INSTITUTE OF ACTUARIAL & QUANTITATIVE STUDIES

Class: FY BSc

Subject : Generative AP

Chapter: Unit 2

Chapter Name: Gen. AI and Prompt Design

Agenda

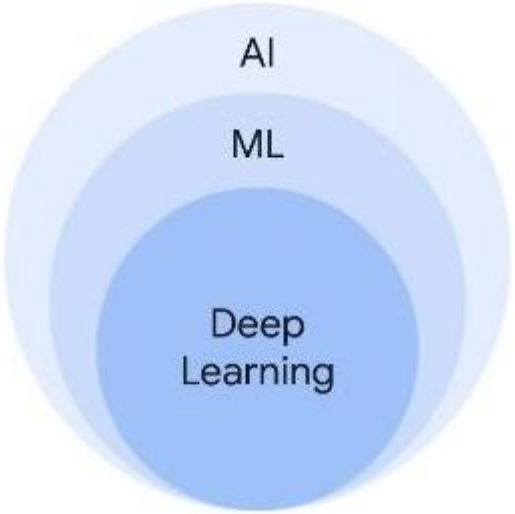
1. Define Generative Artificial Intelligence(AI)
2. Explain how Generative AI works
3. Describe Generative AI Model Types
4. Describe Generative Applications

1.1 AI and Machine Learning

- AI is the theory and development of computer systems able to perform tasks normally requiring human intelligence
- Machine Learning gives computers the ability to learn without explicit programming

Artificial Intelligence

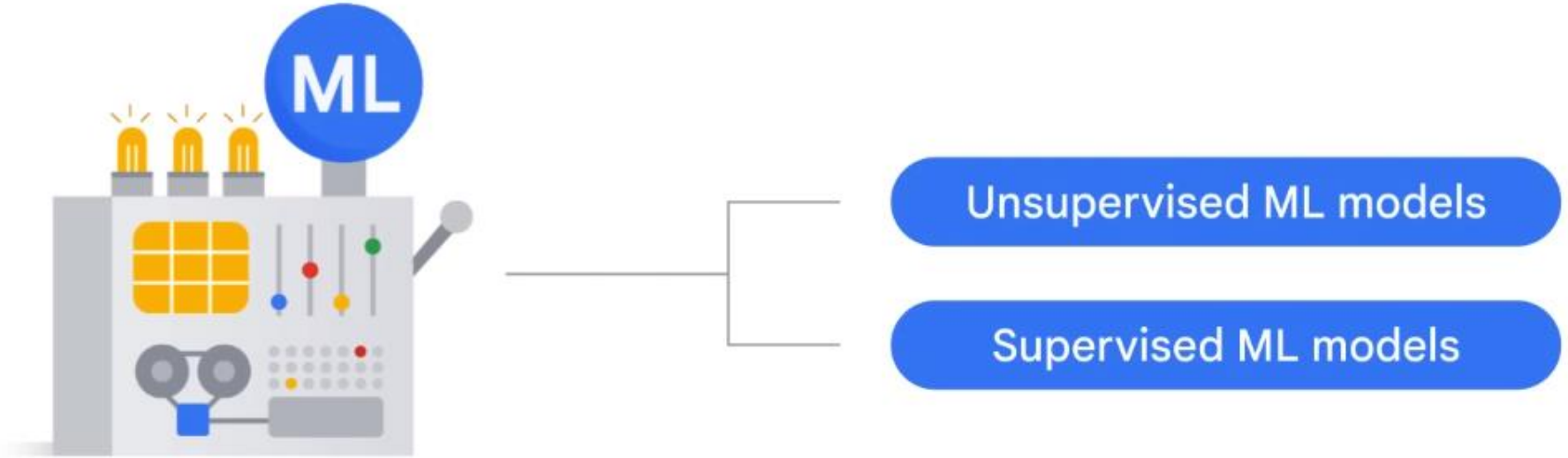
is a discipline



Machine Learning

is a subfield

1.2 Machine Learning



1.2.1 Supervised Learning

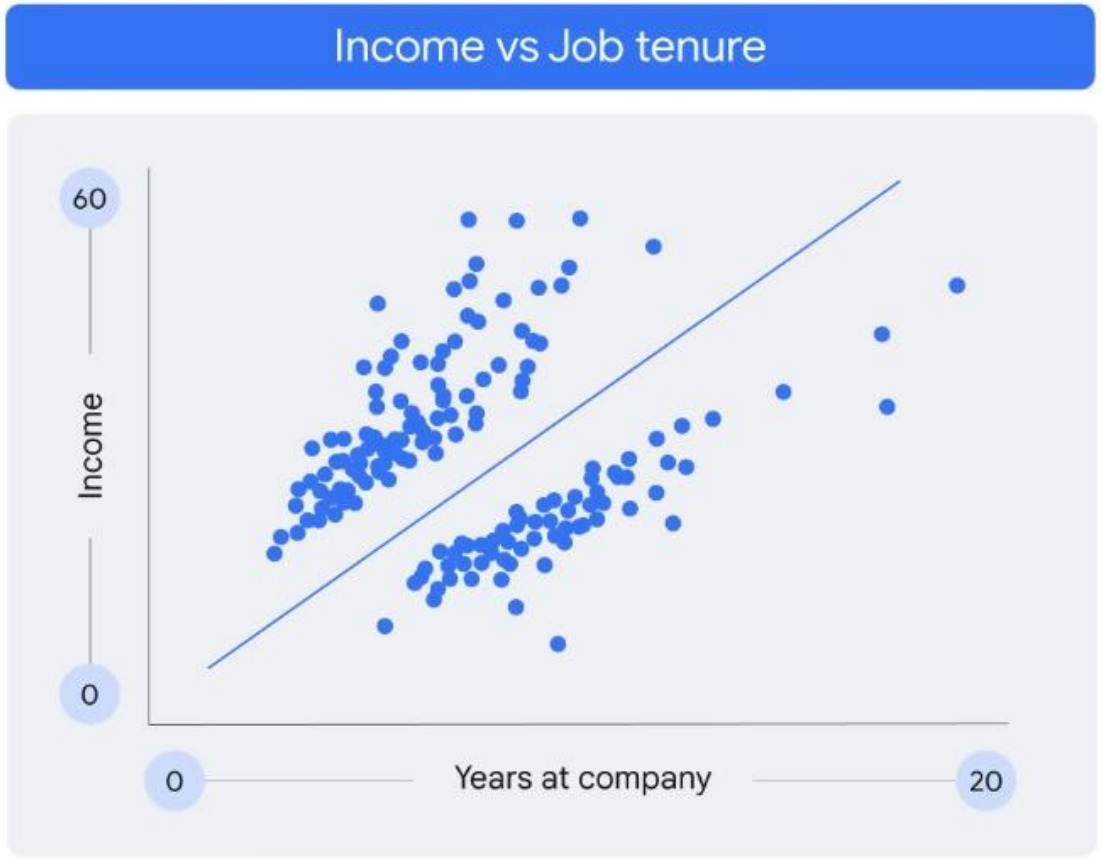
- It implies the data is already labeled
- In supervised learning we are learning

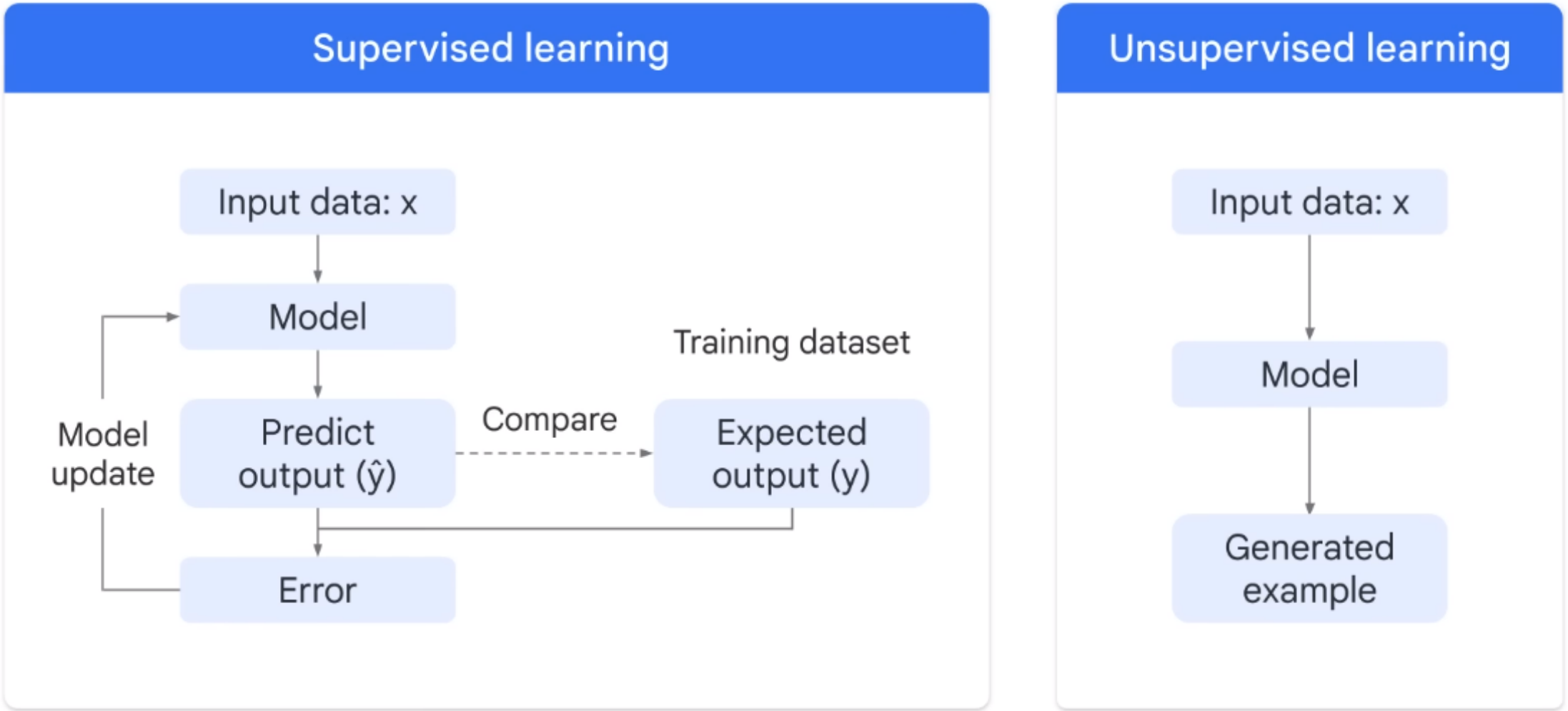
  we are learning from past examples to

  predict future values

1.2.1 Unsupervised Learning

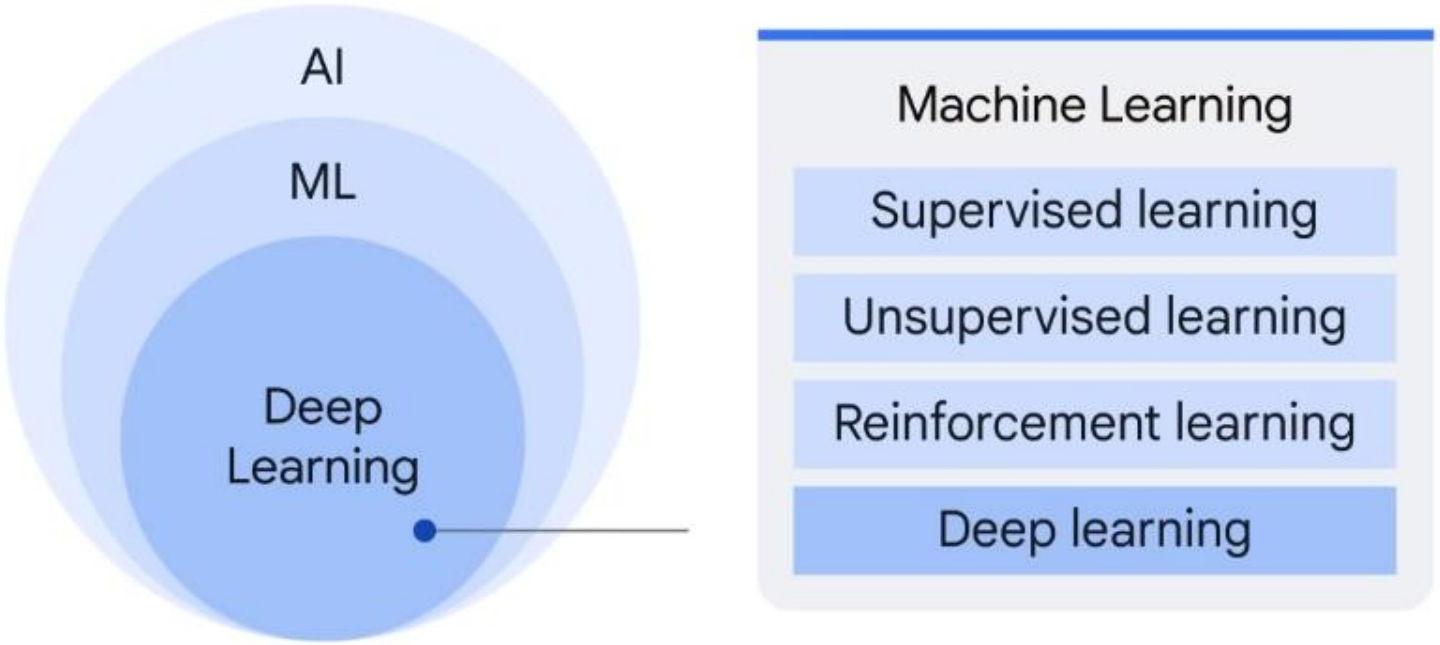
- It implies the data is not labeled
- Unsupervised problems are all about looking at the raw data and seeing if it naturally falls into groups

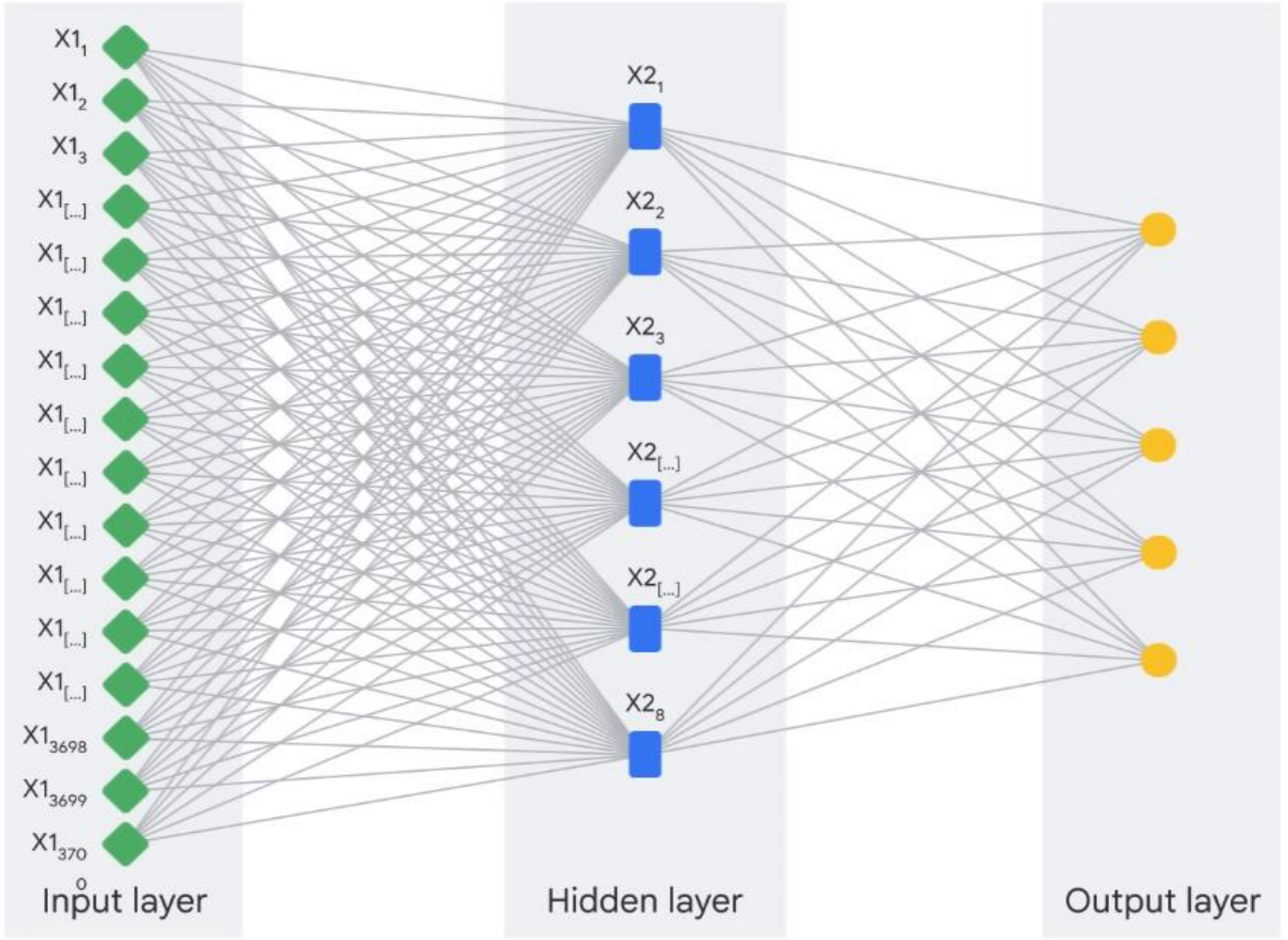



Supervised learning
Input data: x
Model
Training dataset
Model update
Predict output (ŷ)
Compare
Expected output (y)
Error
Unsupervised learning
Input data: x
Model
Generated example

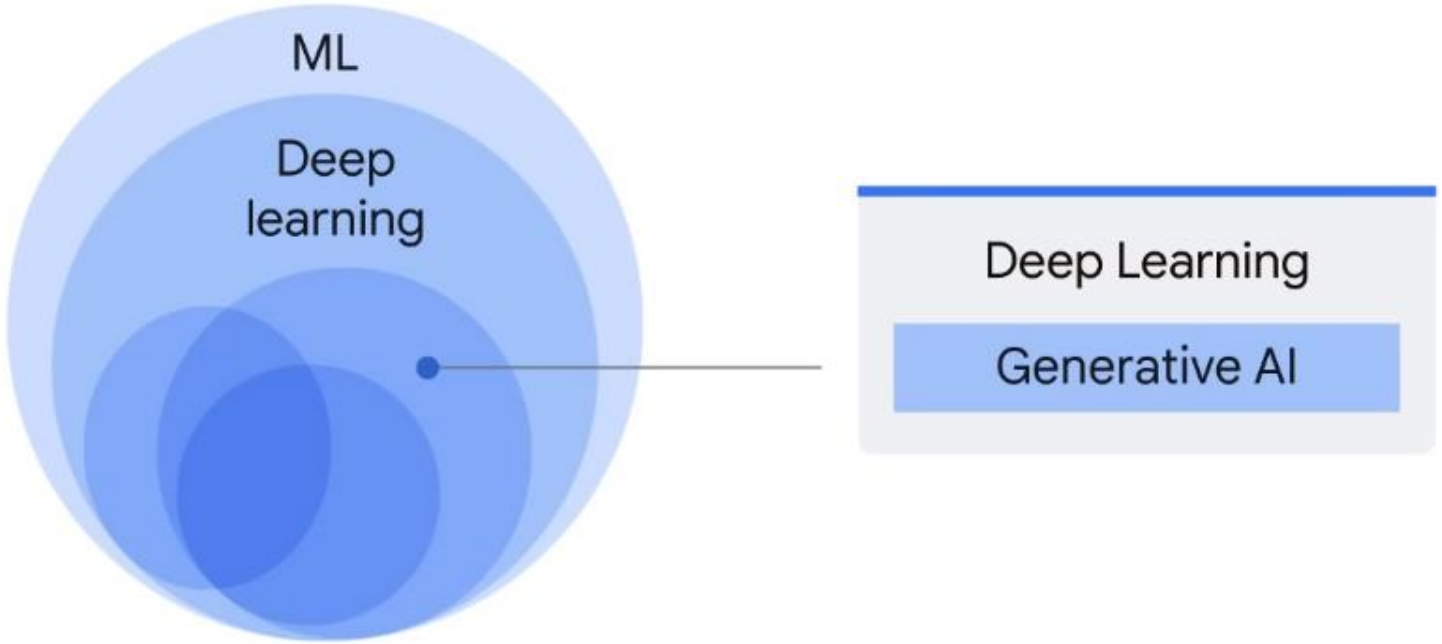
1.3 Deep Learning

- Deep Leaning uses Artificial Neural Networks – allowing them to process more complex patterns than traditional machine learning

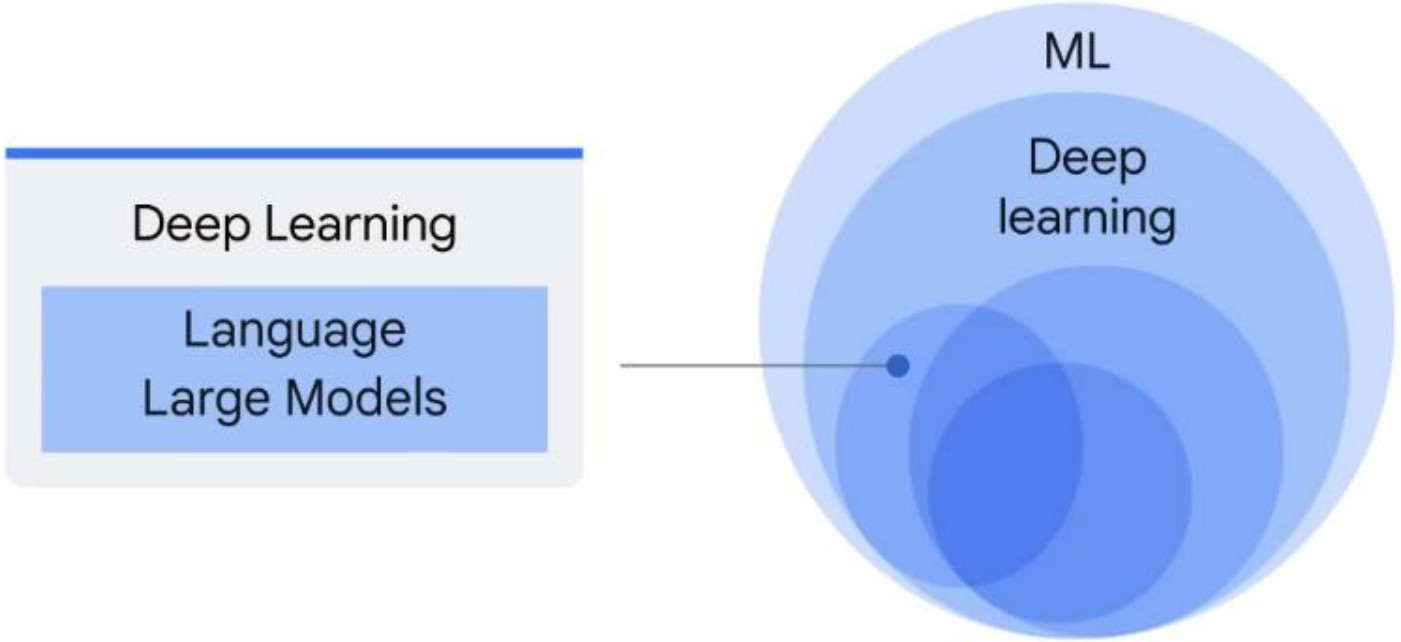



X1[1]
X1[2]
X1[3]
X1[...]
X1[...]
X1[...]
X1[...]
X1[...]
X1[...]
X1[...]
X1[...]
X1[...]
X1[...]
X1[...]
X1[...]
X13698
X13699
X1370
Input layer
X2[1]
X2[2]
X2[3]
X2[...]
X2[...]
X28
Hidden layer
Output layer

1.4 Generative AI

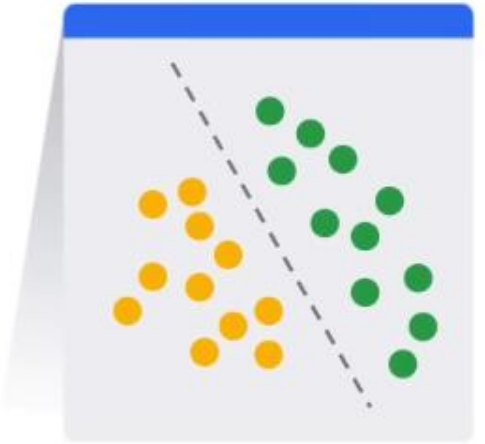


1.4 Large Language Models (LLMs)

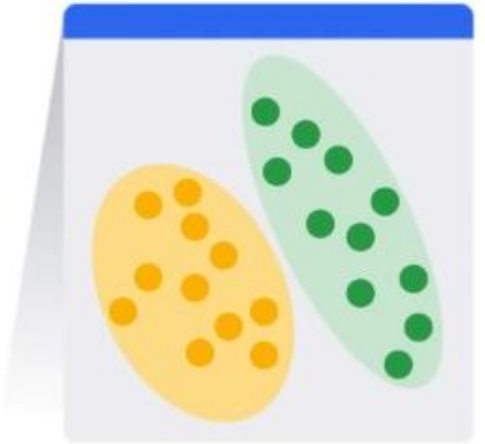


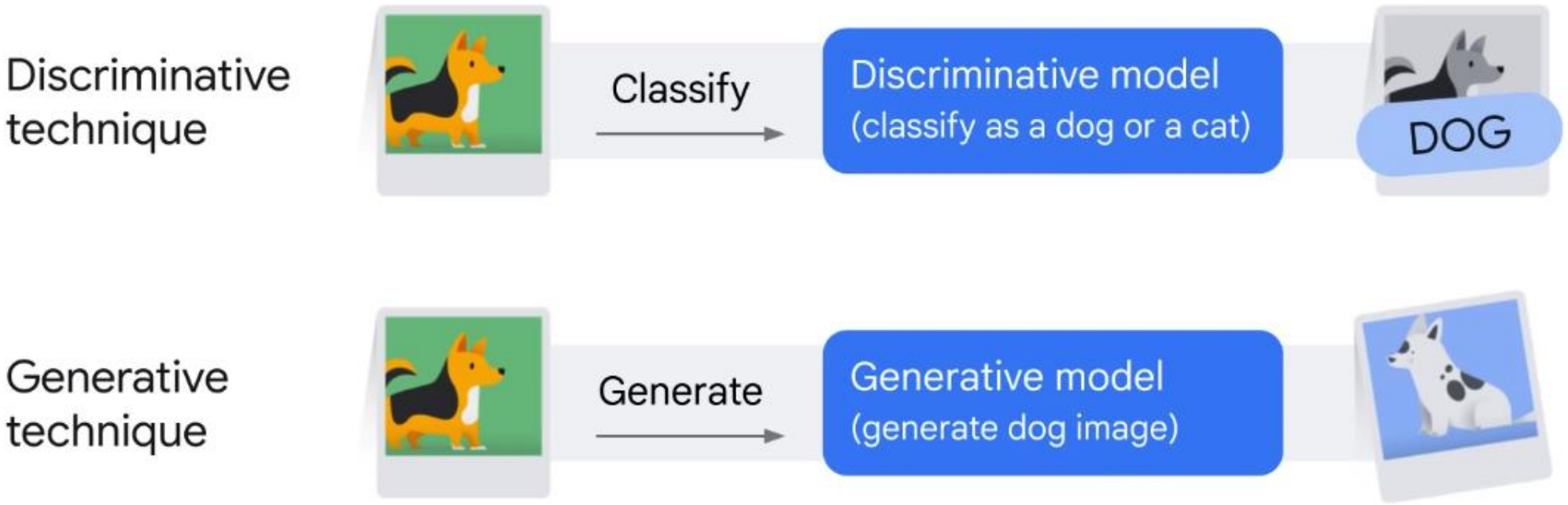
1.5 Deep Learning Model Types

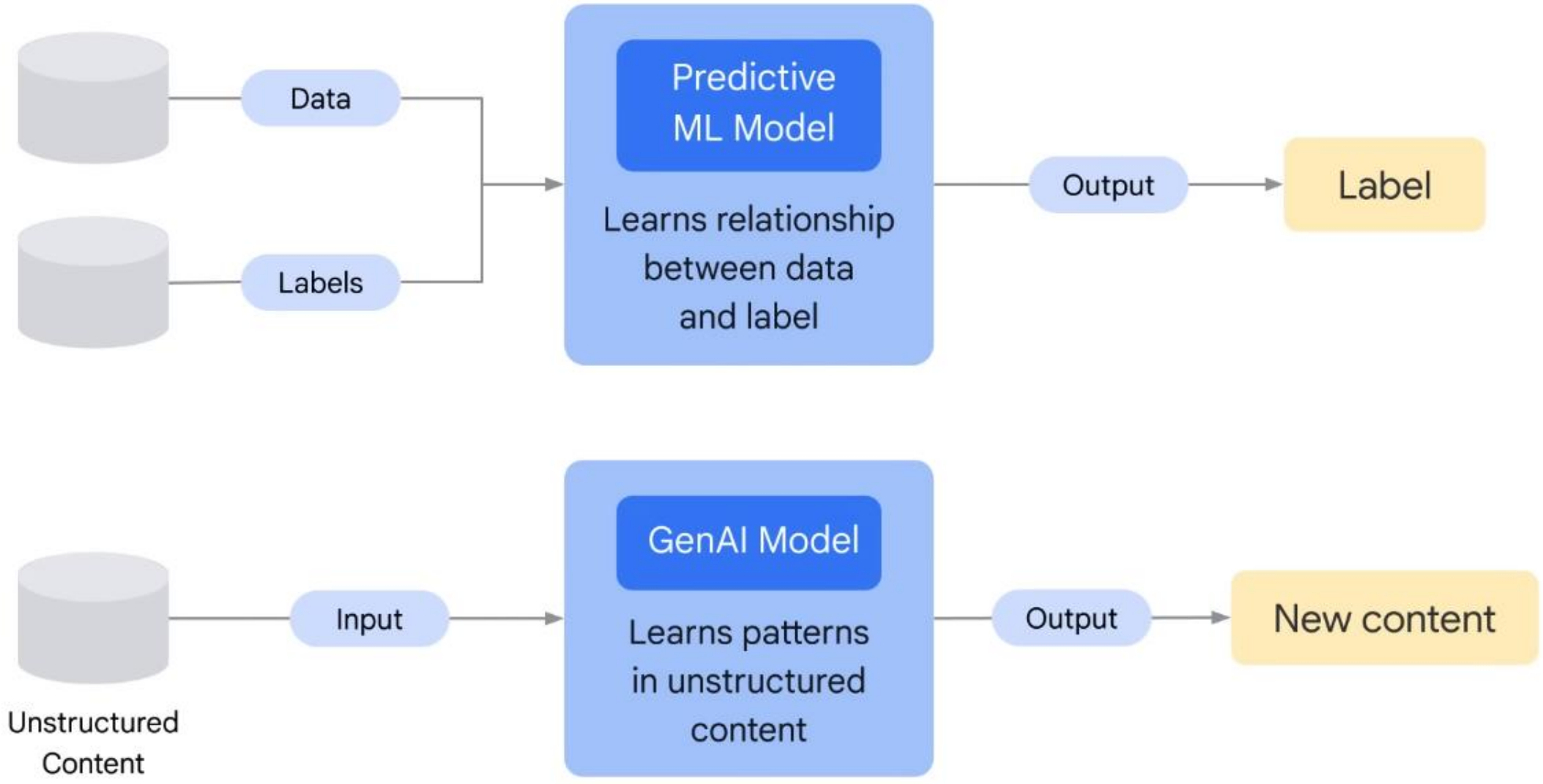
- Discriminative
  - Used to classify or predict Typically trained on a dataset of labelled data
  - Learns the relationship between the features of the data points and the labels

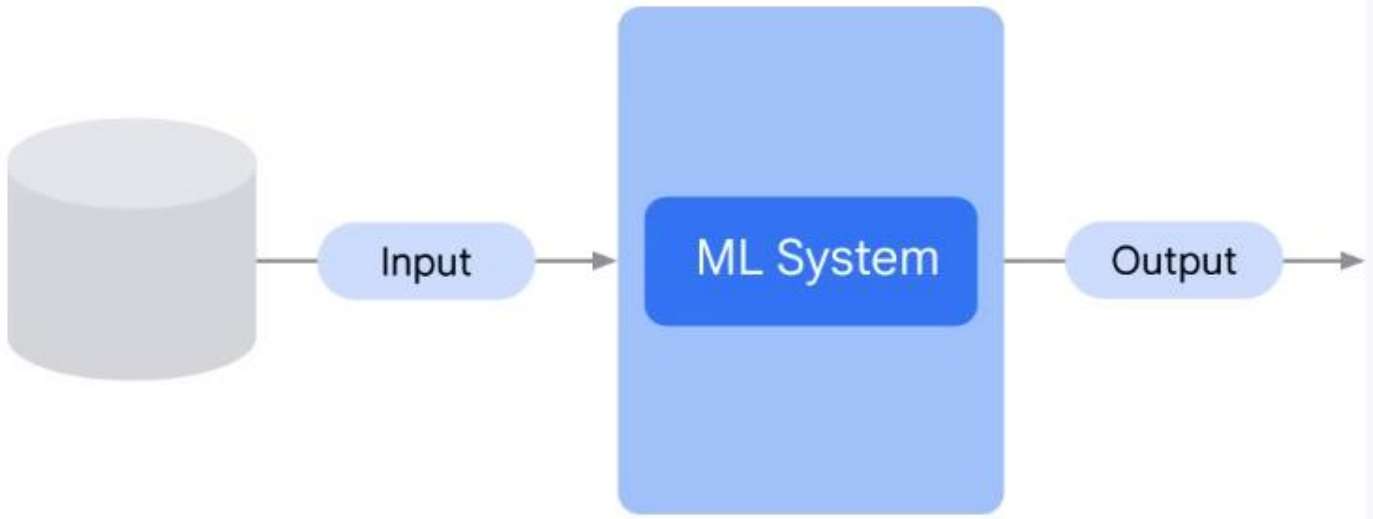


- Generative
  - Generates new data that is similar to data it was trained on
  - Understands distribution of data and how likely a given example is • Predict next word in a sequence




Discriminative technique
Classify
Discriminative model (classify as a dog or a cat)
DOG
Generative technique
Generate
Generative model (generate dog image)


Data
Labels
Predictive ML Model
Learns relationship between data and label
Output
Label
Unstructured Content
Input
GenAI Model
Learns patterns in unstructured content
Output
New content

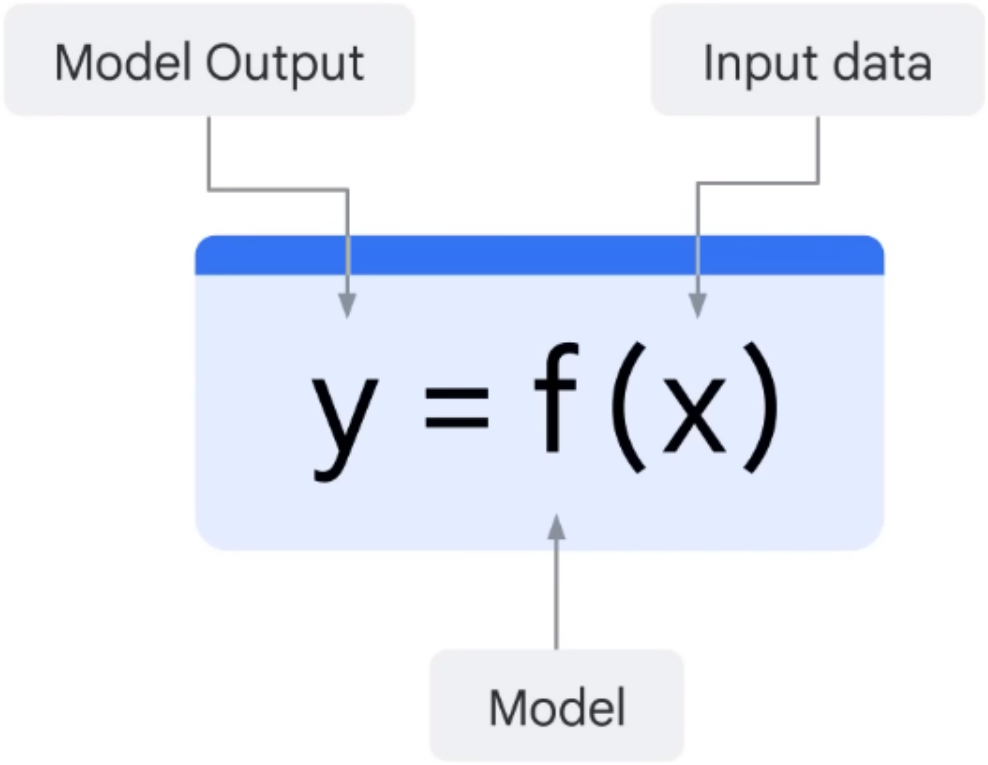


Not GenAI when y is a:

- Number
- Discrete
- Class
- Probability

Is GenAI when y is:

- Natural language
- Image
- Audio



Not GenAI when y is a:

- Number
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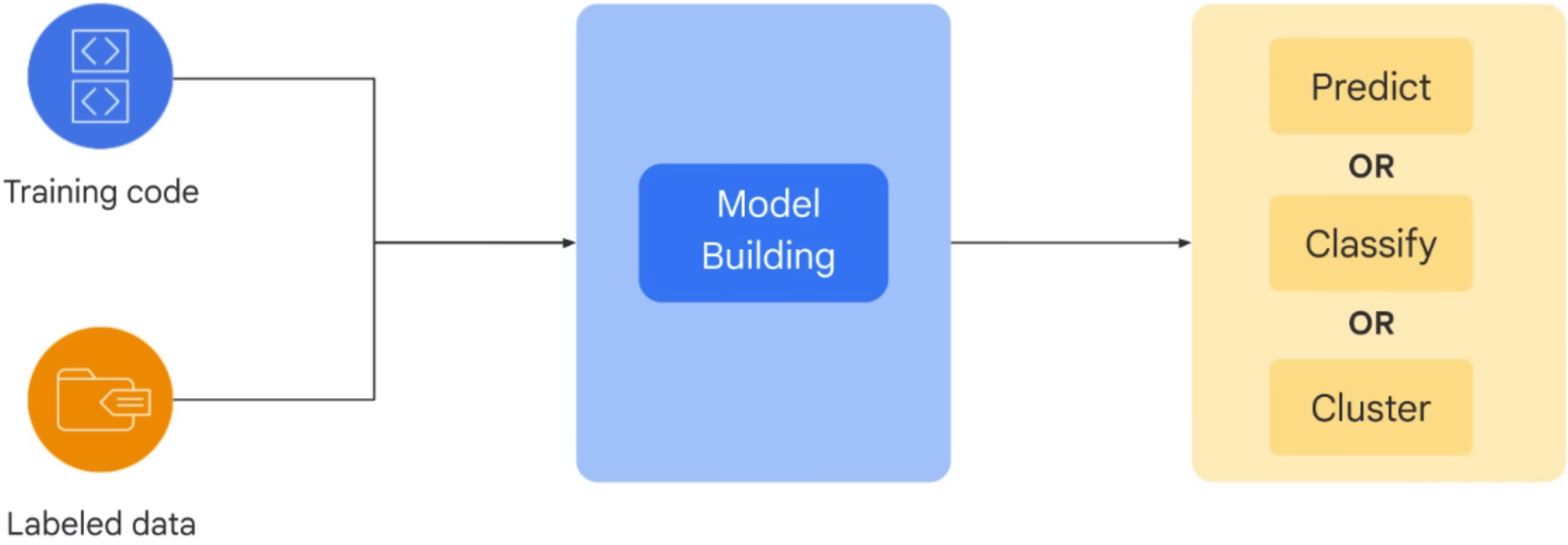
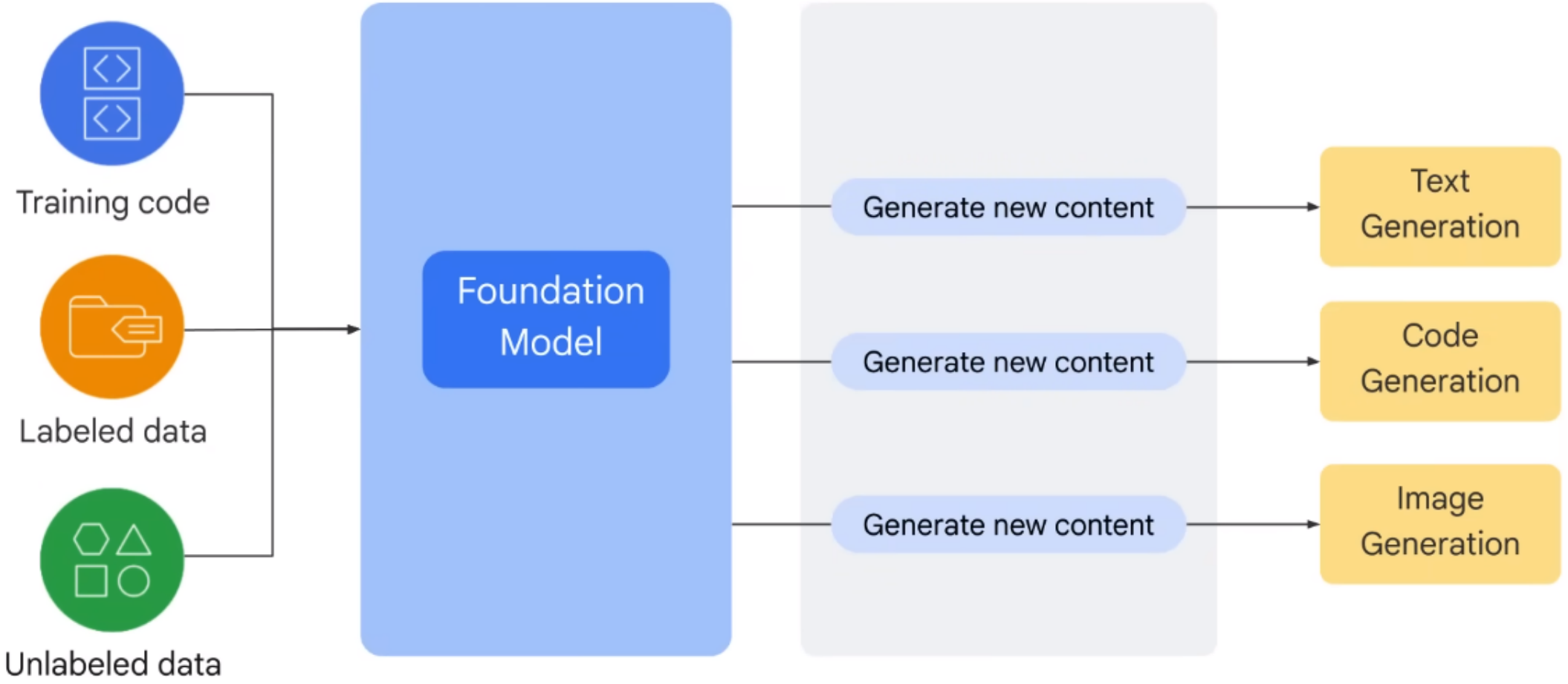
Is GenAI when y is:

- Natural language
- Image
- Audio

Classical Supervised & Unsupervised Learning

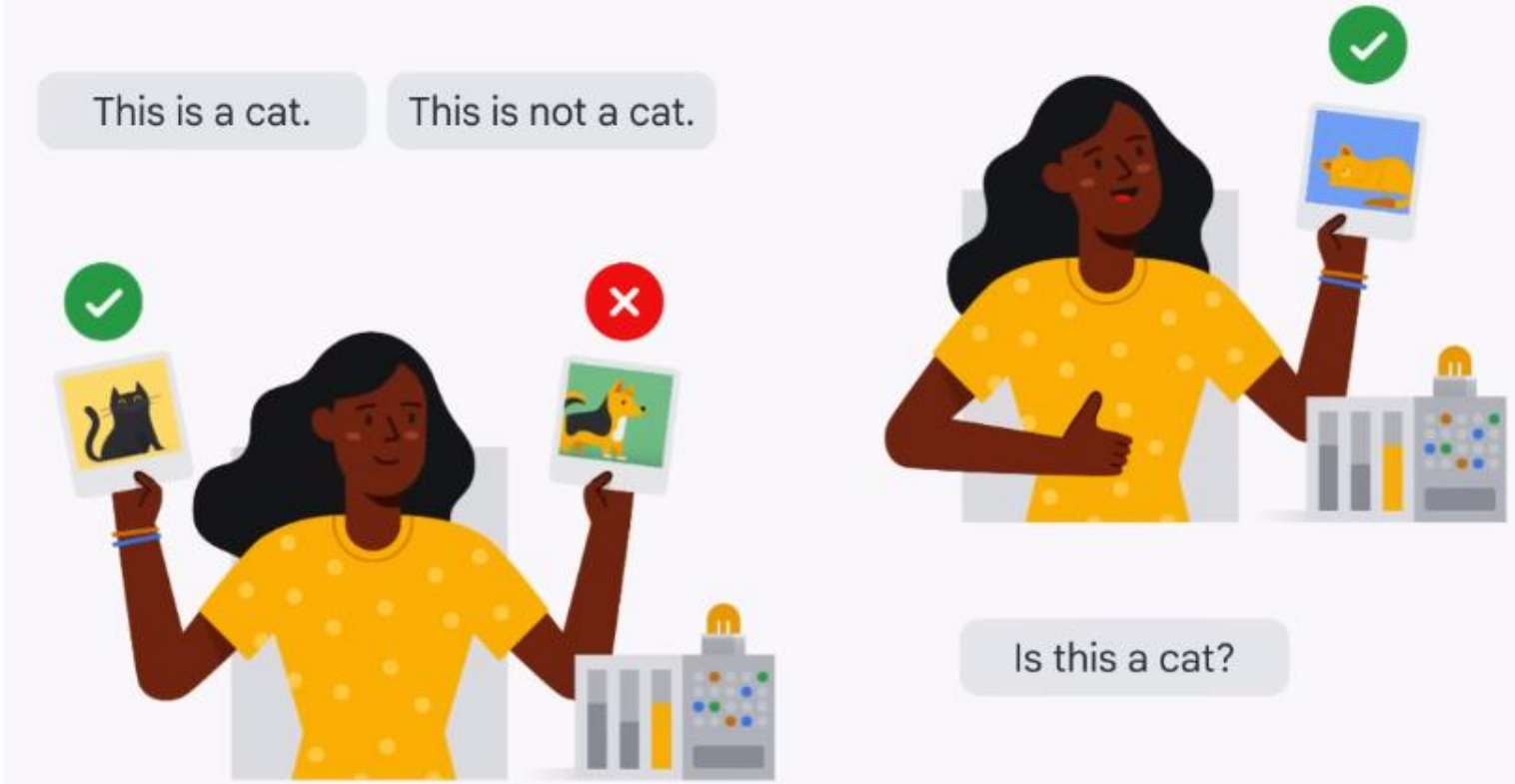


Gen AI Supervised, Semi-Supervised & Unsupervised Learning

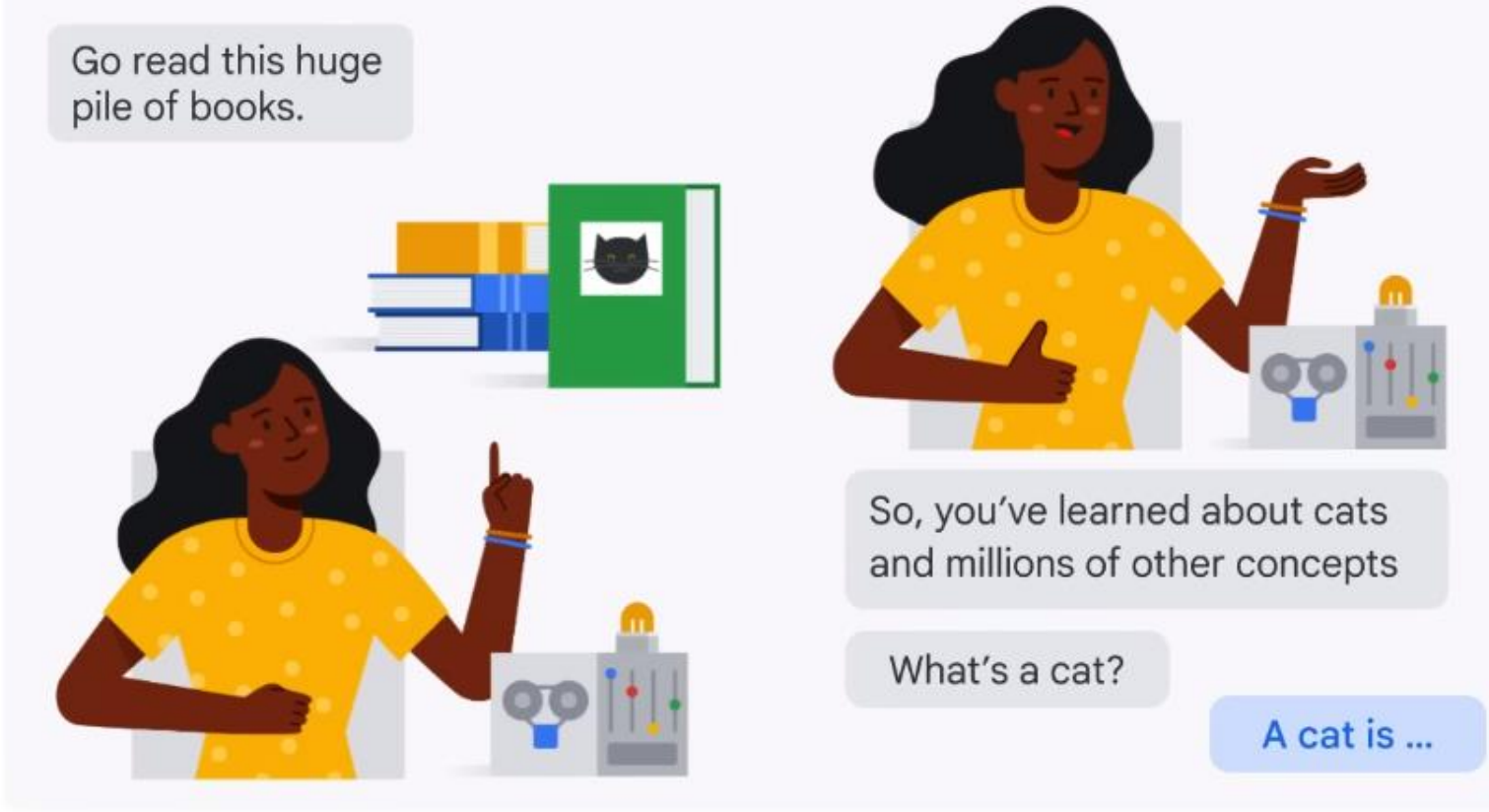


Traditional programming

Wave of neural networks | ~2012



Generative language models | LaMDA, PaLM, GPT, etc.



1.6 Generative AI

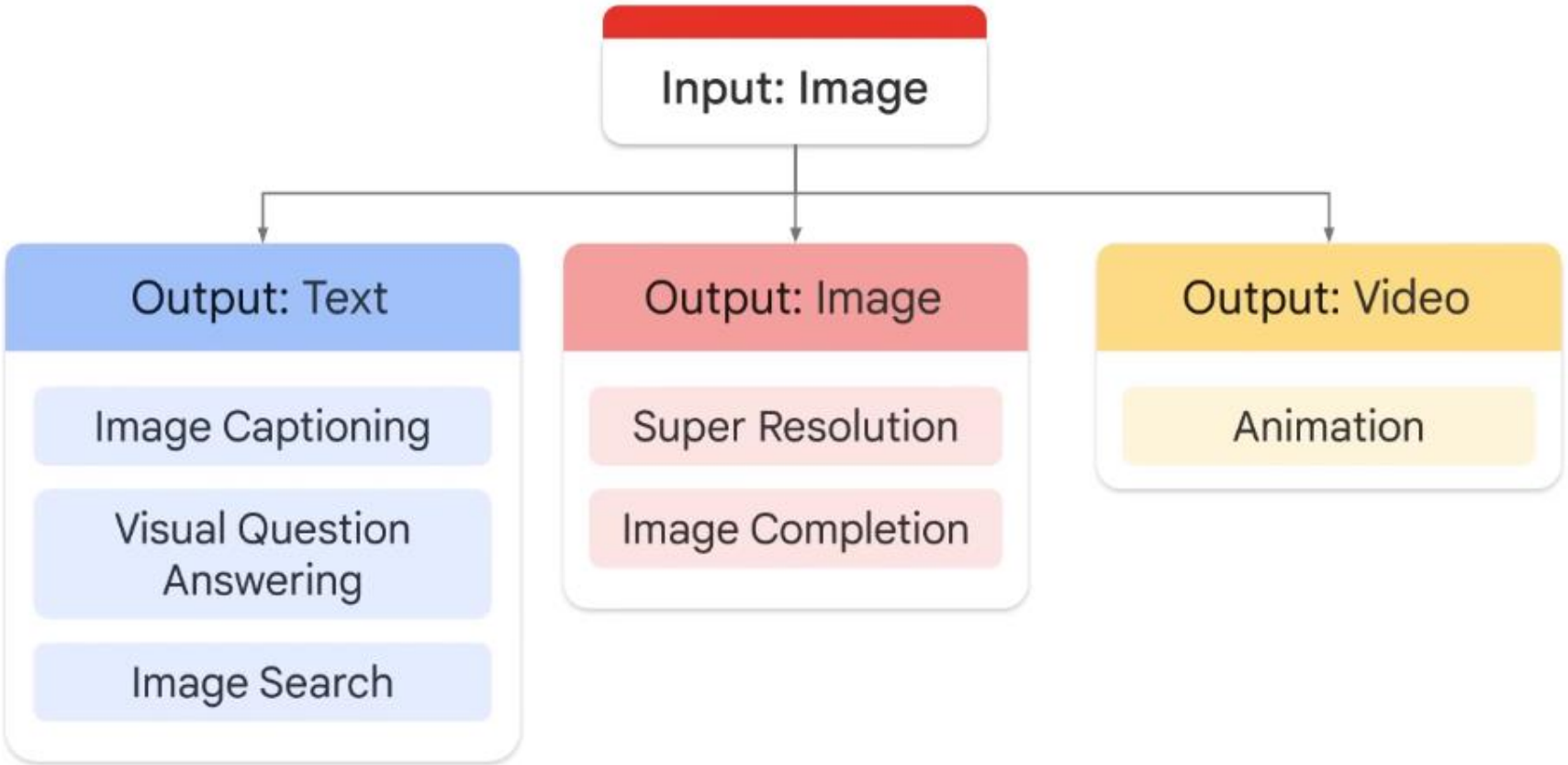
- GenAI is a type of Artificial Intelligence that creates new content based on what it has learned from existing content.
- The process of learning from existing content is called training and results in the creation of a statistical model.
- When given a prompt, GenAI uses this
- statistical model to predict what an expected
- response might be-and this generates new content.

1.7 Generative Models

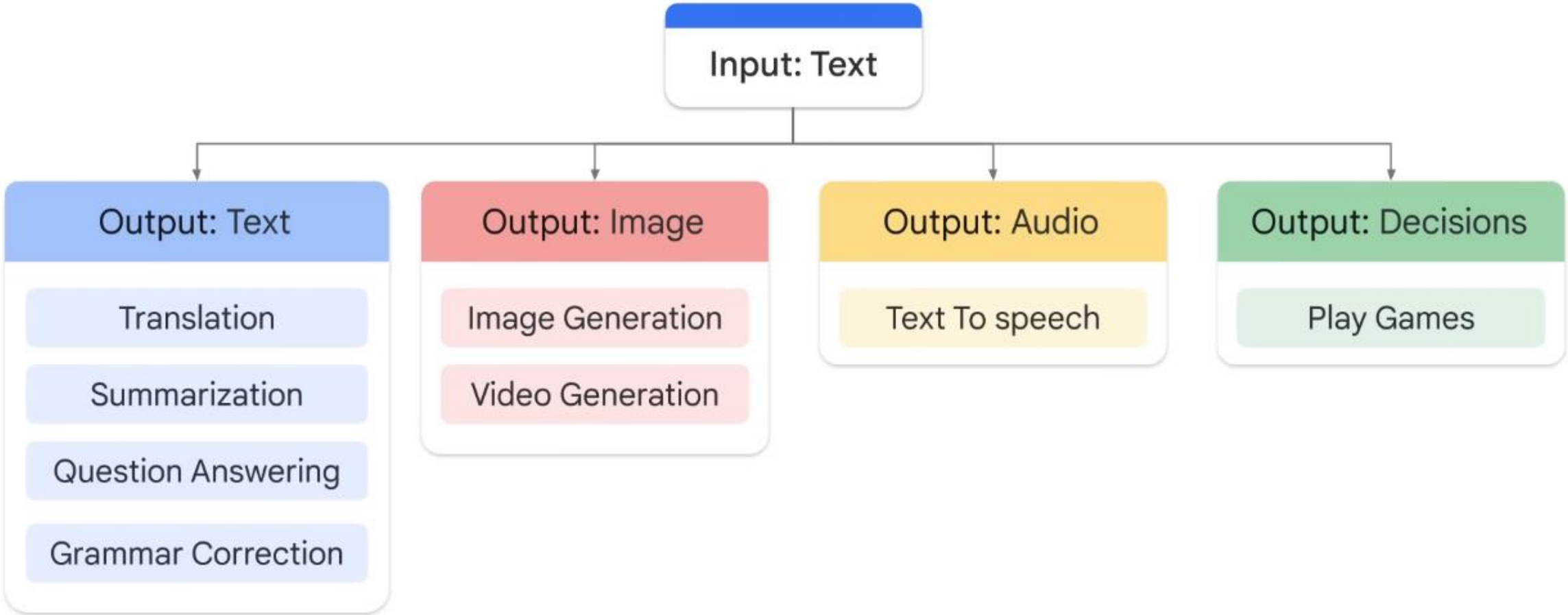
- Generative language models:
  - Generative language models learns about patterns in language through training data.
  - Then, given some text, they predict what comes next.

- Generative image models:
  - Generative image models produce new images using techniques like diffusion.
  - Then, given a prompt or related imagery, they transform random noise into images or generate images from prompts.

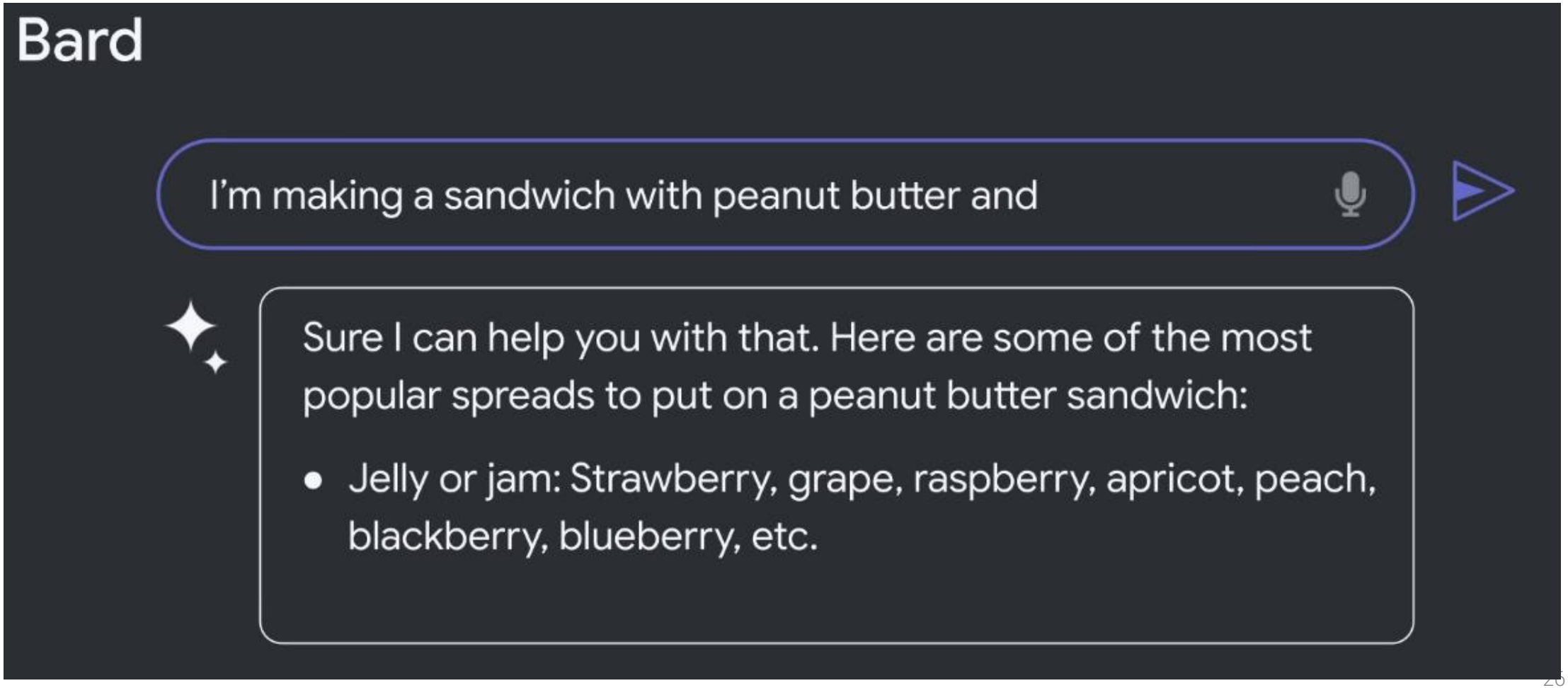
1.8 Types of Generative AI Based on Data



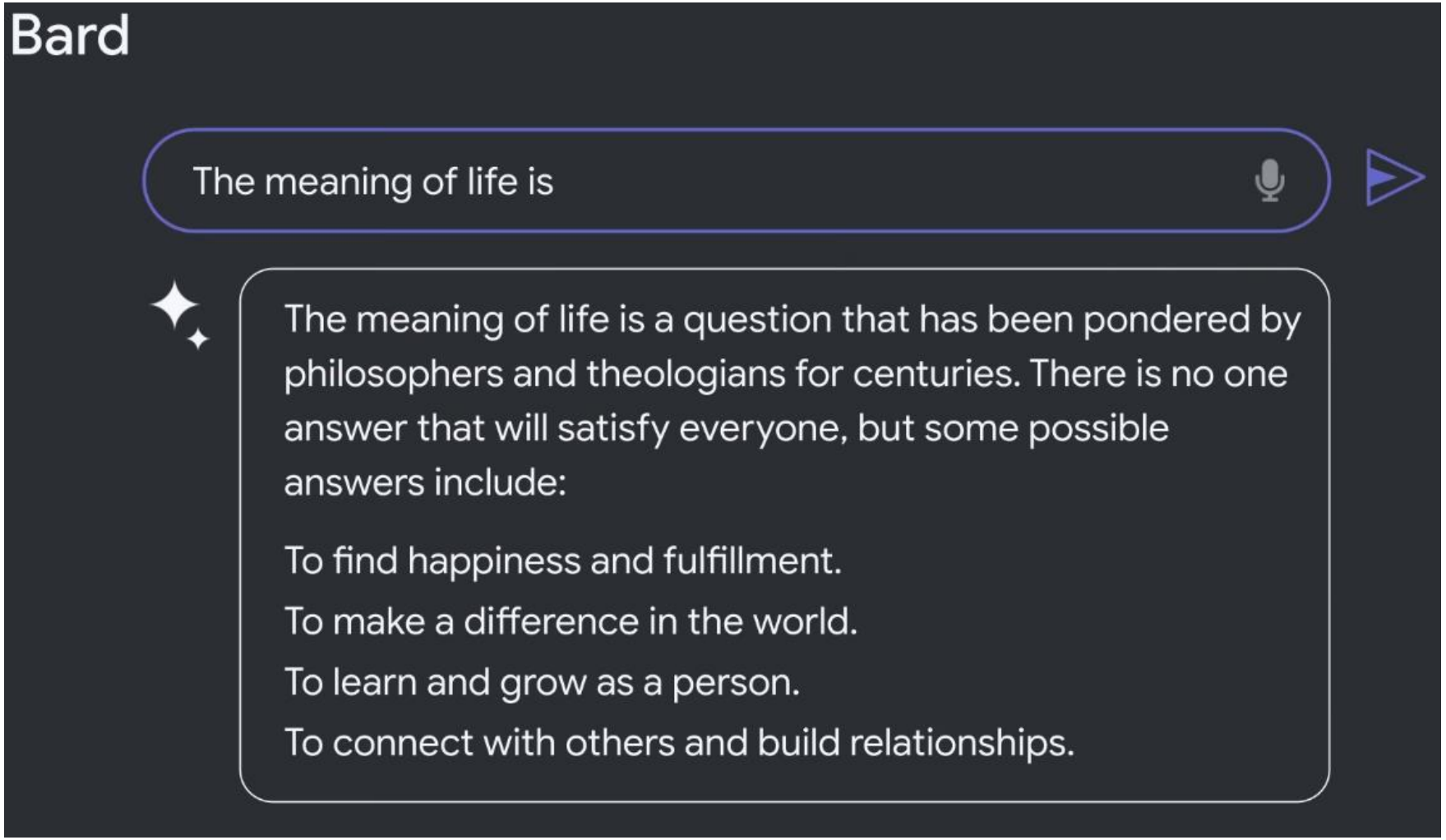
1.8 Types of Generative AI Based on Data



1.9 Examples of Generative language Models



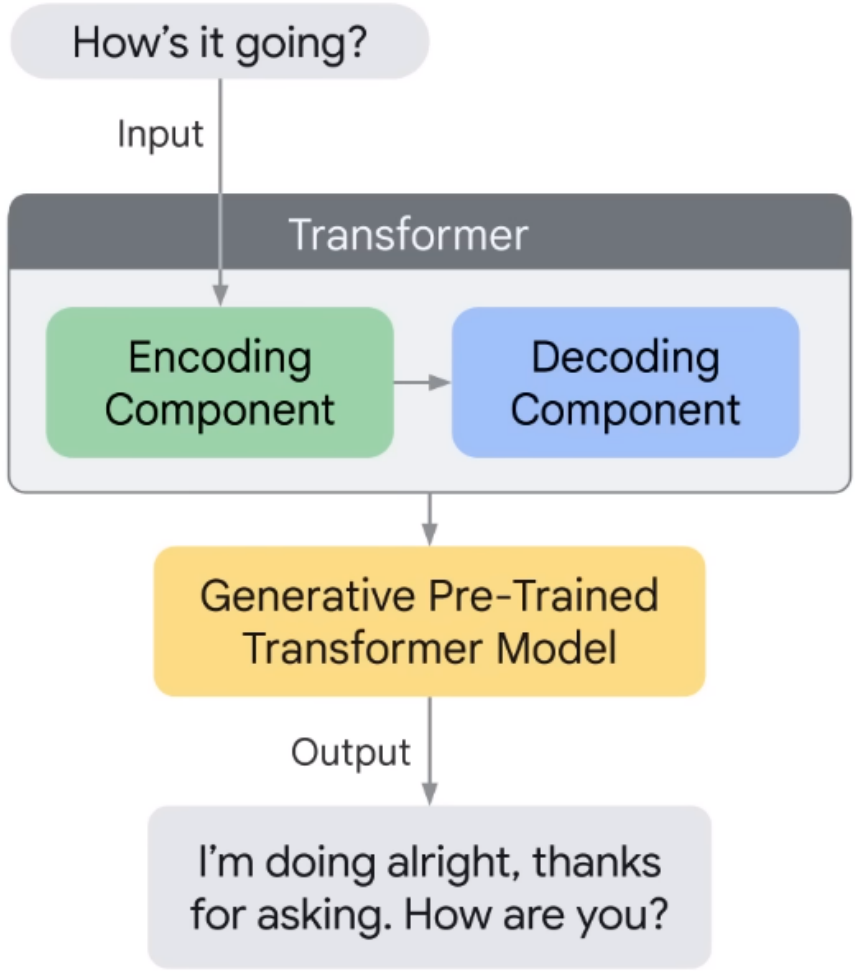
1.9 Examples of Generative language Models



1.10 How it works?

Pre Training:

- Large amount of data
- Billions of parameter
- Unsupervised learning



1.11 Hallucinations

- These are words or phrases that are generated by the model that are often nonsensical or grammatically incorrect

- Challenges:
  - The model is not trained on enough data
  - The model is trained on noisy or dirty data
  - The model is not given enough context
  - The model is not given enough constraints

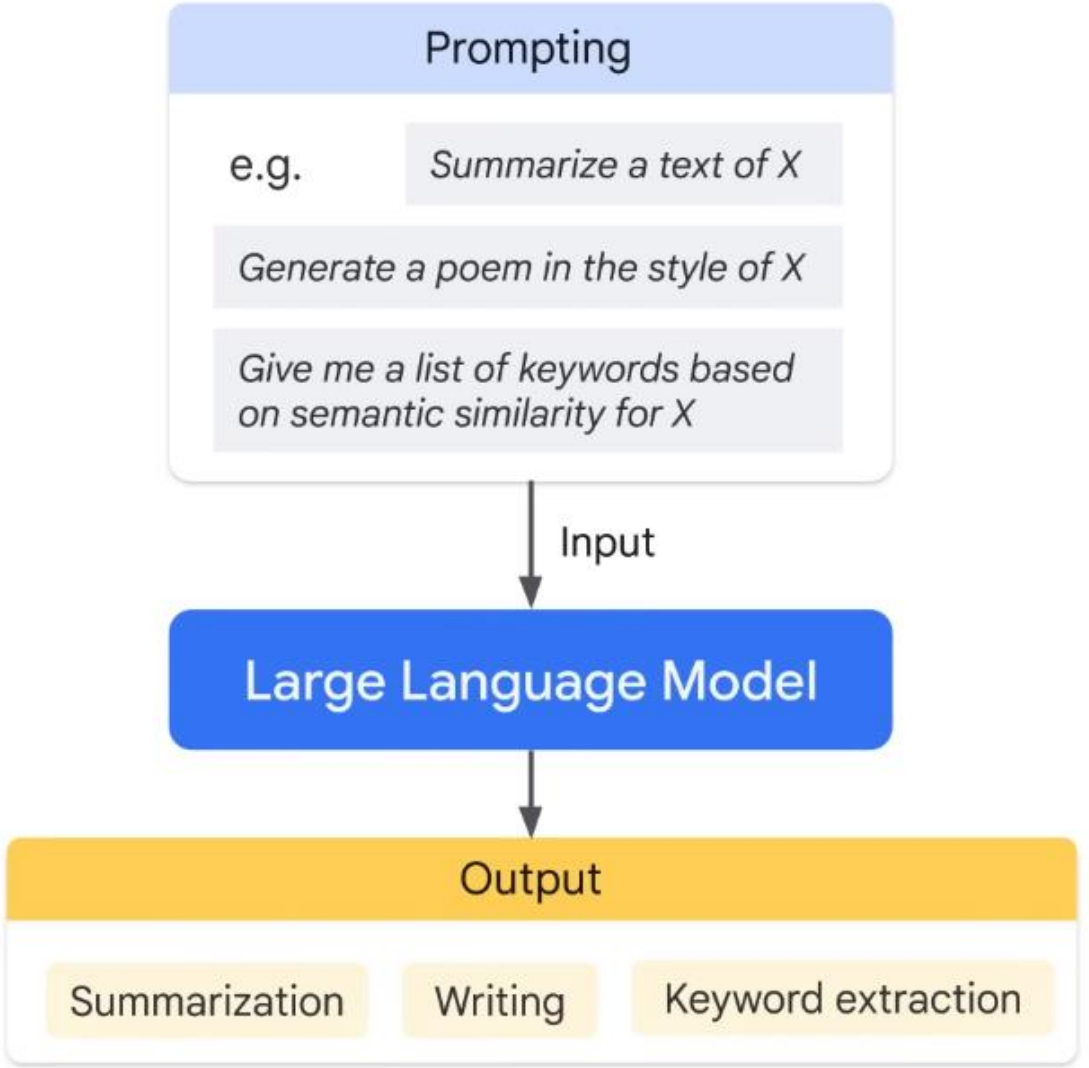
1.12 Prompt Design

- The quality of the input determines the quality of the output

Forming a Database

Inputting a Prompt

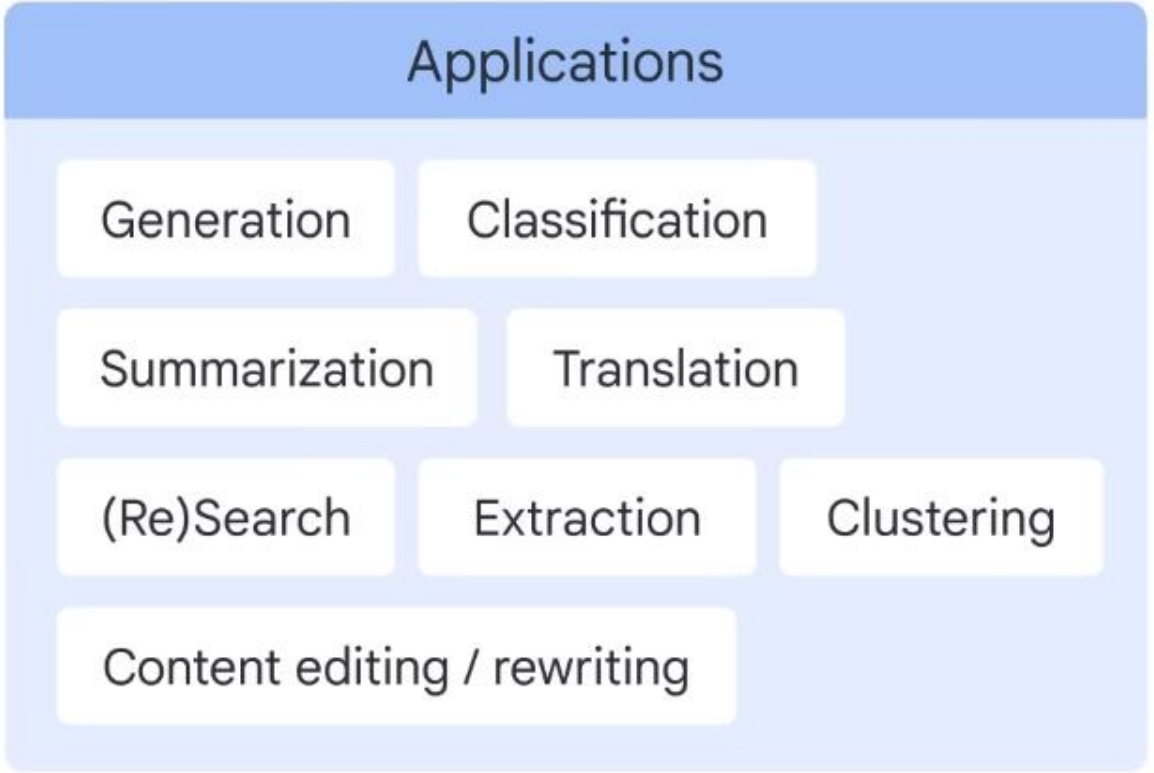
Generating content



1.13 Model types

1. Text-to-text

- Text-to-text models take a natural language input and produce text output. These models are trained to learn the mapping between a pair of texts (e.g. translation from one language to another).



1.13 Model types

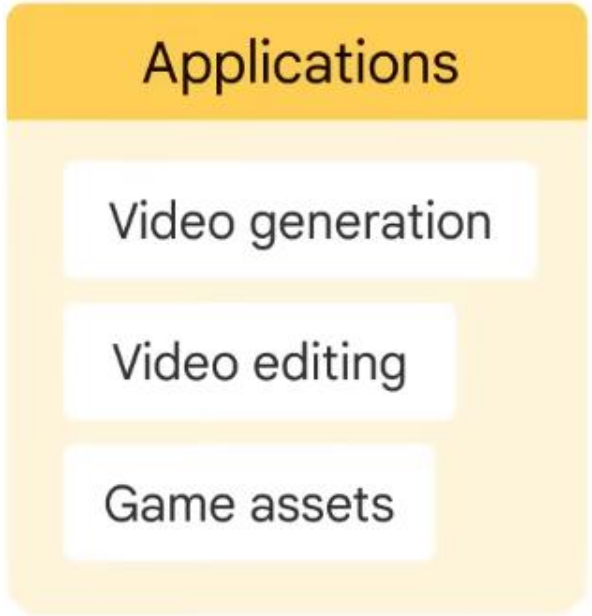
2. Text-to-image

- Text-to-image models are relatively new and are trained on a large set of images, each captioned with a short text description. Diffusion is one method used to achieve this.

1.13 Model types

3. Text-to-video/ Text-to-3D

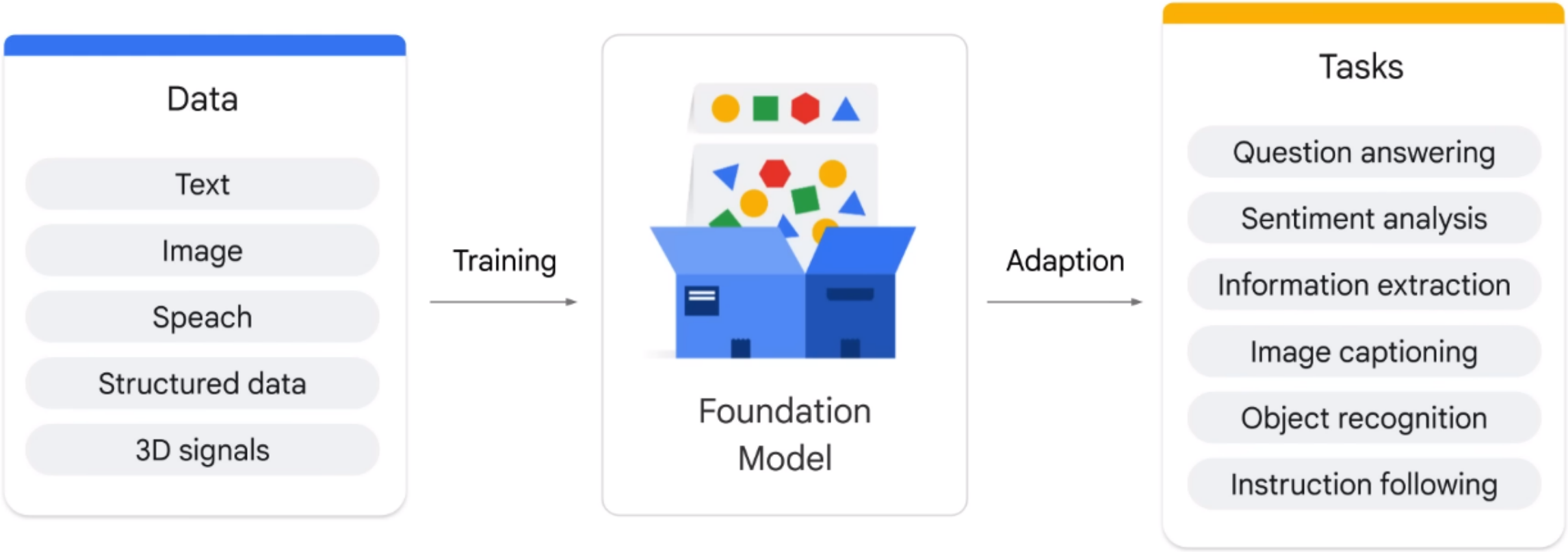
- Text-to-video models aim to generate a video representation from text input. The input text can be anything from a single sentence to a full script, and the output is a video that corresponds to the input text. Similarly Text-to-3D models generate three-dimensional objects that correspond to a user's text description (for use in games or other 3D worlds).



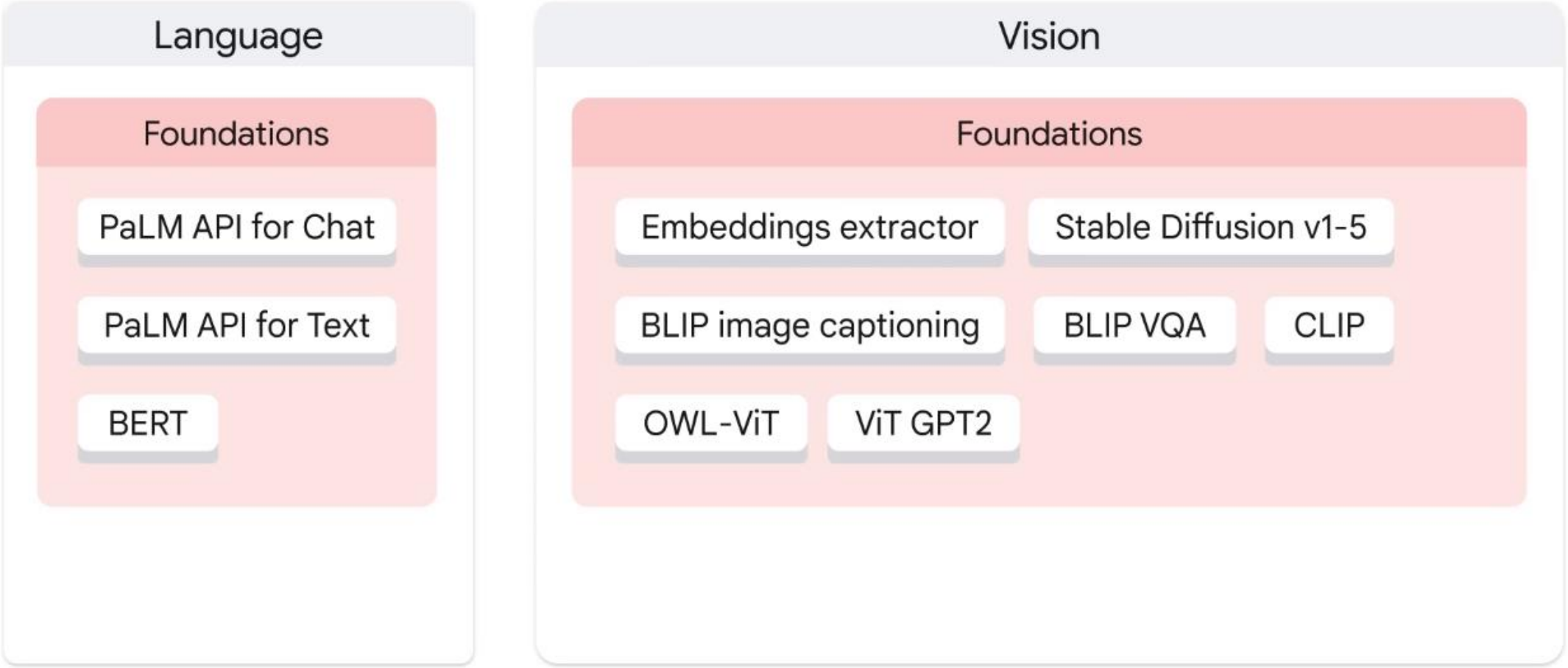
1.13 Model types

1. Text-to-task

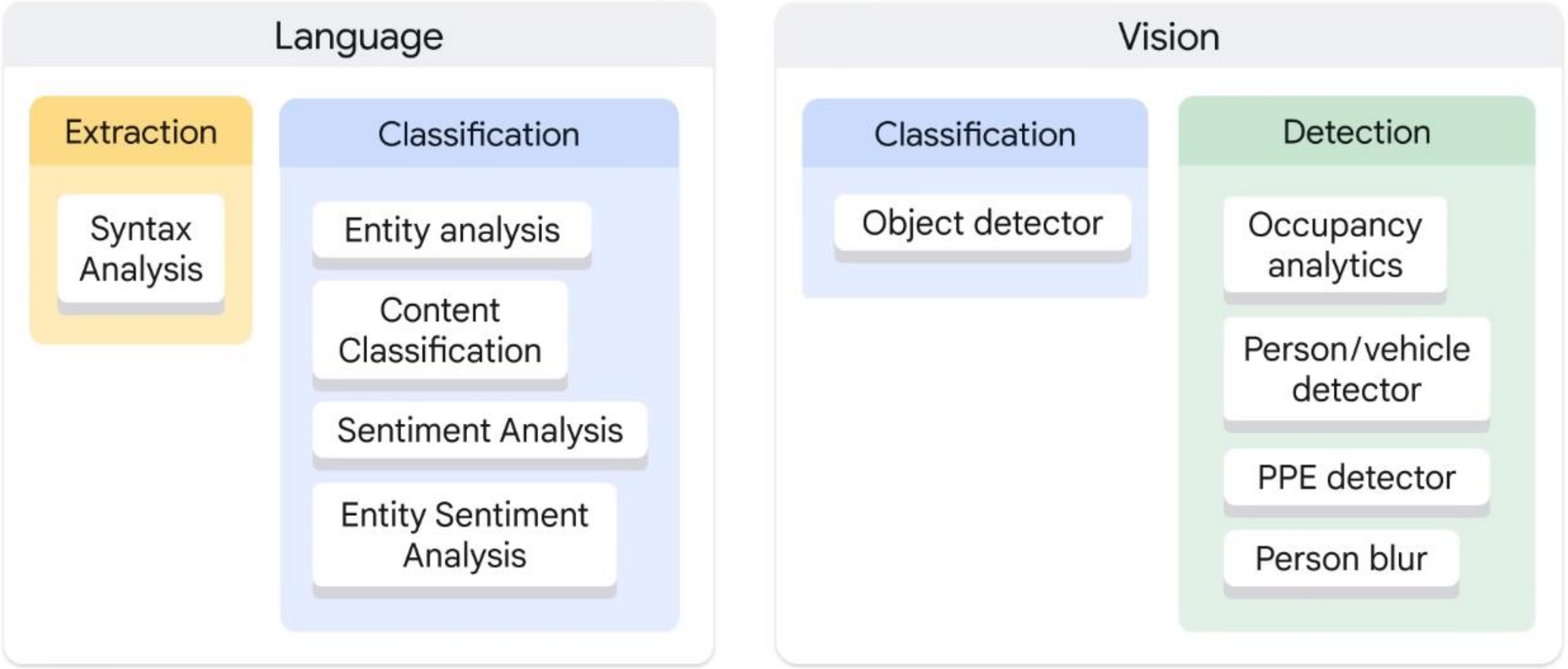
- Text-to-task models are trained to perform a specific task or action based on text input. This task can be a wide range of actions such as answering a question, performing a search, making a prediction, or taking some sort of action. For example, a text-to-task model could be trained to navigate web UI or make changes to a doc through the GUI.


Data
Text
Image
Speach
Structured data
3D signals
Training
Foundation Model
Adaption
Tasks
Question answering
Sentiment analysis
Information extraction
Image captioning
Object recognition
Instruction following

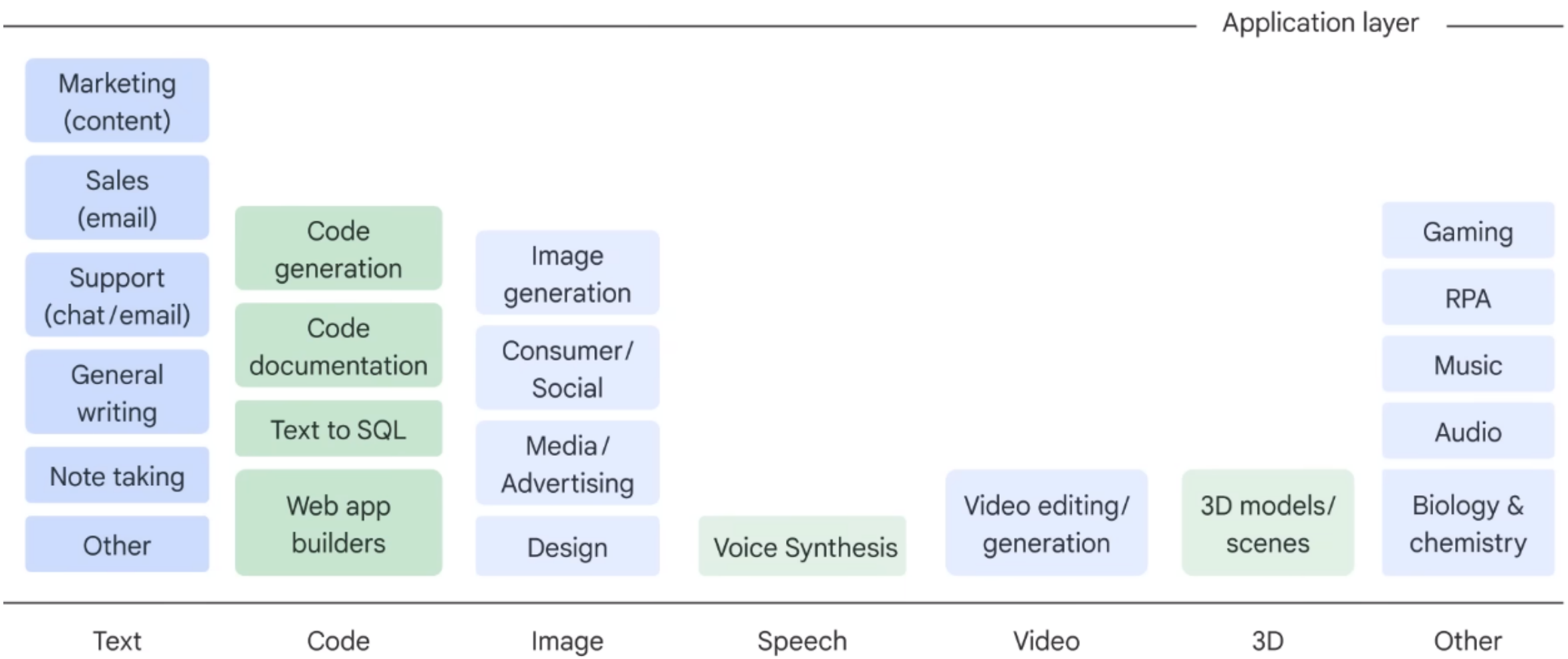
Model Garden: Vertex AI Foundation Models



Model Garden Task Specific Models



The generative AI Application Landscape



GenAI Studio

- Fine-tune models
- Deploy models to production
- Create Chatbots
- Image Generation
- And more!

Language

Test, tune, and deploy generative AI language models. Access the PaLM API for Chat for content generation, chat, summarization, and more.

Vision

Write text prompts to generate new images or generate new areas of an existing image.