Introduction to AI

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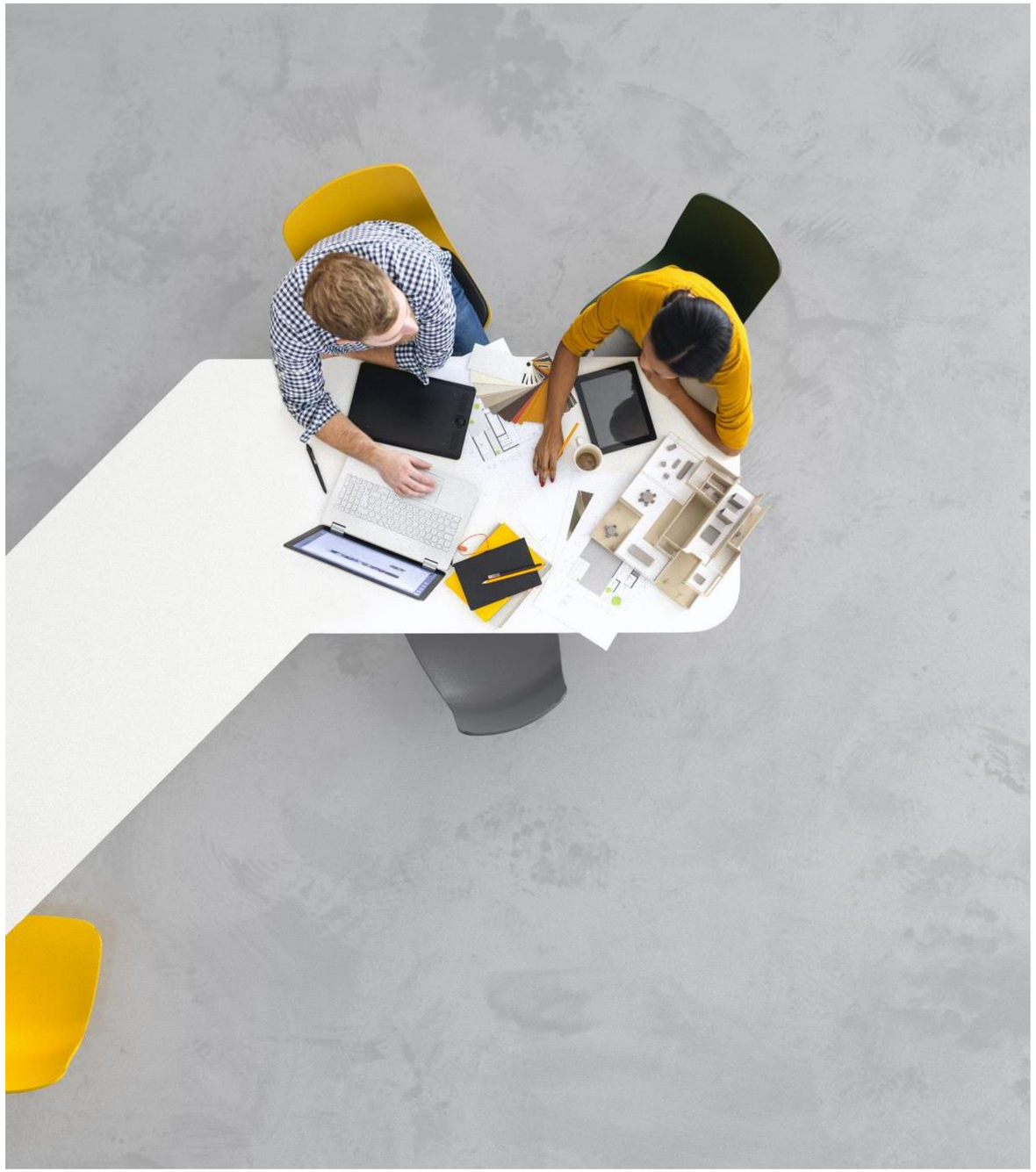

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What is AI?

AI refers to the ability of computer systems to attempt to mimic the problem-solving and decision-making capabilities of the human mind.

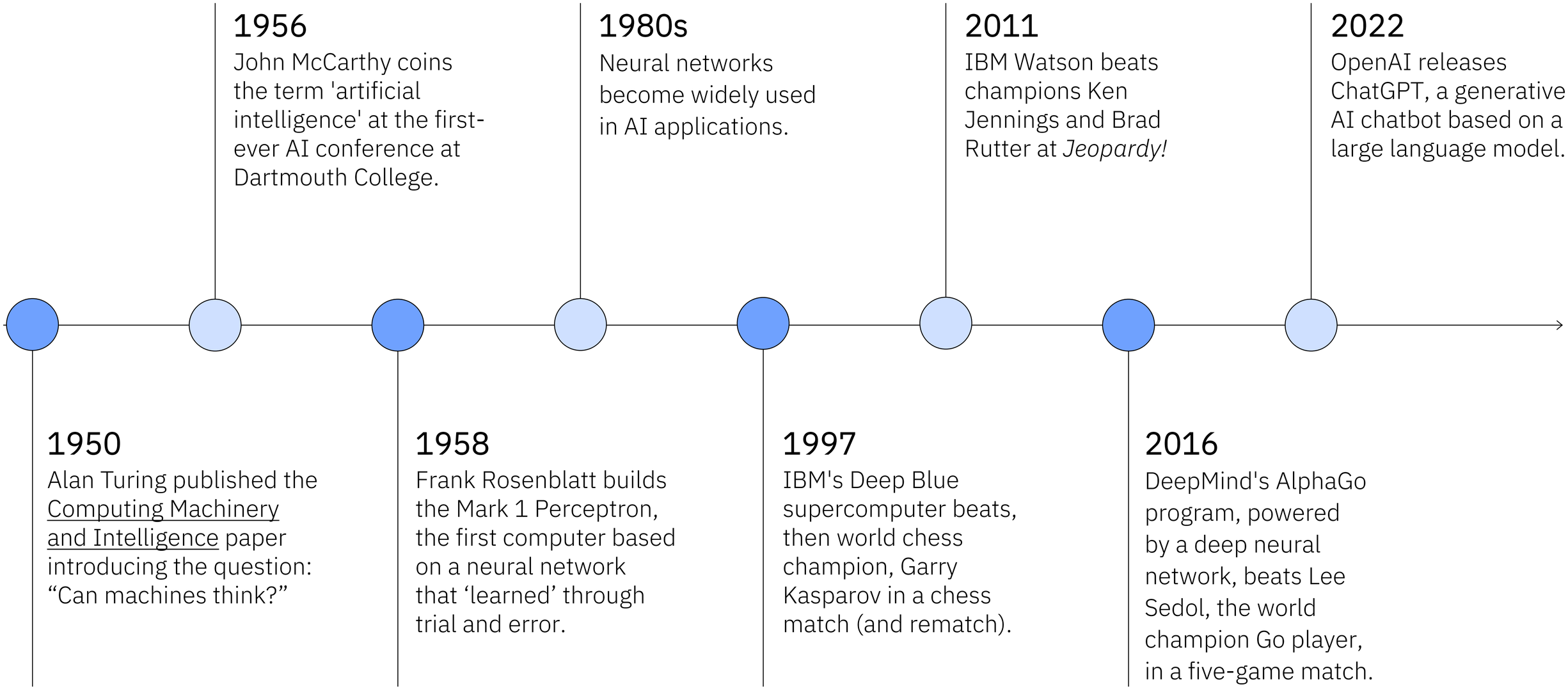
Computer vision

Data science

Natural language processing (NLP)

Robotics

AI milestones



Artificial Intelligence (AI)

Human intelligence exhibited by machines

AI can be defined as a technique that enables machines to mimic cognitive functions associated with human minds – cognitive functions include all aspects of learning, reasoning, perceiving, and problem solving.

Machine Learning (ML)

Systems that learn from historical data

ML-based systems are trained on historical data to uncover patterns. Users provide inputs to the ML system, which then applies these inputs to the discovered patterns and generates corresponding outputs.

Deep Learning (DL)

ML technique that mimics human brain function

DL is a subset of ML, using multiple layers of neural networks, which are interconnected nodes, which work together to process information. DL is well suited to complex applications, like image and speech recognition.

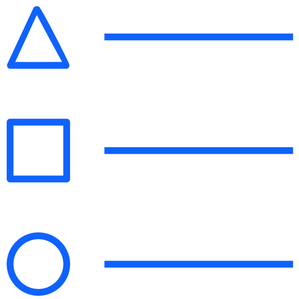
Foundation Model

Generative AI systems

AI model built using a specific kind of neural network architecture, called a transformer, which is designed to generate sequences of related data elements (for example, like a sentence).

1950's 1980's 2010's 2020's

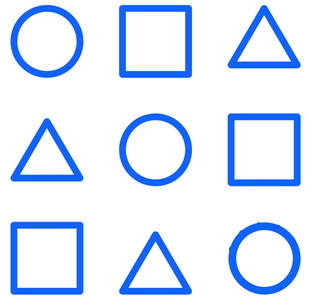
Rules-based systems



programmed with a series of instructions & logical rules

for example: “a triangle has three sides”

Machine learning systems

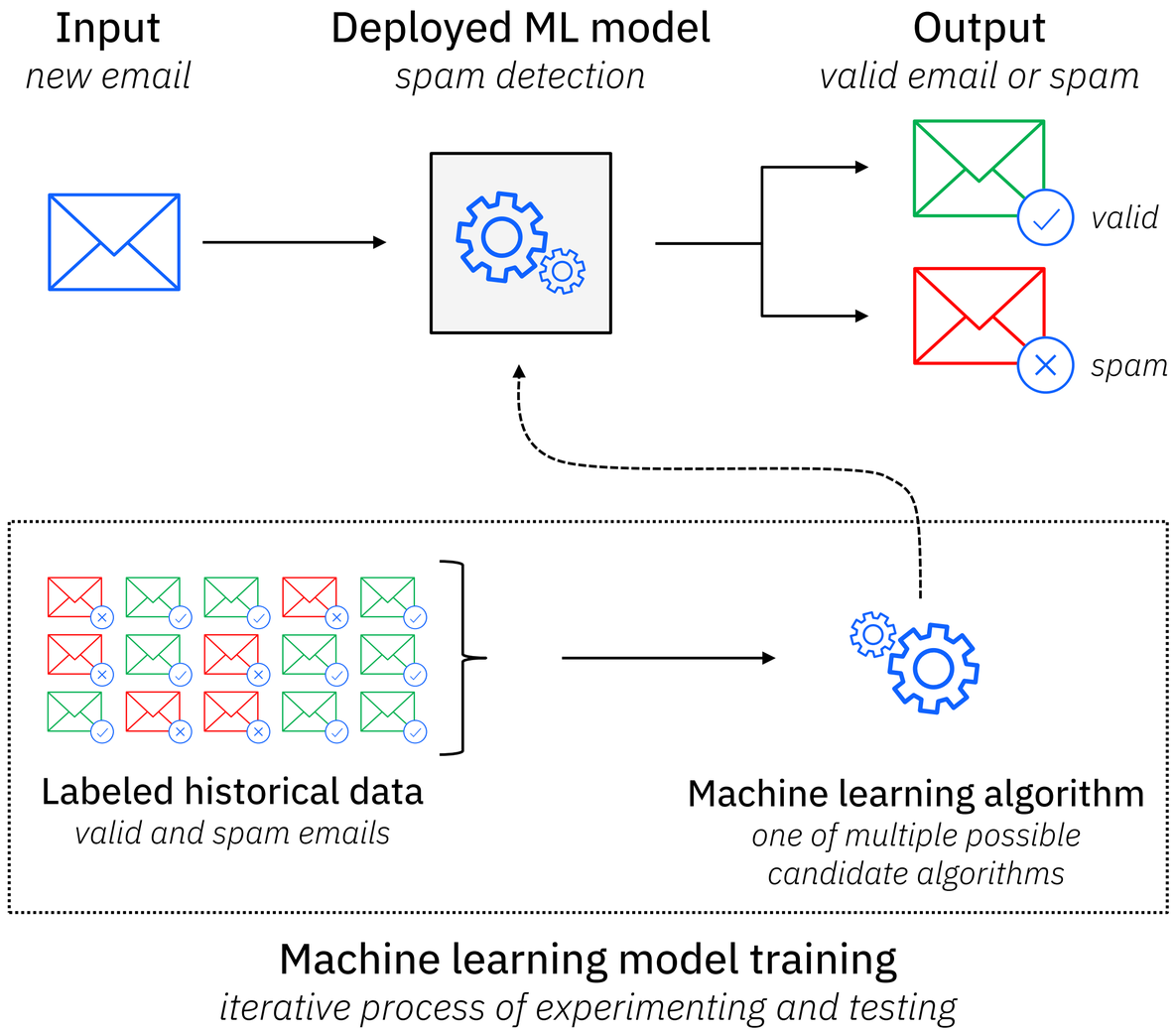


trained with a series of examples

for example: “here are pictures of many triangles”

What is a machine learning (ML) model?

Example: Spam detection for email



Machine learning (ML) types

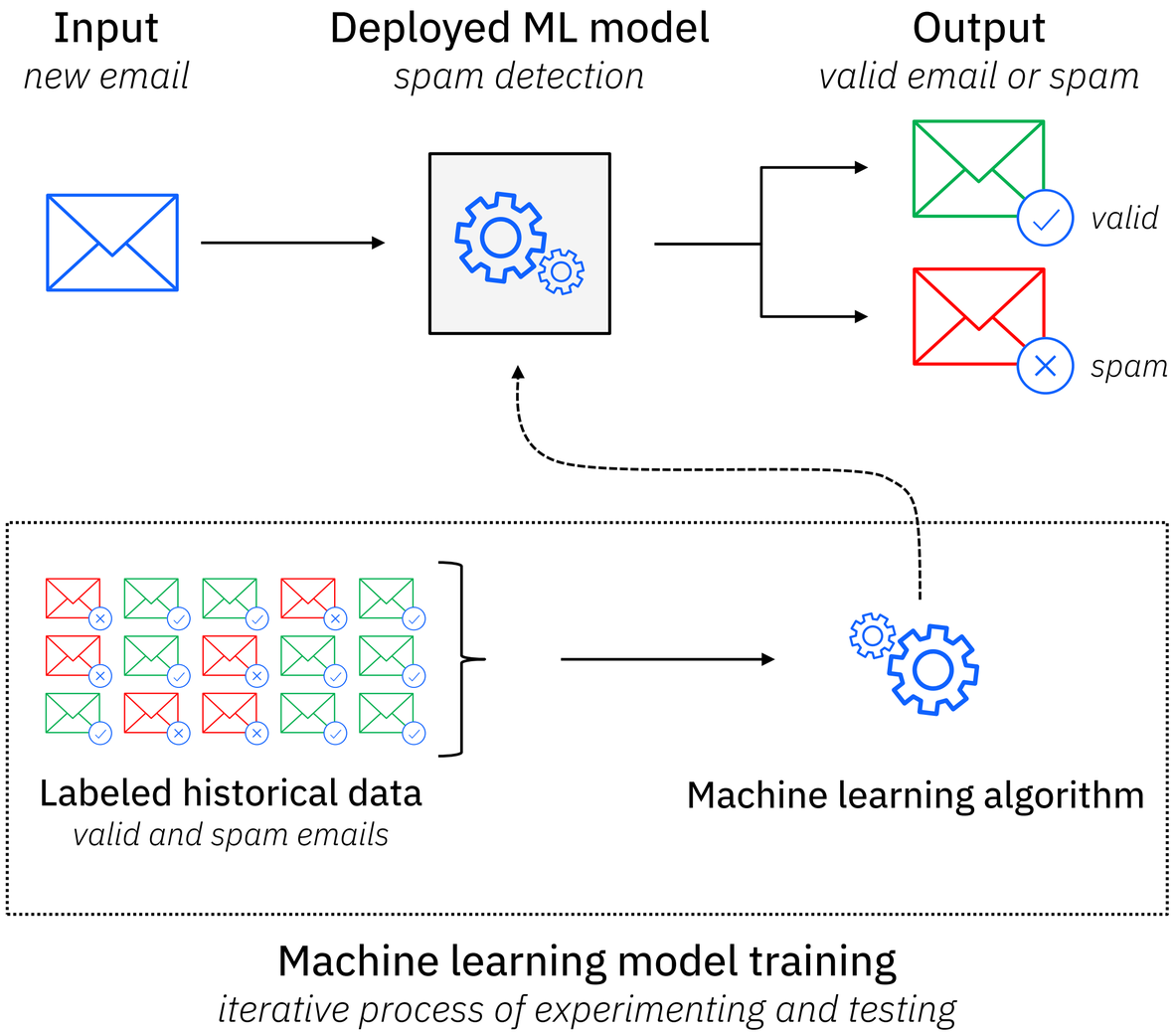
Classification models

Classification models assign labels to model inputs or assign them to specific categories.

Common use cases include:

- Fraud detection: predict whether a transaction is fraudulent based on patterns in the data
- Sentiment analysis: classify text as positive, negative, or neutral
- Medical diagnosis: assign a disease label to a patient's case, based on symptoms and medical history
- Image recognition: recognize objects or identify people based on visible features and characteristics

Example: Spam detection for email



Machine learning (ML) types

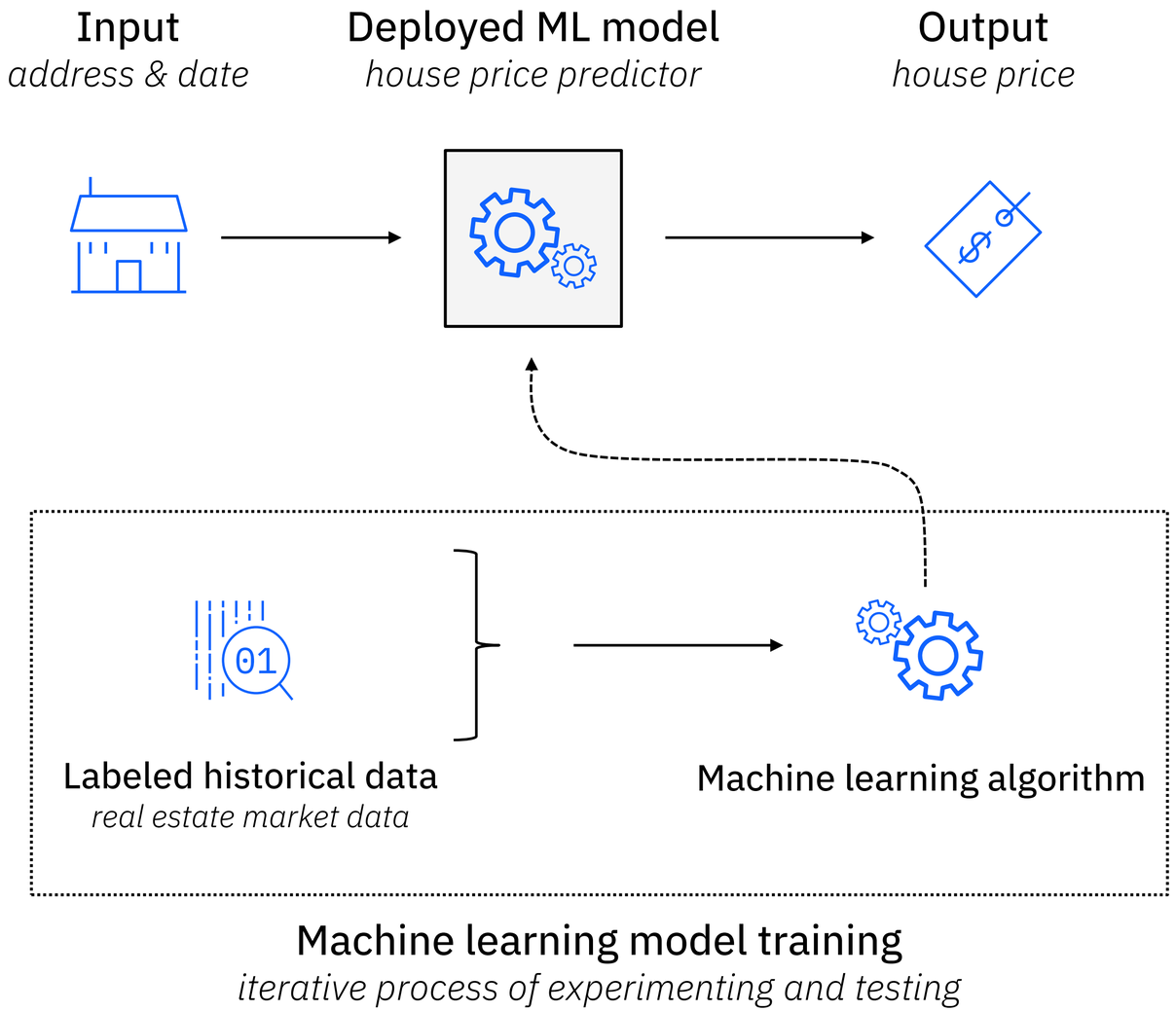
Regression models

Regression models make predictions based on the model input.

Common use cases include:

- Stock market analysis: securities price prediction based on historical data or news events
- Sales: forecasting based on historical data or market trends
- Healthcare: predict patient outcomes based on factors such as age, gender, medical history, or treatment plans
- Customer behavior analysis: predict future customer purchasing patterns based on demographic data, past purchase history, and advertising campaigns

Example: House price prediction



Machine learning (ML) types

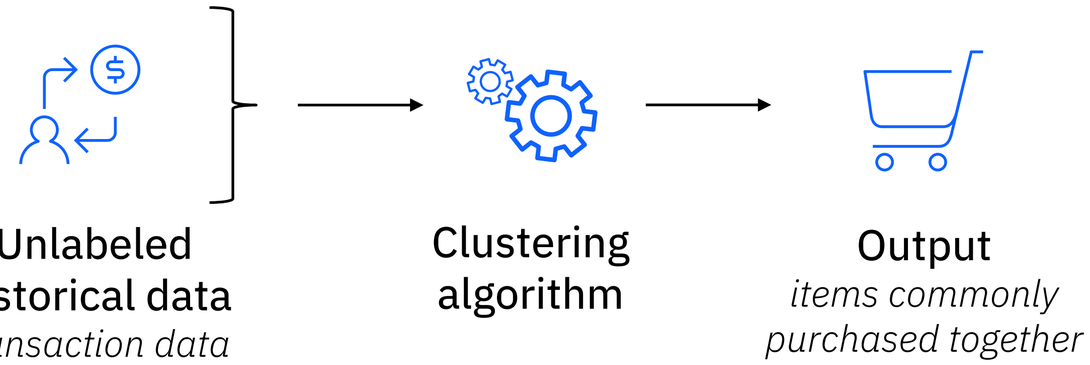
Clustering models

Clustering models identifies distinct groupings of individual data points that share common characteristics within a larger data set.

Common use cases include:

- Customer segmentation: group customers based on similar preference, behaviors, and demographics
- Genetic analysis: group genes with similar functions or processes
- Social network analysis: identify communities or groups within a social network
- Market basket analysis: identify items that are commonly purchased together

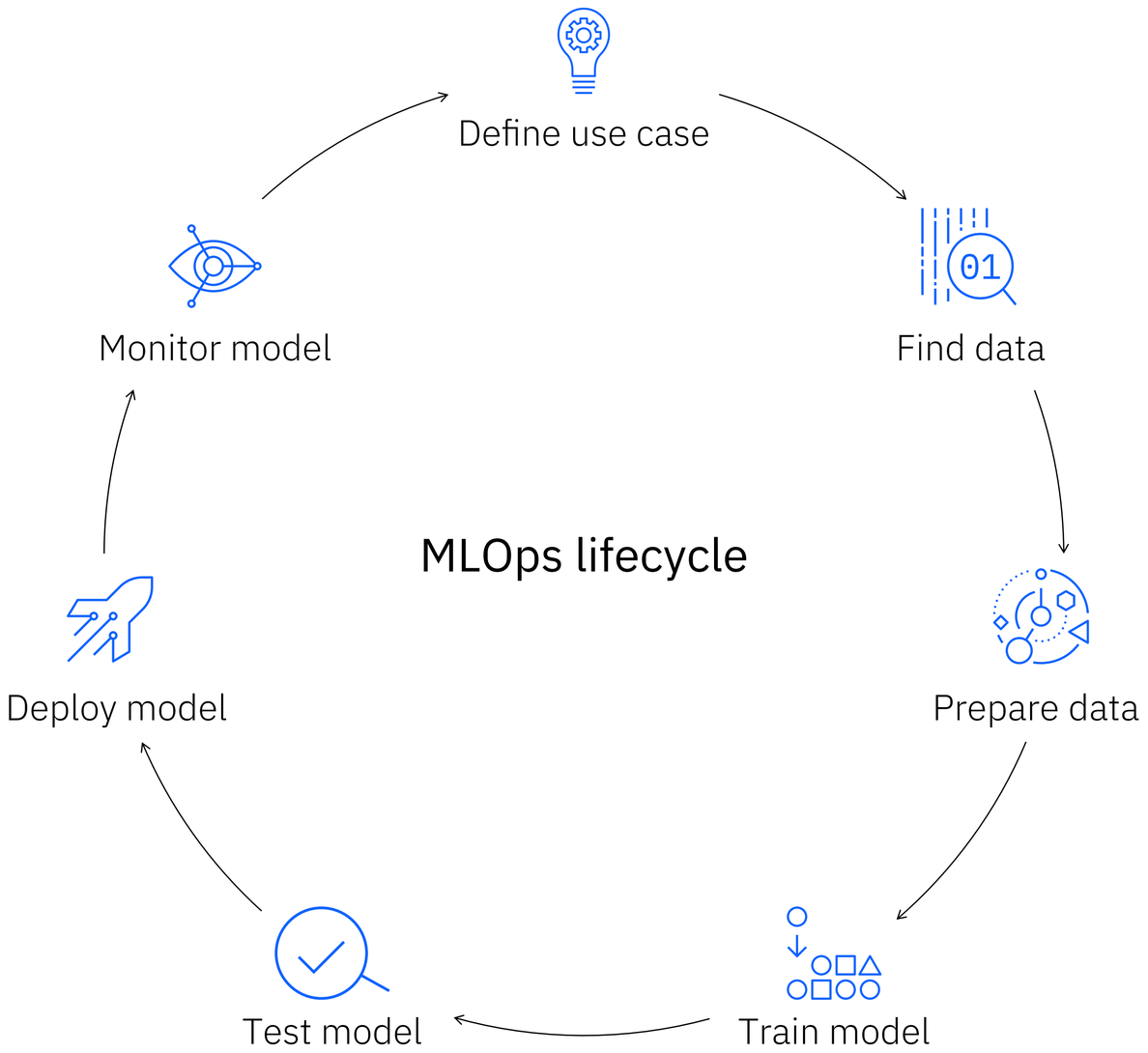
Example: Market basket analysis



Machine learning operations (MLOps) lifecycle

Use math, statistics, specialized programming, and analytics to extract meaningful insights from data.

Designed to build, deploy, manage, and monitor ML models.



Machine learning (ML) methods

Supervised learning

An operator provides the ML algorithm with a known dataset that includes desired inputs and outputs.

Semi-supervised learning

By using a combination of labeled and unlabeled data, ML algorithms can learn to label unlabeled data.

Unsupervised learning

The machine determines the correlations and relationships by analyzing available data.

Reinforcement learning

A technique that teaches an AI model to find the best result by trial and error.

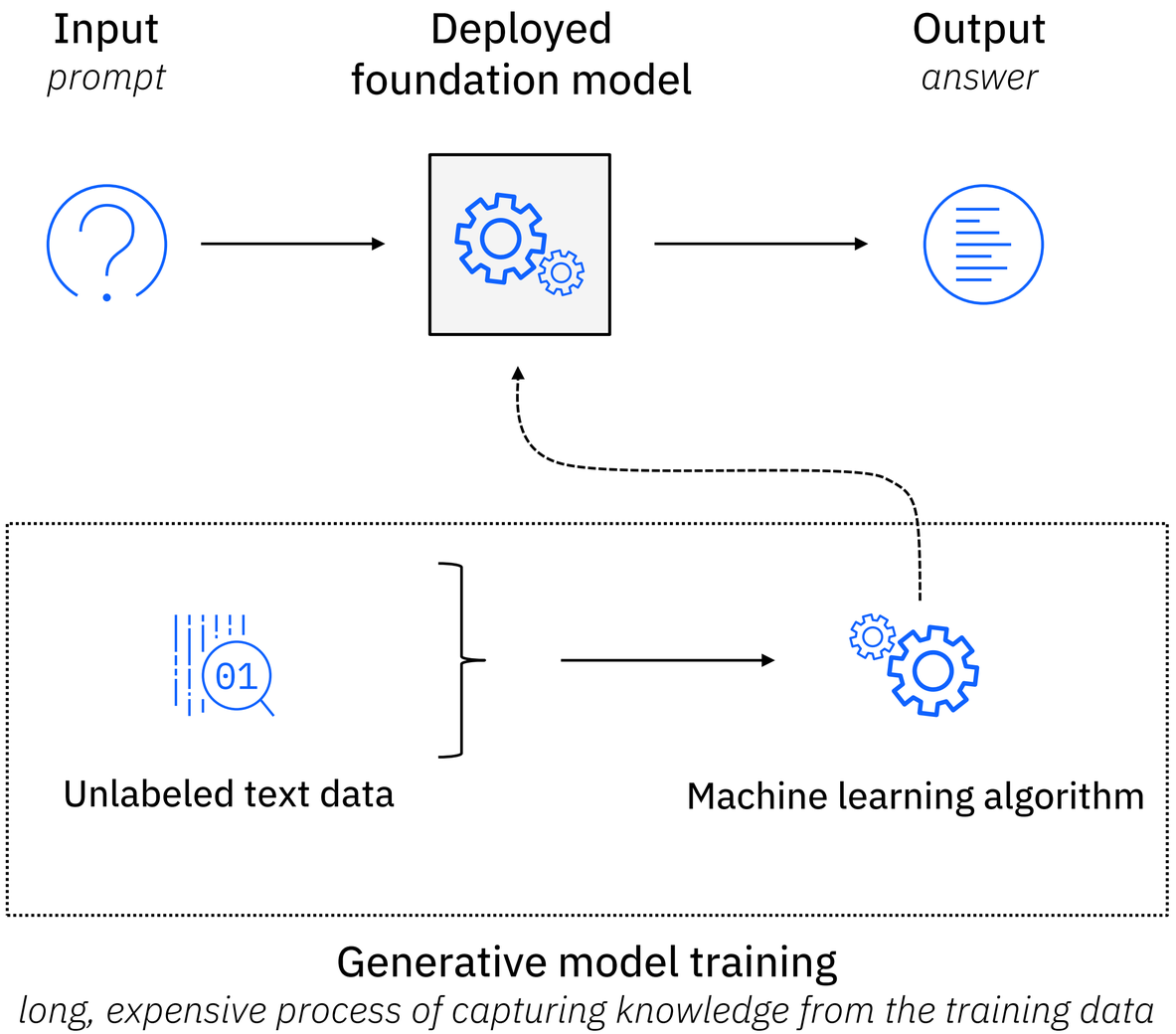
Foundation models

Generative models create new data in response to input requests (prompts).

Common use cases include:

- Text generation: generate new text in response to a prompt, summarizing text, or writing a lengthy essay
- Code generation: generate computer code based on a textual description of the proposed program
- Image generation: create images based on the prompt

Example: Text generation



Foundation model usage

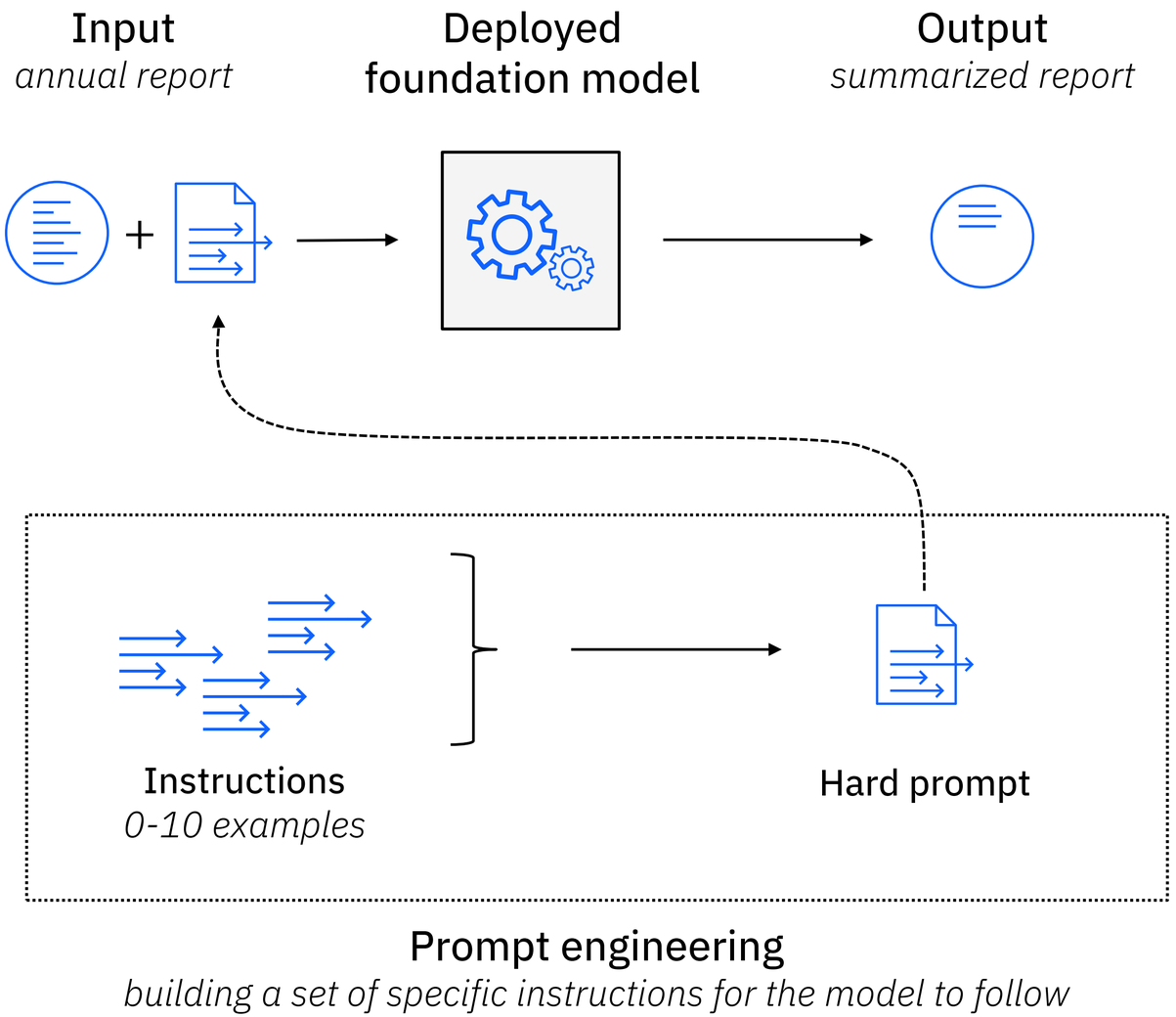
Prompt engineering

Engineered prompts (hard prompts) are developed through trial and error

The underlying model does not change

Useful for quick experimentation

Example: Text summarization



Prompt engineering

building a set of specific instructions for the model to follow

Foundation model usage

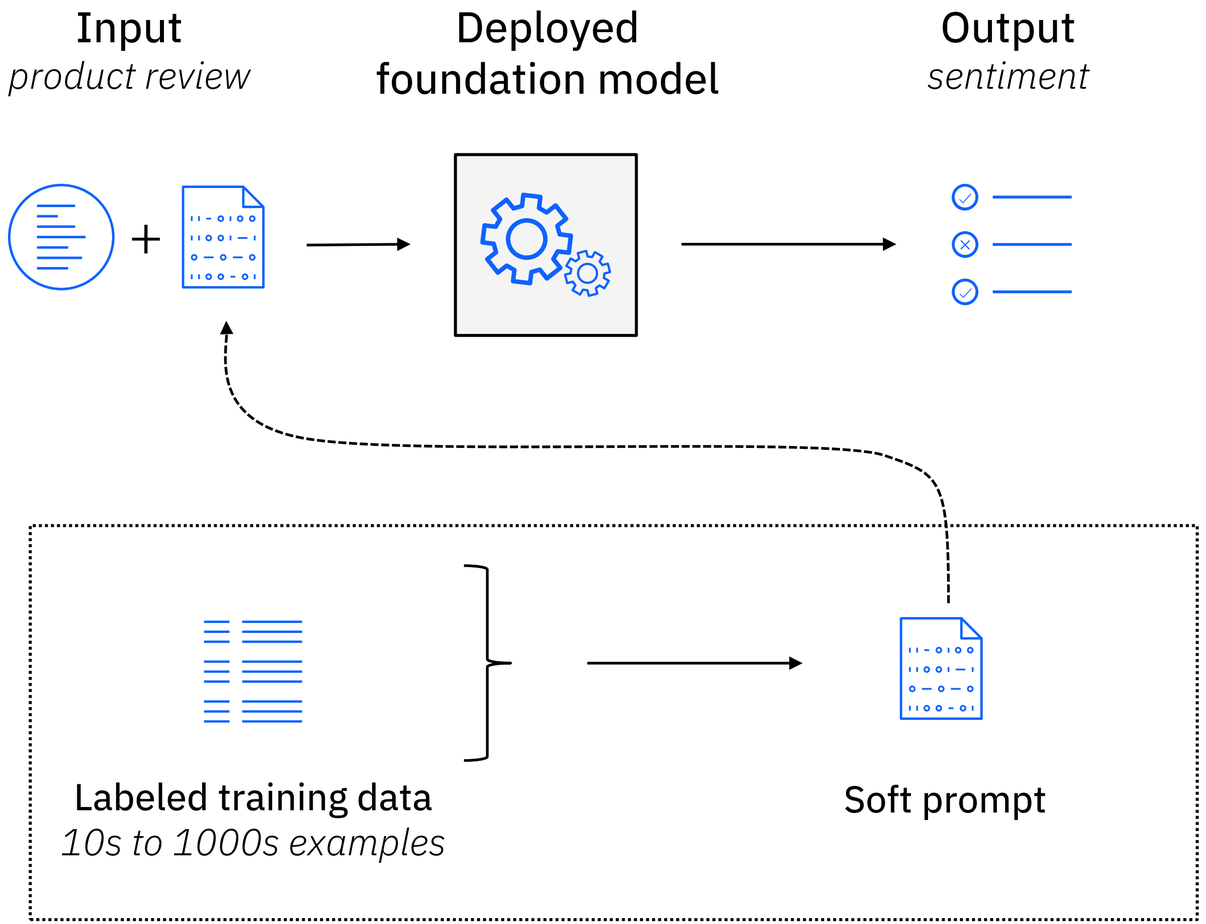
Prompt tuning

Tunable soft prompts are encoded sets of labeled training data

The underlying model does not change

Good model performance for specific use cases reflected by the training data

Example: Sentiment classification



Prompt tuning

use a labeled data set to encode 100s of input/output examples

Foundation model usage

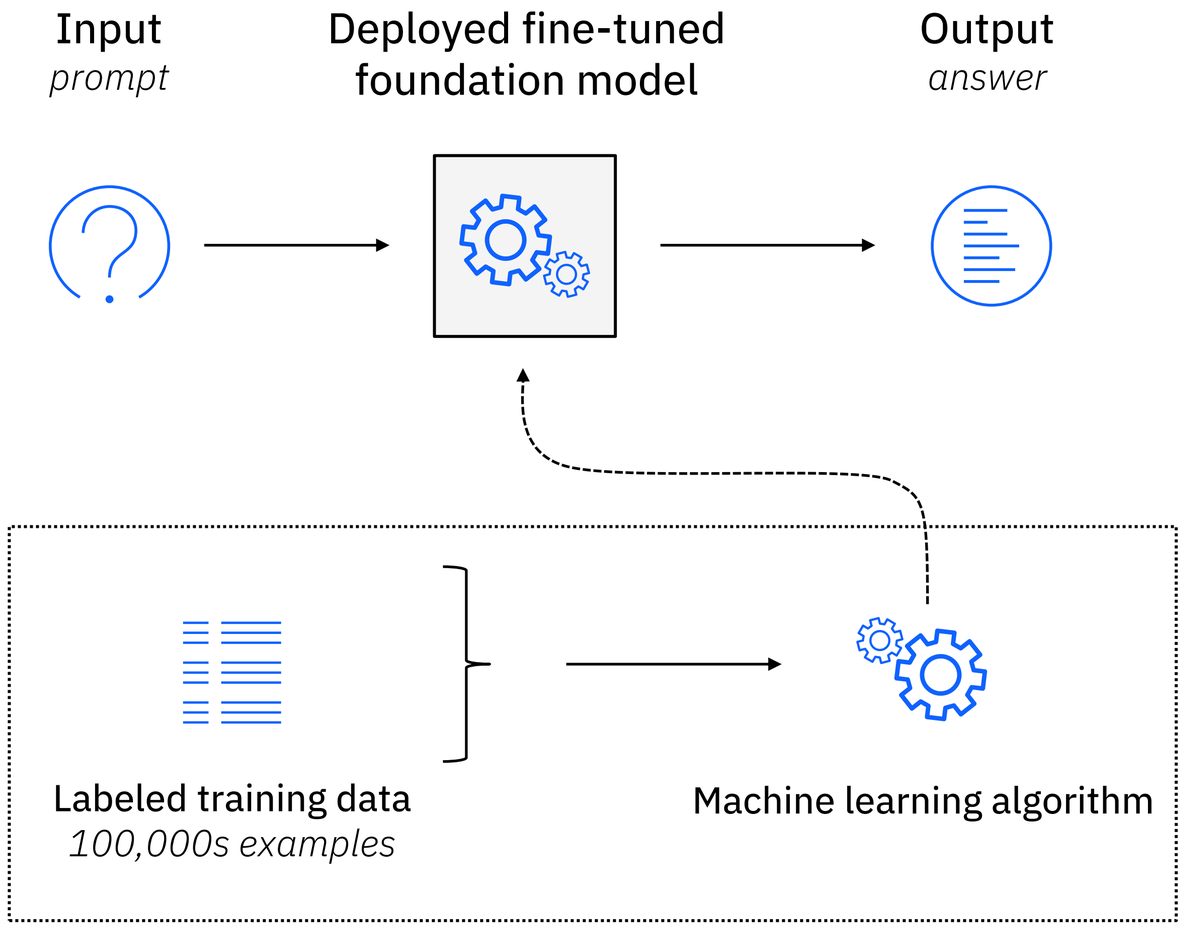
Fine tuning

A fine-tuned model is a new customized deployment of a pre-existing model

The underlying model has been changed to reflect the training data

Good model performance for specific use cases reflected by the training data

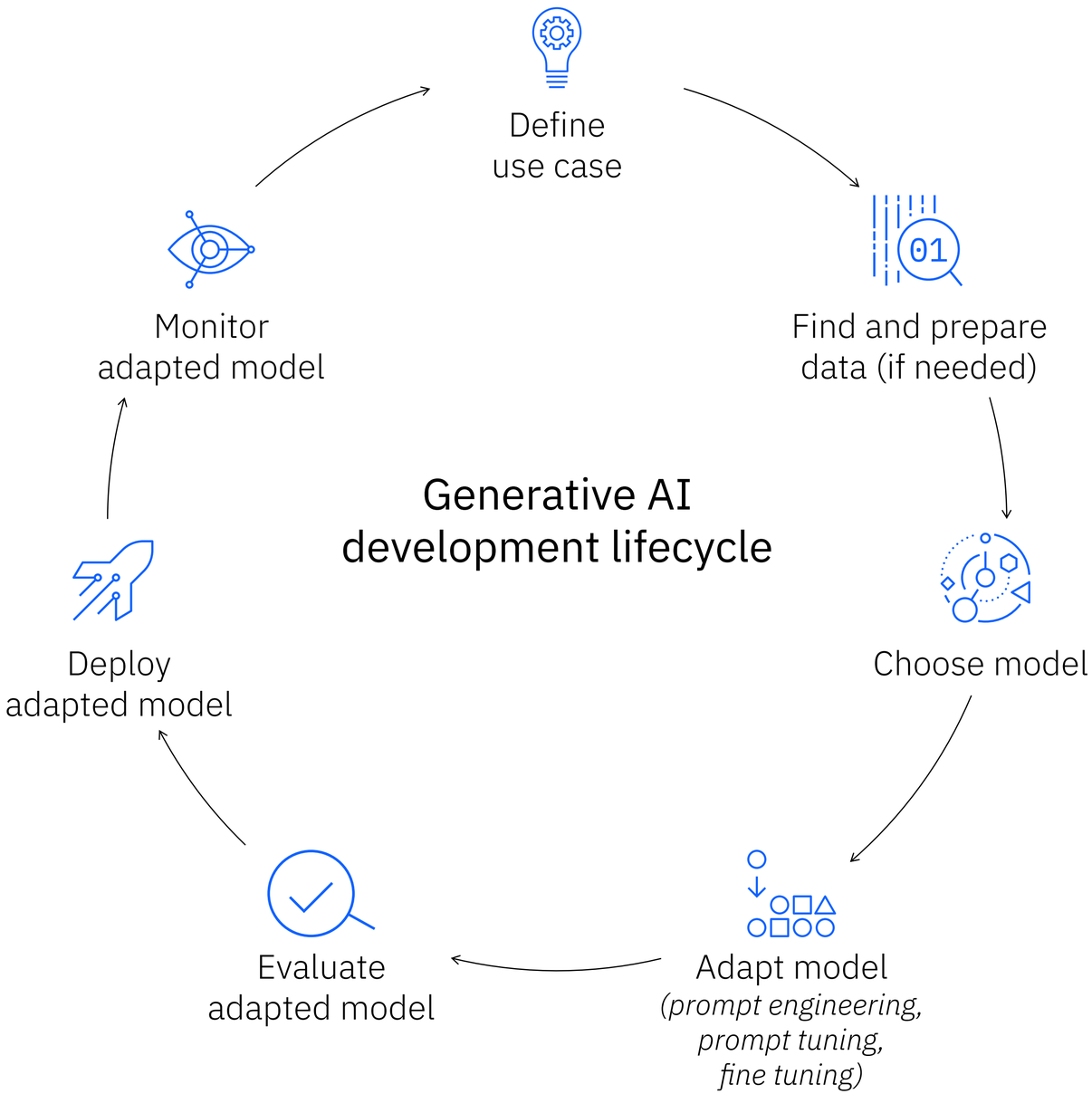
Example: Text generation



Generative AI development lifecycle

Use foundation models to infuse AI into business workflows.

Designed to choose, adapt, deploy, and monitor customized generative AI models.



Large language models (LLMs)

LLMs are machine learning models that have been trained on large quantities of unlabeled text using self-supervised learning and can perform a variety of natural language processing tasks .

ChatGPT is an example of a generative AI chatbot developed using an LLM.

Traditional AI applications

Speech recognition

Customer service

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Computer vision

Recommendation engines

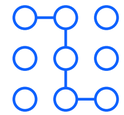
Automated stock trading

Natural language processing

The technology that gives computers the ability to understand text and spoken words in much the same way humans can.

Natural language processing use cases

Spam detection



Machine translation

Chatbots and virtual assistants

Social media sentiment analysis

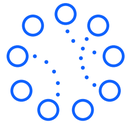
Text summarization

Conversational AI

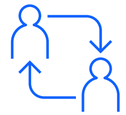
Chatbots and virtual assistants or agents, can make it easy for users to find the information they need by responding to their questions and requests through text or audio input without the need for human intervention, providing 24-hour availability to users.

Conversational AI use cases

Customer support



Accessibility



HR processes

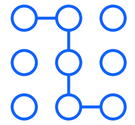
Healthcare

IoT devices

Computer software

Generative AI applications

Text generation



Code generation

Music generation

Generate simulated data

Image & video generation

Glossary of AI terms

- Algorithm
- Artificial general intelligence (AGI)
- Artificial intelligence (AI)
- Artificial narrow intelligence (ANI)
- Artificial super intelligence (ASI)
- Bias
- Convolutional neural network (CNN)
- Deep learning (DL)
- Foundation model
- Generative AI
- Hallucination
- Large language model (LLM)
- Machine learning (ML)
- Natural language generation (NLG)
- Natural language processing (NLP)
- Natural language understanding (NLU)
- Neural networks
- Parameters
- Transformer model