Intro to Deep Learning

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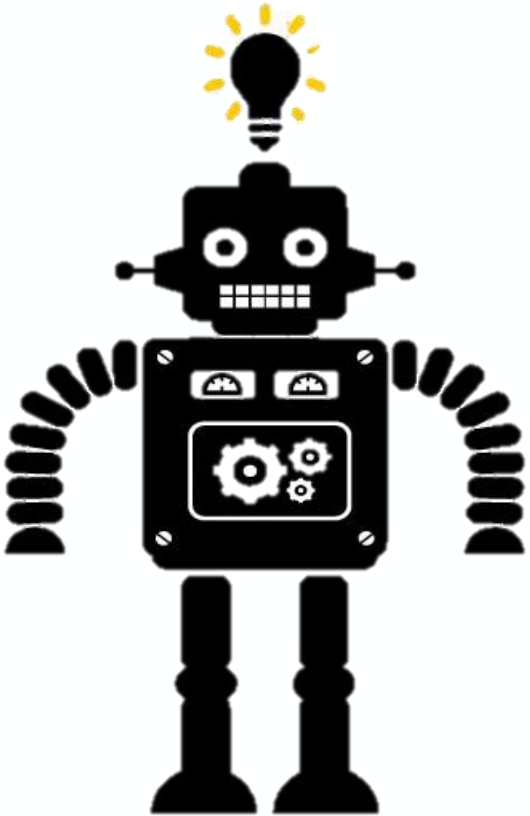
Materials from

- Intel Deep Learning https://www.intel.com/content/www/us/en/developer/learn/course-deep-learning.html
- Introduction to Neural Networks https://www.deeplearning.ai/

What is Machine Learning?

Machine learning allows computers to learn and infer from data.



Classical Programming and Machine Learning

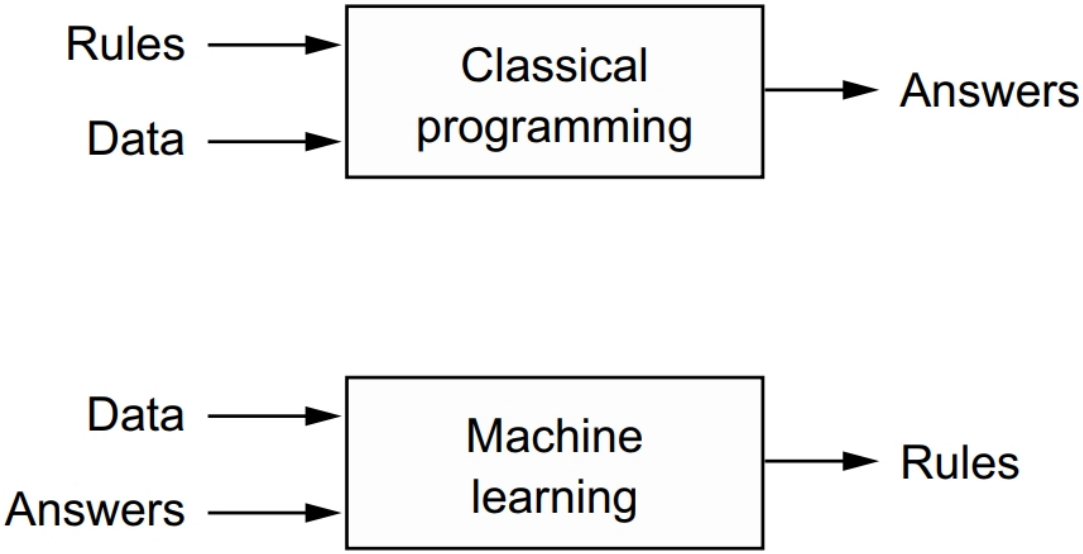
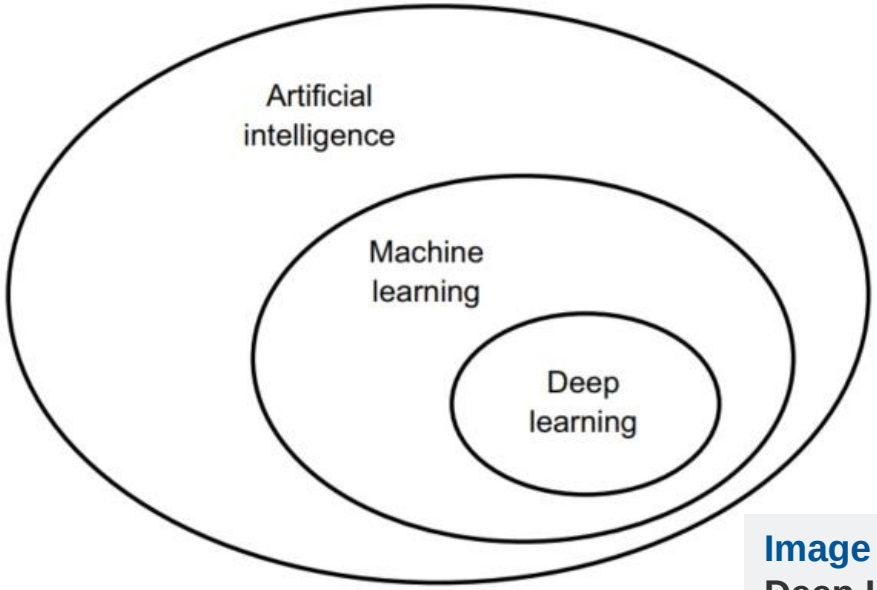


Image Source:
Deep Learning with Python, Second Edition
By Francois Chollet

Artificial Intelligence, Machine Learning, and Deep Learning



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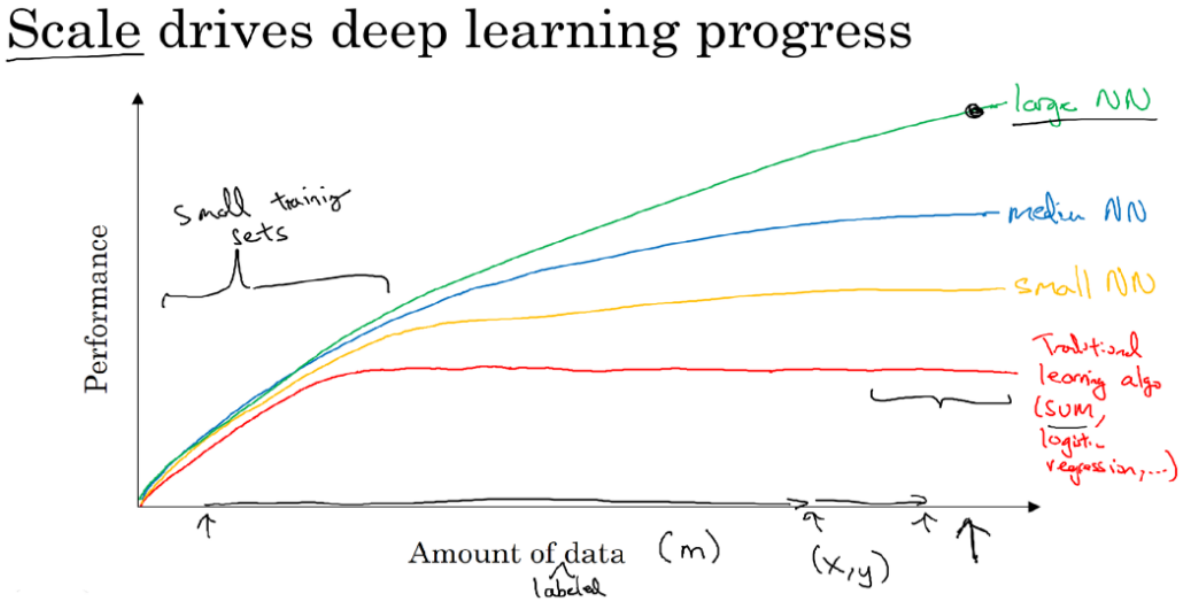
Why is Deep Learning Taking Off?

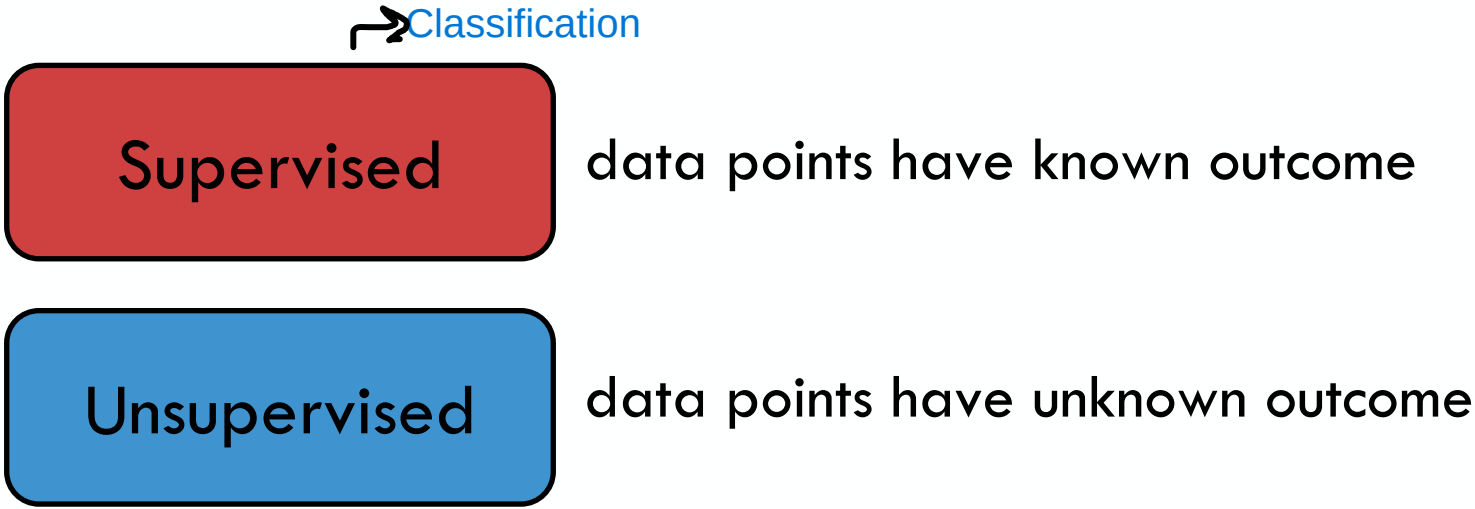
Deep learning is taking off due to a large amount of data available through the digitization of the society, faster computation and innovation in the development of neural network algorithm.



Two things have to be considered to get to the high level of performance:

1. Being able to train a big enough neural network
2. Huge amount of labeled data

Types of Machine Learning

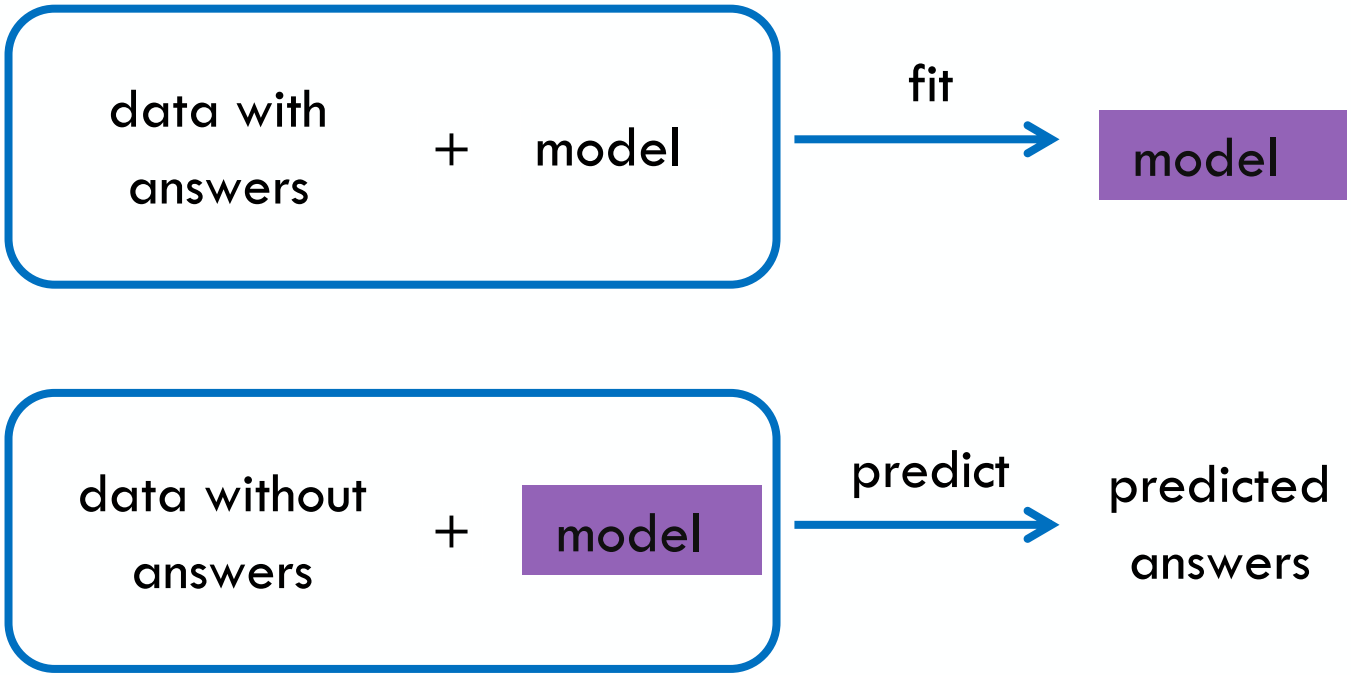


Types of Supervised Learning

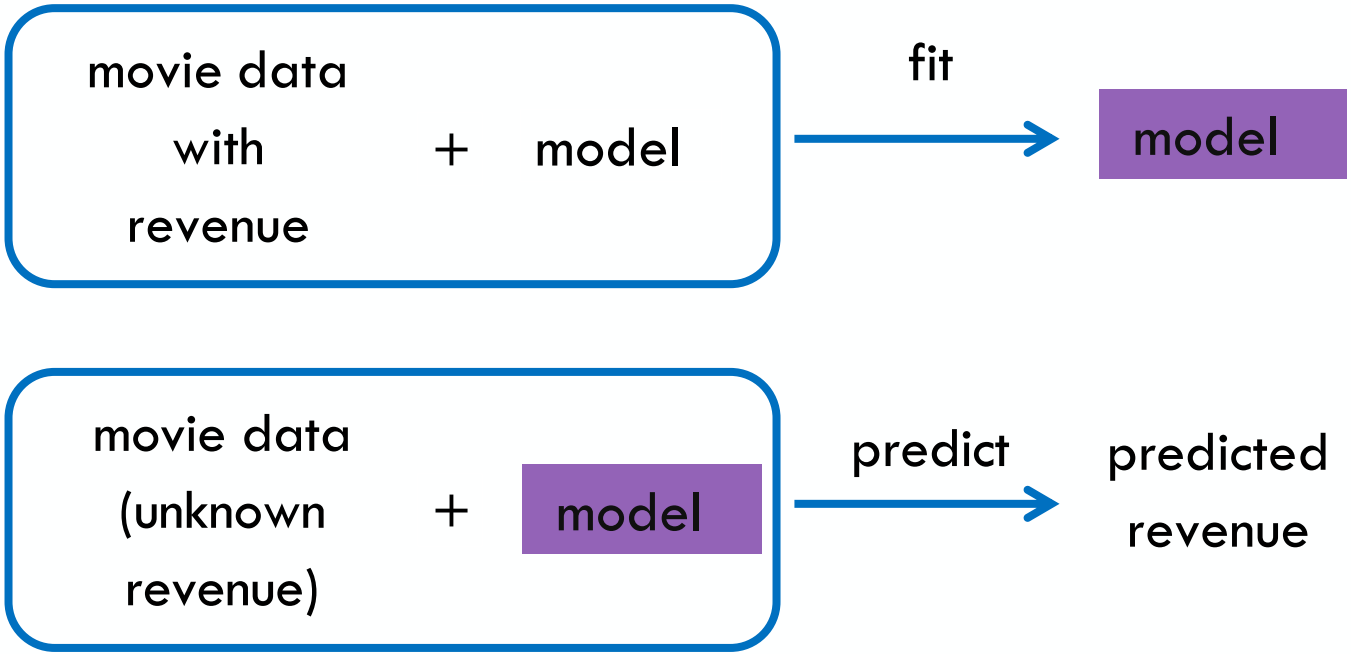
Regression — outcome is continuous (numerical)

Classification — outcome is a category

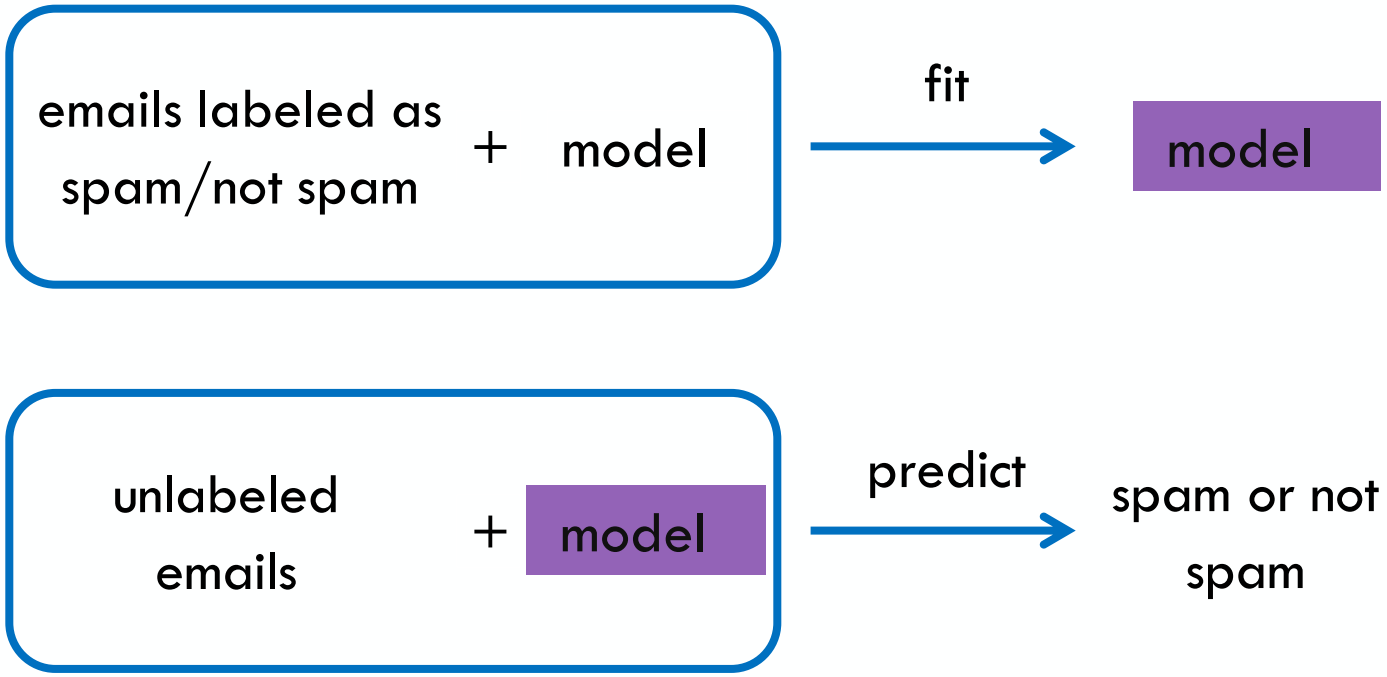
Supervised Learning Overview



Regression: Numeric Answers



Classification: Categorical Answers



Metrics for Regression

- **Root Mean Square Error (RMSE)**

$$RMSE = \sqrt{\frac{1}{n}\sum_{i=1}^{n}(y_i - \hat{y}_i)^2}$$

$\hat{y}_i$ → Y hat

- **Mean Absolute Error (MAE)**

$$MAE = \frac{1}{n}\sum_{i=1}^{n}|y_i - \hat{y}_i|$$

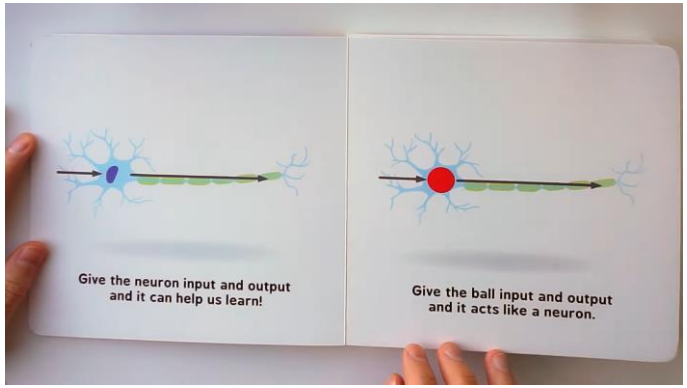
Metrics for Classification

- **Accuracy**

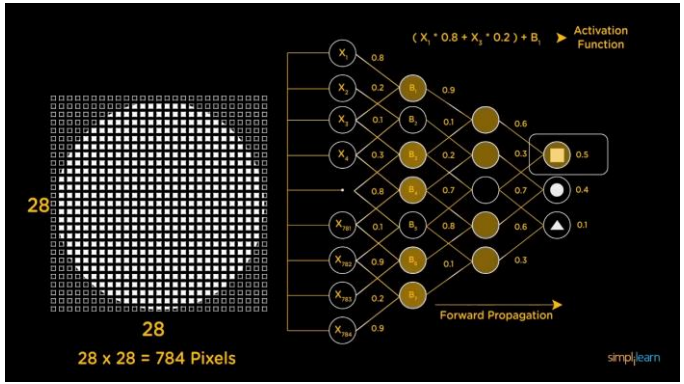
$$\text{Accuracy} \quad \sout{RMSE} = \frac{TP + TN}{TP + TN + FP + FN}$$

True Positive (TN) - This is correctly classified as the class of target.
True Negative (TN) - This is correctly classified as not a class of target.
False Positive (FP) - This is wrongly classified as the class of target.
False Negative (FN) - This is wrongly classified as not a class of target.

Video Illustrations



https://www.youtube.com/watch?v=IX6acE4l1YQ



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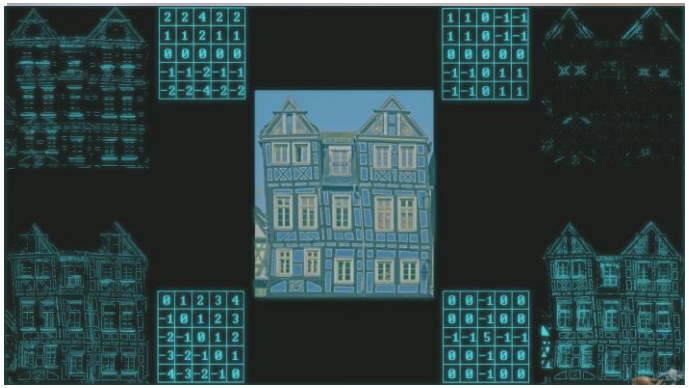
Video Illustrations

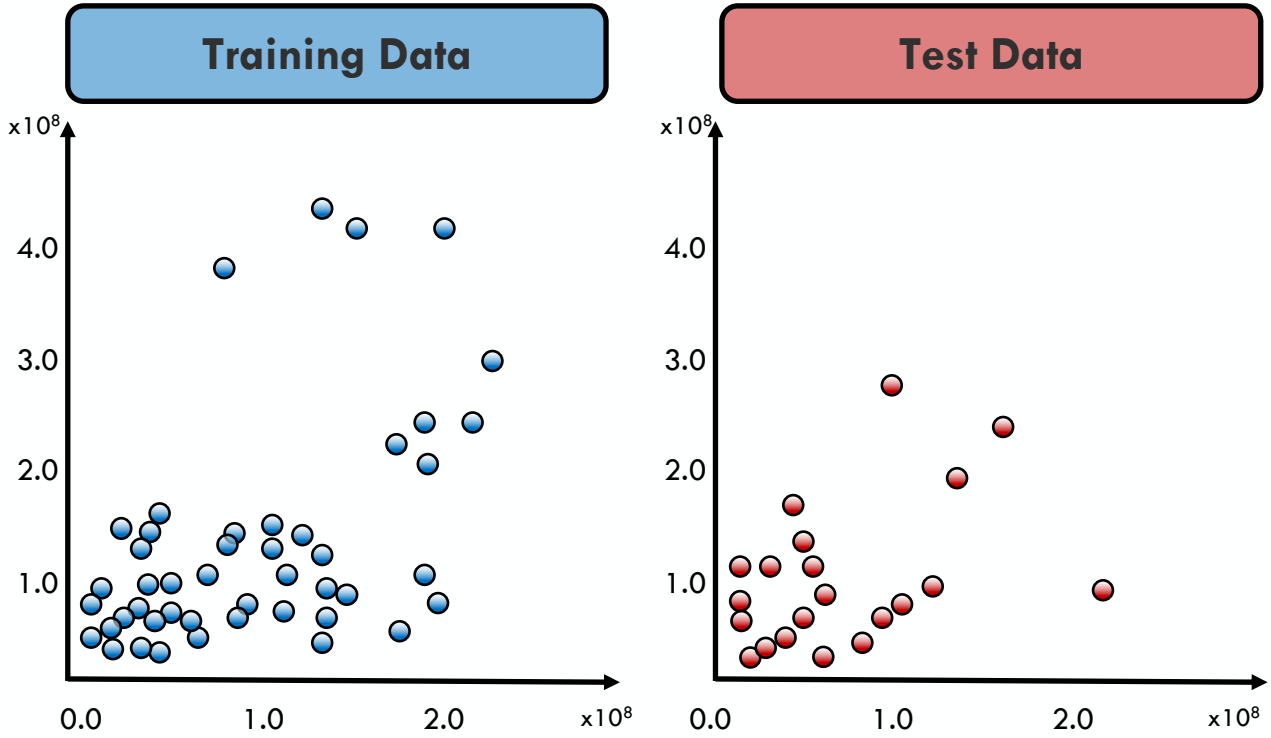


https://www.youtube.com/watch?v=pj9-rr1wDhM

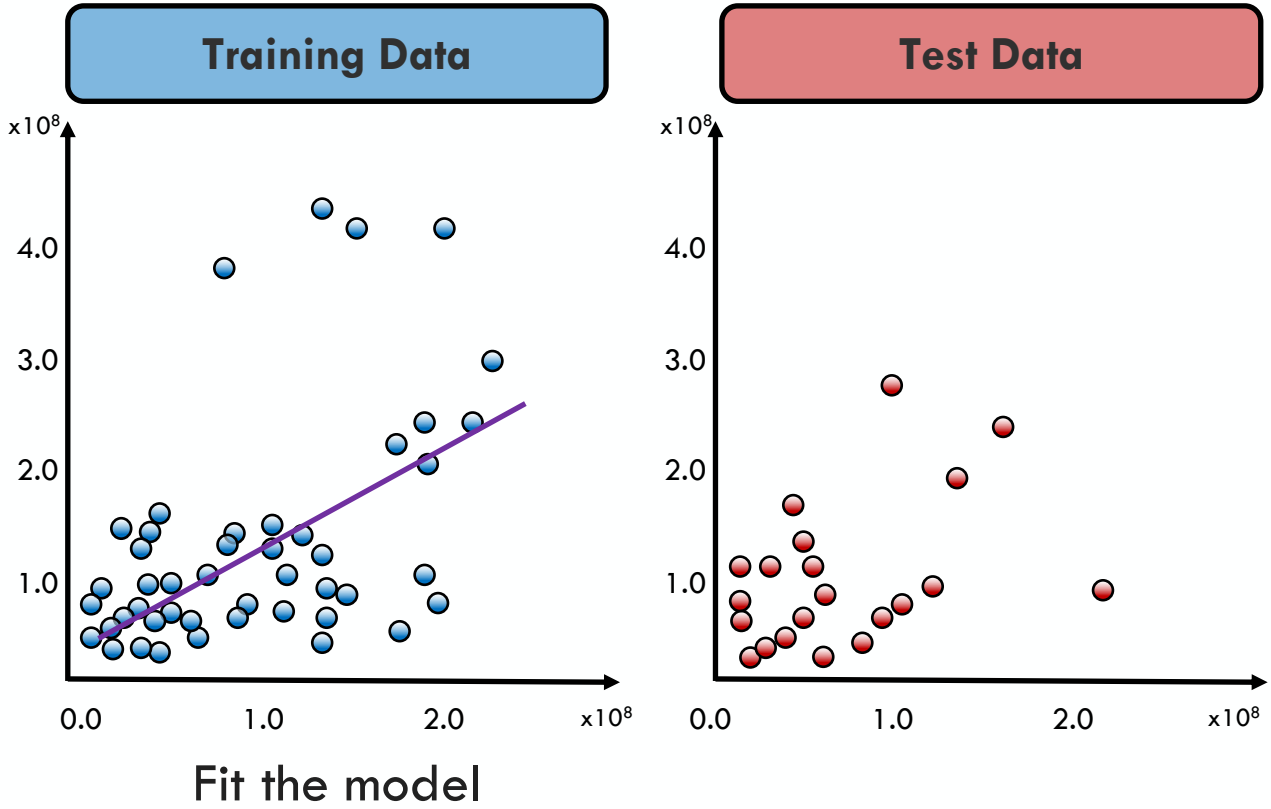
การติดตั้งโปรแกรม

1. ดาวน์โหลด Anaconda จาก www.anaconda.com/products/distribution
2. ติดตั้ง Anaconda
3. เรียกโปรแกรม Anaconda Prompt จากเมนู Start
4. รันคำสั่งต่อไปนี้
   - conda create --name dl_env python=3.9
   - conda activate dl_env
   - conda install ipykernel numpy pandas pydotplus scikit-learn matplotlib
   - pip install tensorflow_cpu graphviz
   - python -m ipykernel install --user --name dl_env --display-name "dl_env"
5. ติดตั้ง opencv จาก https://www.lfd.uci.edu/~gohlke/pythonlibs/#opencv
6. ดาวน์โหลดโค้ดและข้อมูลจาก https://tinyurl.com/4usyaetw
7. รันคำสั่ง jupyter notebook

Using Training and Test Data

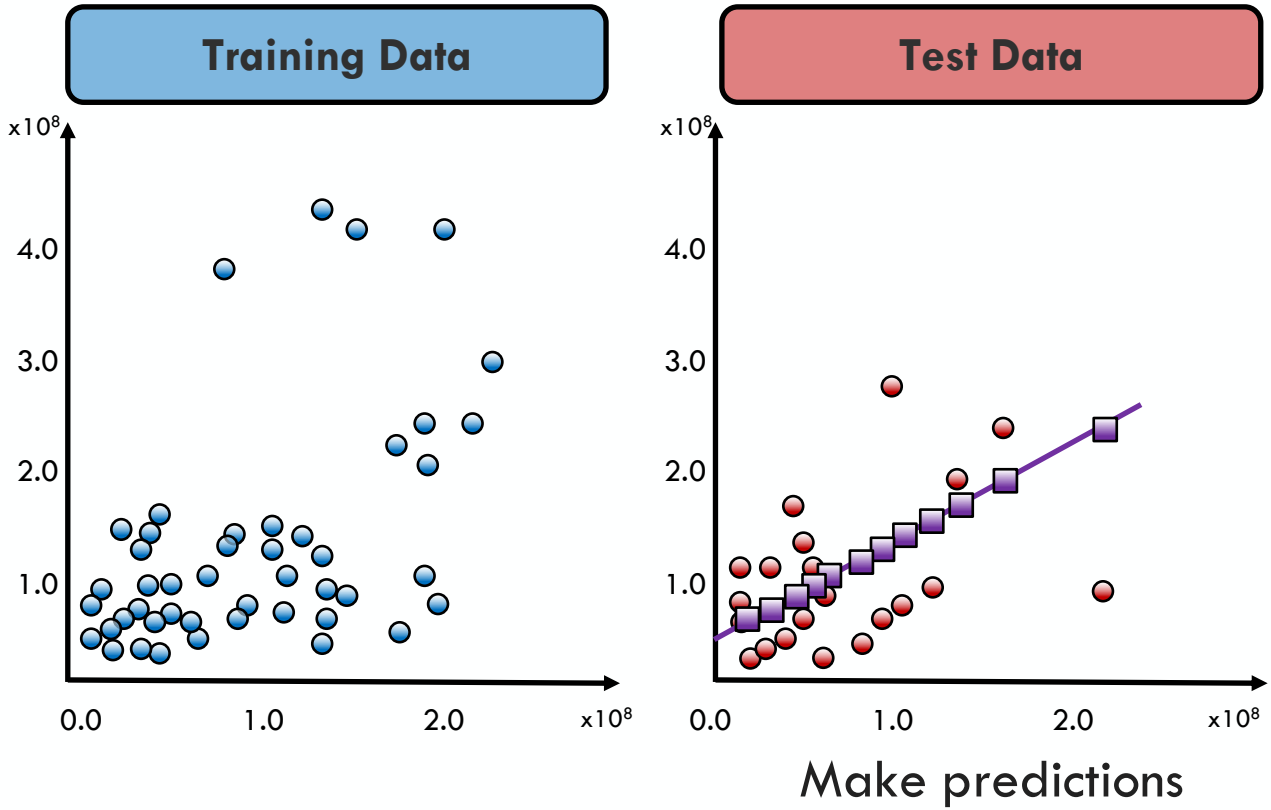


Using Training and Test Data



Fit the model

Using Training and Test Data



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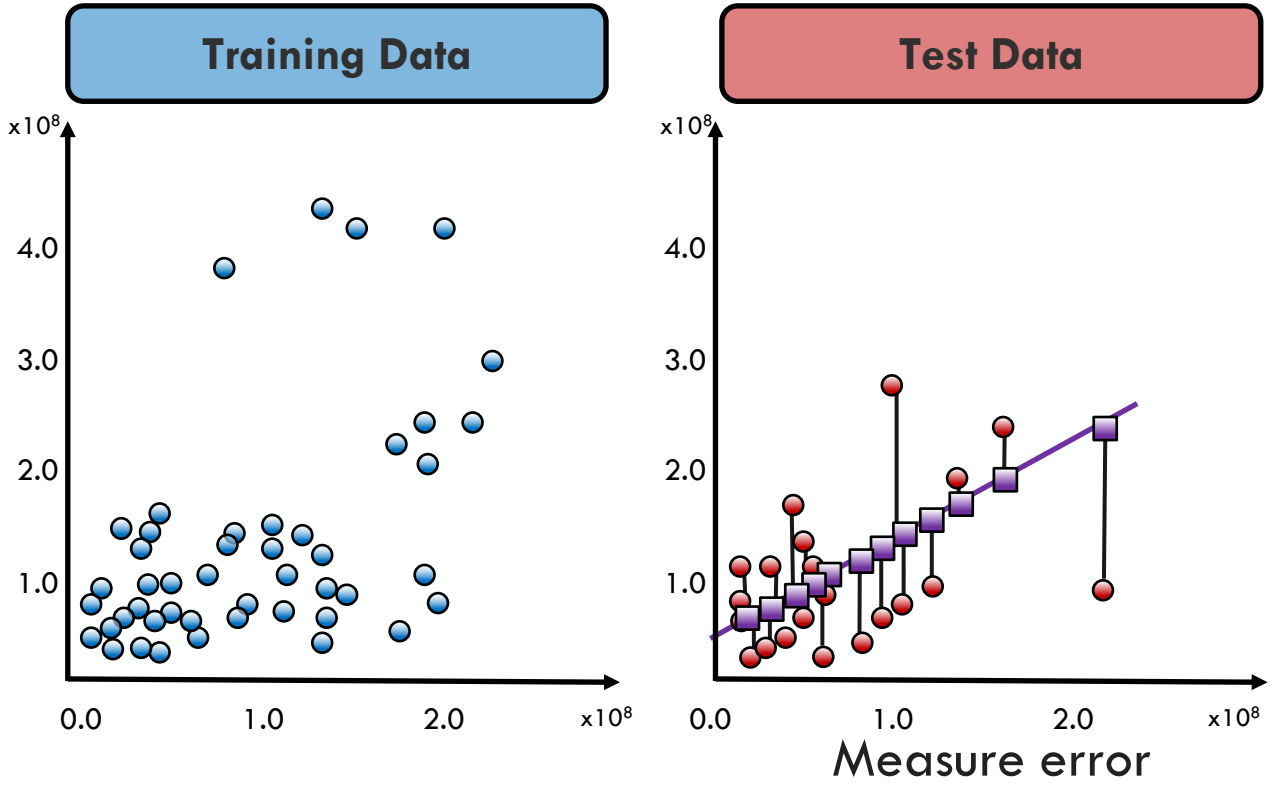
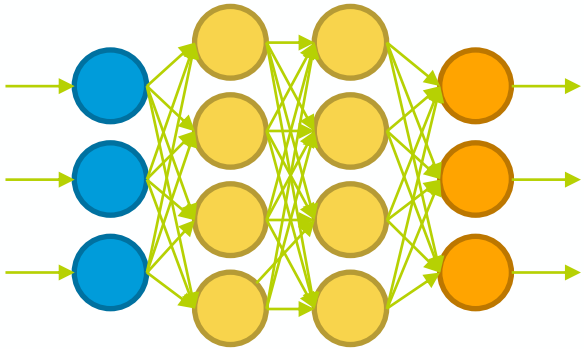


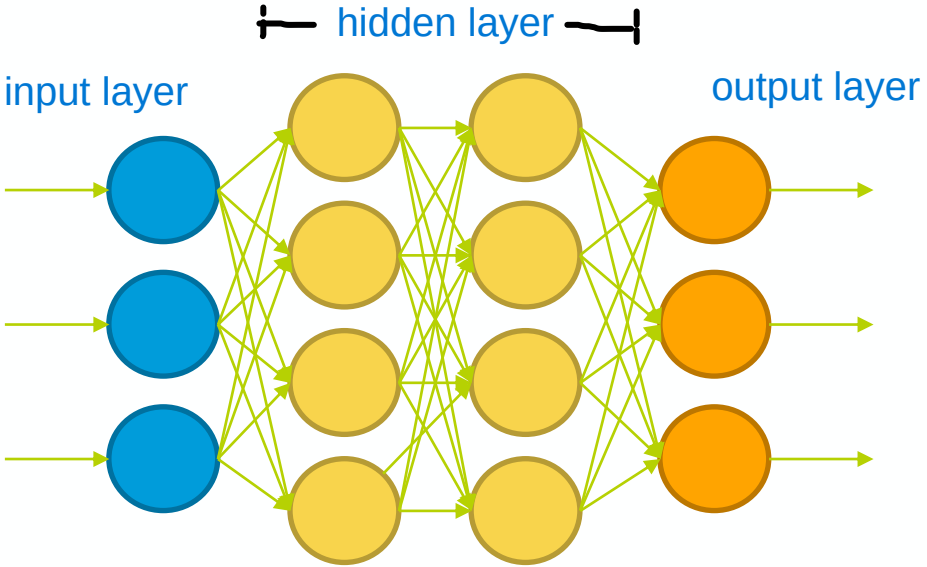
Motivation for Neural Nets

- Use biology as inspiration for mathematical model
- Get signals from previous neurons
- Generate signals (or not) according to inputs
- Pass signals on to next neurons
- By layering many neurons, can create complex model



Neural Net Structure

if have 1 hidden layer
call shallow learning



Input
(Feature Vector)

Output
(Label)

- Can think of it as a complicated computation engine
- We will ”train it” using our training data
- Then (hopefully) it will give good answers on new data