

A futuristic robot with a white and black body is standing in a server room. The robot is looking at a server rack filled with various components and glowing lights. The room is dimly lit with blue and red lights, creating a high-tech atmosphere. The robot's right hand is reaching out towards the server rack.

AI for CCNA

<https://www.melearning.net>

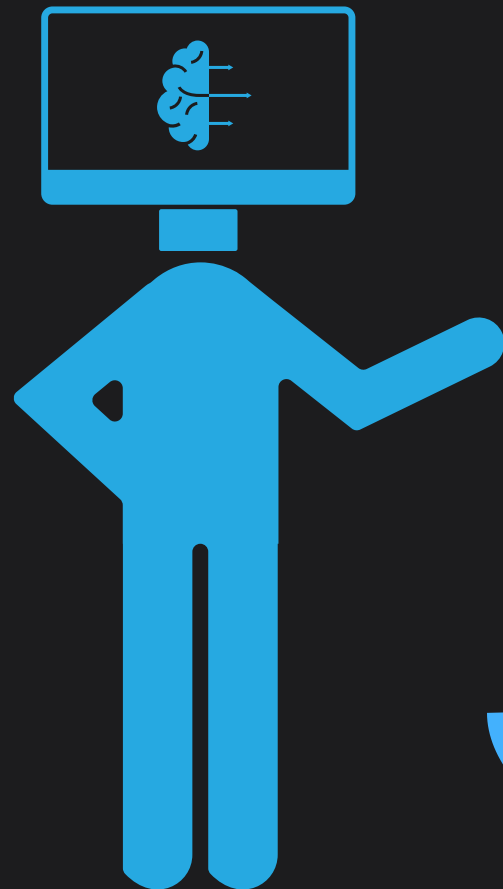
Artificial Intelligence



CCNA Exam v1.1 (200-301)

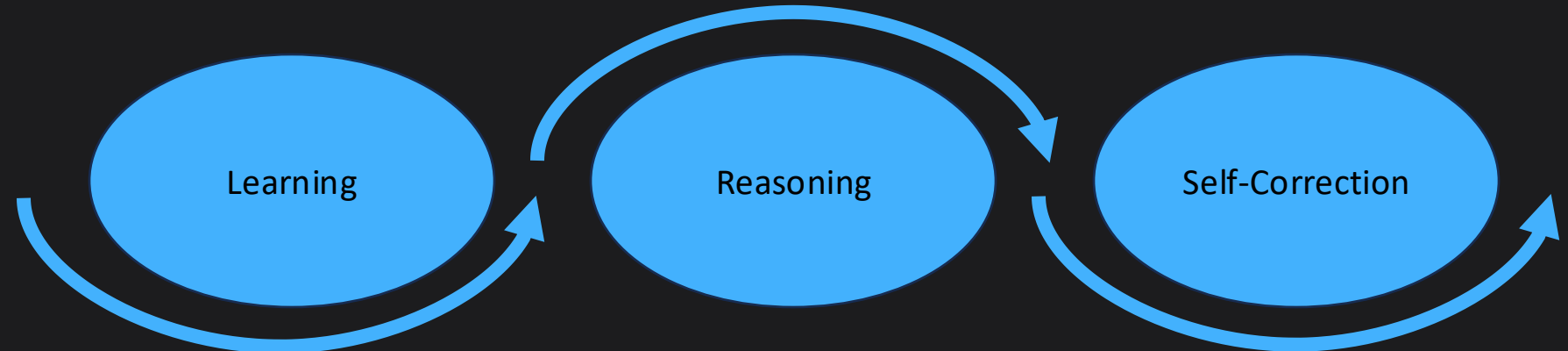
- 10%** **6.0** **Automation and Programmability**
- 6.1 Explain how automation impacts network management
- 6.2 Compare traditional networks with controller-based networking
- 6.3 Describe controller-based, software defined architecture (overlay, underlay, and fabric)
 - 6.3.a Separation of control plane and data plane
 - 6.3.b Northbound and Southbound APIs
- 6.4** **Explain AI (generative and predictive) and machine learning in network operations**

Artificial Intelligence



What is AI?

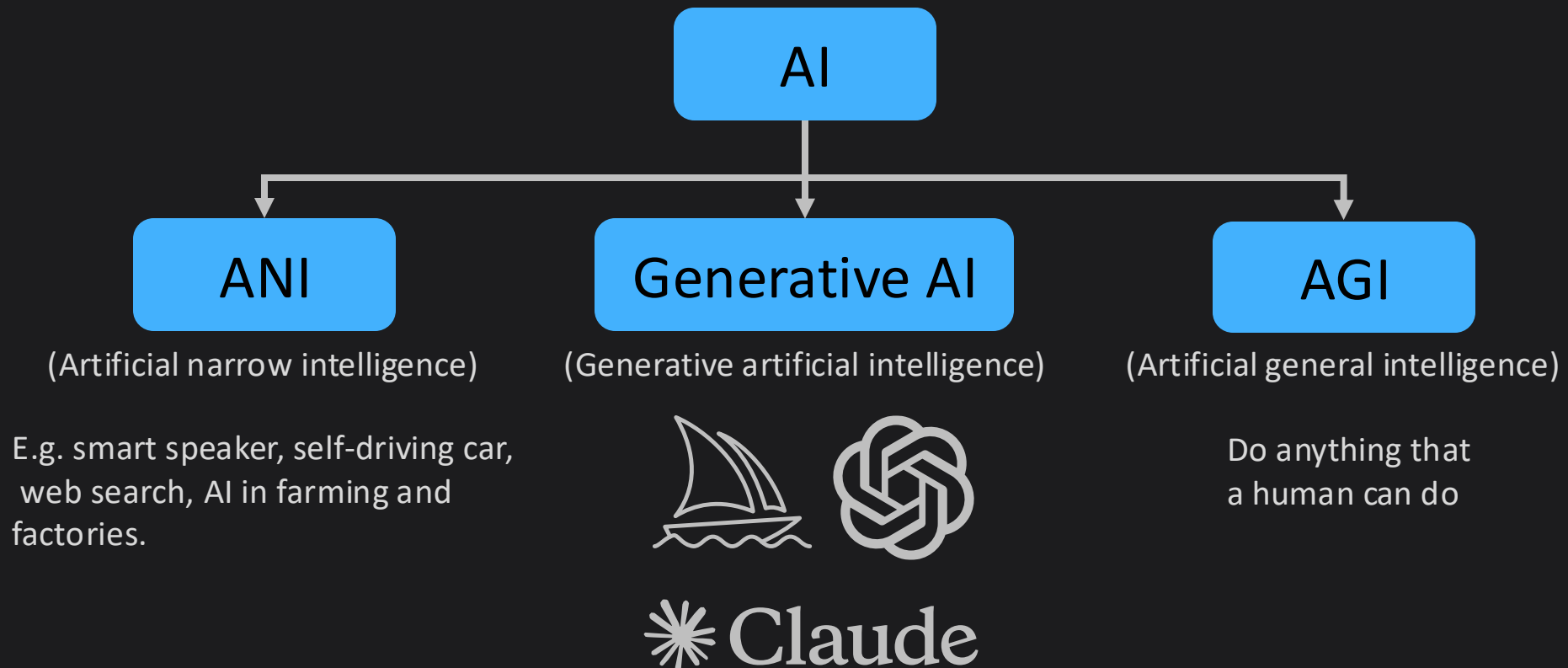
Human Intelligence Simulated by Computer Systems



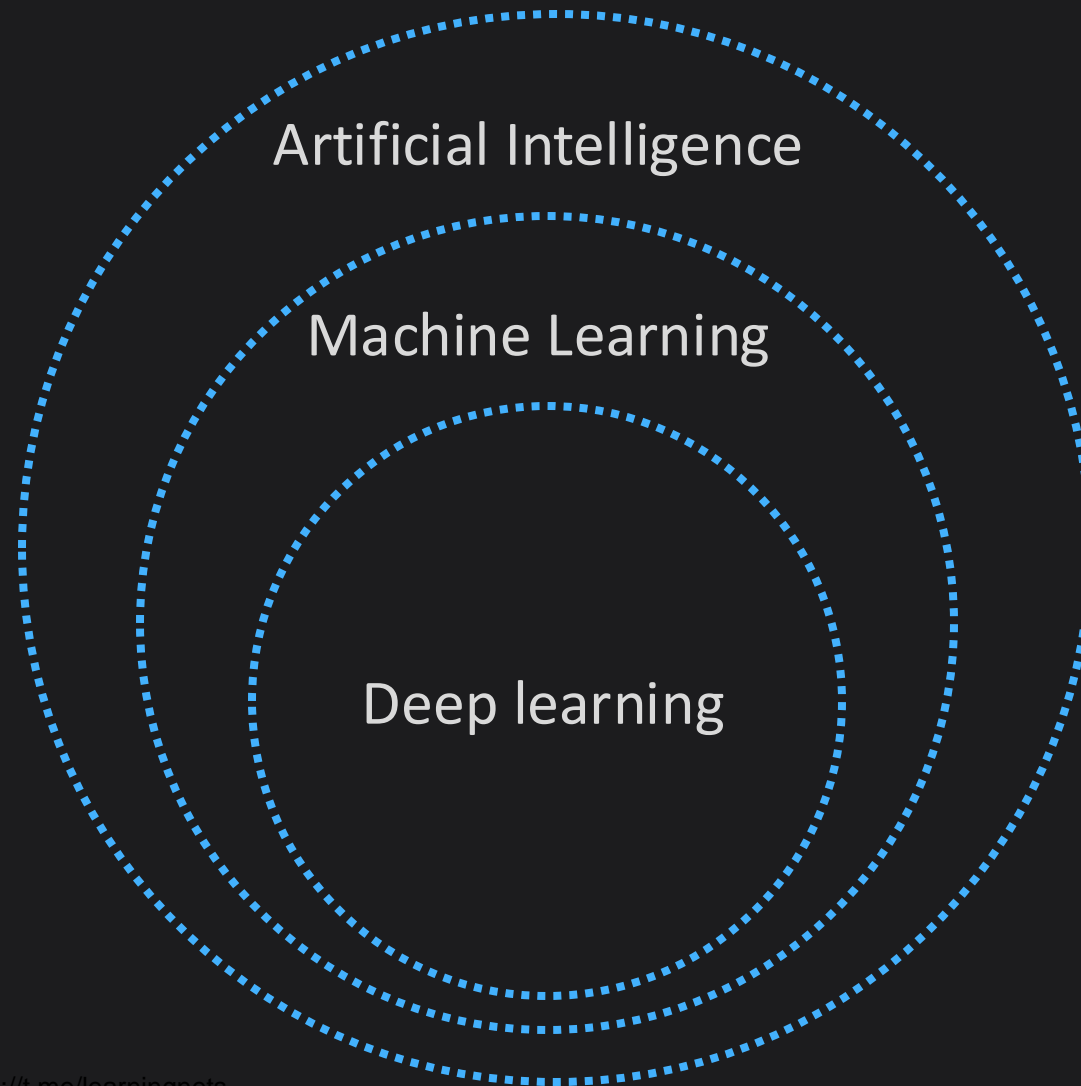
Source: Cisco U

Artificial Intelligence

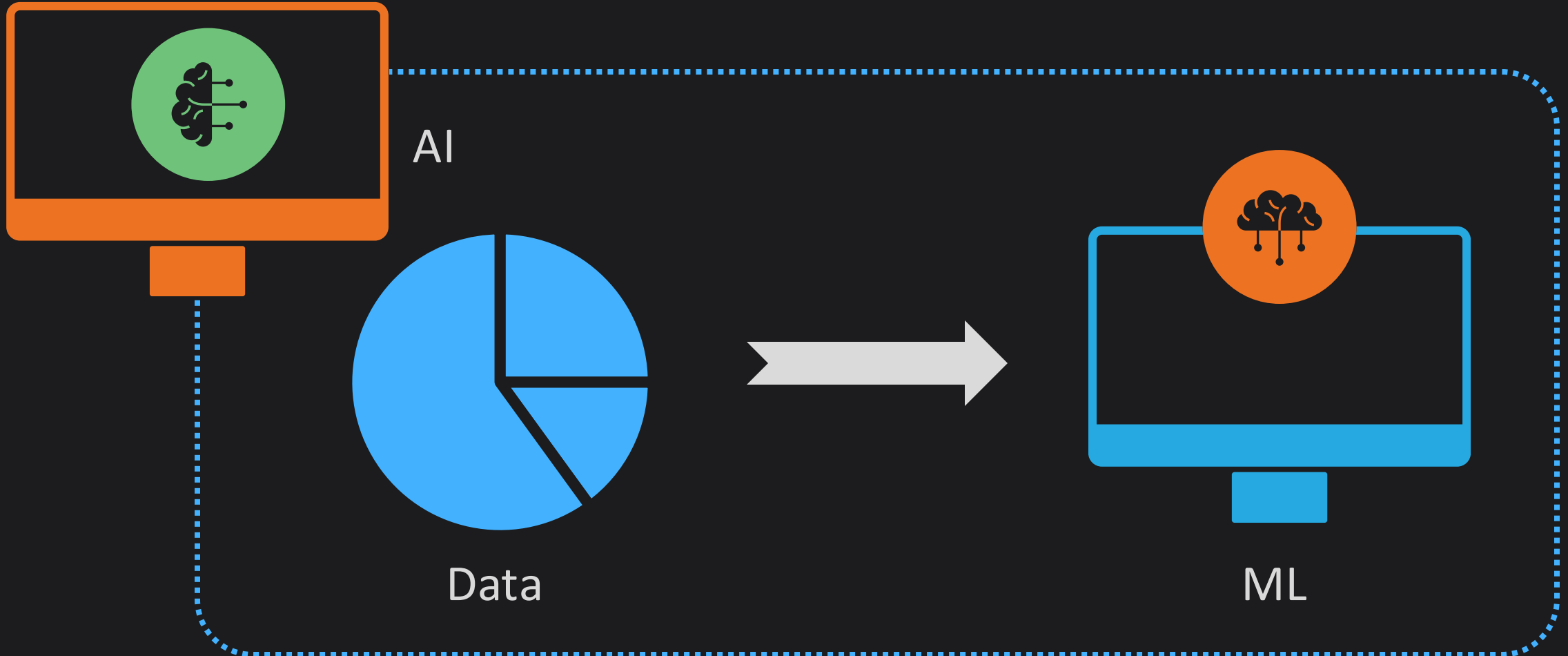
Machine recognizes patterns in the data



Artificial Intelligence

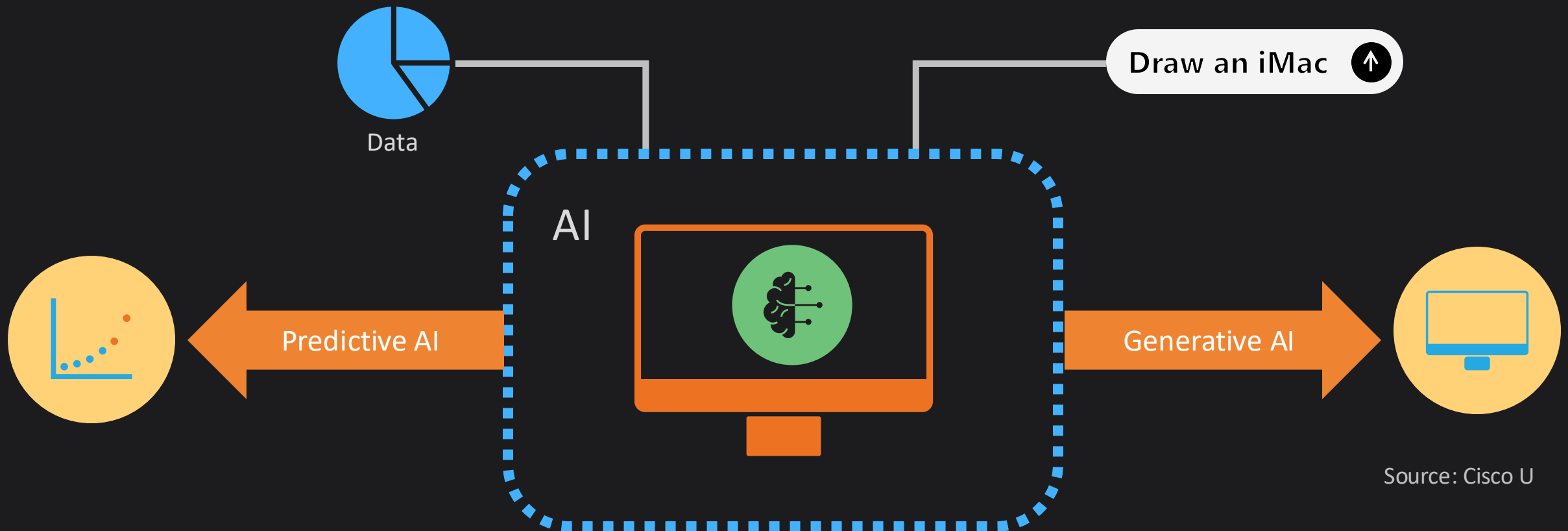


Artificial Intelligence



Artificial Intelligence

Types of AI – Predictive and Generative



Source: Cisco U

Traditional Code

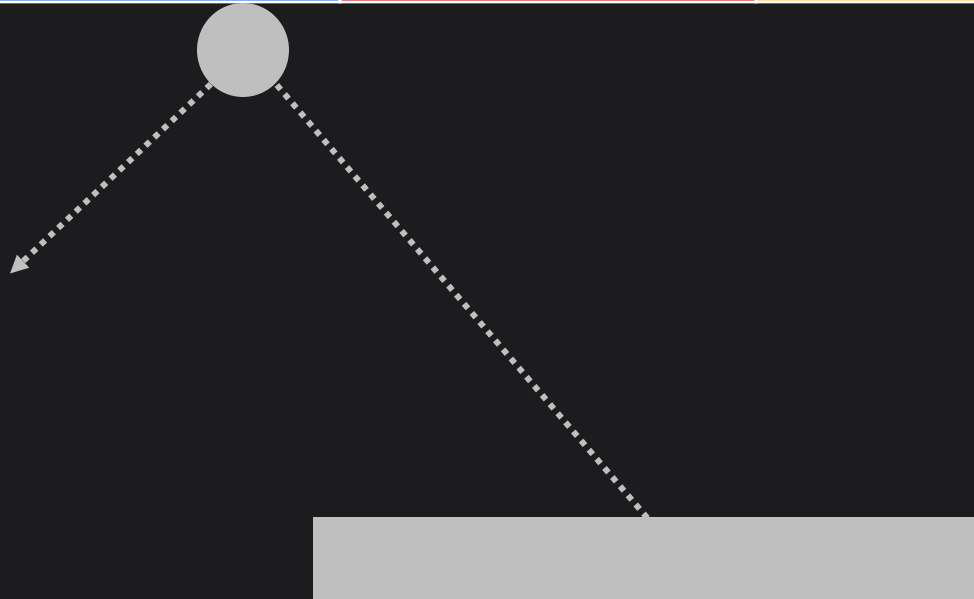
If it's raining

 then take umbrella

Else

 take Hat

Game



```
if (ball.collide(brick)) {  
  removeBrick();  
  ball.dx=-1*(ball.dx);  
  ball.dy=-1*(ball.dy);  
}
```

Source: Introduction to TensorFlow: Coursera

How would you code this (activity recognition)?



```
0 1 0 1 0 0 1 0 1 0 1 0 0 1 0 1 0 1 0  
1 0 0 1 0 1 0 1 0 1 0 0 1 0 1 1 1 0 1  
0 1 0 0 1 0 1 0 1 0 0 1 0 1 0 1 0 0 1  
0 1 0 1 0 0 1 0 1 0 1 0 0 1 0 1 0 1 0
```

Speed < 4



```
1 0 1 0 1 0 0 1 0 1 0 0 1 0 1 0 1 0 1  
0 1 0 1 0 1 0 0 1 0 0 1 0 0 1 0 0 0 1  
0 0 1 0 0 1 1 1 1 1 0 1 0 1 0 1 1 1 1  
1 0 1 0 1 0 0 1 0 0 1 1 1 1 0 1 0 1 1
```

Speed > 4



```
1 0 0 1 0 1 0 0 1 1 1 1 1 1 0 1 0 1 0 1  
1 1 0 1 0 1 0 1 1 1 0 1 0 1 0 1 1 1 0  
1 0 1 0 1 0 1 1 1 1 0 1 0 1 0 1 0 1 1  
1 1 1 1 1 1 0 0 0 1 1 1 1 1 0 1 0 1 0 1
```

Speed > 12



```
1 1 1 1 1 1 1 1 1 1 1 0 1 0 0 1 1 1 0 1  
0 0 1 1 1 1 1 0 1 0 1 1 1 1 1 0 1 0 1  
0 1 0 1 1 1 0 1 0 1 0 1 0 1 0 1 1 1 0  
1 0 1 0 1 0 1 0 1 0 1 0 0 1 1 1 1 1 0
```

Who knows?

Traditional programming

Rules: Programming Language

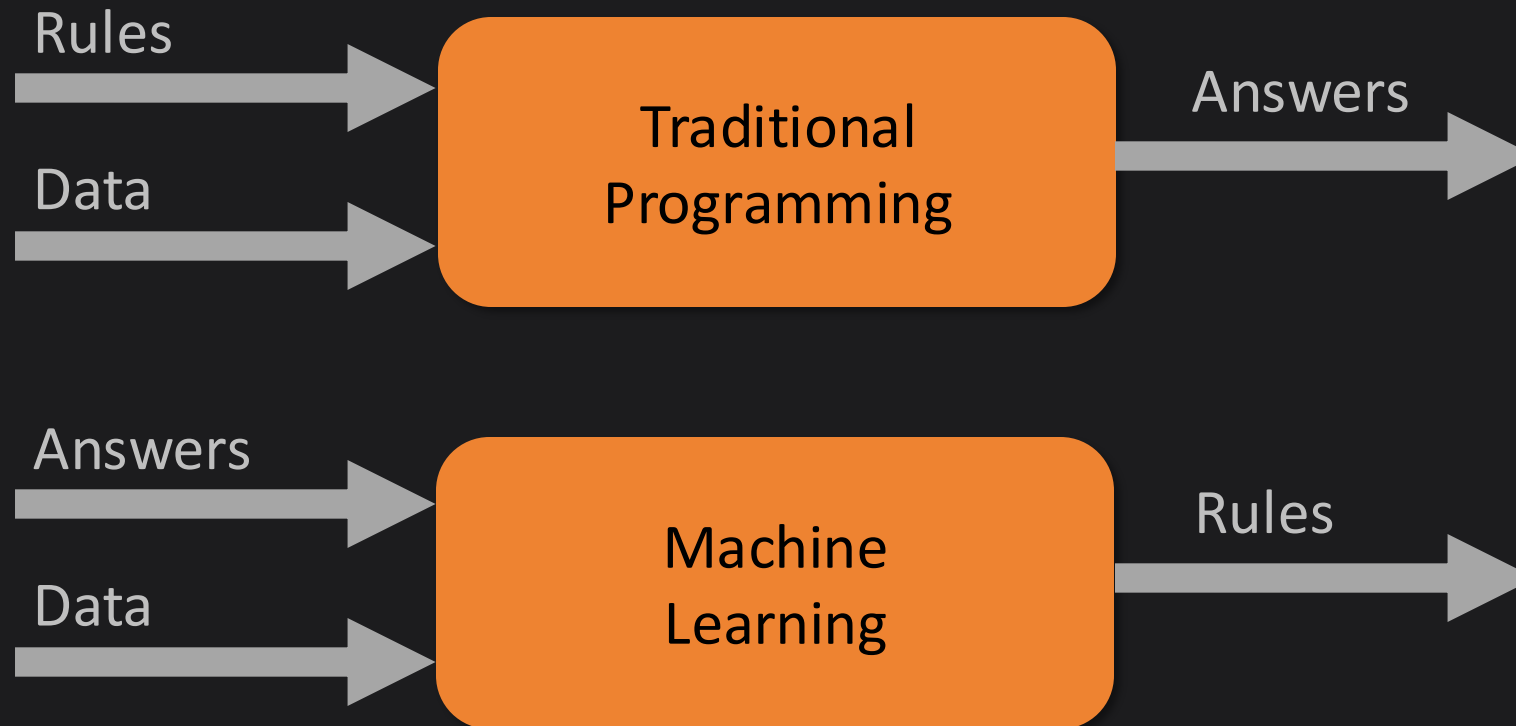
Data: Various sources like variables or databases etc.



Source: Introduction to TensorFlow: Coursera

Machine learning

Answers and data in, rules out.



Source: Introduction to TensorFlow: Coursera

Machine learning

Get lots of data

Add labels to indicate what the data is



Source: Introduction to TensorFlow: Coursera

Machine recognizes patterns in the data

Activity Recognition



```
0 1 0 1 0 0 1 0 1 0 1 0 0 1 0 1 0 1 0
1 0 0 1 0 1 0 1 0 1 0 0 0 1 0 1 1 1 0 1
0 1 0 0 1 0 1 0 1 0 0 1 0 1 0 1 0 0 1
0 1 0 1 0 0 1 0 1 0 1 0 0 1 0 1 0 1 0
```

Label = WALKING



```
1 0 1 0 1 0 0 1 0 1 0 0 1 0 1 0 1 0 1
0 1 0 1 0 1 0 0 1 0 0 1 0 0 1 0 0 0 1
0 0 1 0 0 1 1 1 1 1 0 1 0 1 0 1 1 1 1
1 0 1 0 1 0 0 1 0 0 1 1 1 1 0 1 0 1 1
```

Label = RUNNING



```
1 0 0 1 0 1 0 0 1 1 1 1 1 1 0 1 0 1 0 1
1 1 0 1 0 1 0 1 1 1 0 1 0 1 0 1 1 1 0
1 0 1 0 1 0 1 1 1 1 0 1 0 1 0 1 0 1 1
1 1 1 1 1 1 0 0 0 1 1 1 1 1 0 1 0 1 0 1
```

Label = BIKING

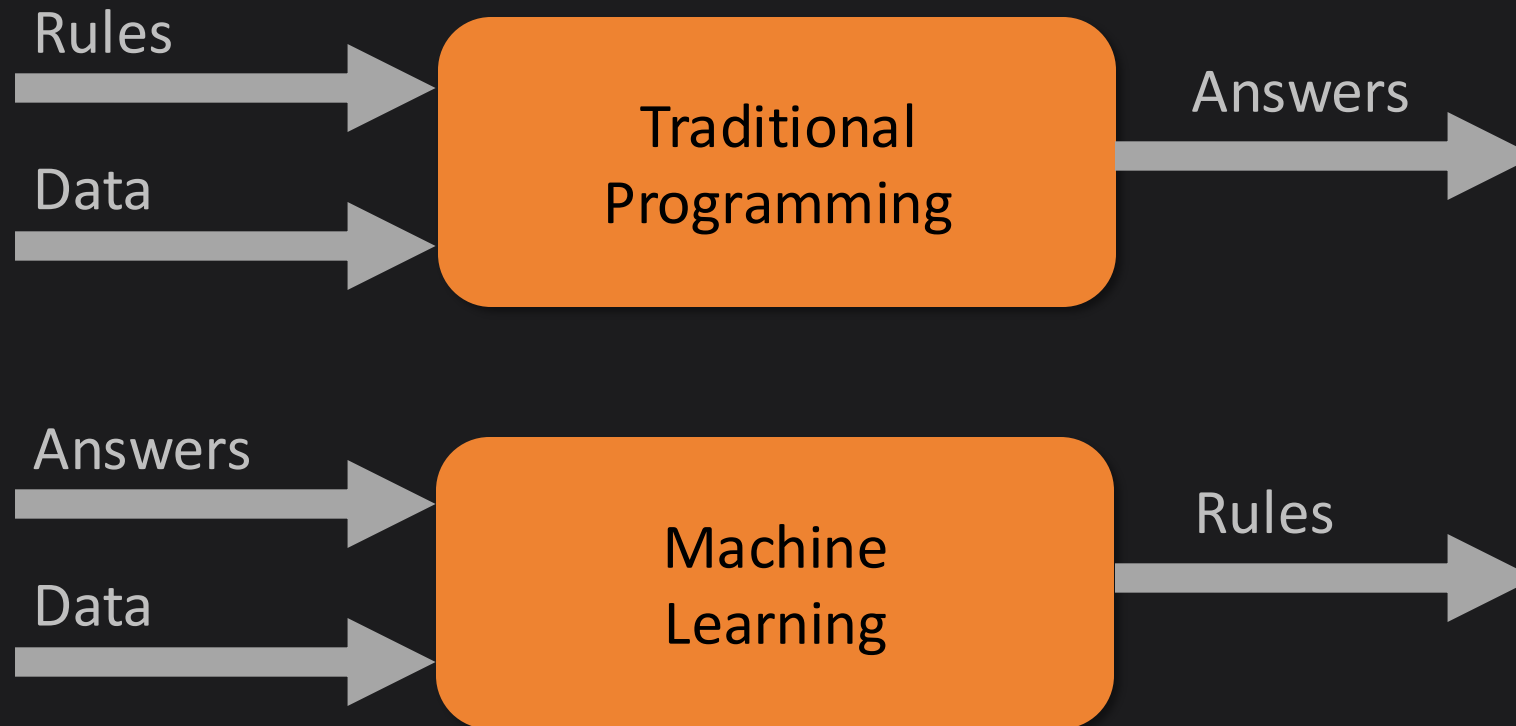


```
1 1 1 1 1 1 1 1 1 1 1 0 1 0 0 1 1 1 0 1
0 0 1 1 1 1 1 0 1 0 1 1 1 1 1 0 1 0 1
0 1 0 1 1 1 0 1 0 1 0 1 0 1 0 1 1 1 0
1 0 1 0 1 0 1 0 1 0 1 0 0 1 1 1 1 1 0
```

Label = GOLFING
(Sort of)

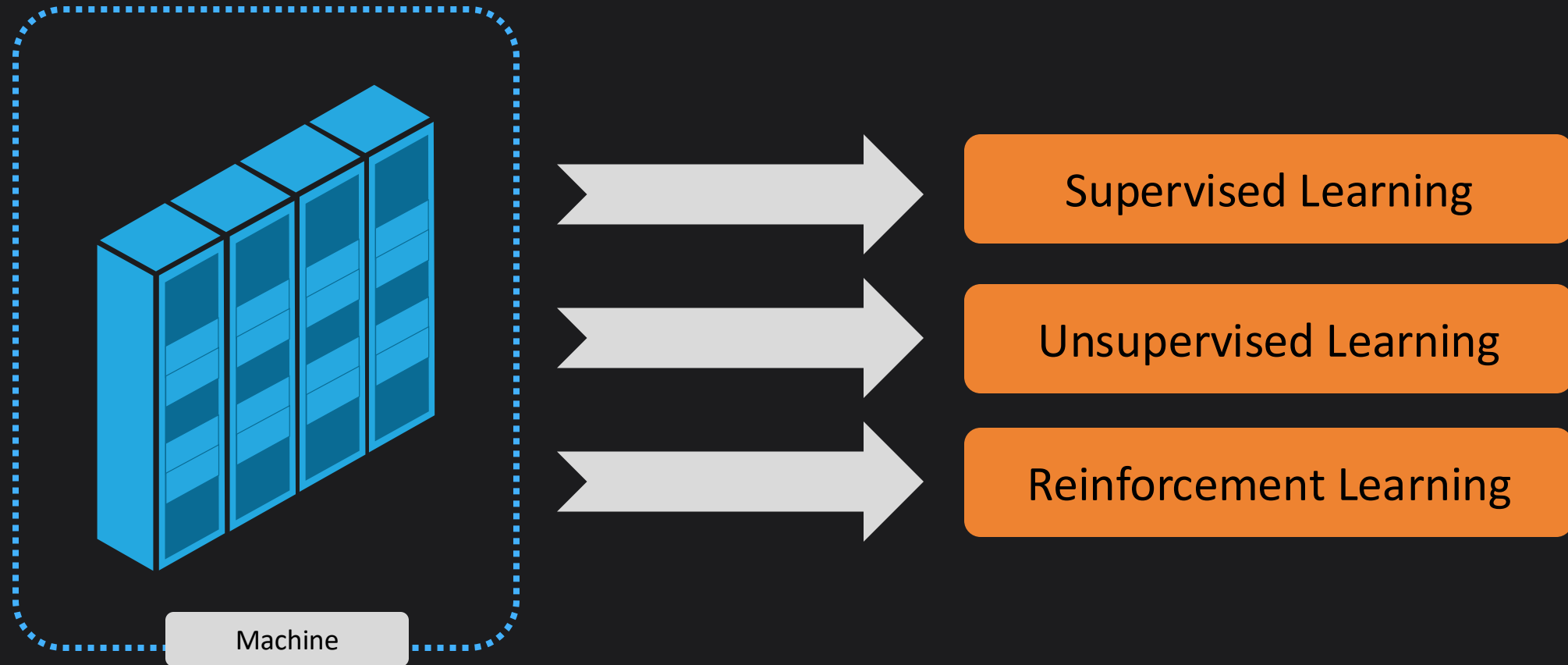
Machine learning

Answers and data in, rules out.



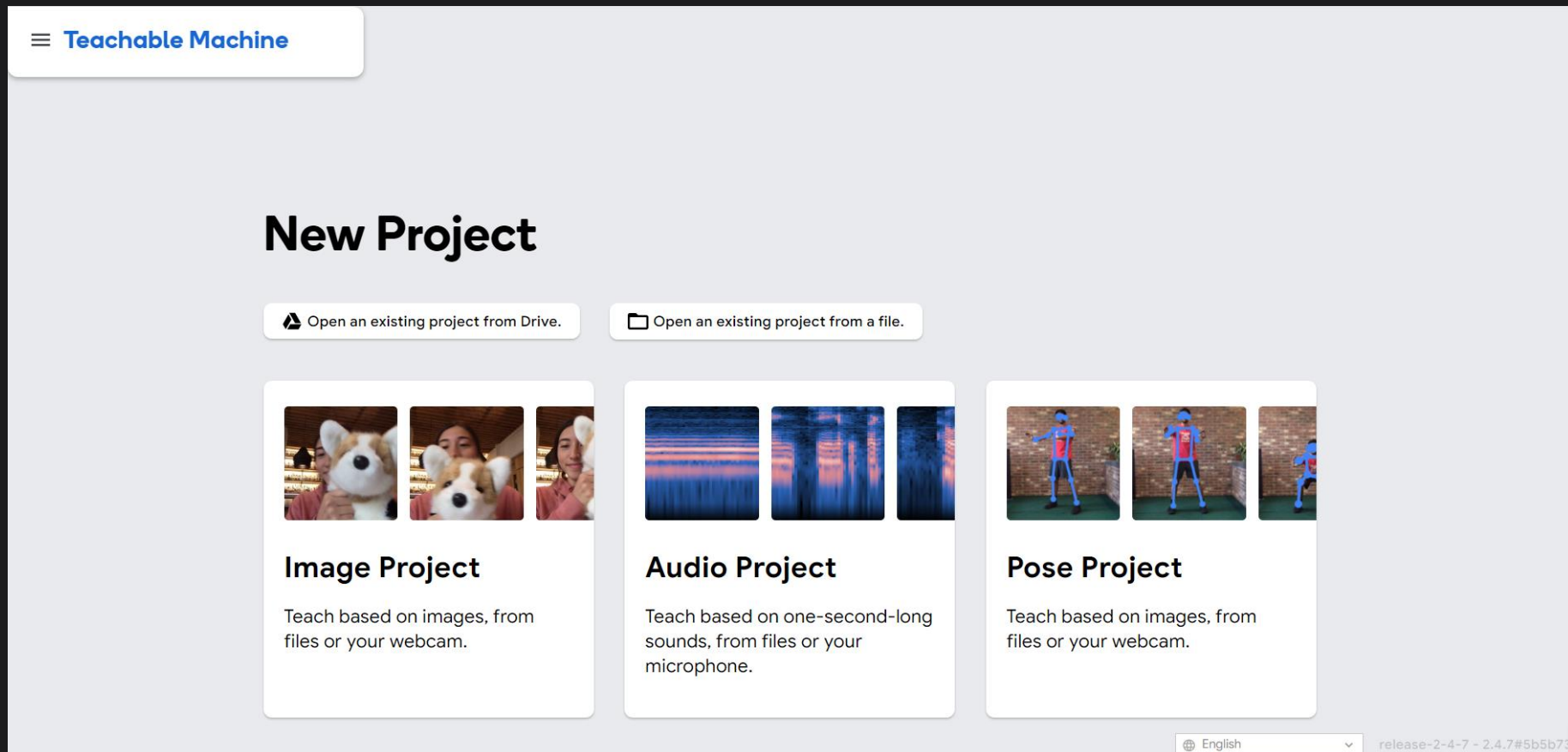
Source: Introduction to TensorFlow: Coursera

Machines can learn in 3 primary ways



Visual example of how Machine Learning works

<https://teachablemachine.withgoogle.com/>



The screenshot displays the Teachable Machine web interface. At the top left, there is a logo with a hamburger menu icon and the text "Teachable Machine". The main heading is "New Project". Below this, there are two buttons: "Open an existing project from Drive." and "Open an existing project from a file.". Three project cards are shown: "Image Project" with three photos of a dog, "Audio Project" with three spectrograms, and "Pose Project" with three images of a person in a blue and red outfit. Each card has a brief description of how to teach based on that type of data. At the bottom right, there is a language dropdown menu set to "English" and a version number "release-2-4-7 - 2.4.7#5b5b73".

Teachable Machine

New Project

Open an existing project from Drive.

Open an existing project from a file.

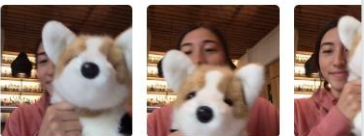
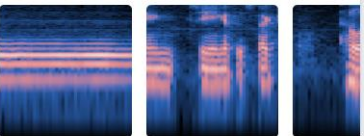



Image Project

Teach based on images, from files or your webcam.



Audio Project

Teach based on one-second-long sounds, from files or your microphone.



Pose Project

Teach based on images, from files or your webcam.

English

release-2-4-7 - 2.4.7#5b5b73

<https://t.me/learningnets>



Visual example of how Machine Learning works

The screenshot shows the Teachable Machine web interface. At the top left, there is a hamburger menu icon followed by the text 'Teachable Machine'. Below this, a 'New Image Project' dialog box is open, featuring a close button (X) in the top right corner. The dialog box contains two main options:

- Standard image model**
 - Best for most uses
 - 224x224px color images
 - Export to TensorFlow, TFLite, and TF.js
 - Model size: around 5mb
- Embedded image model**
 - Best for microcontrollers
 - 96x96px greyscale images
 - Export to TFLite for Microcontrollers, TFLite, and TF.js
 - Model size: around 500kb
 - [See what hardware supports these models.](#)

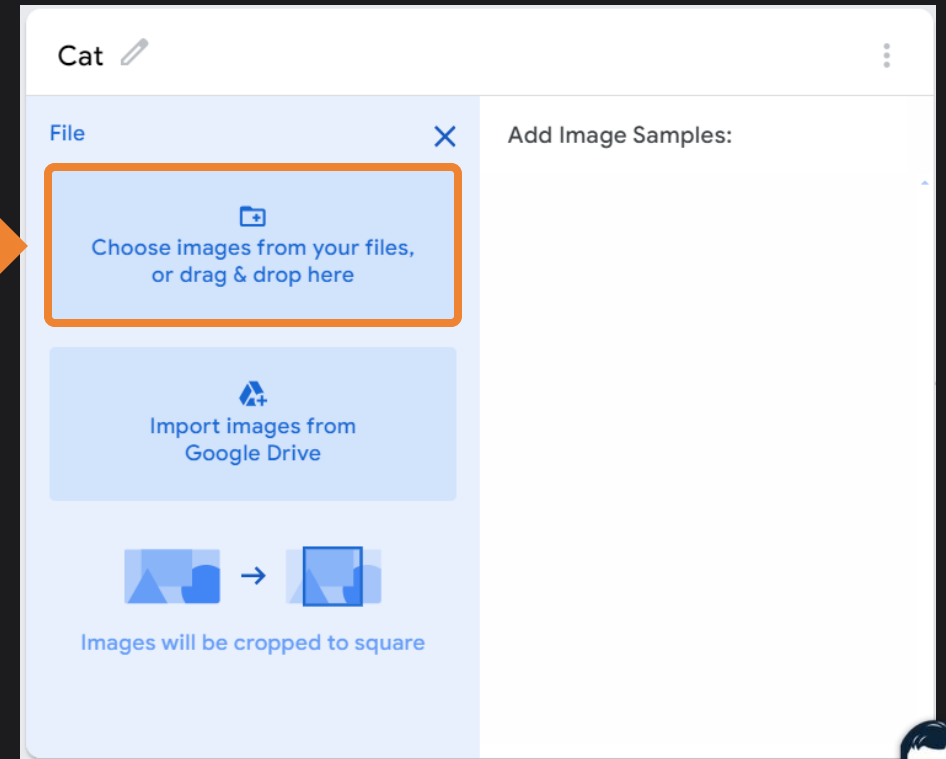
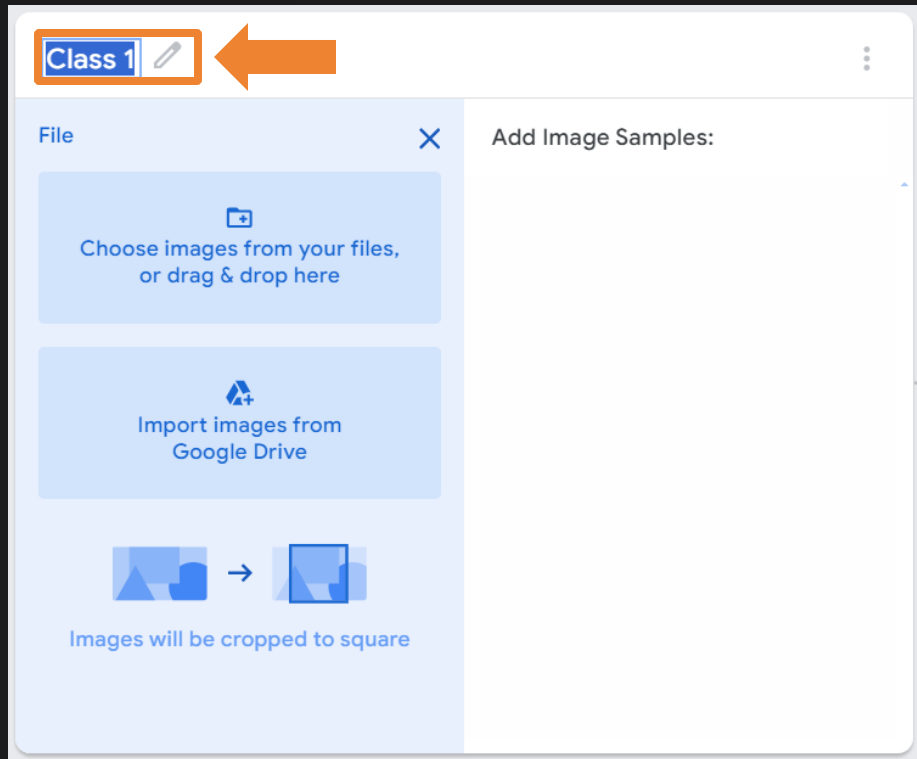
Below the dialog box, three project types are visible: 'Image Project', 'Audio Project', and 'Pose Project'. An orange arrow points from the left towards the 'Standard image model' option in the dialog box.

Visual example of how Machine Learning works

The image shows the Teachable Machine web interface. At the top left, there is a menu icon and the text "Teachable Machine". The main area contains two class cards, "Class 1" and "Class 2", each with a "Webcam" and "Upload" button. An orange arrow points to the "Class 1" card. Below the class cards is a dashed box with the text "Add a class". To the right, there is a "Training" panel with a "Train Model" button and an "Advanced" dropdown menu. Further right is a "Preview" panel with an "Export Model" button and a message: "You must train a model on the left before you can preview it here." The interface is clean and modern, with a light gray background and white panels.

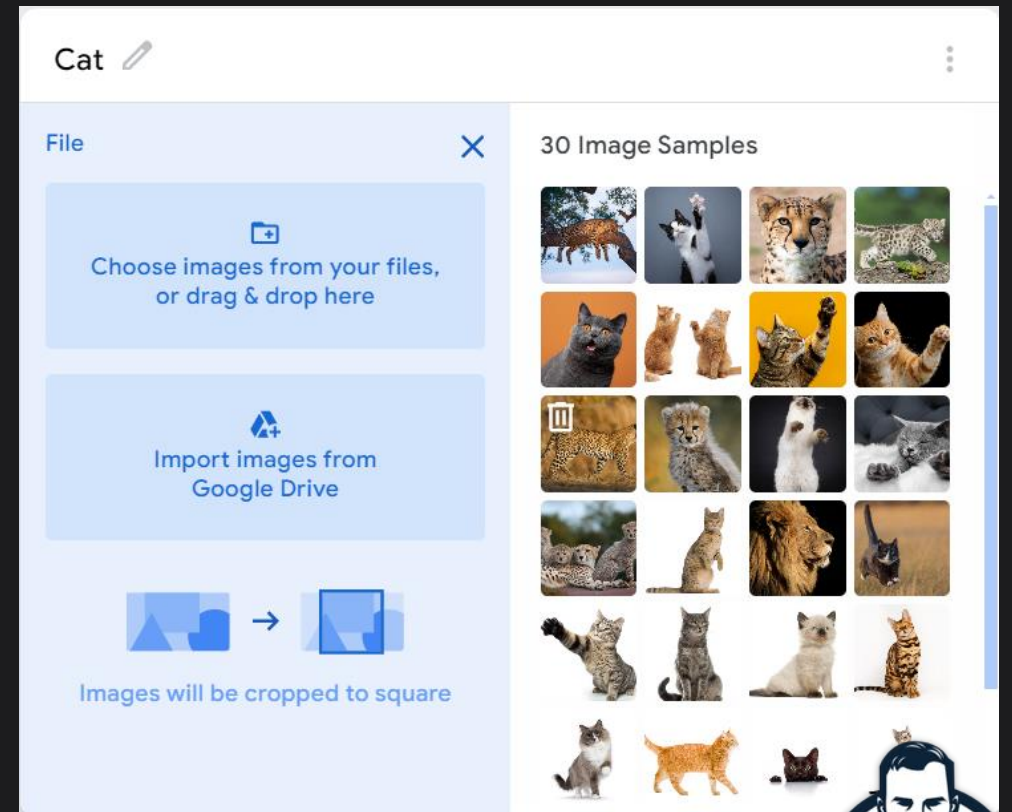
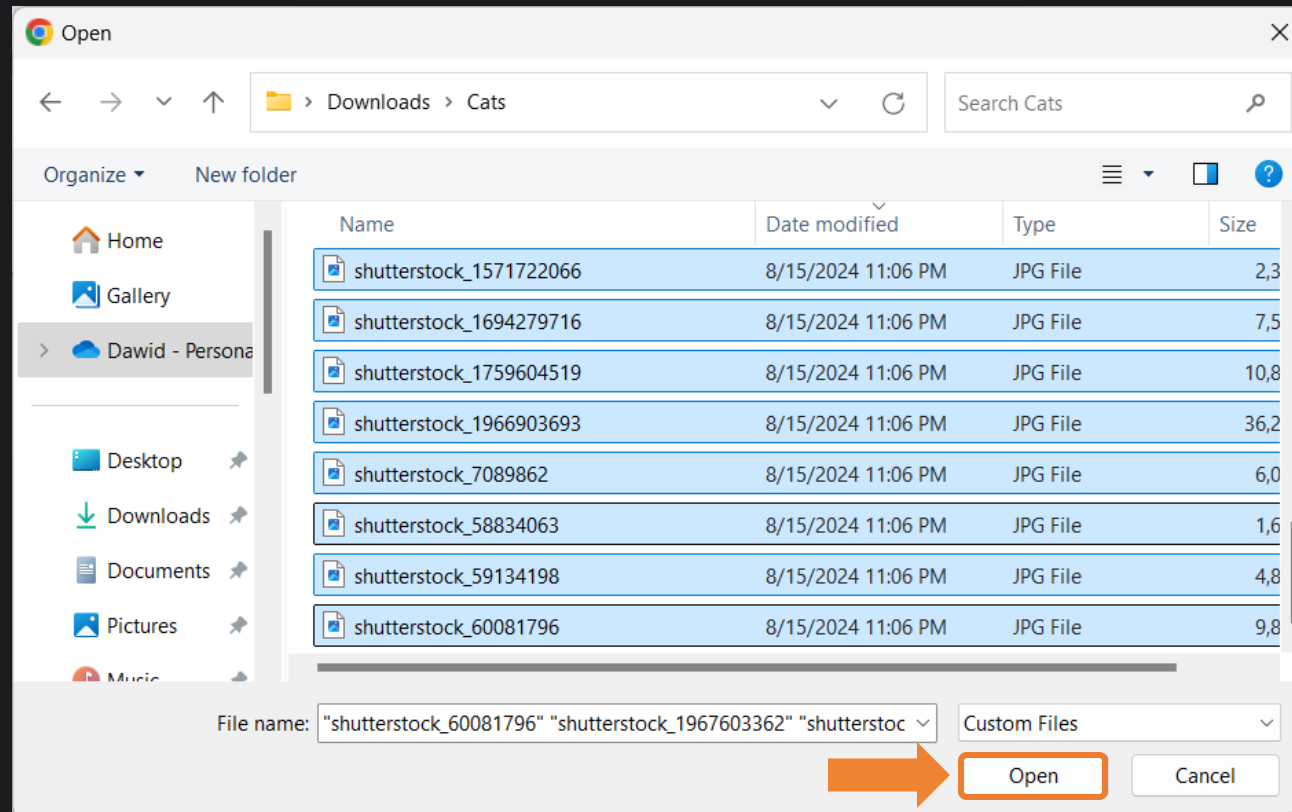
Visual example of how Machine Learning works

Change class name to Cat. Click on Choose images from your files, or drag & drop here



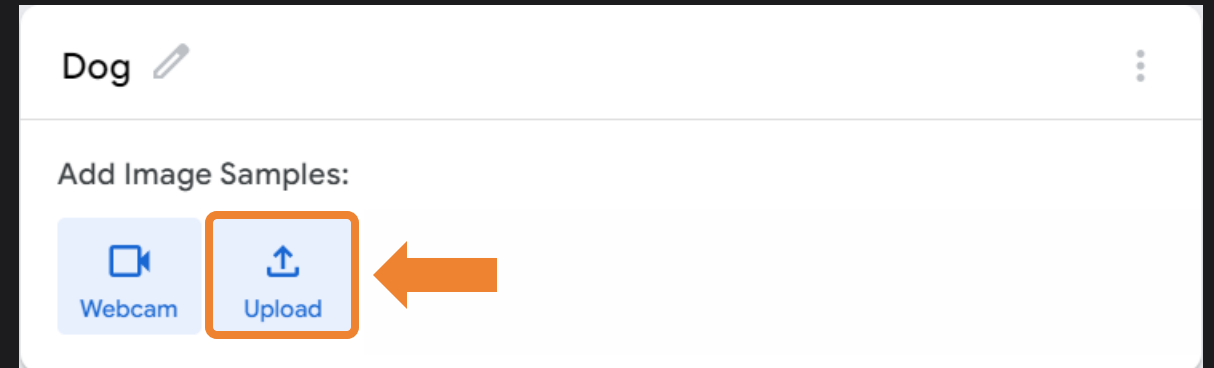
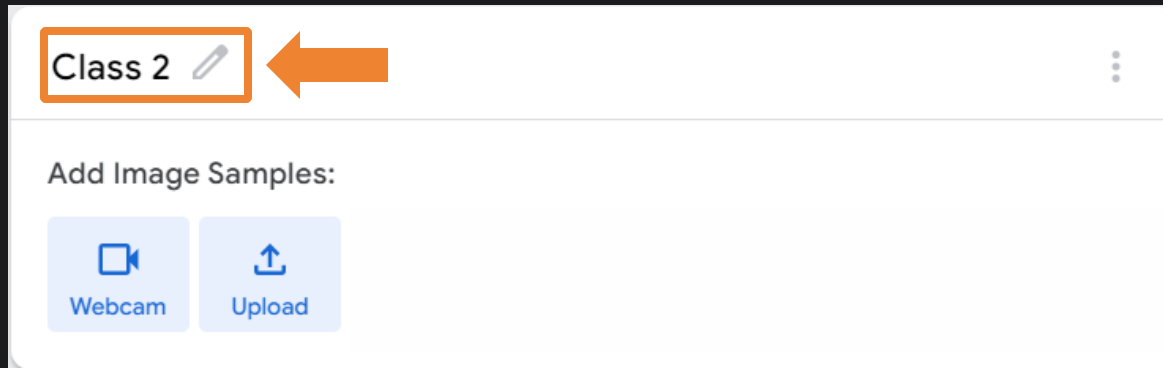
Visual example of how Machine Learning works

Select the cat photos you want to upload and press Open.

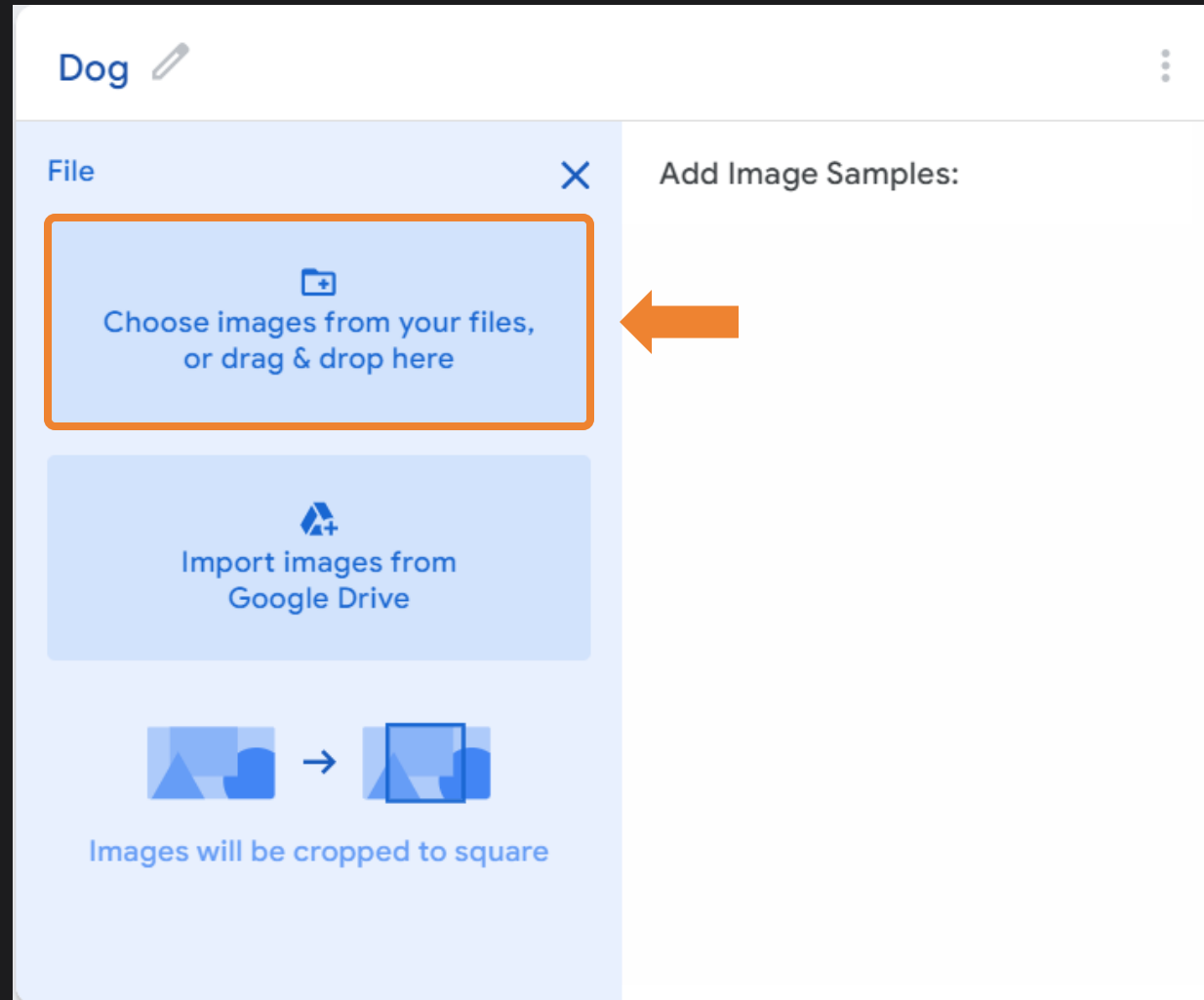


Visual example of how Machine Learning works

Change class name to Dog. Click on Upload and Choose images from your files, or drag & drop here.

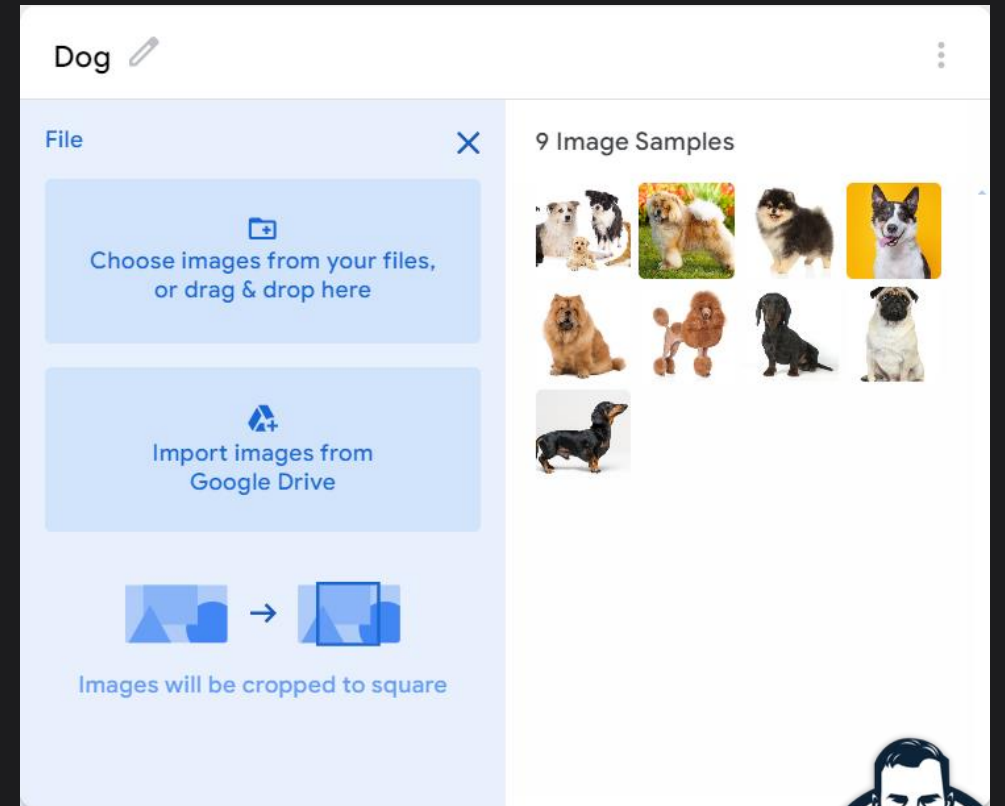
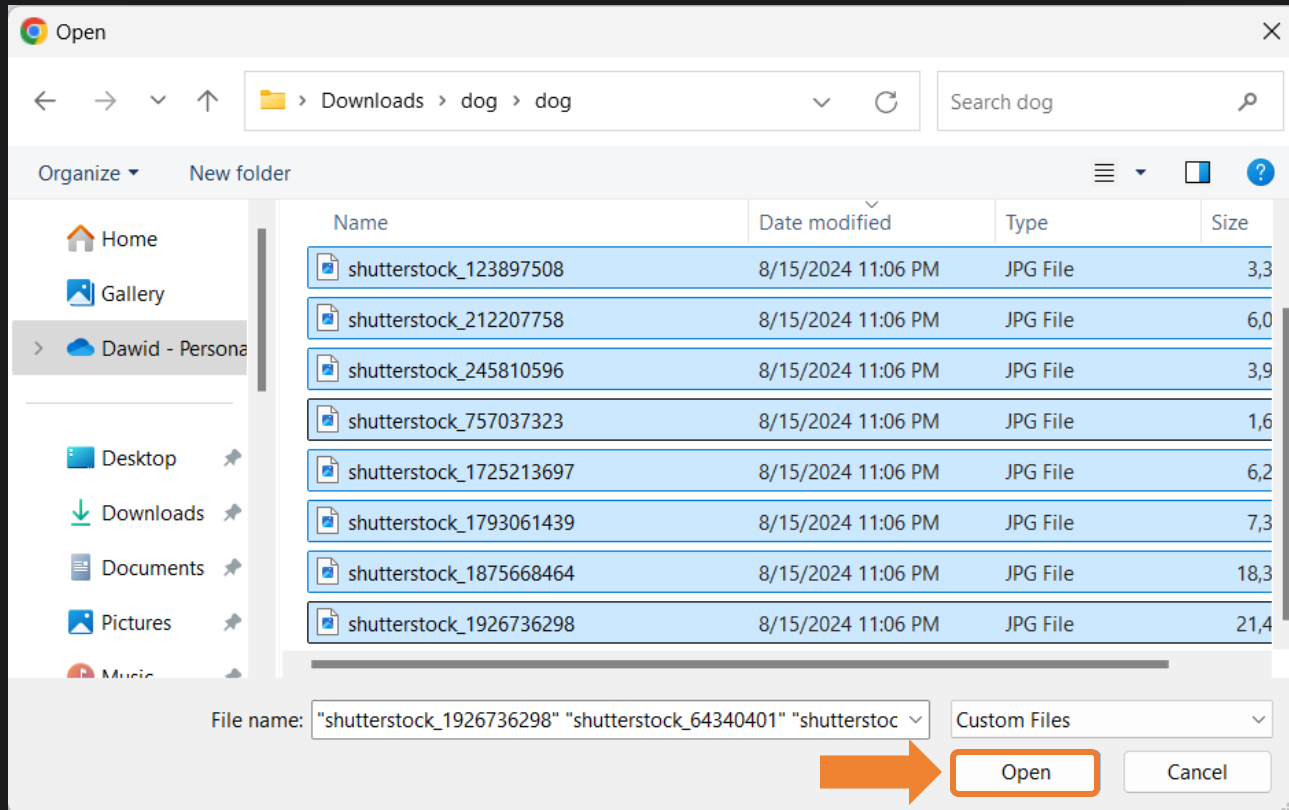


Visual example of how Machine Learning works



Visual example of how Machine Learning works

Select the cat photos you want to upload and press Open.



Visual example of how Machine Learning works


Click on Train Model.

The screenshot displays the Teachable Machine web interface. At the top, there is a navigation bar with the 'Teachable Machine' logo and a row of animal icons. The main content area is divided into two panels. The left panel, titled 'Dog', contains three options for adding images: 'Choose images from your files, or drag & drop here', 'Import images from Google Drive', and 'Images will be cropped to square'. The right panel, titled '9 Image Samples', shows a grid of nine dog images. An orange arrow points from the 'Train Model' button in the 'Training' panel to the 'Train Model' button in the 'Training' panel. The 'Training' panel also includes an 'Advanced' dropdown menu. The 'Preview' panel on the right contains an 'Export Model' button and a message: 'You must train a model on the left before you can preview it here.' At the bottom of the interface, there is a language selector set to 'English' and a version number 'release-2-4-7 - 2.4.7#5b5b73'. A dashed box at the bottom left contains the text 'Add a class'.

Visual example of how Machine Learning works

Select File from dropdown. Click on Choose images from your files, or drag & drop here. Upload a photo to test the model.

Preview [Export Model](#)

Input  Webcam ▾


There was an error opening your webcam. Make sure permissions are enabled or switch to image uploading.

Output

Cat

Dog

Preview [Export Model](#)

Input ON Webcam ▾
 Webcam
File

There was an error opening your webcam. Make sure permissions are enabled or switch to image uploading.

Output

Cat

Dog

Preview [Export Model](#)

Input ON File ▾

Choose images from your files, or drag & drop here

Import images from Google Drive

Output


Cat

Dog

Preview [Export Model](#)

Choose images from your files, or drag & drop here

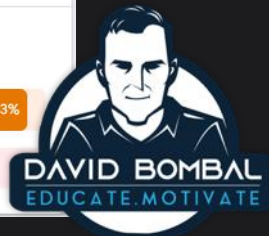
Import images from Google Drive



Output

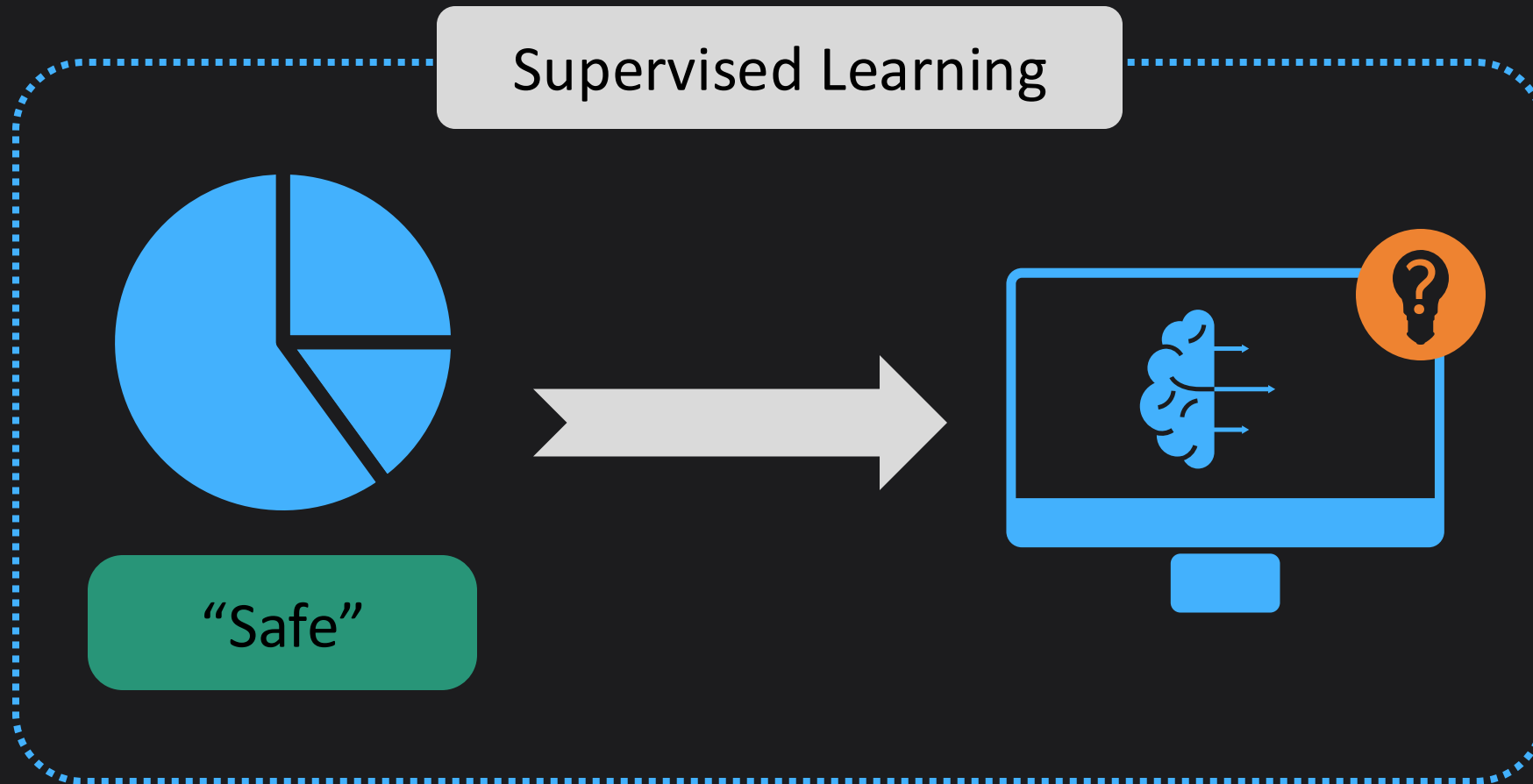
Cat

Dog



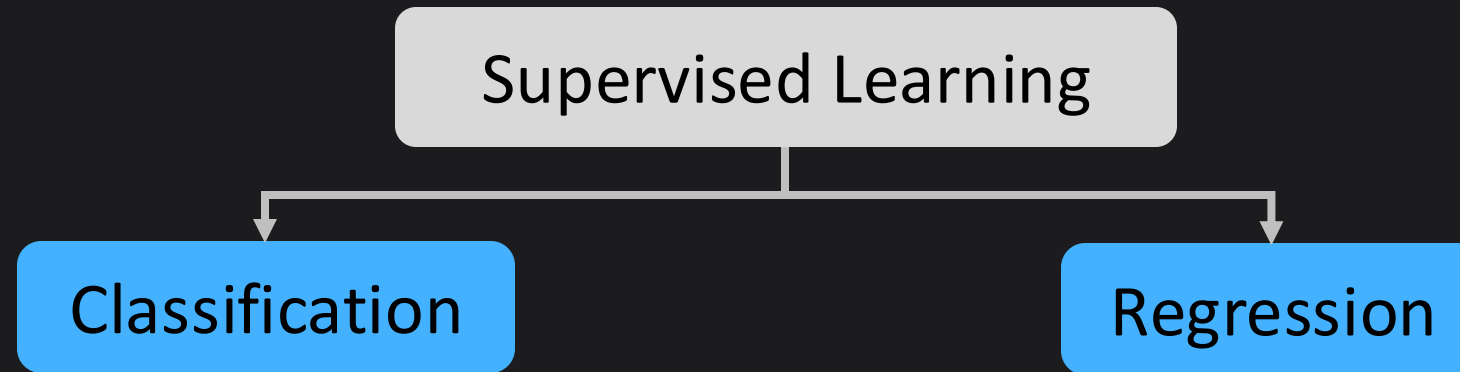
Supervised Learning

AI is trained using labeled datasets



Supervised Learning

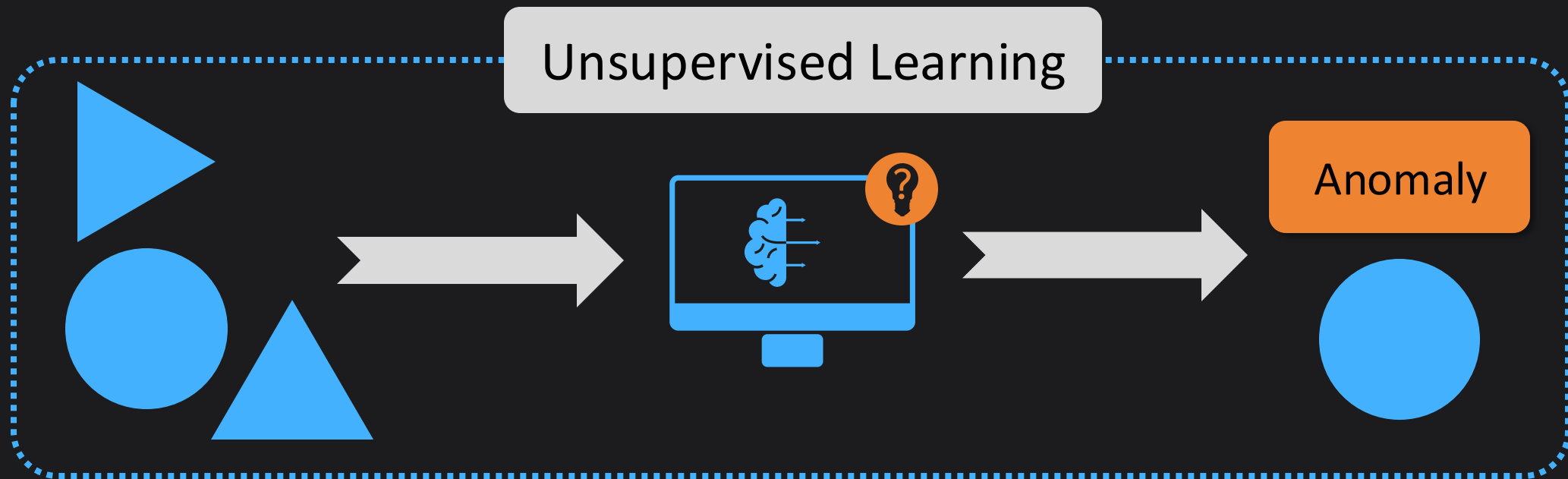
Supervised Learning



Unsupervised Learning

Does not rely on labeled datasets

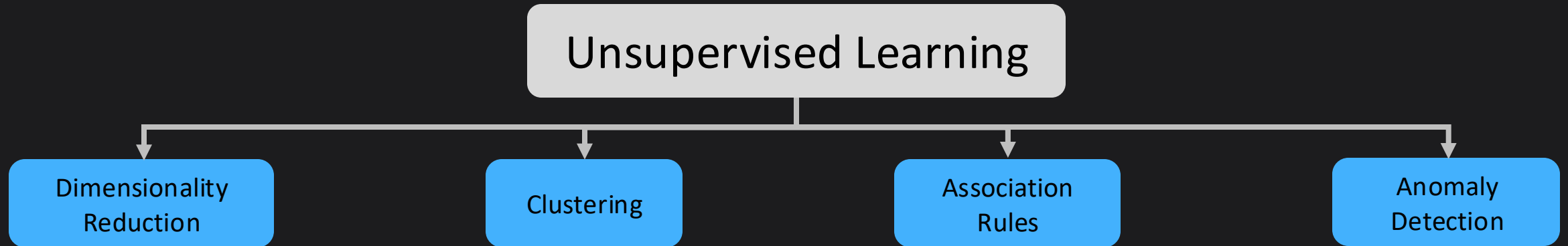
AI uncovers patterns or groupings by itself



Source: Cisco U

Unsupervised Learning

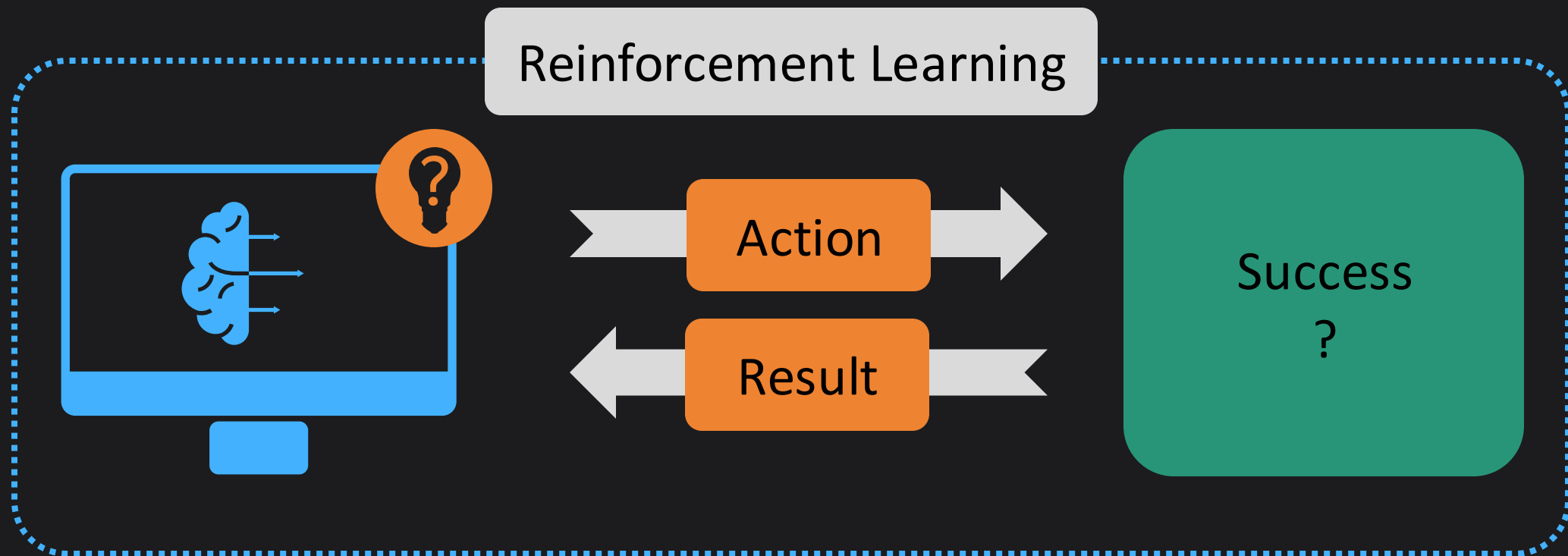
Unsupervised Learning



Reinforcement Learning

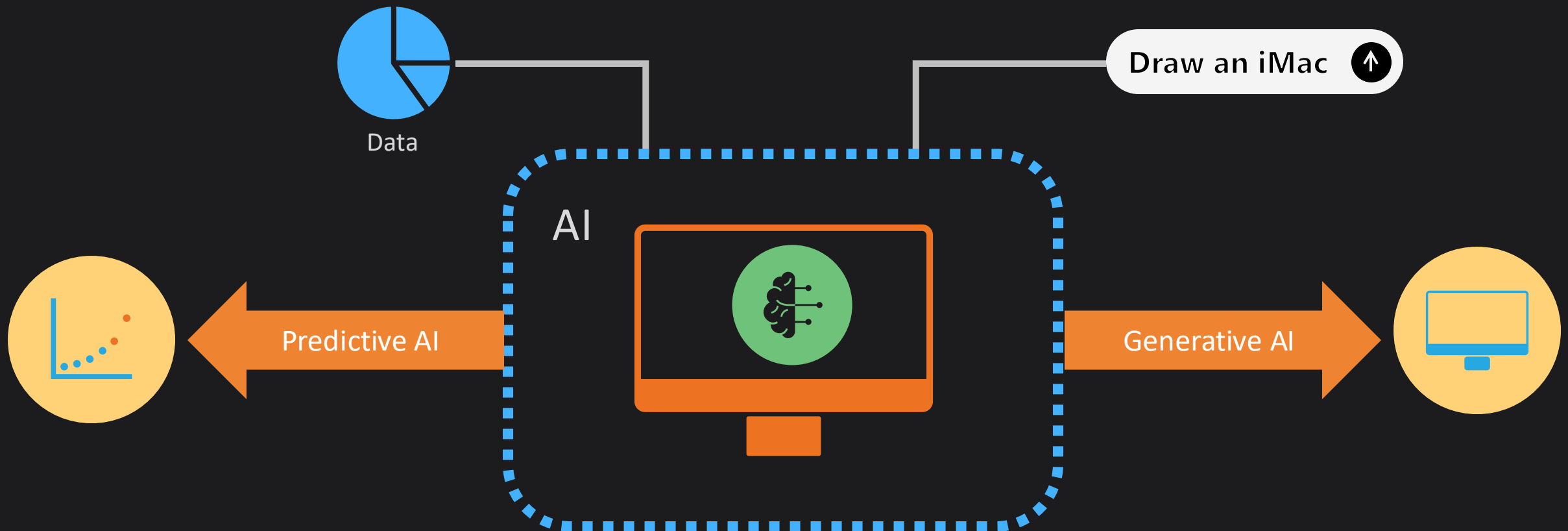
AI system learns from the results of its actions

Like “trial-and-error” learning method



Artificial Intelligence

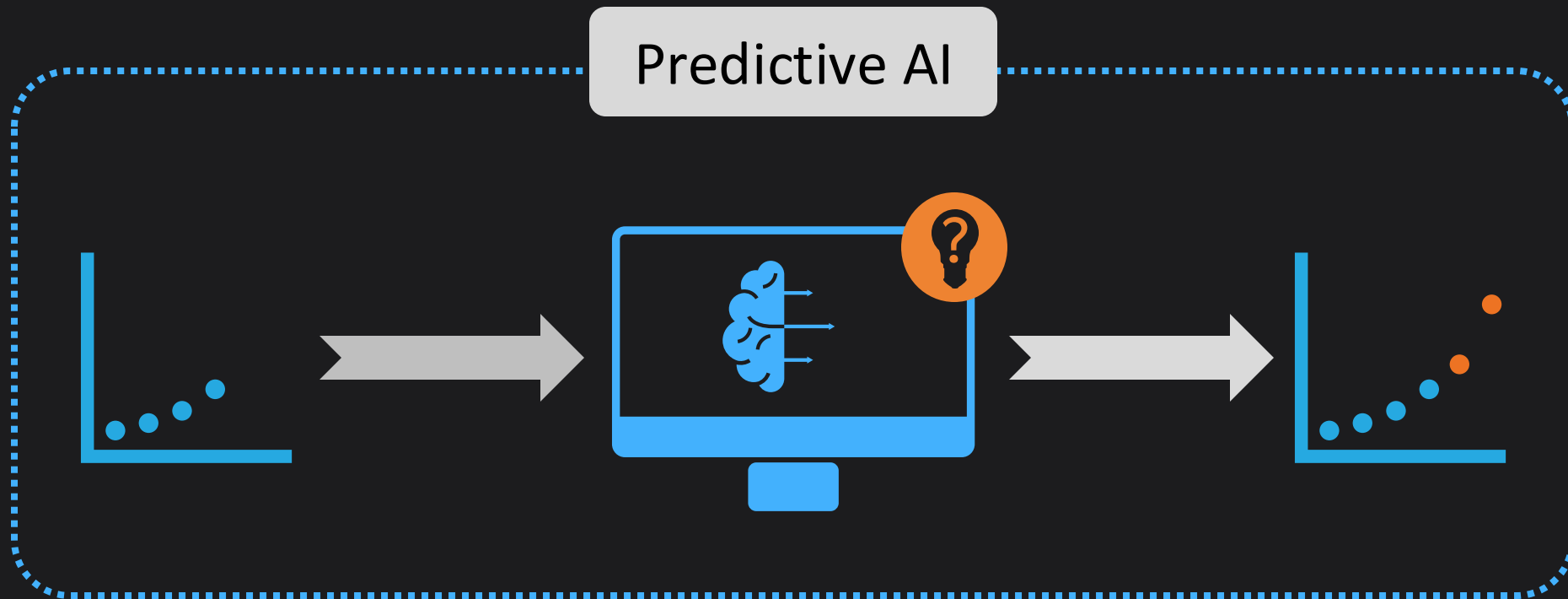
Types of AI – Predictive and Generative



Predictive AI

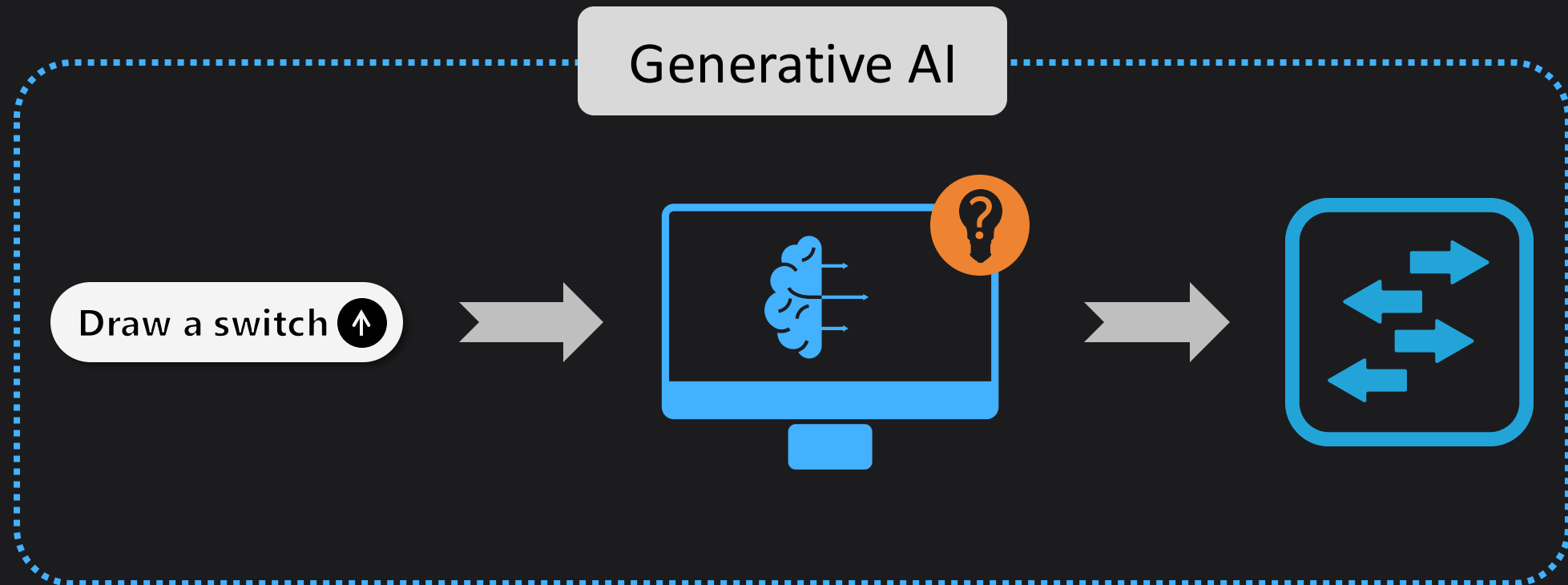
Analyze historical data to forecast future outcomes

Relies on machine learning algorithms to identify patterns and trends within vast datasets



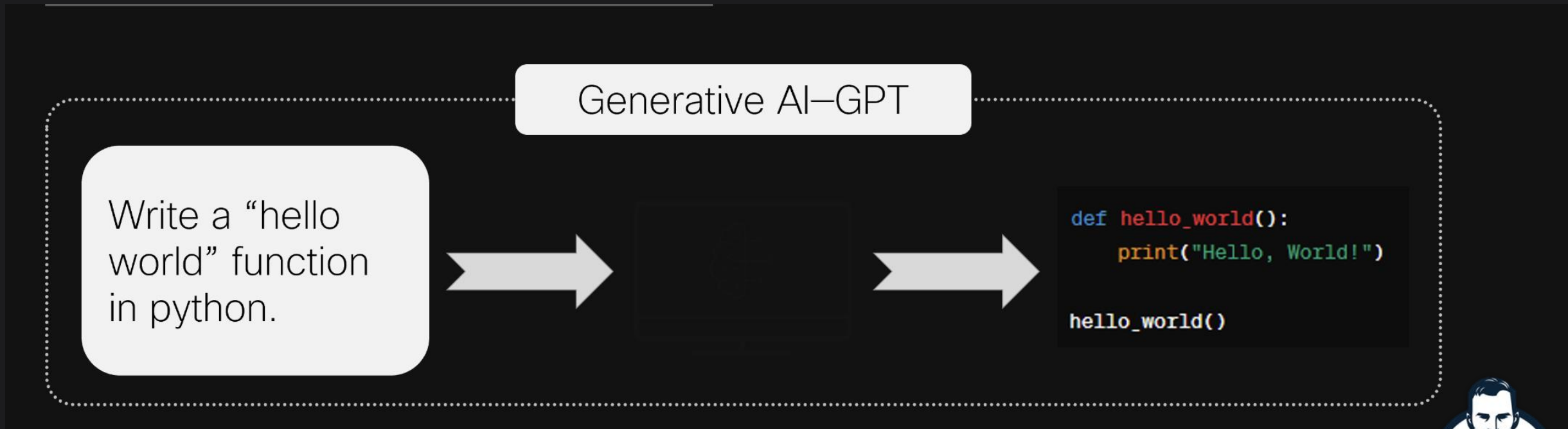
Generative AI

Goes beyond prediction to create novel insights, employing sophisticated machine learning models like Generative Adversarial Networks (GANs) and transformer models.



Generative AI

A particular kind of generative AI called Generative Pre-Trained Transformer (GPT) gained in popularity thanks to its advanced language processing capabilities..



Generative AI

Goes beyond prediction to create novel insights, employing sophisticated machine learning models like Generative Adversarial Networks (GANs) and transformer models.



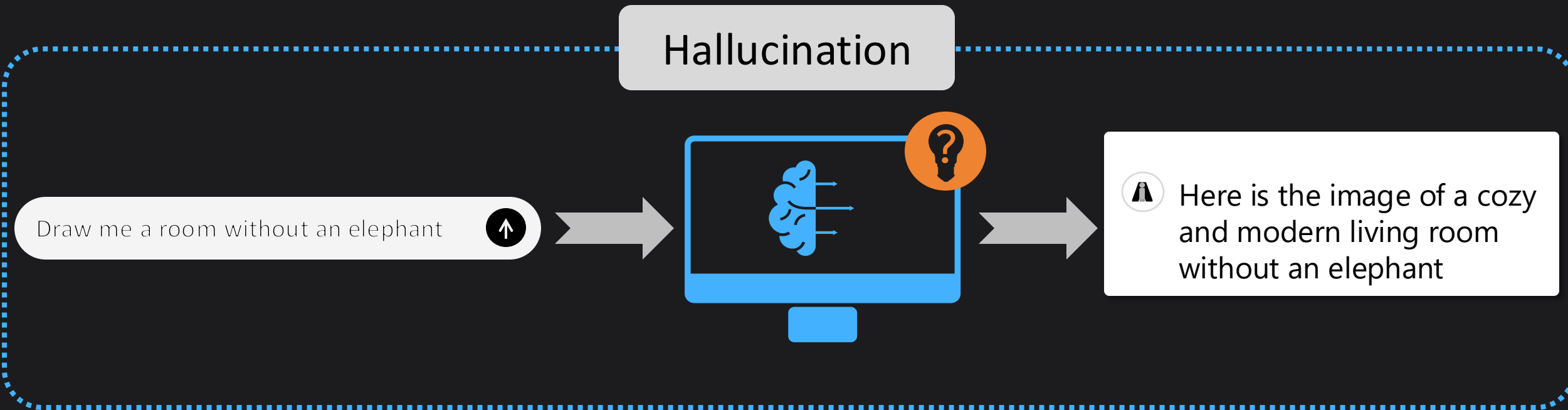
Generative AI: Demos

Examples:

1. Midjourney
2. Suno
3. ChatGPT

Hallucinations

AI confidently gives you incorrect information




Source: Cisco U

Hallucinations

ChatGPT (Dall-E example)

ChatGPT 4o

Draw me a room without an elephant



Here is an image of a modern living room without an elephant. Let me know if there's anything else you'd like!

Message ChatGPT

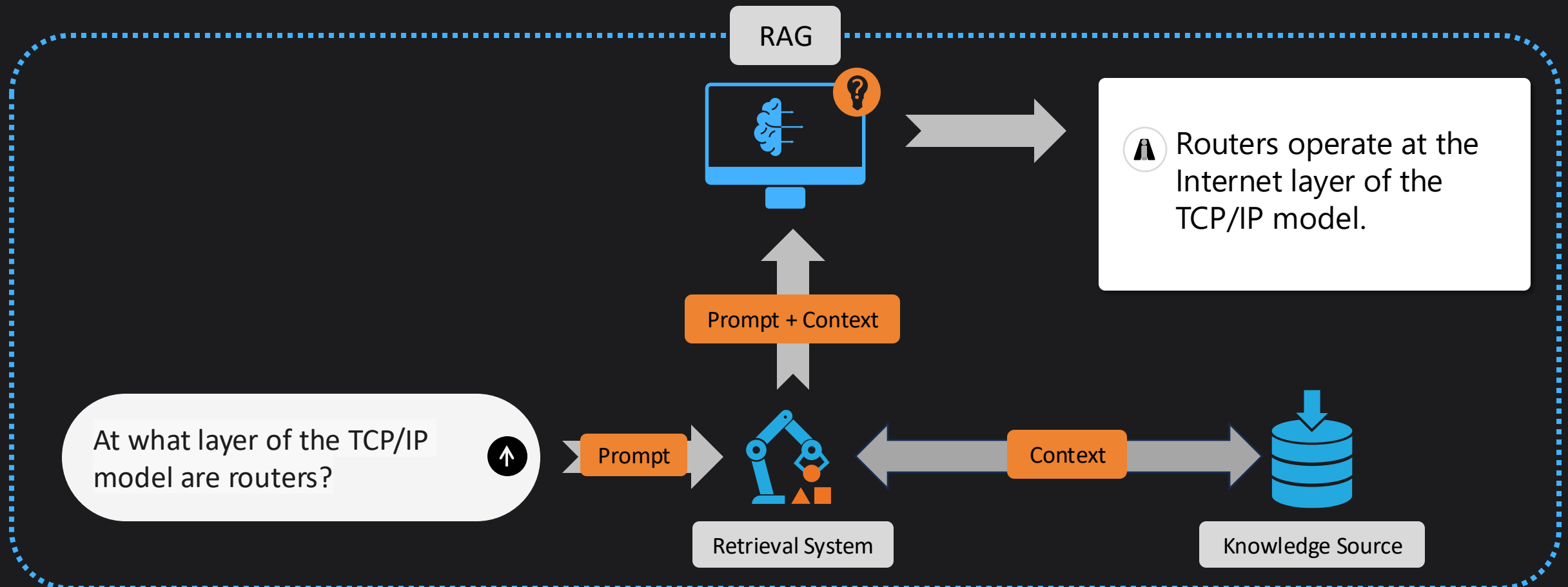
ChatGPT can make mistakes. Check important info.

The image shows a modern living room with a large elephant standing in the window. The room features a light-colored sofa, a coffee table, a bookshelf, and a large window with curtains. The elephant is positioned in the window, looking out. The room is well-lit and has a contemporary aesthetic.

Retrieval-Augmented Generation (RAG)

Reduce Hallucinations and out of date answers

Combines the capabilities of a retrieval system and a generative mode



A futuristic robot with a white and black body is standing in a server room. The robot is looking at a server rack filled with various components and glowing lights. The room is dimly lit with blue and red lights, creating a high-tech atmosphere. The robot's right hand is reaching towards the server rack.

AI for CCNA

<https://www.melearning.net>