen AI is

not the final result,
but the beginning of new process.

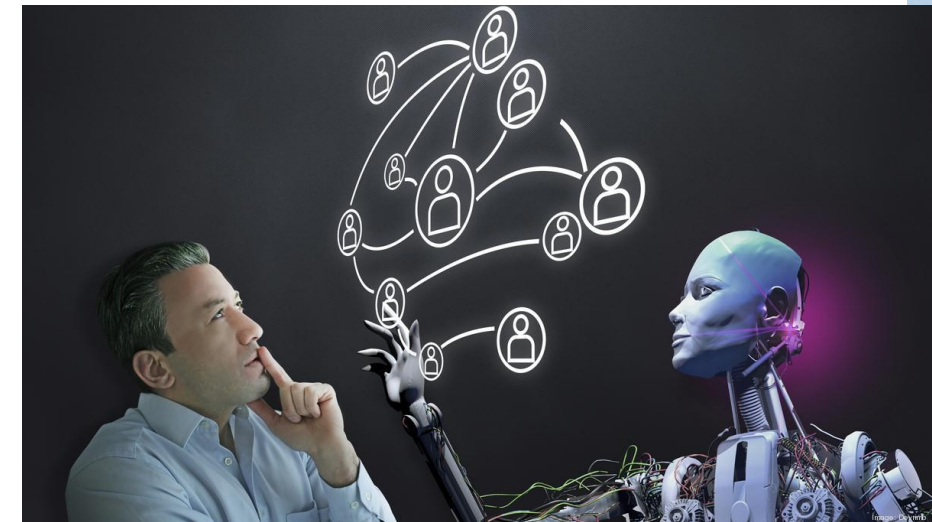
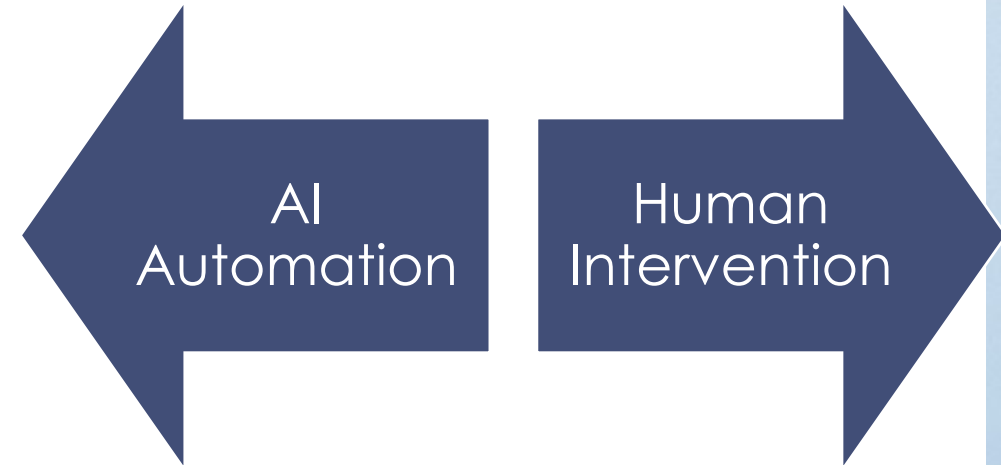
End-to-End Process Redesign with Gen AI

- **Comprehensive Review**: Biometrics leadership should review the entire biometric process
 - study design
 - database lock
 - submission.
- **Identify Opportunities**: Focus on high-impact areas where Gen AI can be integrated to add value.
- **Systems Efficiency Thinking**: Apply a holistic approach to streamline processes and reduce inefficiencies.

Goal: **Improve overall efficiency and effectiveness** of biometric workflows through Gen AI integration.

Human vs AI Collaboration Policy

- Clear delineation
 - AI-driven activities (Vibe Coding)
 - Human-driven activities
- AI roles
 - **Assistant**: e.g., generating initial code or report templates
 - **Autonomous Operator**: e.g., handling routine coding development and checks.
- Human intervention- required to ensure **oversight** and **accountability**.



Regulatory Strategy

- **Forward-thinking leadership**
 - Expecting evolving regulatory requirements
 - Engaging proactively with authorities.
- **Key strategies:**
 - Preparing comprehensive documentation of validation approaches
 - Developing SOPs, Working Instructions, and Guidelines for Gen driven process.
 - Validating software packages used by AI tools to ensure regulatory compliance (e.g., R or Python packages)





People Empowerment

- Capability Building
- Culture Transformation

Comprehensive Capability Building



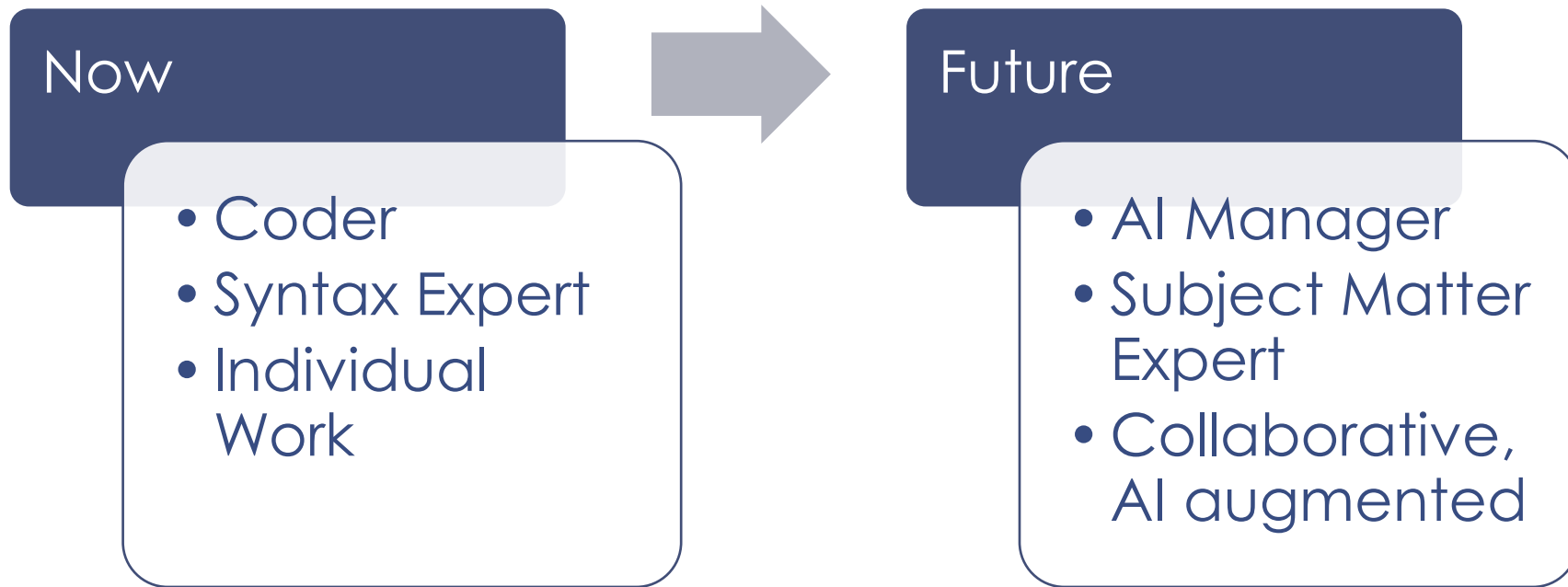
- Focus areas for capability building:
 - Technical proficiency with Gen AI tools (e.g., ChatGPT, Copilot)
 - Prompt engineering
 - Validation skills for AI-generated outputs
 - Understanding of Agentic Workflow – AI and Human Collaboration
 - More Human-like Characteristics : EQ, Creativity, Critical Thinking, Collaboration, Communication
- A systematic approach ensures department-wide readiness for Gen AI integration.

Culture Transformation

- Foster **psychological safety** to encourage experimentation with Gen AI tools.
- Promote a mindset of **responsible innovation**—where creativity thrives without compromising compliance.
- Goals : To ensure continued commitment to **regulatory compliance** while embracing AI change.



Evolving Roles for US



Leading into the future – Gen AI Strategy

- Define AI augmented Biometrics Roadmap
- **Position Biometrics as the innovation hub** within clinical development: the bridge between data, analytics, application and AI.
- Shift from “**Submission deliverables**” to “**building intelligent AI powered team.**”
- Lower language barriers : from **SAS to multi-lingual programming.** Use the best tools for the right job.

Gen AI gives us a Head Start. We don't need to start from the blank page.



Future of Gen AI & Biometric team?

Gen
AI



Biom
etric

Avenger
(Super)
Biometric

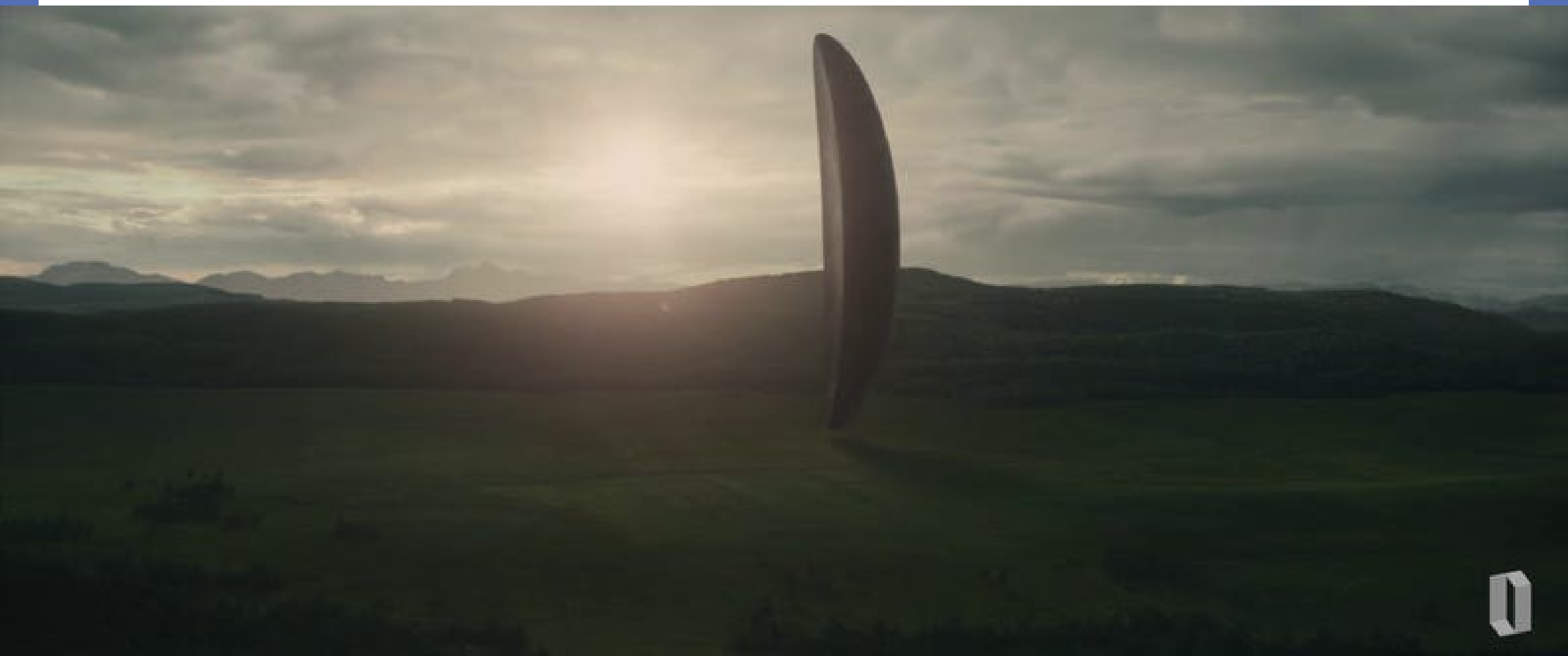


Future of Gen AI and US

- Gen AI has arrived
- Evolving Roles
- New Skill Sets Building
- AI and Human Collaboration
- Leading into the future



Gen AI has arrived



Attacking vs Understanding



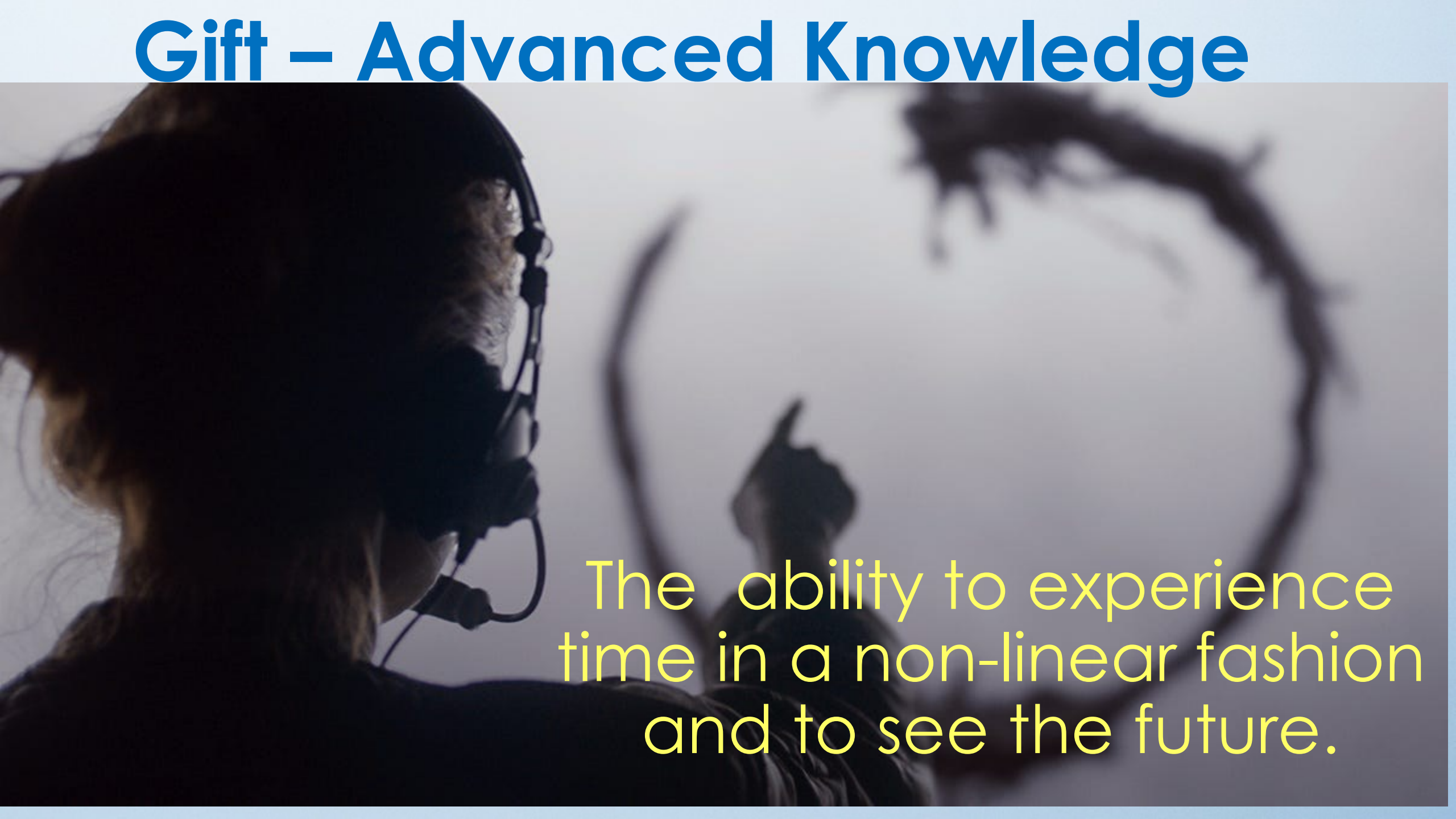
What is Gen AI for us?



Replacing
us?

Augmenting
us?

Gift – Advanced Knowledge

A person is shown from the side, wearing a headset with a microphone. They are looking at a screen that displays a globe. A hand is pointing at the screen, specifically at a point on the globe. The background is a light blue gradient.

The ability to experience
time in a non-linear fashion
and to see the future.

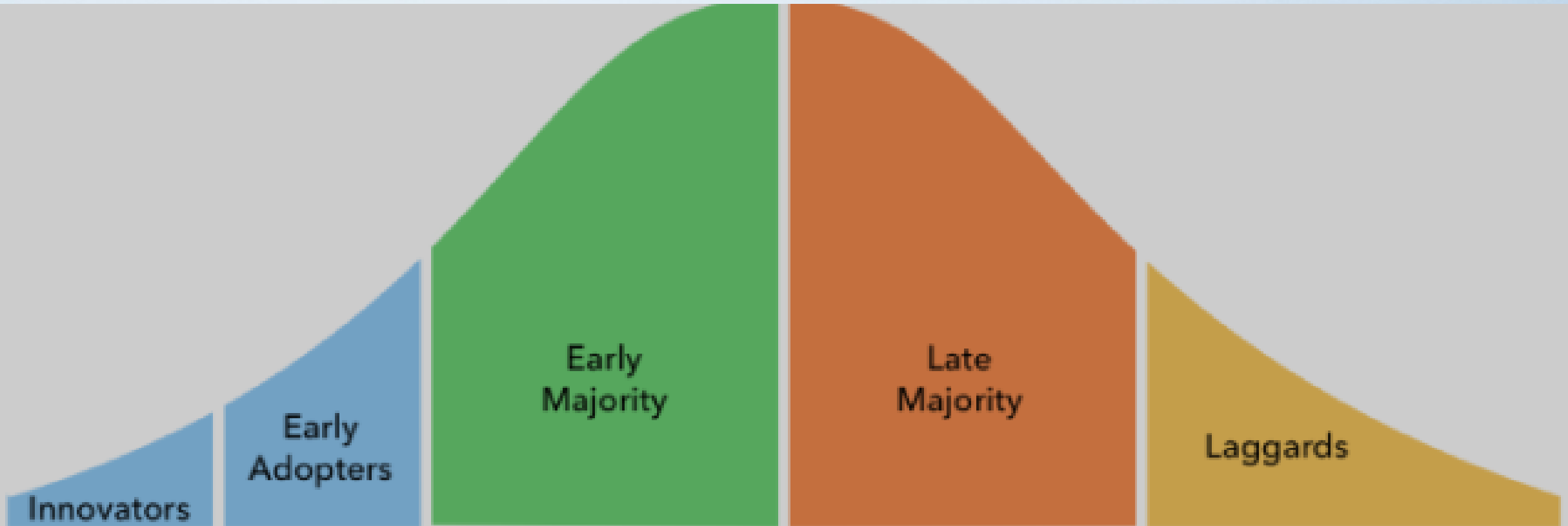
ChatGPT Users vs Non-Users Comparison in Boston Consulting

- Results of ChatGPT Users
 - finished **12.2%** more tasks on average
 - completed tasks **25.1%** more quickly
 - produced **40%** higher quality results



Discussion :

Where do we want our Biometric team to be in Gen AI Adopter?



Q & A (Discussion)

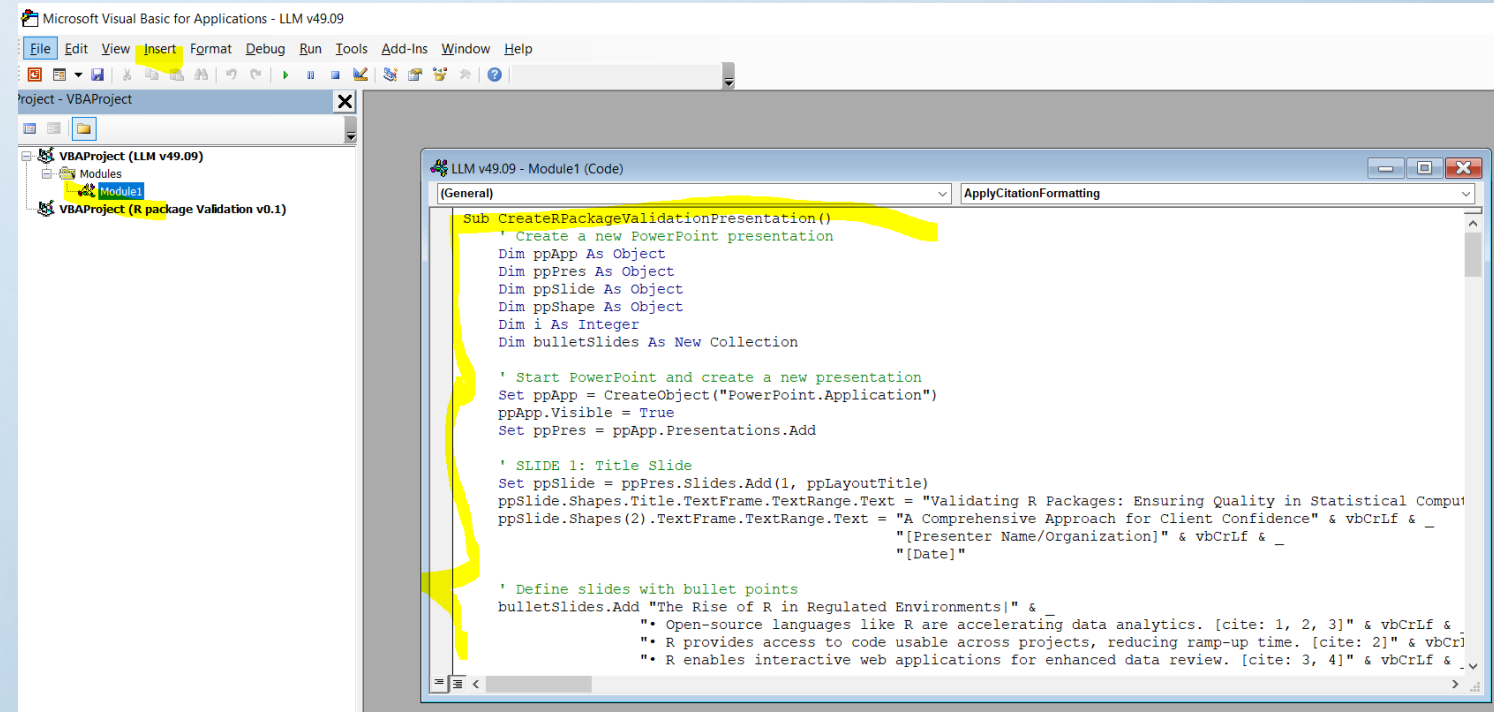


Appendix



How to create power-point using ChatGPT and VBA

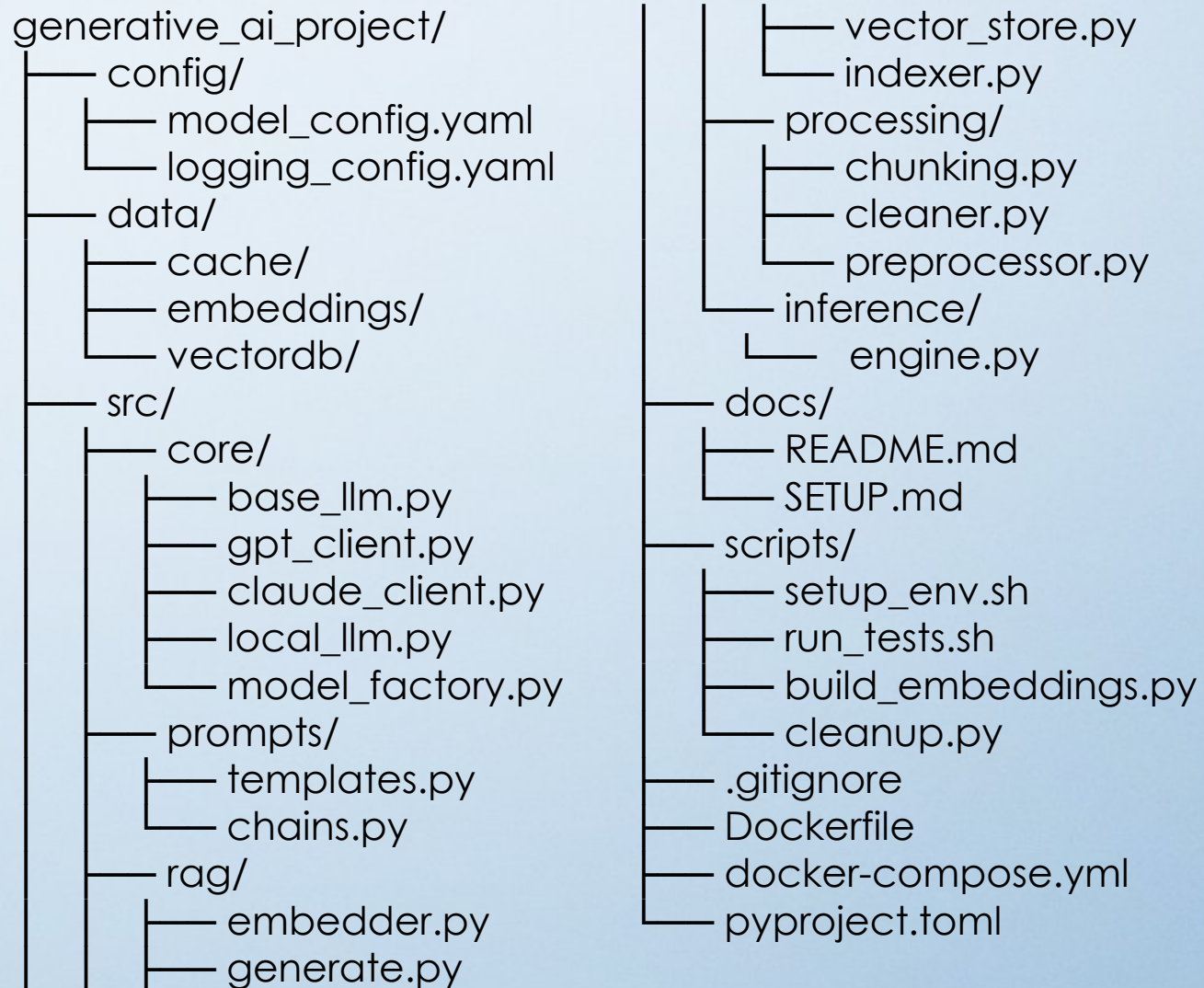
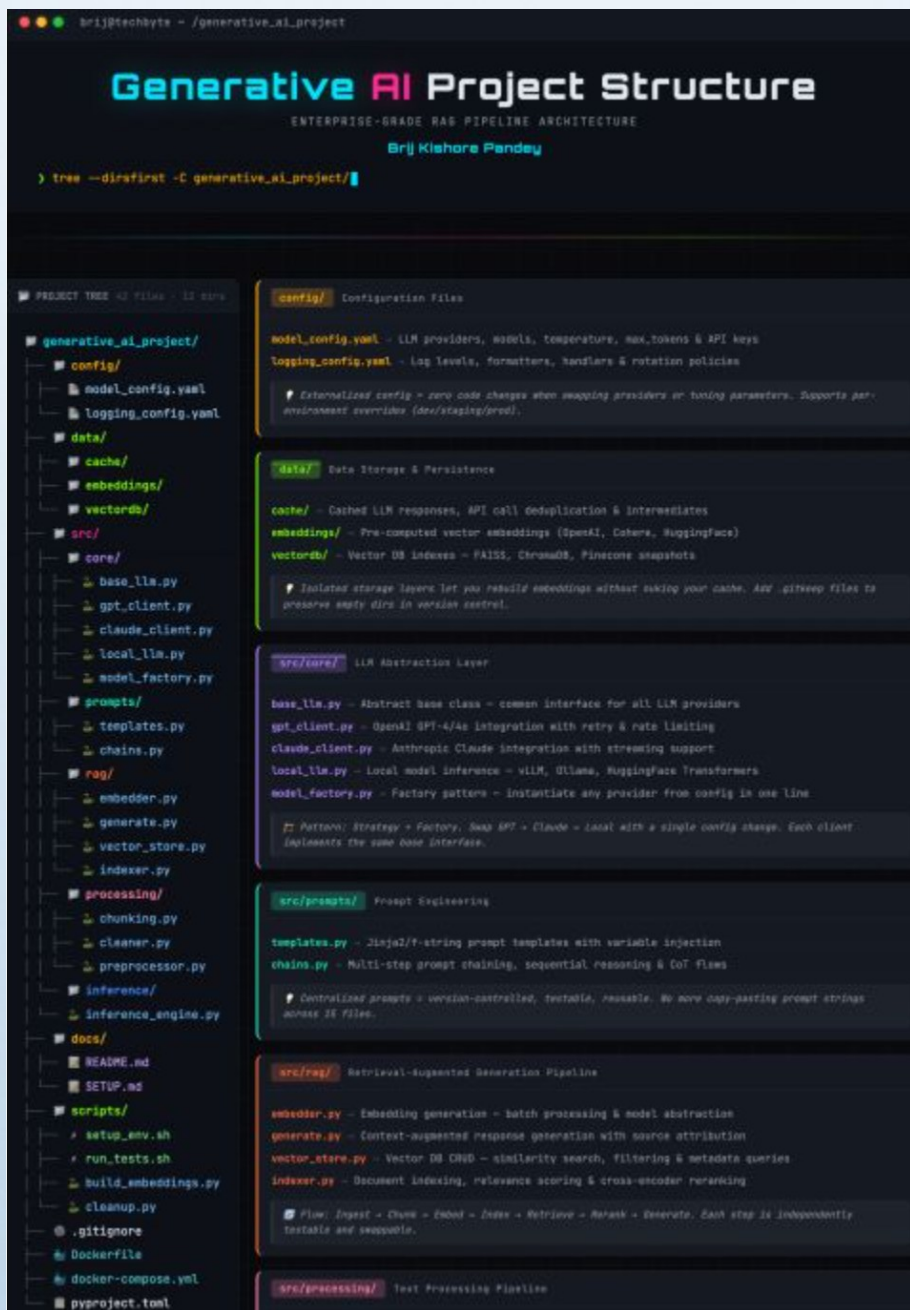
- Gen AI
 - Prompt for the contents in ChatGPT, Gemini, Anthropic
 - Then, prompt for VBA codes for the contents (e.g., create VBA code to create the slides in power point using above contents). Copilot works best. Others gave a lot of wrong VBA.
- Open Power point application
 - Go to “Developer”, “Visual Basic”
 - Select “Module” and “Insert”



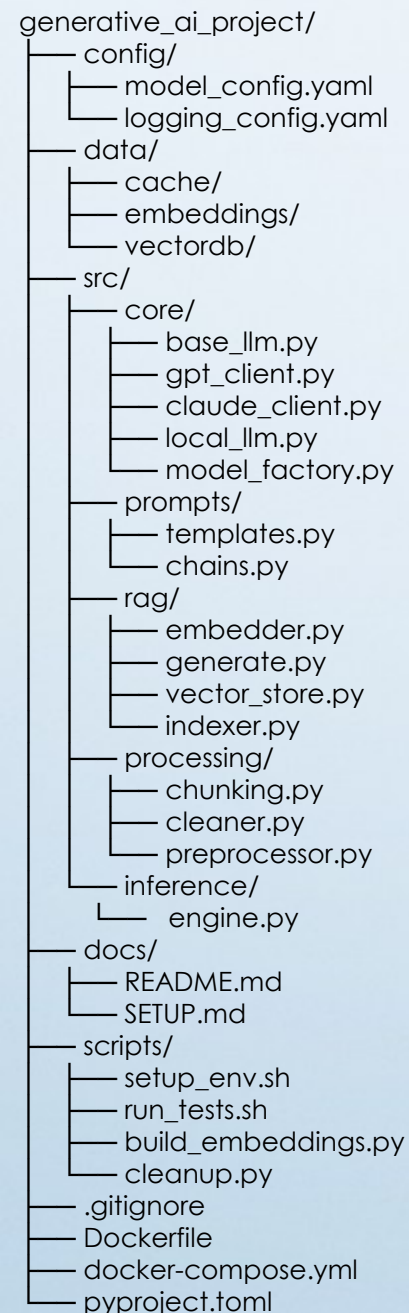
The screenshot displays the Microsoft Visual Basic for Applications (VBA) editor interface. The title bar reads "Microsoft Visual Basic for Applications - LLM v49.09". The menu bar includes File, Edit, View, Insert, Format, Debug, Run, Tools, Add-Ins, Window, and Help. The Project Explorer on the left shows a project named "VBAProject (LLM v49.09)" with a "Modules" folder containing "Module1" and "VBAProject (R package Validation v0.1)". The Code window on the right, titled "LLM v49.09 - Module1 (Code)", shows the following VBA code:

```
Sub CreateRPackageValidationPresentation()  
    ' Create a new PowerPoint presentation  
    Dim ppApp As Object  
    Dim ppPres As Object  
    Dim ppSlide As Object  
    Dim ppShape As Object  
    Dim i As Integer  
    Dim bulletSlides As New Collection  
  
    ' Start PowerPoint and create a new presentation  
    Set ppApp = CreateObject("PowerPoint.Application")  
    ppApp.Visible = True  
    Set ppPres = ppApp.Presentations.Add  
  
    ' SLIDE 1: Title Slide  
    Set ppSlide = ppPres.Slides.Add(1, ppLayoutTitle)  
    ppSlide.Shapes.Title.TextFrame.TextRange.Text = "Validating R Packages: Ensuring Quality in Statistical Comput  
    ppSlide.Shapes(2).TextFrame.TextRange.Text = "A Comprehensive Approach for Client Confidence" & vbCrLf & _  
        "[Presenter Name/Organization]" & vbCrLf & _  
        "[Date]"  
  
    ' Define slides with bullet points  
    bulletSlides.Add "The Rise of R in Regulated Environments|" & _  
        "• Open-source languages like R are accelerating data analytics. [cite: 1, 2, 3]" & vbCrLf & _  
        "• R provides access to code usable across projects, reducing ramp-up time. [cite: 2]" & vbCrLf & _  
        "• R enables interactive web applications for enhanced data review. [cite: 3, 4]" & vbCrLf & _
```

AI Project Codebase Structure



AI Project Codebase Structure



- **config/** → Externalize everything. Model providers, parameters, logging levels. One YAML change, zero code changes.
- **data/** → Separate your cache, embeddings, and vector DB indexes. When you need to rebuild embeddings, you don't nuke your cache.
- **src/core/** → This is the secret sauce. A base LLM interface with dedicated clients for GPT, Claude, and local models. `model_factory.py` handles instantiation. Swap providers in one line.
- **src/prompts/** → Reusable templates + multi-step prompt chains. Stop copy-pasting prompts across files.
- **src/rag/** → Full RAG pipeline: embedding → indexing → vector store → retrieval → reranking. Each component is independently testable.
- **src/processing/** → Chunking, cleaning, normalization. The unglamorous work that makes or breaks your RAG quality.
- **src/inference/** → Dedicated engine for runtime execution and environment setup.
- **scripts/** → Automation for env setup, testing, embedding builds, and cleanup. If you're doing it manually, you're doing it wrong.