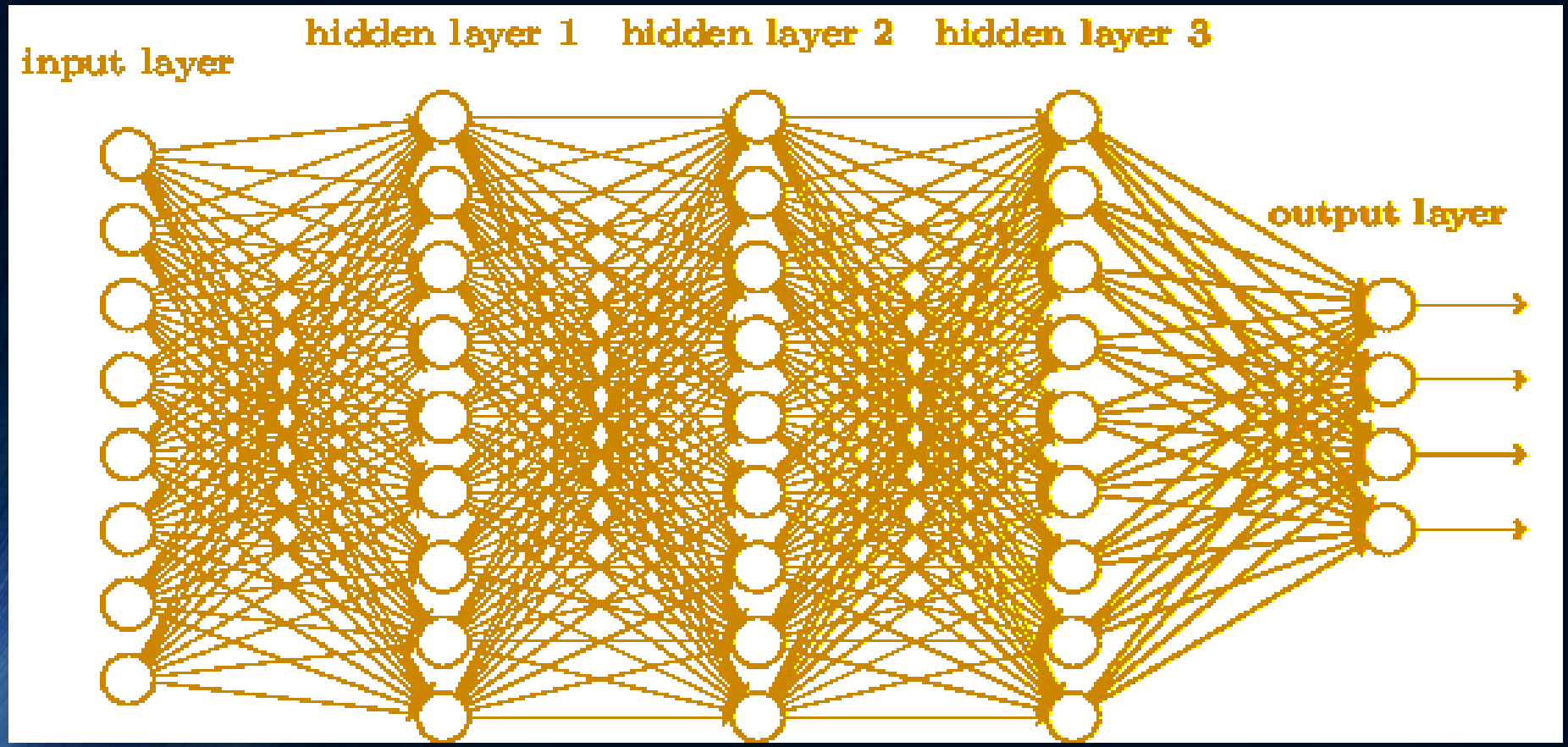
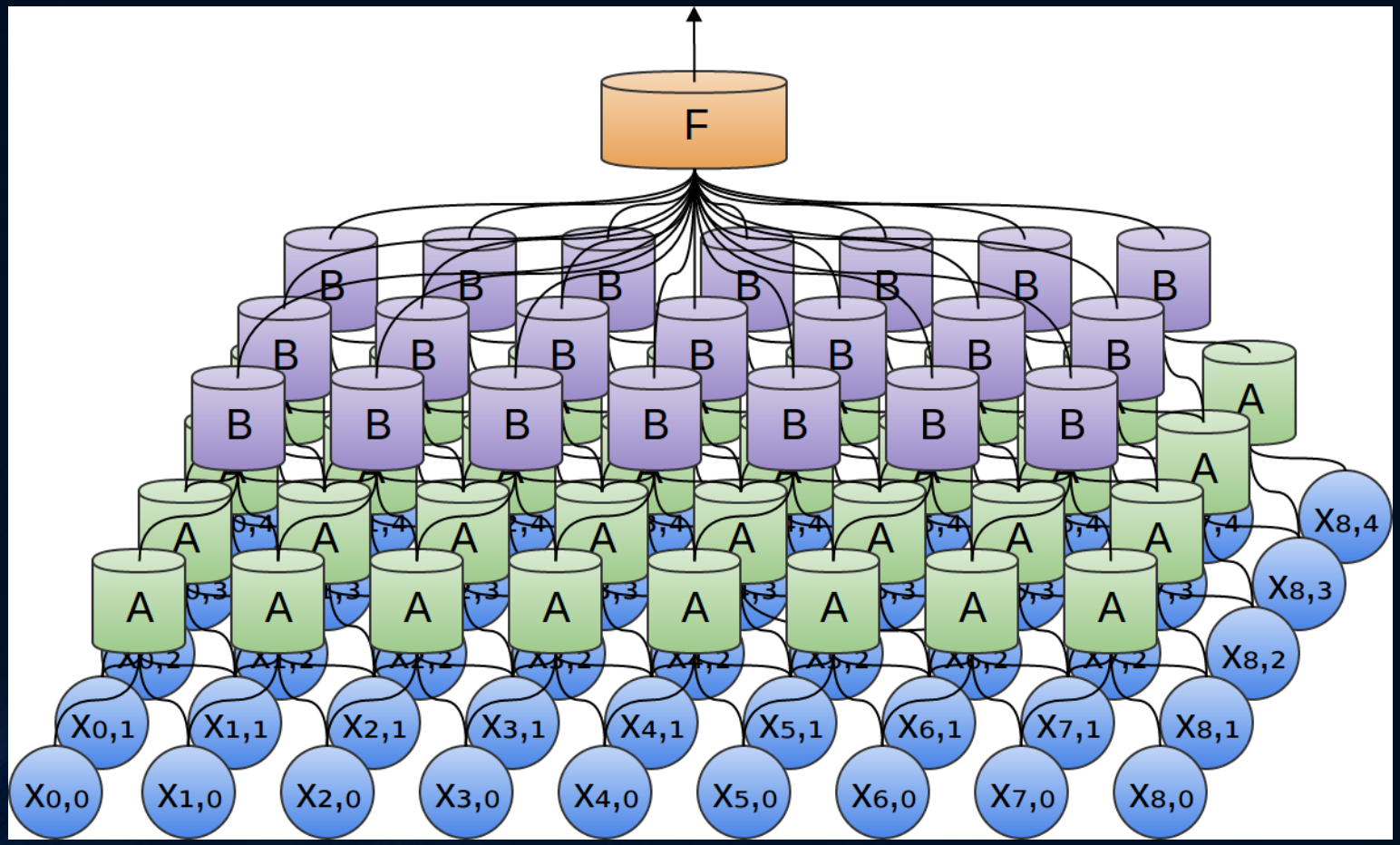
Deep Learning

Ref: https://towardsdatascience.com/deep-learning-101-for-dummies-like-me-a53e3caf31b1
https://www.forbes.com/sites/bernardmarr/2018/10/01/what-is-deep-learning-ai-a-simple-guide-with-8-practical-examples/#702b1b298d4b

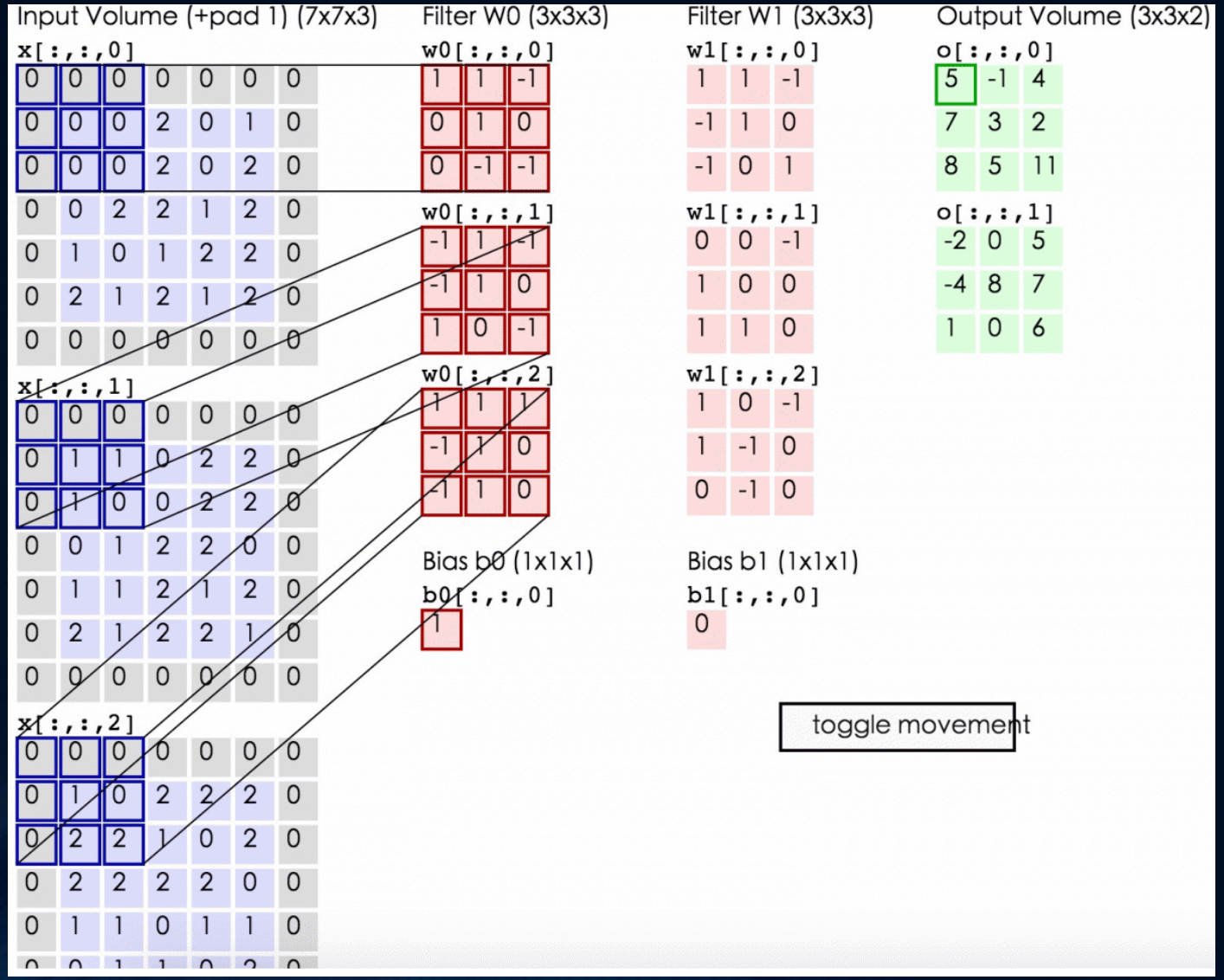
Fully Connected Layers



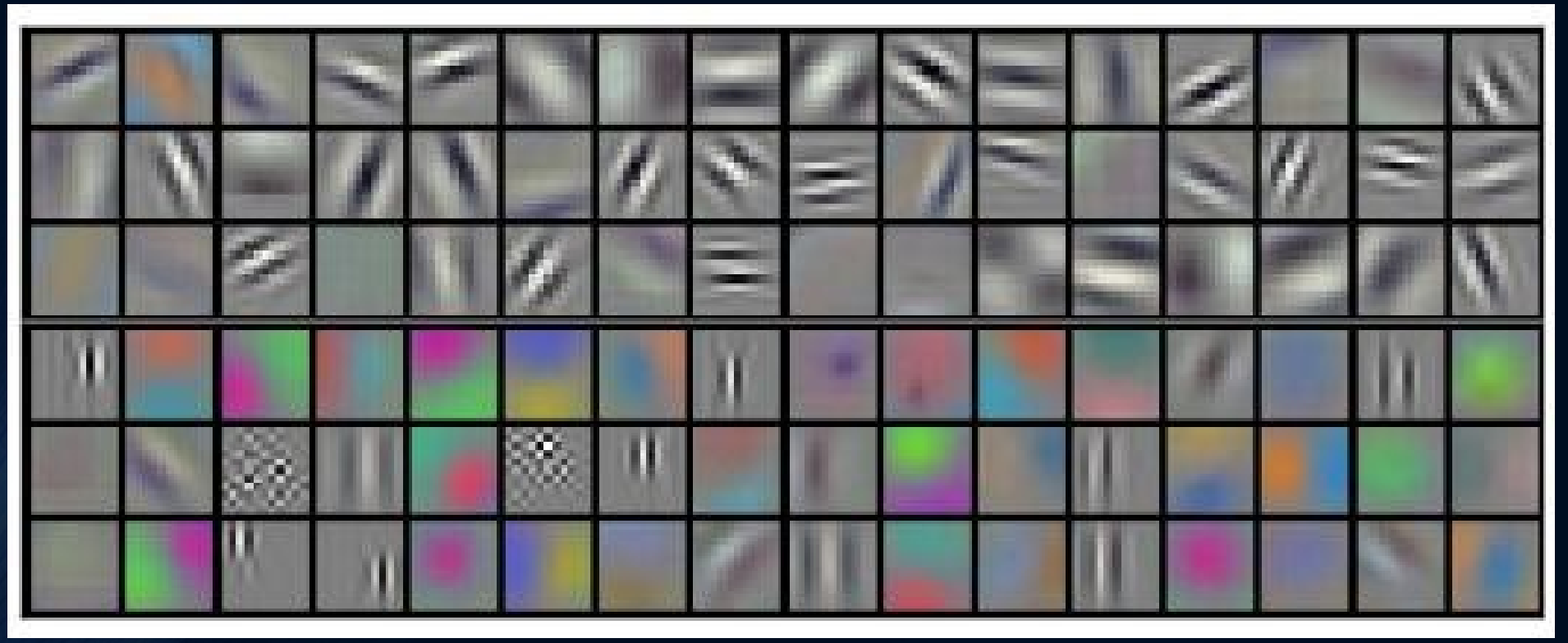
Convolutional Layers



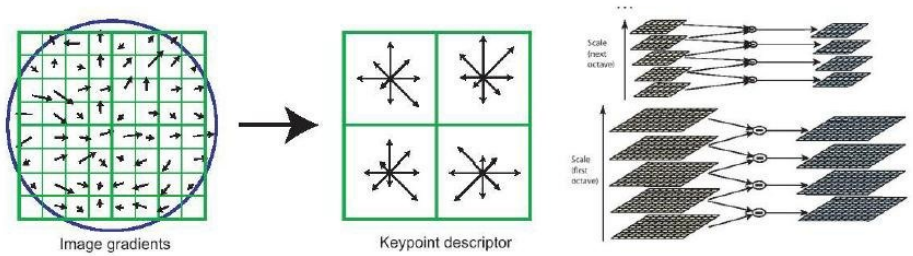
Convolutional Layers



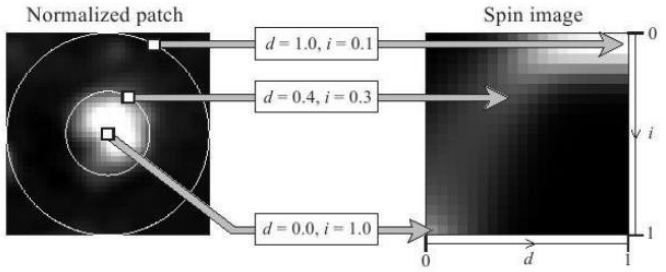
Convolution Filters



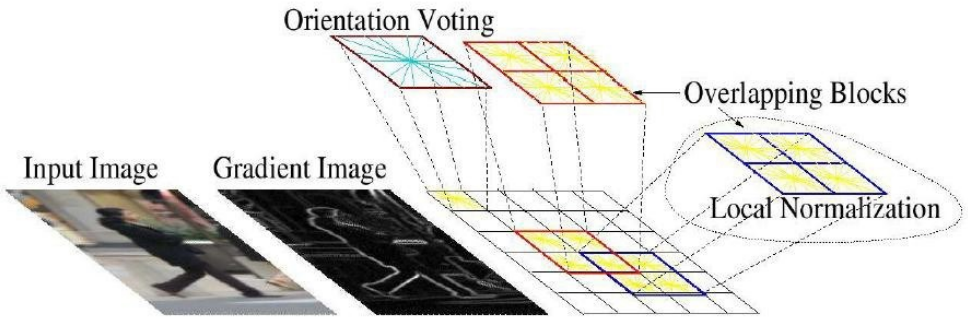
Computer vision features



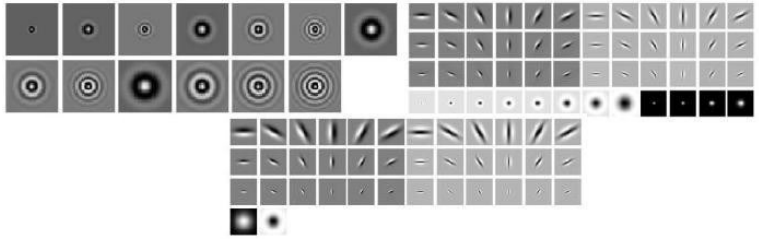
SIFT



Spin image



HoG



Textons

and many others:

SURF, MSER, LBP, Color-SIFT, Color histogram, GLOH, …..

Traditional Recognition Approach

Features are not learned

Input data (pixels) → feature representation (hand-crafted) → Learning Algorithm (e.g., SVM)

Image

Low-level vision features (edges, SIFT, HOG, etc.)

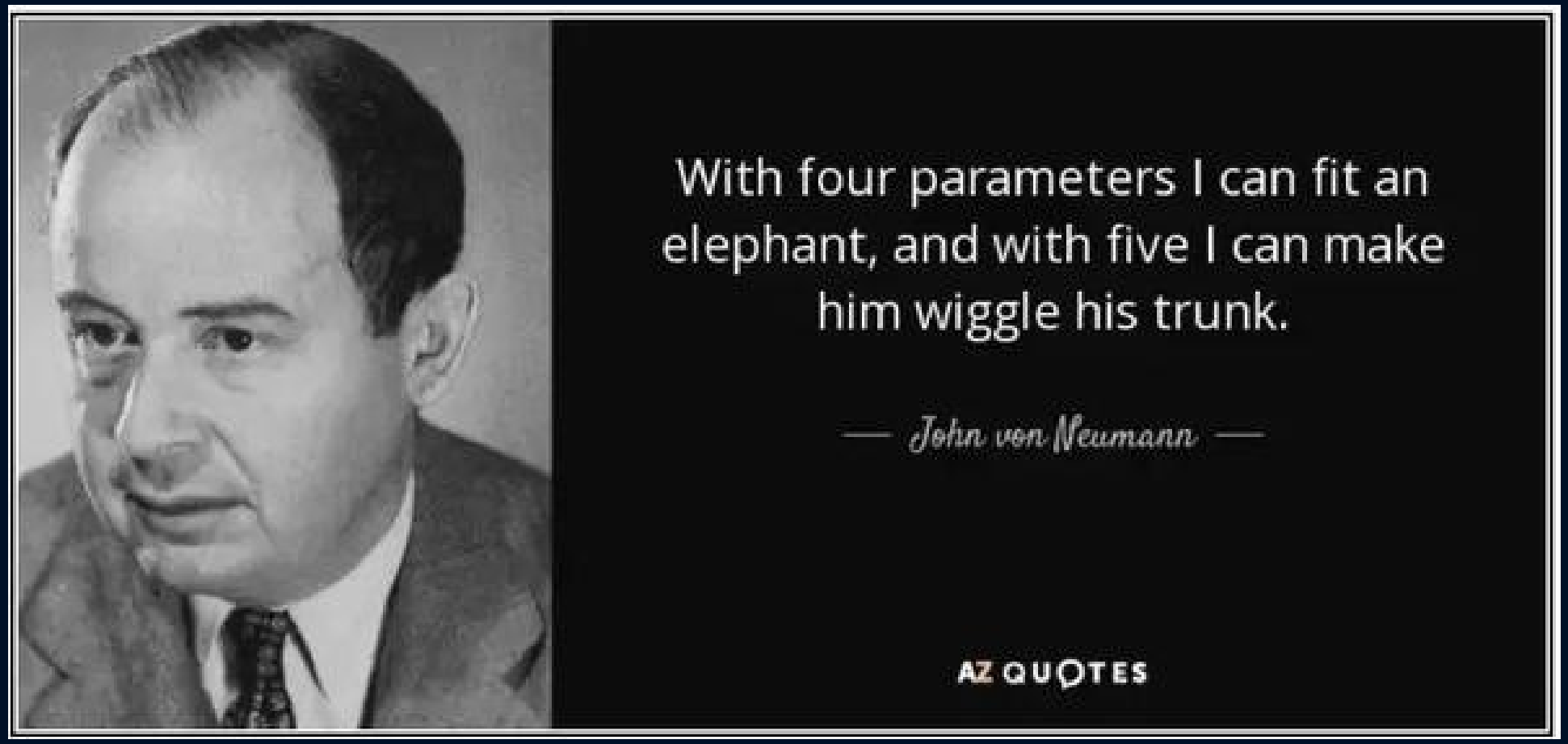
Object detection / classification

Feature Engineering vs. Learning

- Feature engineering is the process of using domain knowledge of the data to create features that make machine learning algorithms work.
- “When working on a machine learning problem, feature engineering is manually designing what the input x's should be.”

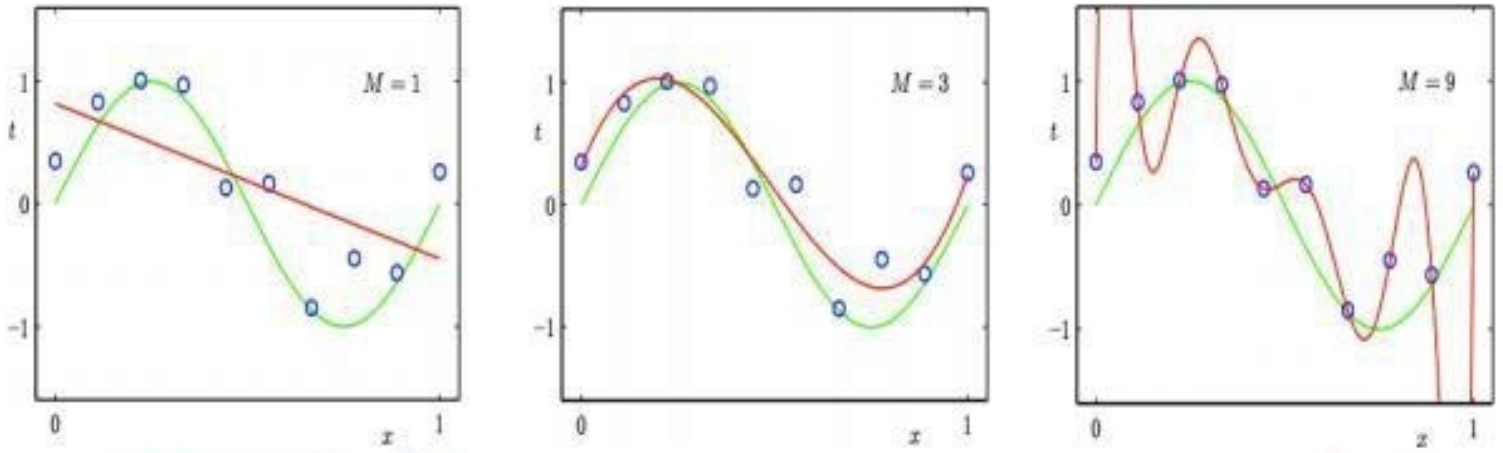
  -- Shayne Miel
- “Coming up with features is difficult, time-consuming, requires expert knowledge.”

  --Andrew Ng


With four parameters I can fit an elephant, and with five I can make him wiggle his trunk.
— John von Neumann —
AZ QUOTES

Under- and Over-fitting examples

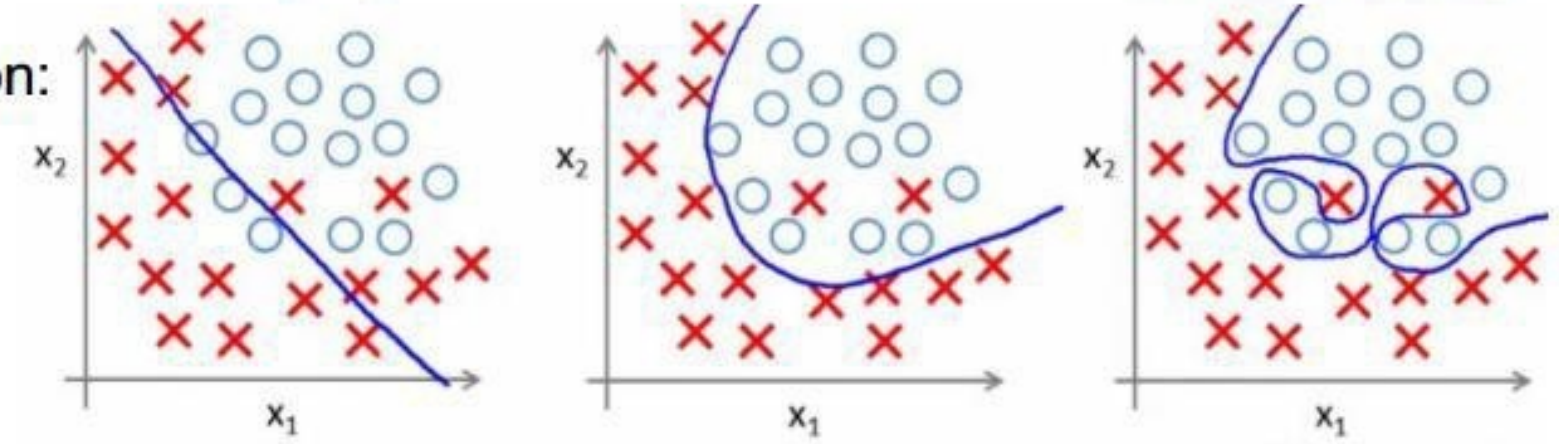
Regression:



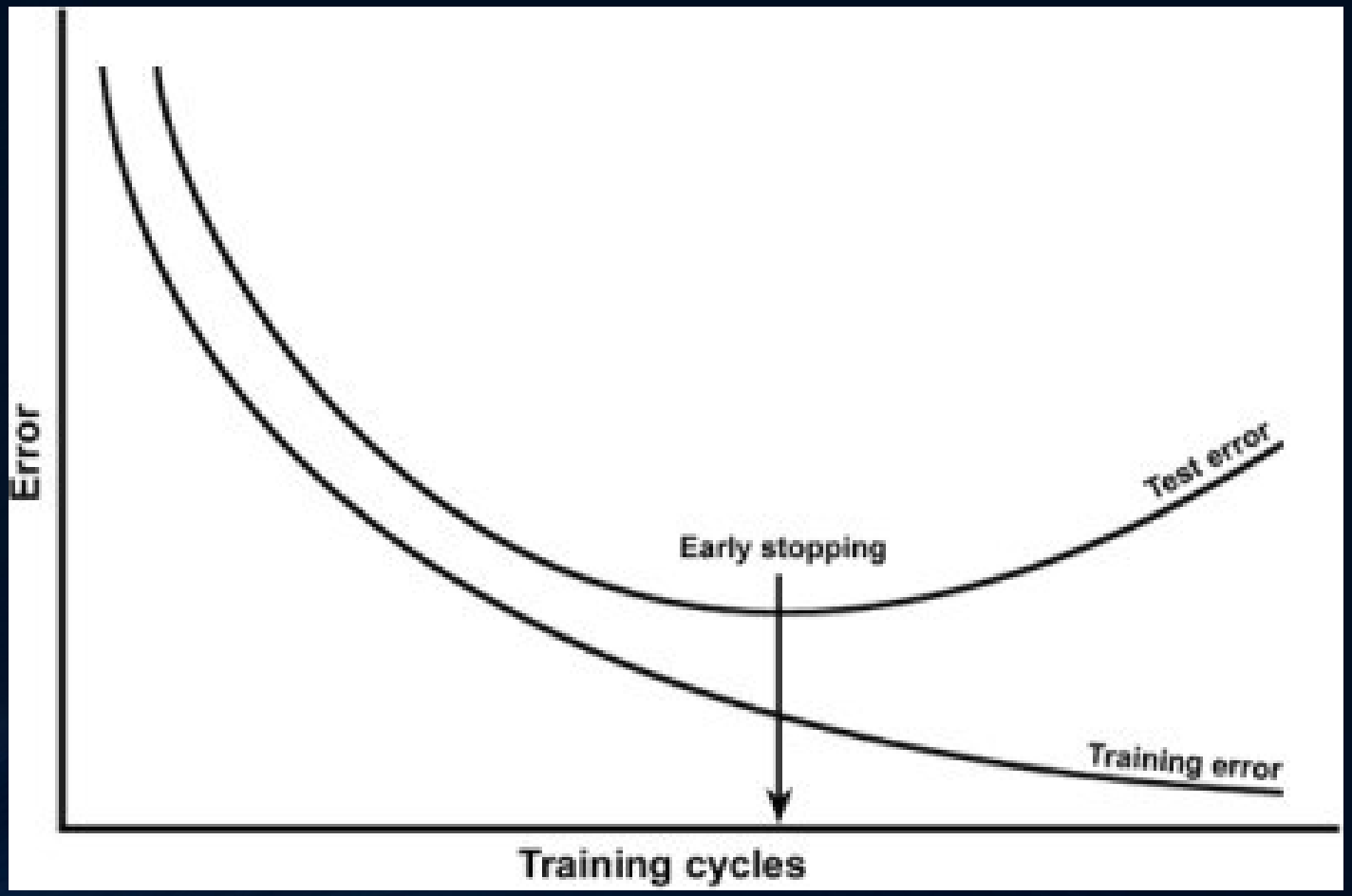
predictor too inflexible:
cannot capture pattern

predictor too flexible:
fits noise in the data

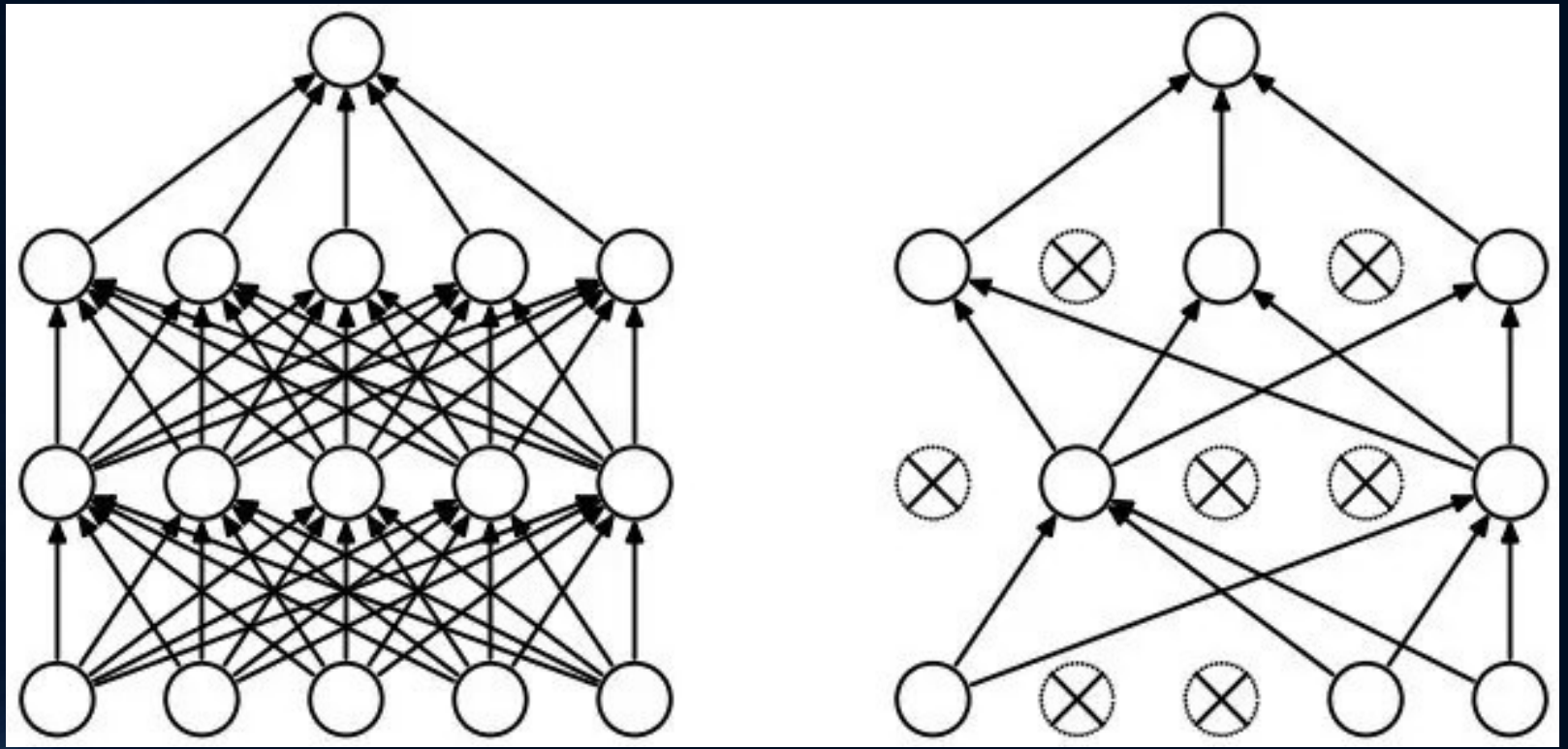
Classification:



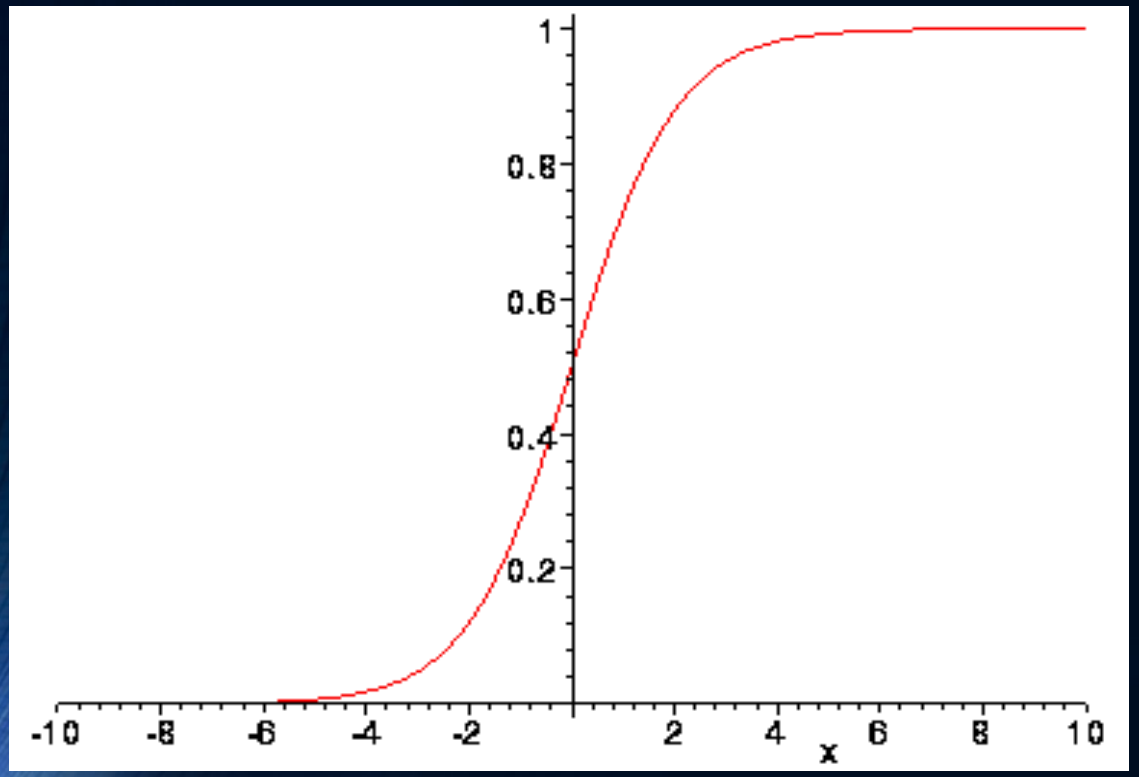
How to detect it in training process?

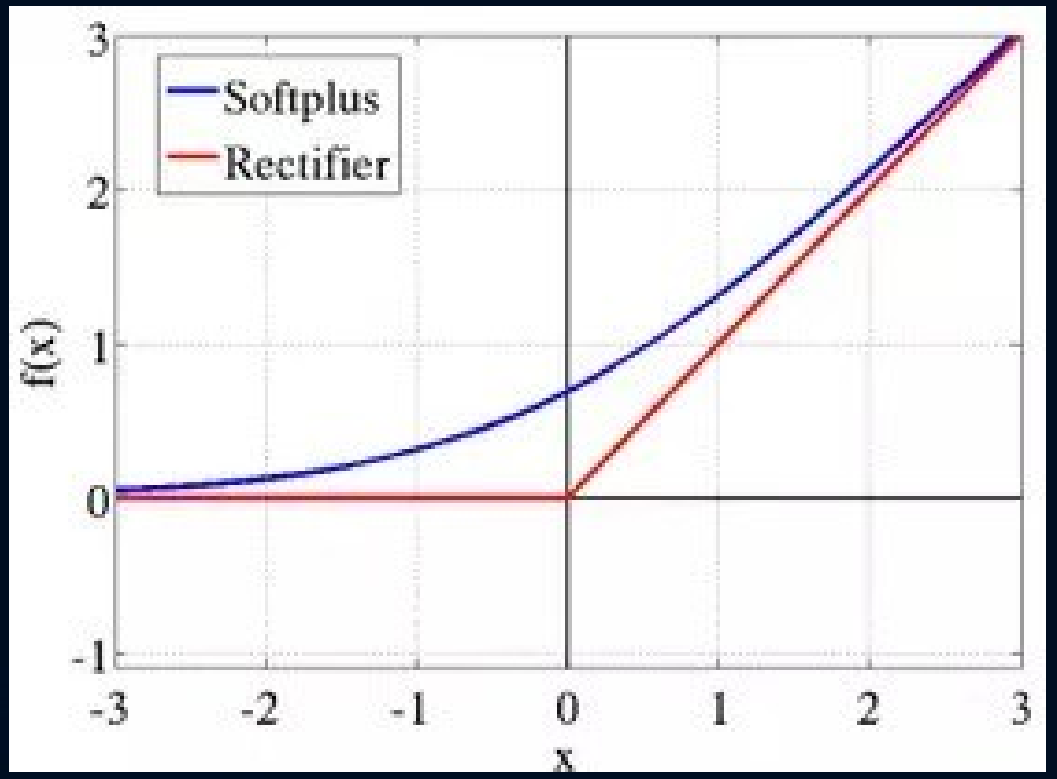


Dropout



Sigmod → ReLU


1
0.8
0.6
0.4
0.2
-10
-8
-6
-4
-2
2
4
6
8
10
x


Softplus
Rectifier
f(x)
3
2
1
0
-1
-3
-2
-1
0
1
2
3
x

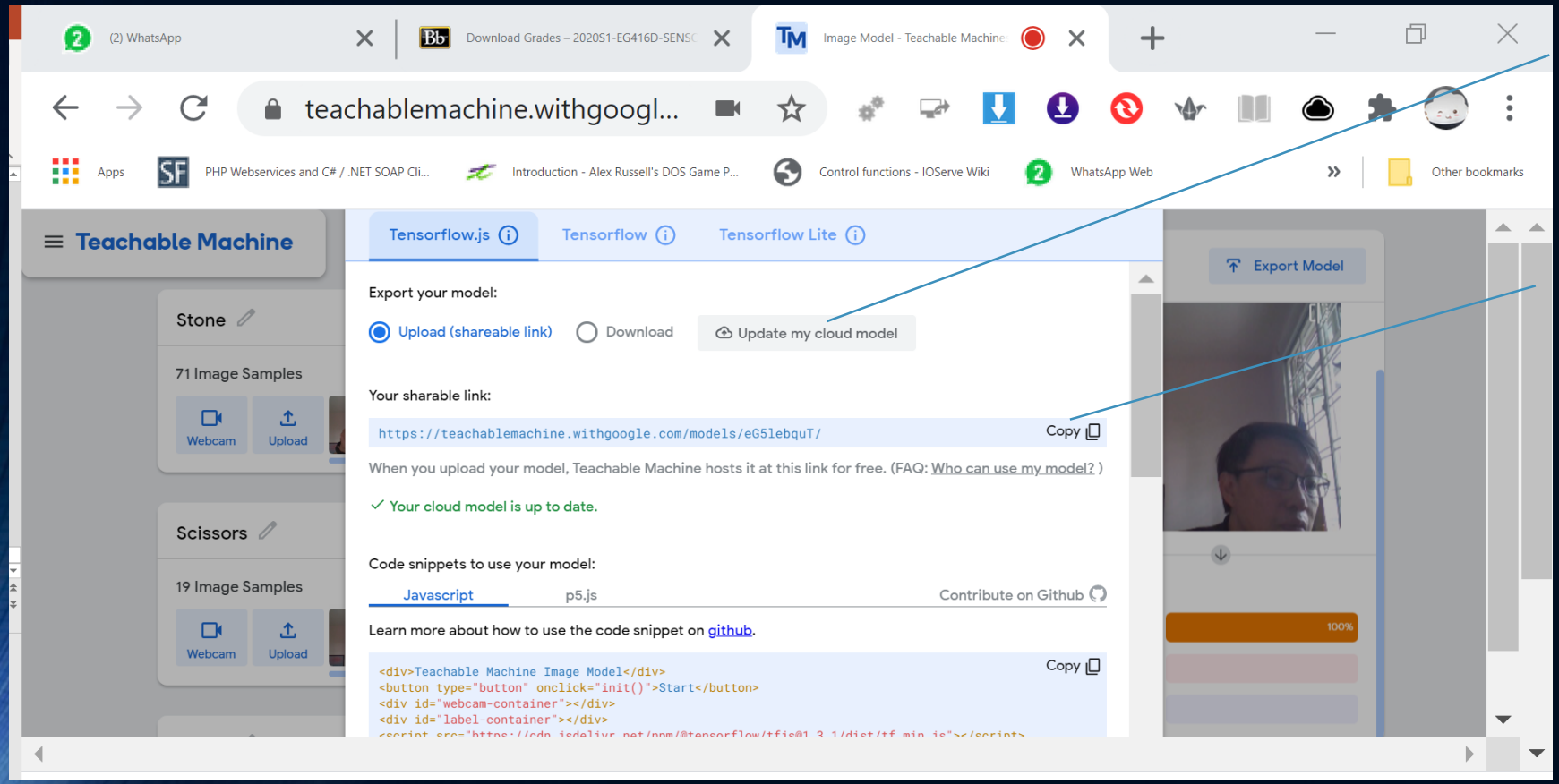
Is Deep Learning Taking Over the World?

- What applications are likely/unlikely to benefit from DL? Why?

Deep Learning Project

- https://teachablemachine.withgoogle.com/train

After training the mode



1. Press t

Neural Network/Deep Learning Site

- https://playground.tensorflow.org
- https://machinelearningforkids.co.uk
- https://www.edgeimpulse.com/blog