

Machine Learning

The Past, Present, and Future of AI



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Session Outline

1

What is Machine Learning (ML)?

How is ML different from traditional programming?

2

What is the difference between ML, DL, and AI?

The history of Artificial Intelligence

3

Under the hood: ML with Pizza

4

Introduction to Machine Learning APIs

**AUTO-CORRECT HAS TROUBLE
WITH THE WORD "ISN'T"**

**TELL ME AGAIN HOW THE MACHINES
WILL ONE DAY TAKE OVER**

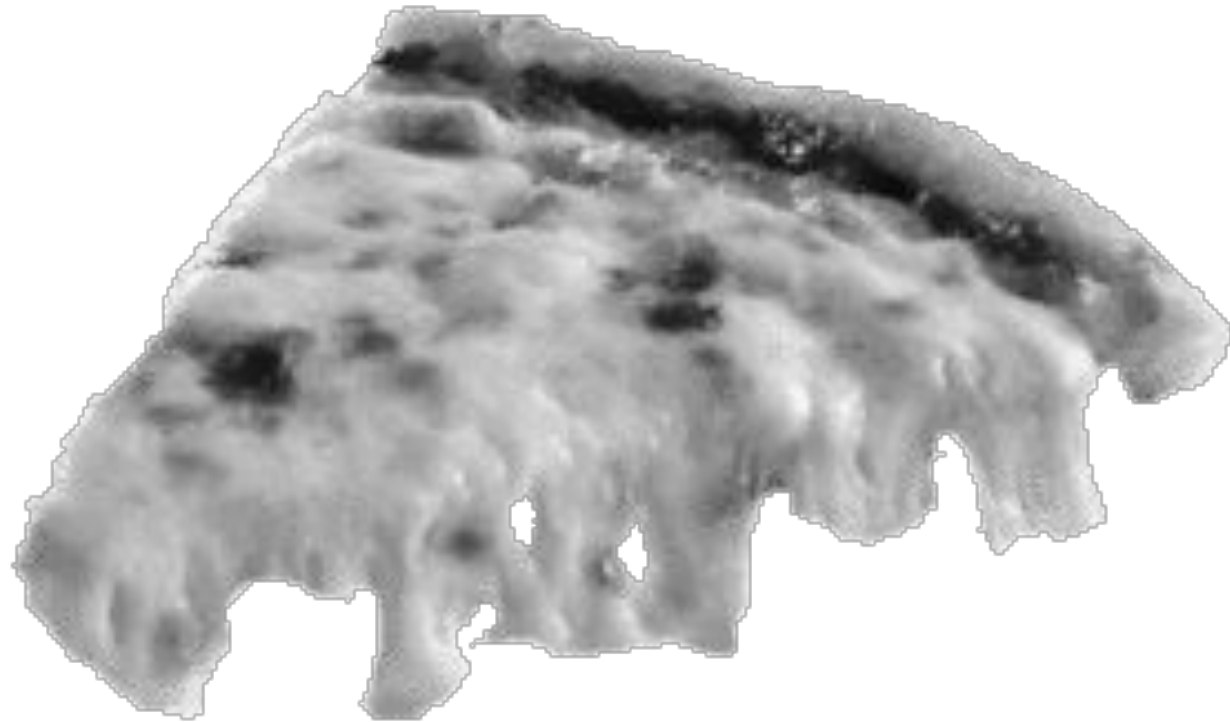
Let's try some
human-powered
image detection



How would we classify these images?



So, what about this?



And now...?



Traditional Programming vs ML



Traditional Programming

Explicit instructions from programmer

Improvements come from better algorithms

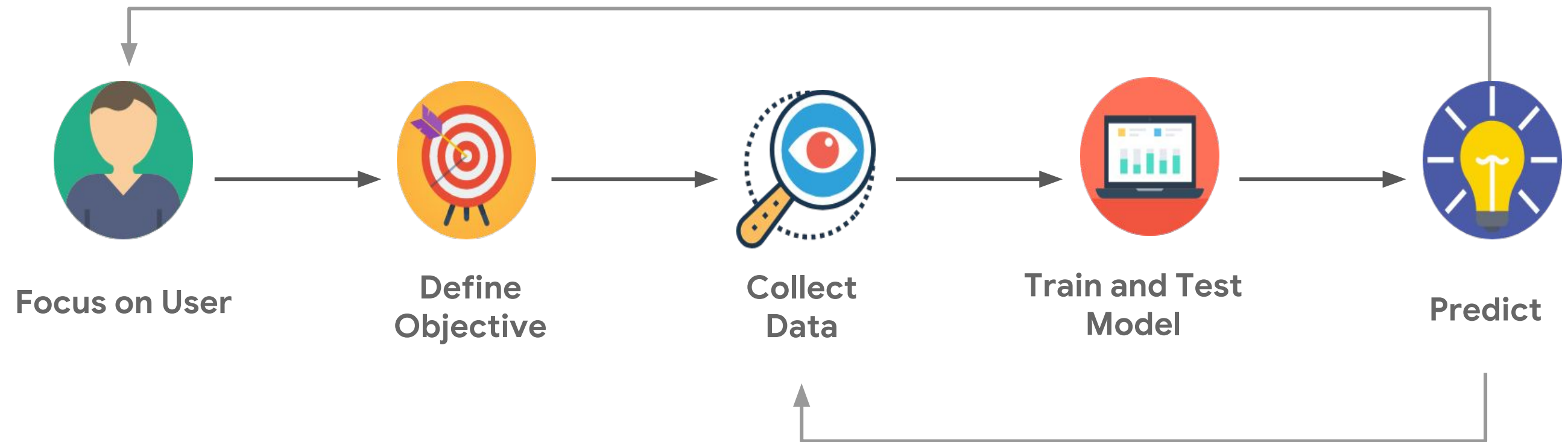


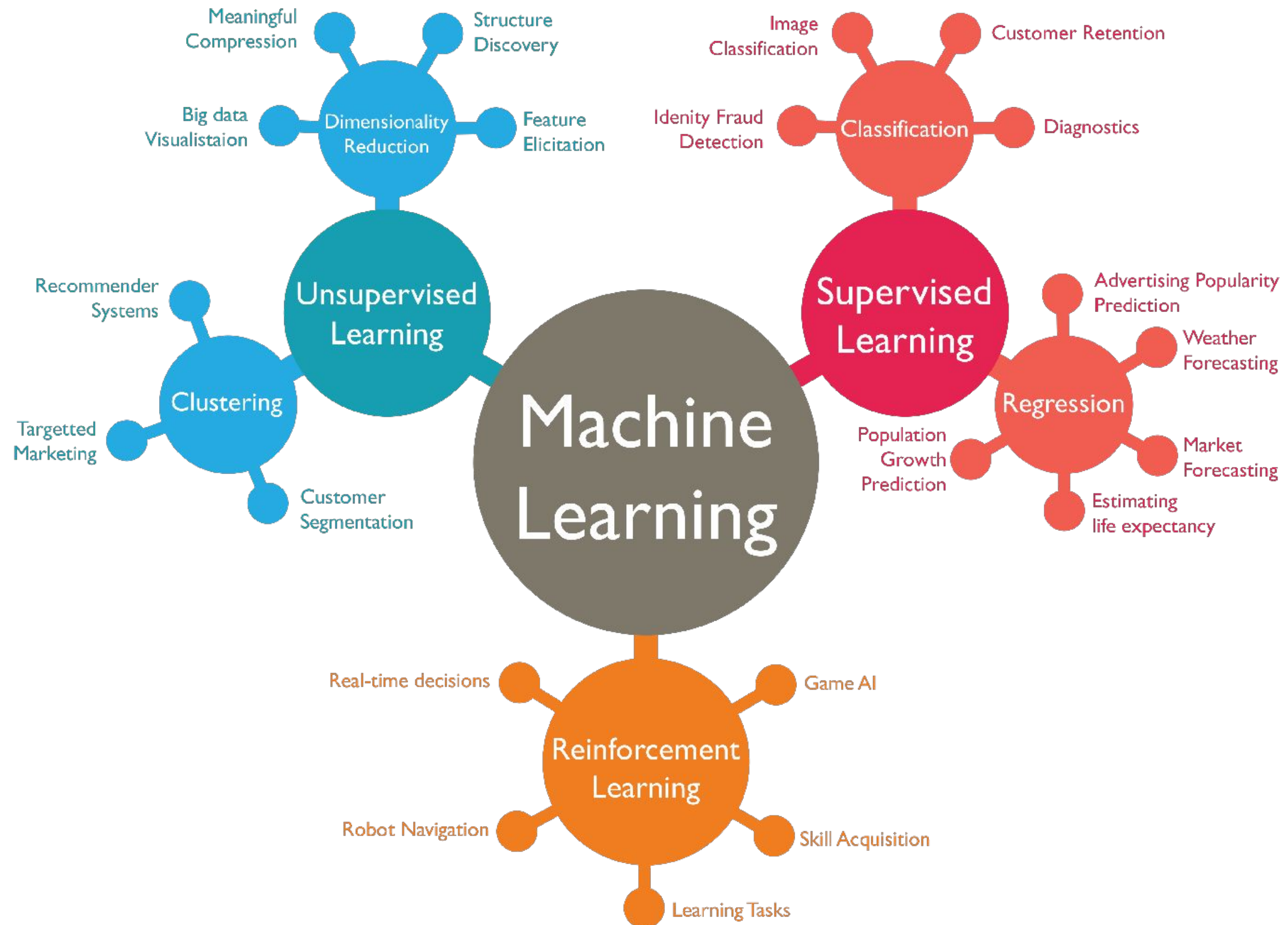
Machine Learning

System learns patterns from data

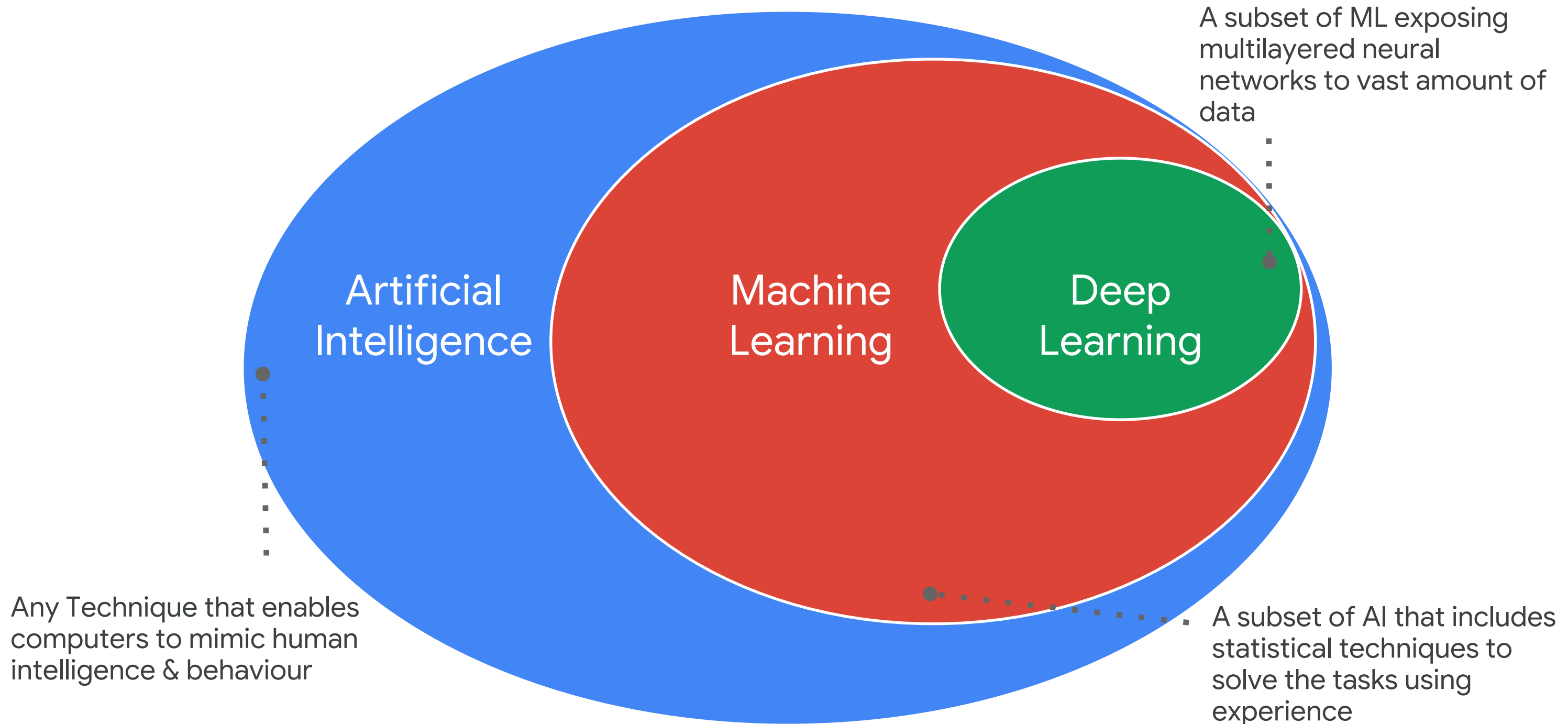
Improvements may also come from additional data

What is Machine Learning?





AI vs ML vs DL



Let's travel back in time...







● 1943

A Logical Calculus of the Ideas Immanent in Nervous Activity

Warren S. McCulloch and Walter H. Pitts published ground-breaking paper. It quickly became the foundational work in the study of artificial neural networks.



1950

Turing Test



Computer scientist **Alan Turing** proposes a test for machine intelligence. **If a machine can trick humans into thinking it is human, then it has intelligence.**



● 1956

A.I. Born

Term 'Artificial Intelligence' is coined by computer scientist, **John McCarthy** to describe “**the science and engineering of making intelligent machines.**”

After that in **1958, Rosenblatt proposed a simple neuron** that is used to classify its input onto 1 or 2 categories.



● 1962



Unimation

First industrial robot company, Unimation founded. The robot goes to work at GM replacing humans on the assembly line.



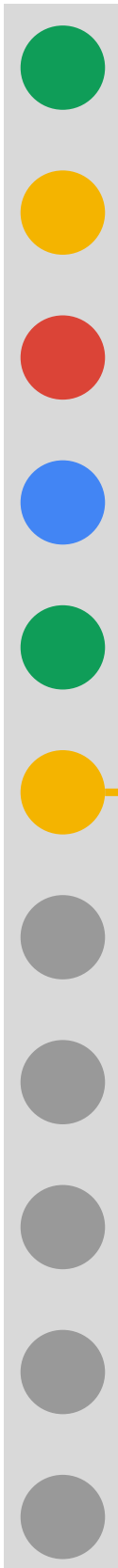
● 1964-66

Eliza

It is an early natural language processing interactive computer program that carries a dialogue in English on any topic.

Pionarring chatbot developed by Joseph Weizenbaum at MIT holds conversations with humans.

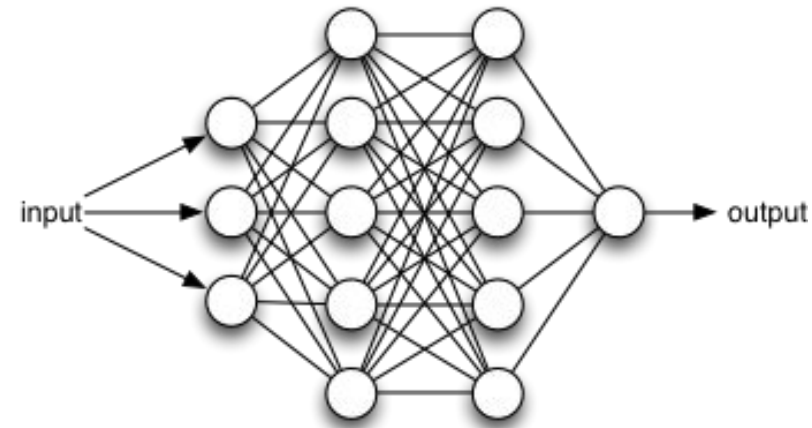




1974

Backpropagation

Paul J. Werbos, a scientist best known for his Harvard University Ph.D. thesis, which first described the process of training artificial neural networks through backpropagation of errors.





● 1997

Deep Blue

A chess playing computer from IBM defeats world chess champion Garry Kasparov.

Several Machine Learning algorithms namely, Decision Tree, Random Forest, Support Vector Machine, RNN, LSTM have been introduced in late 20th century.



● 2011

Siri, Watson

Apple integrates Siri, an intelligent virtual assistant with a voice interface, into the iPhone 4S.

IBM's question answering computer Watson wins first place on popular \$1M prize television quiz show **Jeopardy**.



● 2014

Eugene, Alexa

Eugene Goostman, a chatbot passes the Turing Test with a third of judges believing Eugene a human.

Amazon launches Alexa, an intelligent virtual assistant with a voice interface that completes shopping.

Proposal of a new framework, **Generative Adversarial Networks** by Ian Goodfellow & team



● 2017

AlphaGo, Google Lens, Actions on Google...

Google's AI based AlphaGo beats world champion Ke Jie in the complex board game of Go, notable for its vast number (2^{170}) of possible positions.

Data become the new oil

Google Lens which can understand what you are looking at

Cloud ML, a suite of ML products

Actions of Google

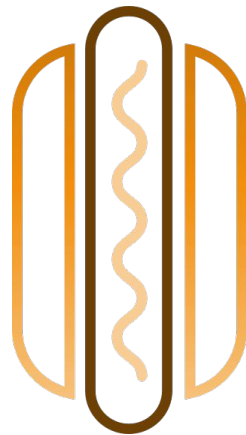
Launch of Gmail's auto-reply

Under the hood: ML with Pizza

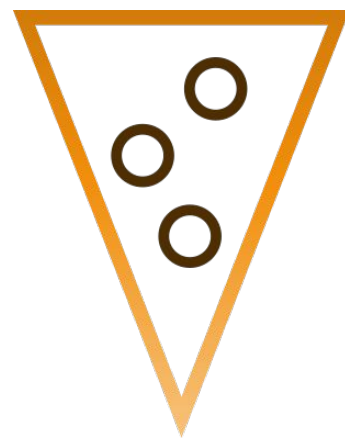


Learning Objective

By the end of the session, you will have run a machine learning experiment to classify foods as **pizza** or **not pizza**



Not-Pizza



Pizza



Pair Work: Run an ML Experiment

1. Find a partner
2. Go to <https://sliceofml.withgoogle.com/>
3. Click "Let's do this"



Run an ML Experiment

Steps to follow



Set an Accuracy Goal

Machine Learning

STEP 1: SET YOUR GOAL

Set Your Accuracy Goal.

In machine learning, accuracy is the fraction of a classification model's predictions that are correct. Please set the accuracy goal you want your pizza classification model to achieve; keep in mind that no model is perfect!

80%

SPLIT YOUR DATA →

Hint

Not sure what to do?

Check here for tips and hints to help you along the way.

Google

Divide data into train and test

80%

TRAINING DATA



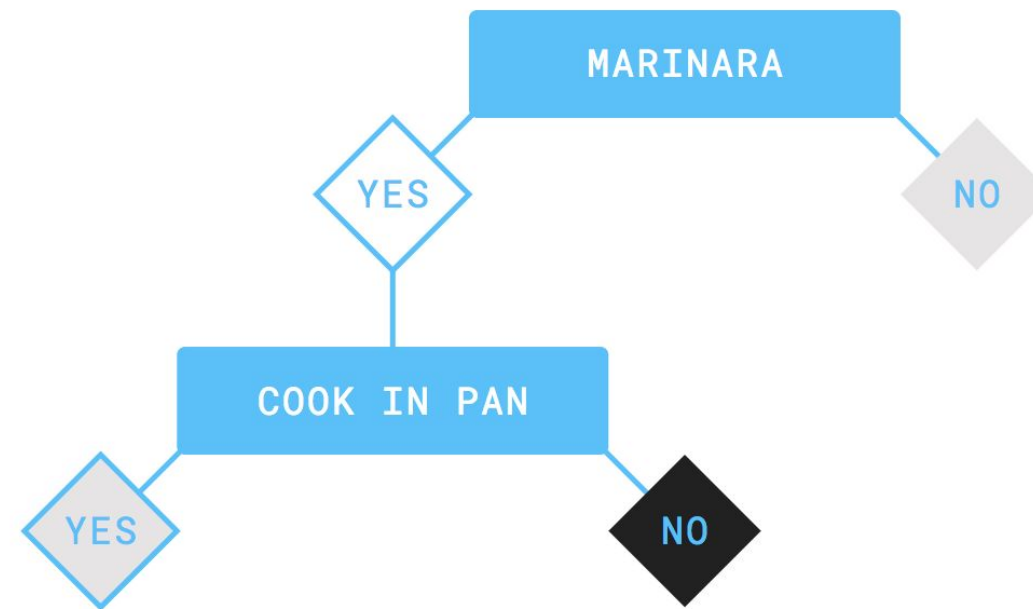
20%

TEST DATA



TRAIN YOUR MODEL →

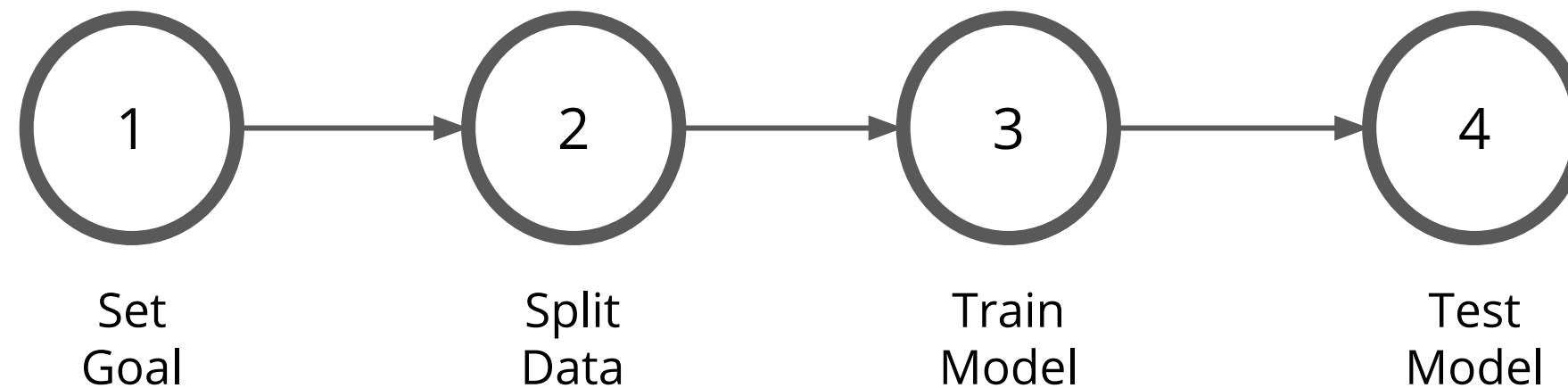
How does the Decision Tree work?



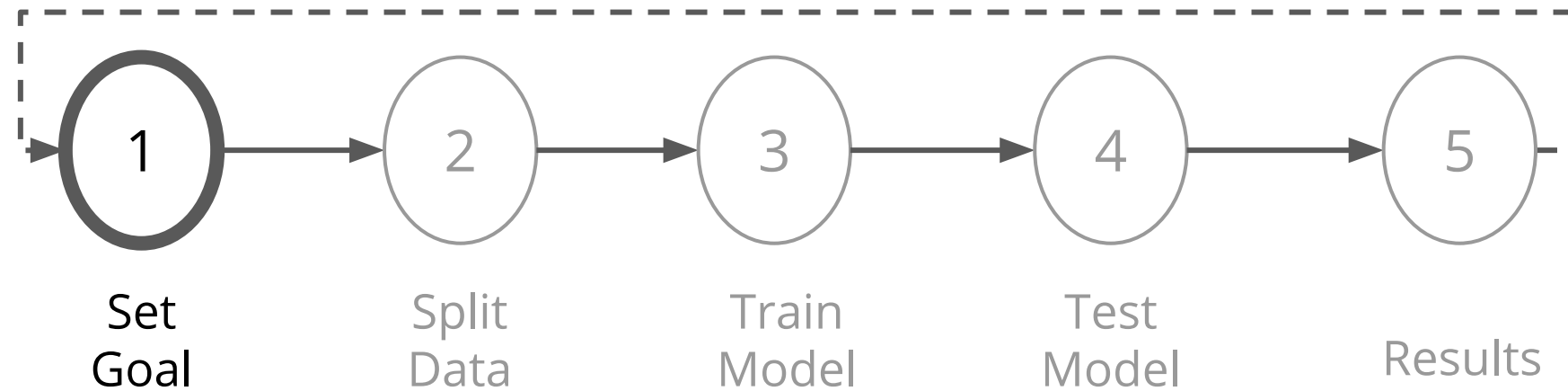
CARBS	MEAT	CHEESE	ROUND	MARINARA	CALORIES	METHOD	ORIGIN	IS PIZZA
YES	YES	YES	NO	YES	774	STOVETOP	ITALY	NO
YES	YES	YES	NO	YES	601	STOVETOP	ITALY	NO
YES	YES	YES	NO	YES	376	STOVETOP	ITALY	NO
YES	YES	YES	NO	YES	822	STOVETOP	ITALY	NO
YES	YES	YES	NO	YES	737	STOVETOP	ITALY	NO
YES	YES	YES	NO	YES	611	STOVETOP	ITALY	NO
YES	YES	YES	NO	YES	906	STOVETOP	ITALY	NO

0 PIZZA / 28 NOT PIZZA

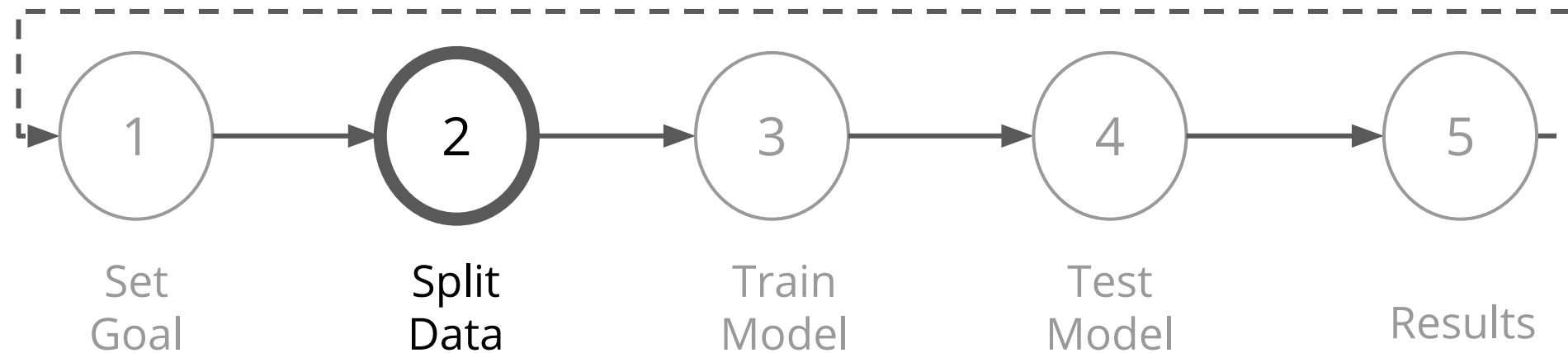
Refine the experiment to get your model's training and testing accuracy to be 90% or more



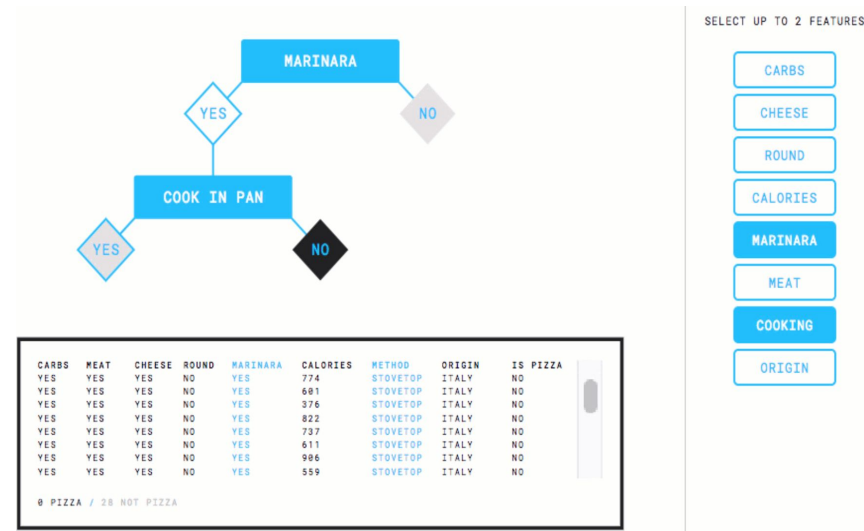
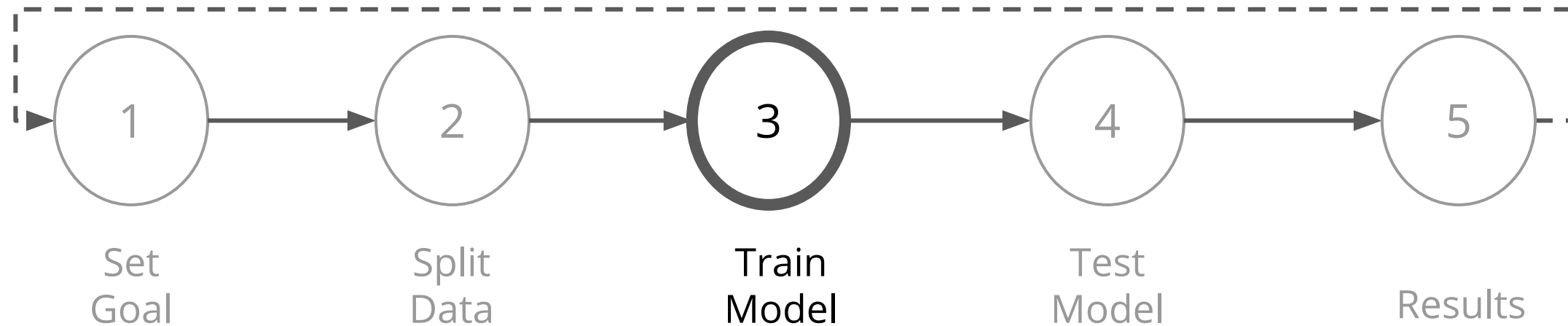
Tweak the model: Run More Experiments



Tweak the model: Run More Experiments



Tweak the model: Run More Experiments



Perfect!

Slice of Machine Learning



Success!

You made awesome improvements to your pizza classifier and achieved your accuracy goal. Remember, your model is only as good as the data it's been trained on and the features you use to describe it. Improvements can always be made; the work of a data scientist never ends!

RUN EXPERIMENT AGAIN →

MORE AI EXPERIMENTS ↗



Your Training
Data Accuracy



Your Test
Data Accuracy



What about photos of
everything?



What about other types
of unstructured data?
Video, audio, text...



Two ways Google can help us!

Use your own data to train models



TensorFlow



Cloud Machine Learning Engine

Machine Learning as an API



Cloud Vision API



Cloud Speech API



Cloud Natural Language API



Cloud Translation API



Cloud Video Intelligence

What is the Google Vision API?



Vision API

Complex image detection with a simple REST request

The Cloud Vision API gives you contextual data on your images by leveraging Google's vast network of machine learning expertise with a single API request. It uses a pre-trained model trained on a large dataset of images, similar to the models used to power Google Photos.





Label
Detection



Face
Detection



OCR



Explicit Content
Detection



Landmark
Detection



Logo
Detection

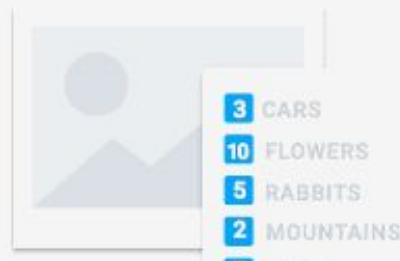
Google

Vision API:

cloud.google.com/vision/



bridge.jpg



- 3 CARS
- 10 FLOWERS
- 5 RABBITS
- 2 MOUNTAINS

Insight From Your Images

Easily **detect broad sets of objects** in your images, from flowers, animals, or transportation to thousands of other object categories commonly found within images. **Vision API improves over time** as new concepts are introduced and accuracy is improved.

GDG Gandhinagar

DevFest

```
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  {  
    "mid": "/m/04x4w7",  
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```

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```



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puente+25.jpg"  
  },  
  ...  
],  
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  },  
  ...  
]
```



cloud.google.com/natural-language/

cloud.google.com/natural-language/

Try the API

×

I have a cat

ANALYZE

[See supported languages](#)

Entities

Sentiment

Syntax

✓ Dependency

✓ Parse Label

✓ Part of Speech

✓ Lemma

✓ Morphology

nsubj

I

PRON

case=NOMINATIVE

number=SINGULAR

person=FIRST

root

have

VERB

mood=INDICATIVE

tense=PRESENT

det

a

DET

dobj

cat

NOUN

number=SINGULAR

Speech API:

cloud.google.com/speech/

Powerful Speech Recognition

Google Cloud Speech API enables developers to **convert audio to text** by applying **powerful neural network models** in an easy to use API. The API **recognizes over 80 languages and variants**, to support your global user base. You can transcribe the text of users dictating to an application's microphone, enable command-and-control through voice, or transcribe audio files, among many other use cases. **Recognize audio uploaded in the request**, and integrate with your audio storage on Google Cloud Storage, by using the same technology Google uses to power its own products.

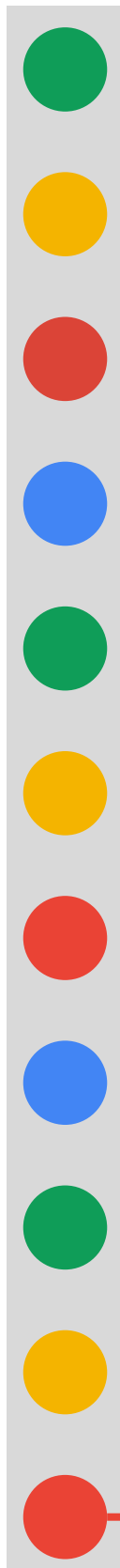


Convert your speech to text right now

Select a language and click "Start Now" to begin recording

English (Great Britain) ▼

 **START NOW**



• This is just a Beginning !

We will have an AI Doctor
Our Boss will be a Bot
Robots will beat us at Sports
News will not be written by Humans, *Poems too!*
We will live as Chatbots after we Die

***The day is not so far when there will be all Robot Speakers at
DevFest Gandhinagar !?***

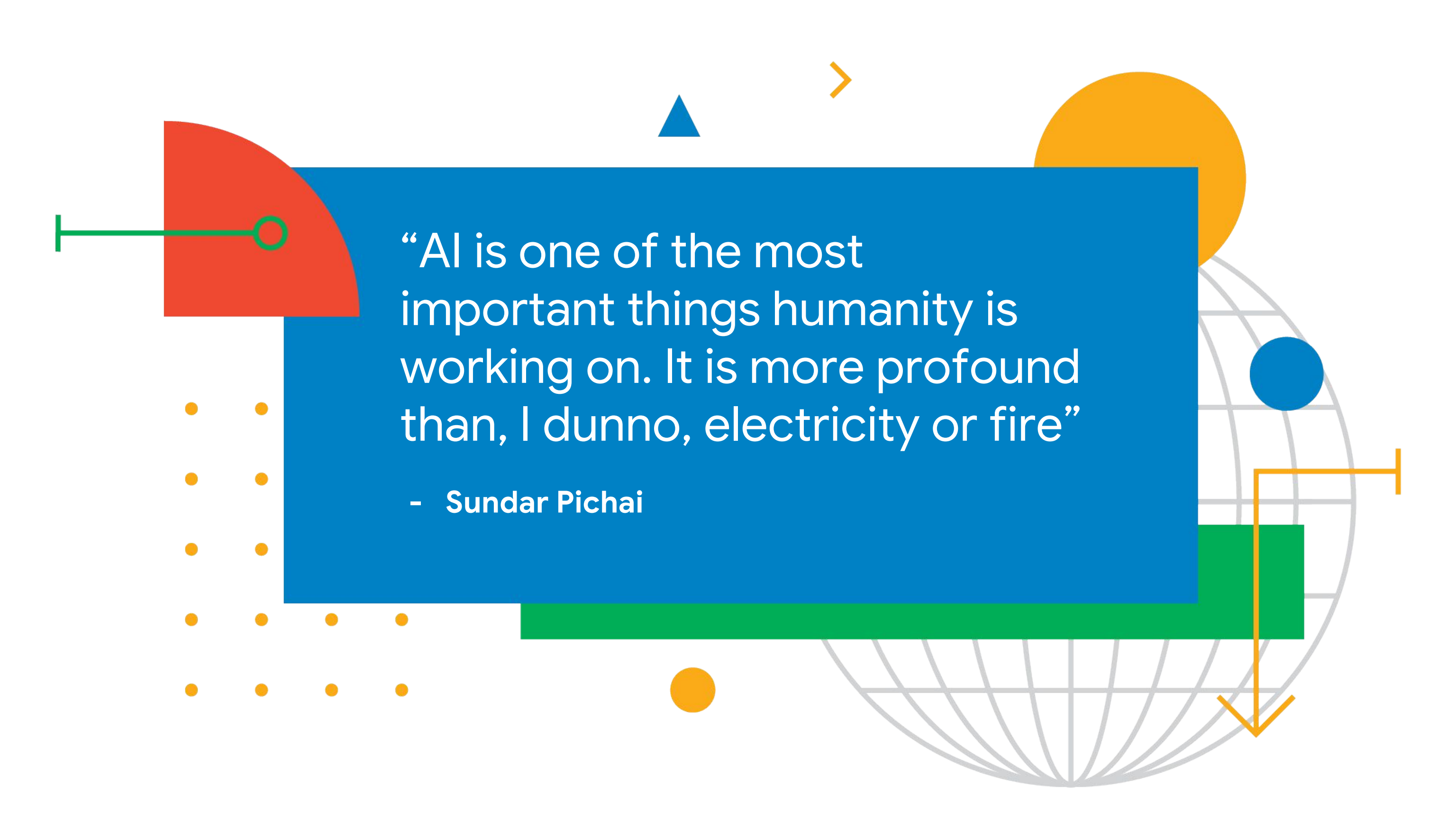
AI could be the reason why we've never met Aliens

Elon Musk described AI as an “existential threat” to humanity, meaning that it could erase mankind from the universe entirely



**I'M NOT SCARED OF A COMPUTER
PASSING THE TURING TEST...**

**I'M TERRIFIED OF ONE THAT
INTENTIONALLY FAILS IT.**

The background features a light gray wireframe globe. Various geometric elements are scattered around: a red quarter-circle with a green line and circle on the left; a blue triangle and a yellow chevron at the top; a large yellow circle on the right; a blue circle on the right; a green rectangle at the bottom right; a yellow arrow pointing down at the bottom right; a yellow circle at the bottom center; and a grid of yellow dots on the left. A large blue rectangle contains the text.

“AI is one of the most important things humanity is working on. It is more profound than, I dunno, electricity or fire”

- Sundar Pichai

DevFest

Q&A

Comments
Suggestions



Thank you!



Charmi Chokshi



charmichokshi

