01- Introduction to Deep Learning

Deep Learning

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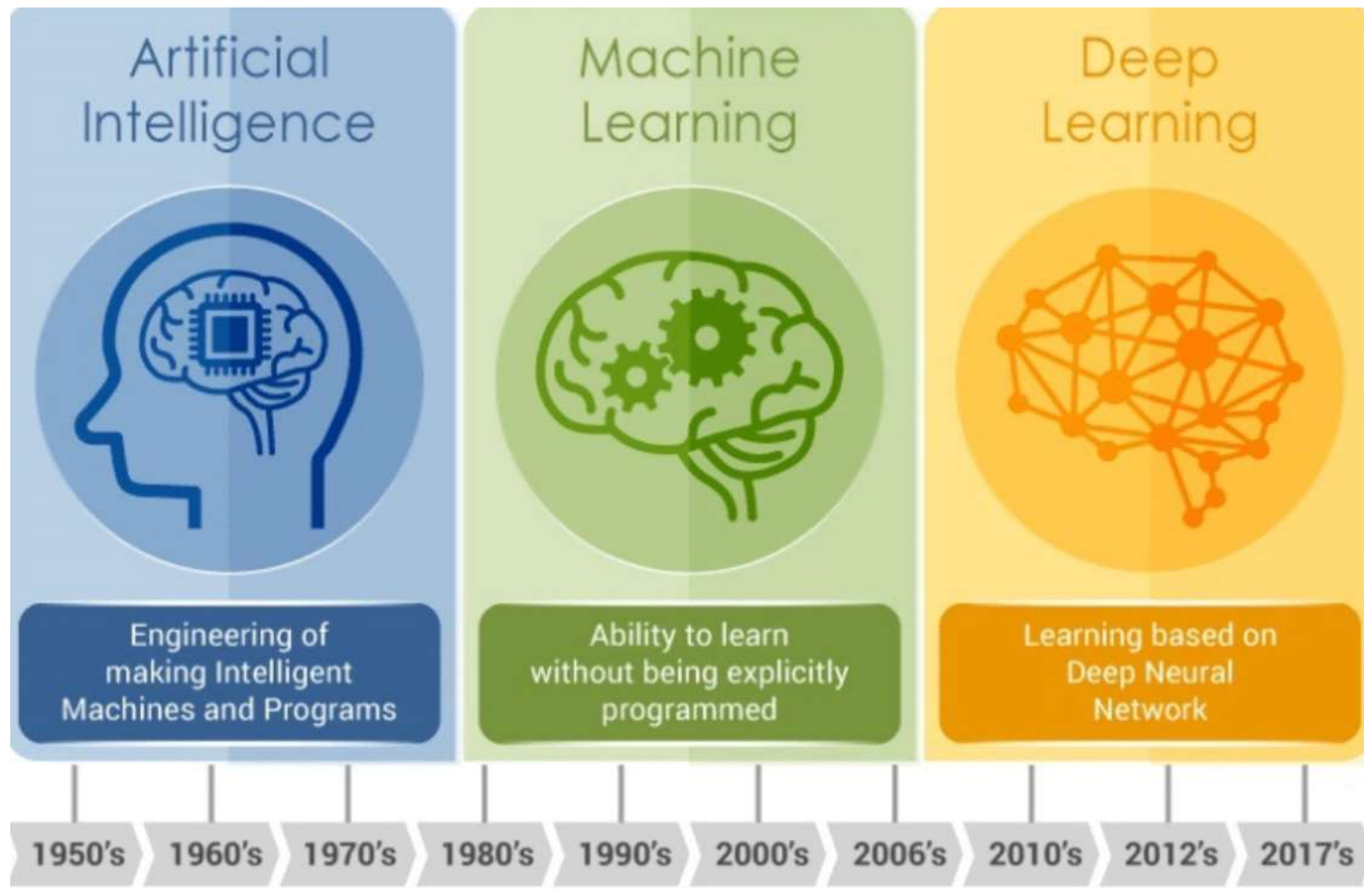
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Outlines

- History of AI, ML, & DL
- What is Deep Learning?
- Why Deep Learning Now?

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History of AI, ML, & DL

Artificial Intelligence	Machine Learning	Deep Learning
Engineering of making Intelligent Machines and Programs	Ability to learn without being explicitly programmed	Learning based on Deep Neural Network

1950's · 1960's · 1970's · 1980's · 1990's · 2000's · 2006's · 2010's · 2012's · 2017's

History of AI, ML, & DL

Beginning of

Artificial Intelligence

Computers are made in part to complete human tasks

Early on, generalized intelligence looked possible

Turned out to be harder than expected

History of AI, ML, & DL

Early Neural Networks

01 Inspired by biology

02 Created in the 1950's

03 Outclassed by Von Neumann Architecture

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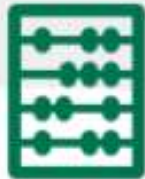# History of AI, ML, & DL

Highly complex

Programmed by hundreds of engineers

Rigorous programming of many rules

https://hbr.org/1988/03/putting-expert-systems-to-work

Expert ystems

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History of AI, ML, & DL
What are these three images?

History of AI, ML, & DL

Traditional Programming

Building a Classifier

1 — Define a set of rules for classification

2 — Program those rules into the computer

3 — Feed it examples, and the program uses the rules to classify

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History of AI, ML, & DL

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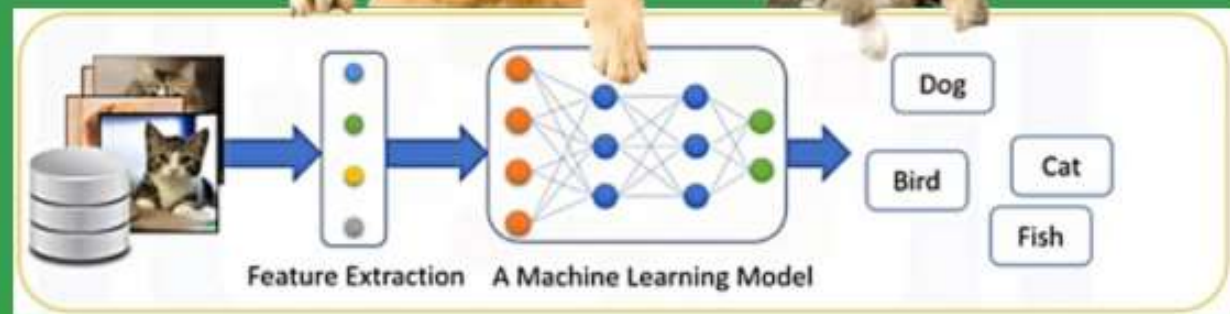
History of AI, ML, & DL

History of AI, ML, & DL

An algorithm that can figure out the rules for us
SO WE DON'T NEED TO WRITE THEM BY HAND

How Machine Learning Work

History of AI, ML, & DL

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How Machine Learning Work

History of AI, ML, & DL

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https://teachablemachine.withgoogle.com
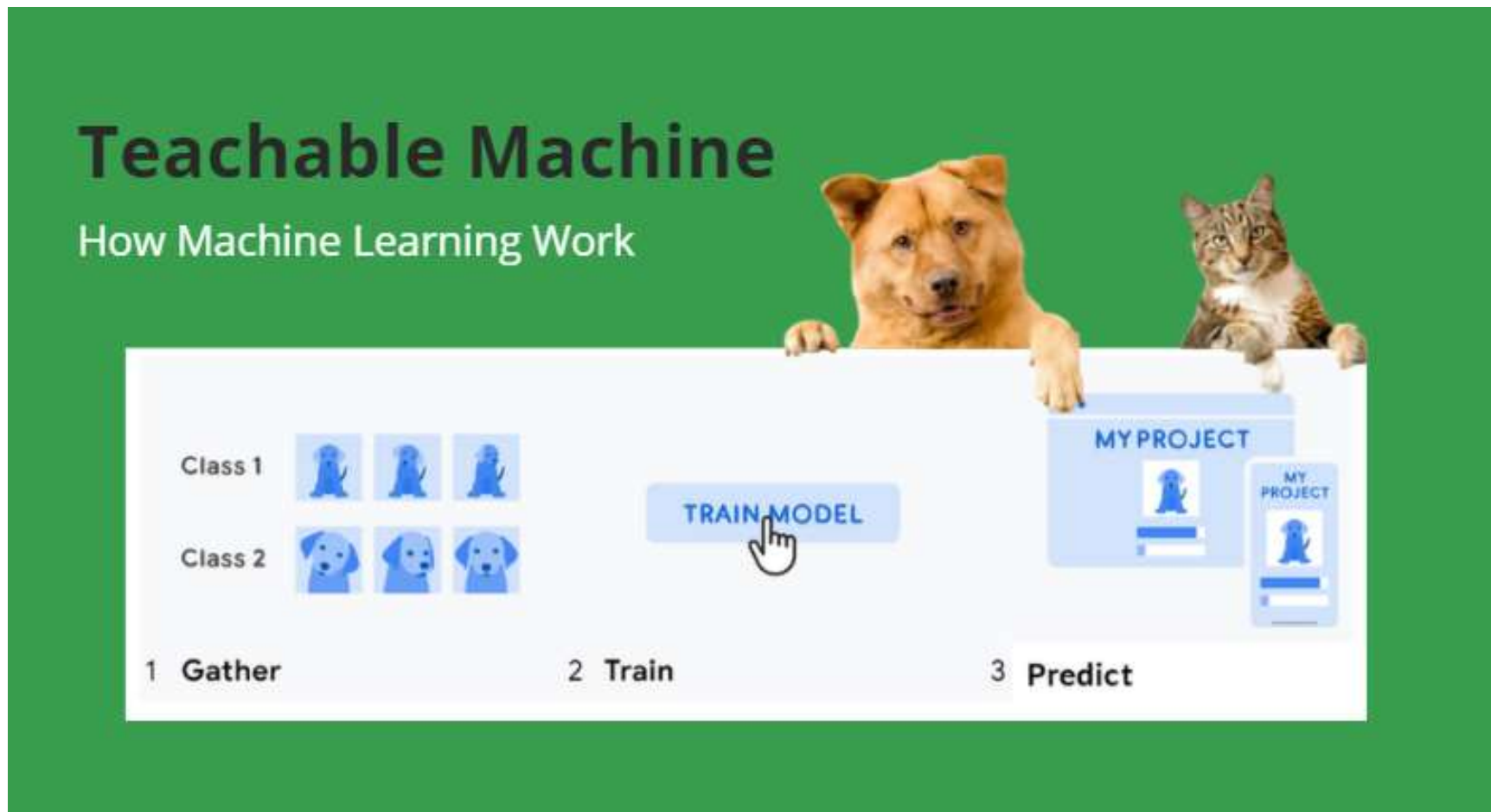
What is Deep Learning?

Deep learning is a technique in the field of artificial intelligence (AI) that uses **deep neural networks** to process information.

Depth and complexity of networks

Up to billions of parameters (and growing)

Many layers in a model

Important for learning complex rules

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What is Deep Learning?

Deep learning allows machines to learn from data **without being explicitly programmed**, by **extracting features from complex and abstract data**.

How Do Children Learn?

"Trail and Error" Technique

1 Expose them to lots of data

2 Give them the "correct answer"

3 They will pick up the important patterns on their own

When to Choose Deep Learning?

Classic Programming

If rules are clear and straightforward, often better to just program it

Deep Learning

If rules are nuanced, complex, difficult to discern, use deep learning

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Why Deep Learning Now?

DATA

- Networks need a lot of information to learn from
- The digital era and the internet has supplied that data

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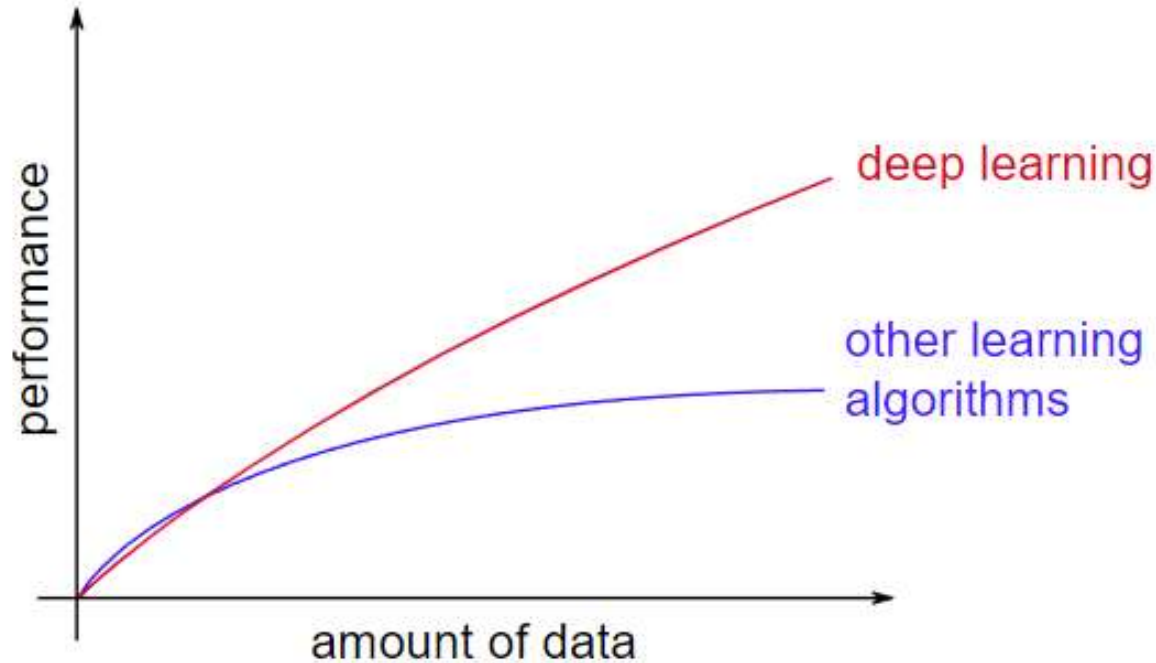# Why Deep Learning Now?

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Why Deep Learning Now?

- Better algorithms & understanding

- Computing power (GPUs, TPUs, …)

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- Computing power (GPUs, TPUs, …)
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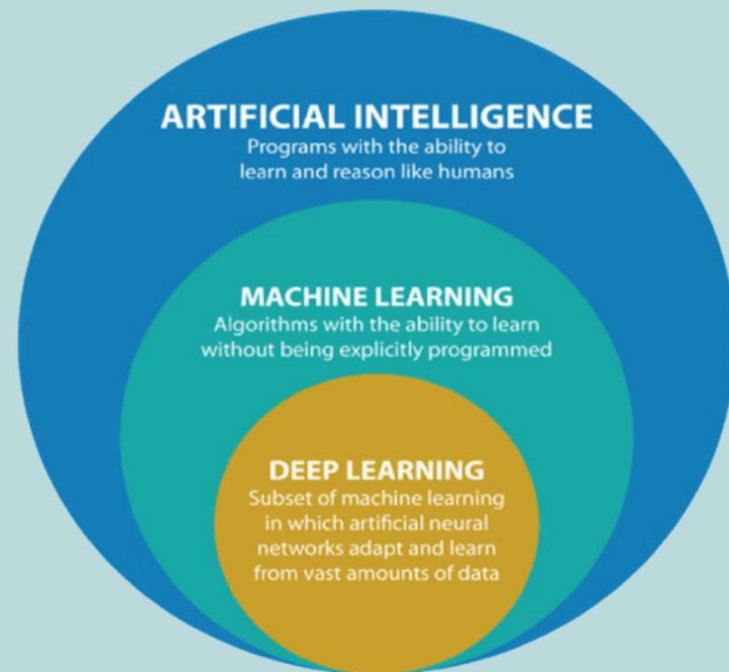
- Computing power (GPUs, TPUs, ...)

- Data with labels

- Open source tools and models

AI, ML, DL

What Is The Difference?

- Artificial Intelligence
- Machine Learning
- Deep Learning

ARTIFICIAL INTELLIGENCE
Programs with the ability to learn and reason like humans

MACHINE LEARNING
Algorithms with the ability to learn without being explicitly programmed

DEEP LEARNING
Subset of machine learning in which artificial neural networks adapt and learn from vast amounts of data

Questions?

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