01-Introduction

* No background in ML / AI
* No need for expensive hardware
  - free cloud services (Colab)
  - paid cloud services
  - PC has resources
* Not AGI
  "Artificial General Intelligence"

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**History**

1940s

1950s

"AI"
Perception

1960s High-water mark

Connectionism / Cybernetics

ANN

Artificial

1969 → AI Winter

Linear Separability

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\begin{align*}
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&\text{X} & & \text{X} & & \text{X} & & \text{X} \\
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\end{align*}
\]
1980s

MLP → Multi-Layer Perception

NN

2000s

"Deep Learning"

Hardware + Data (GPUs) (TB)

Random Forest is the other ML technique you should know
Machine Learning

- Supervised (we have labeled data)
- Unsupervised (clustering)
- Reinforcement (delayed label)

Inputs $\rightarrow$ Program $\rightarrow$ Results
A Deep Learning Program

"Training"

Inputs (weights) → Program → Results

Toggle able

Inputs → Architecture → Predictions

Parameters

(Resnet 18)
(Alex Net)
(UNet)

Labels

Evaluation → Loss

New Inputs → Architecture → New Predictions
Parameters:
- (ResNet 18)
- (AlexNet)
- (UNet)

"Inference"

ML vs. DL

- ML -> shallower models
- DL -> deeper models (more computation)
- ML -> hand-designed features
- DL -> automatically extract features

Dr. Andrew Ng
Example: predict sale price of a house

- Size
- # of bedrooms
- Zip code
- Cost of living

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\begin{align*}
\text{Size} & \rightarrow \text{NN} & \text{Price} \\
\# \text{ of bedrooms} & \rightarrow \text{NN} & \text{Price}
\end{align*}
\]

\begin{align*}
\text{Inputs} & \rightarrow \text{Features} \\
\text{Features} & \rightarrow \text{Output}
\end{align*}
zip code

cost of living

No feature Engineering

- NN are often called a "Black Box" model

- Explainable AI

Example: "Wake words" mode

OK Google

Alexa
Hey Siri

Input: [Handwritten audio waveform]

Audio Waveform

time

RNN

Recurrent Neural Network

"NN with memory"

Limitations

- Can only train a NN if you have labeled data.
- They only learn what you tell them to learn
0 Just give predictions

0 Easy to create an abomination