Machine Learning

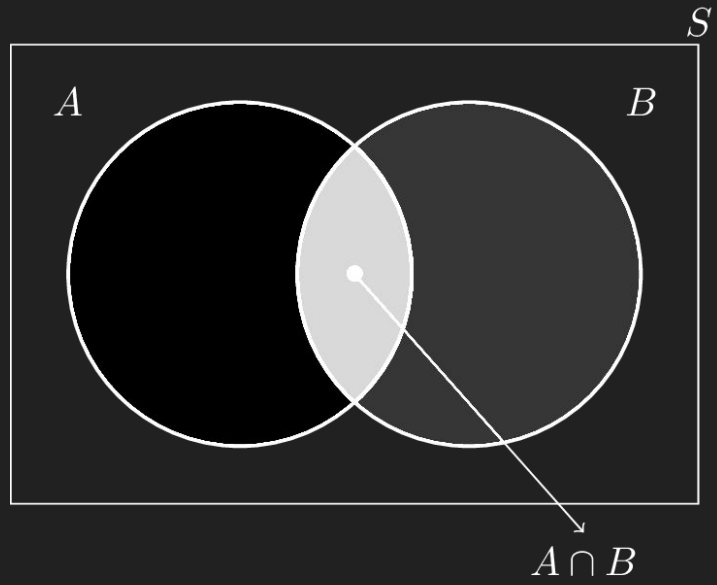
How computers can make predictions

Machine learning and AI

- Artificial intelligence is simply a program that is able to achieve a certain task we describe as “intelligence”.
  - Chat bots
  - NPCs
  - Computer Vision
  - Things that can *predict*
- Machine learning is the study of computer algorithms that improve automatically through experience. It is seen as a subset of artificial intelligence.
  - You have an equation that has some random variables (parameters)
  - An algorithm tries different parameters and *optimizes* for the best outcome.

A machine can learn?

- How do we estimate things that might happen, or more specifically, events?
- Probabilities!
- Probability theory and statistics are the core of machine learning
  - Also commonly referred to as “Statistical Learning” for this reason



$$P(A|B) = \frac{P(A \cap B)}{P(B)}$$

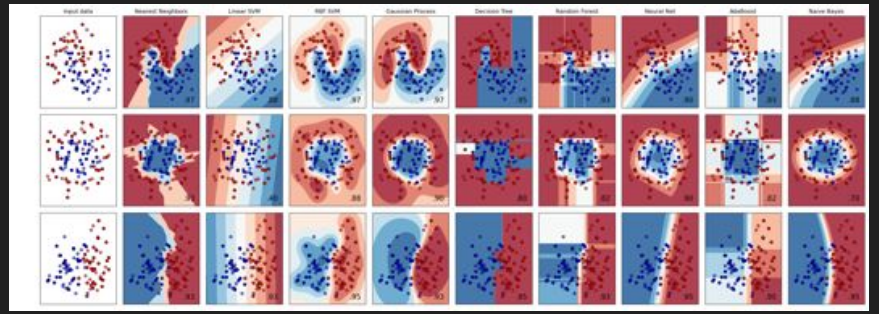
Libraries

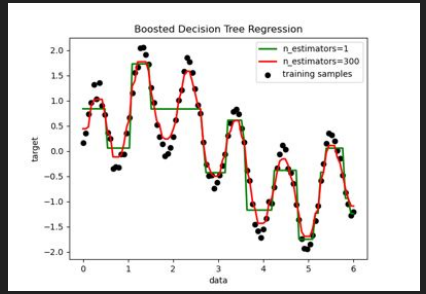
- scikit-learn
- Tensorflow/Keras
- PyTorch
- FastAI
- etc

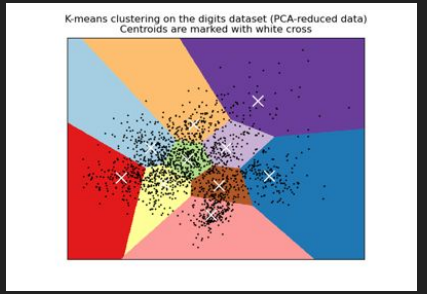
Models

- Algorithms
  - KNN
  - Naive Bayes
  - Random Forest
  - Decision Tree
  - Logistic Regression (Softmax)
  - Support Vector Machines
  - Linear Regression
  - Neural Networks
  - etc

- Models
  - Classification
  - Clustering
  - Regression
  - Time-series forecasting
  - etc

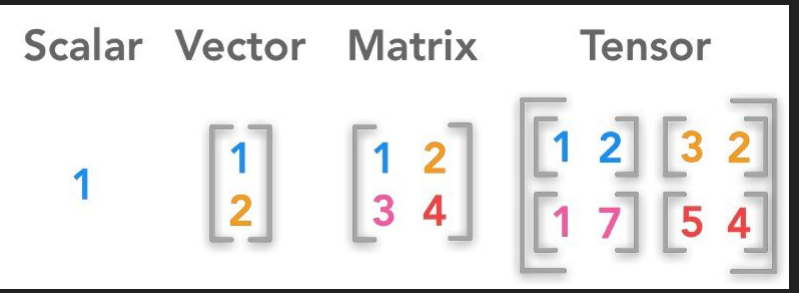


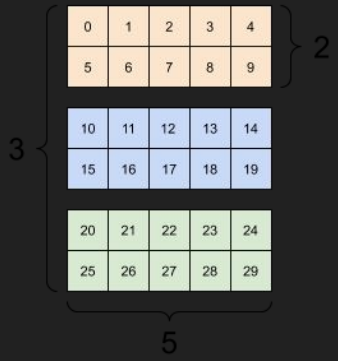


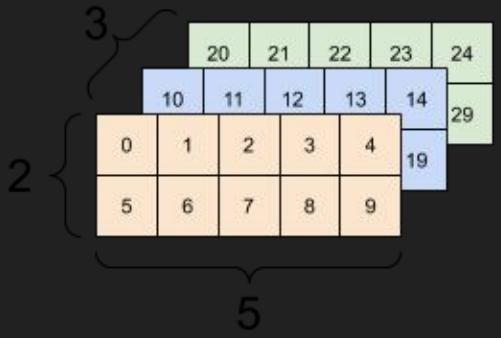


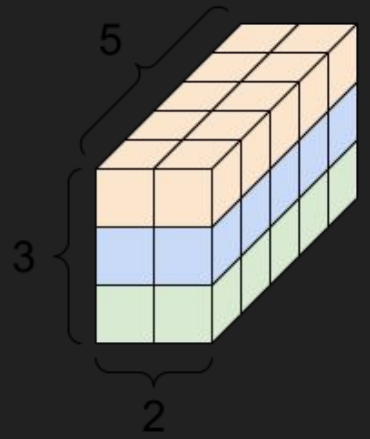
Tensorflow?

- What's a tensor?
  - 3D Matrix (matrix of vectors)
- Tensorflow works with tensors
- Primarily neural network based
  - Has other functions as well









(Deep) Neural Network

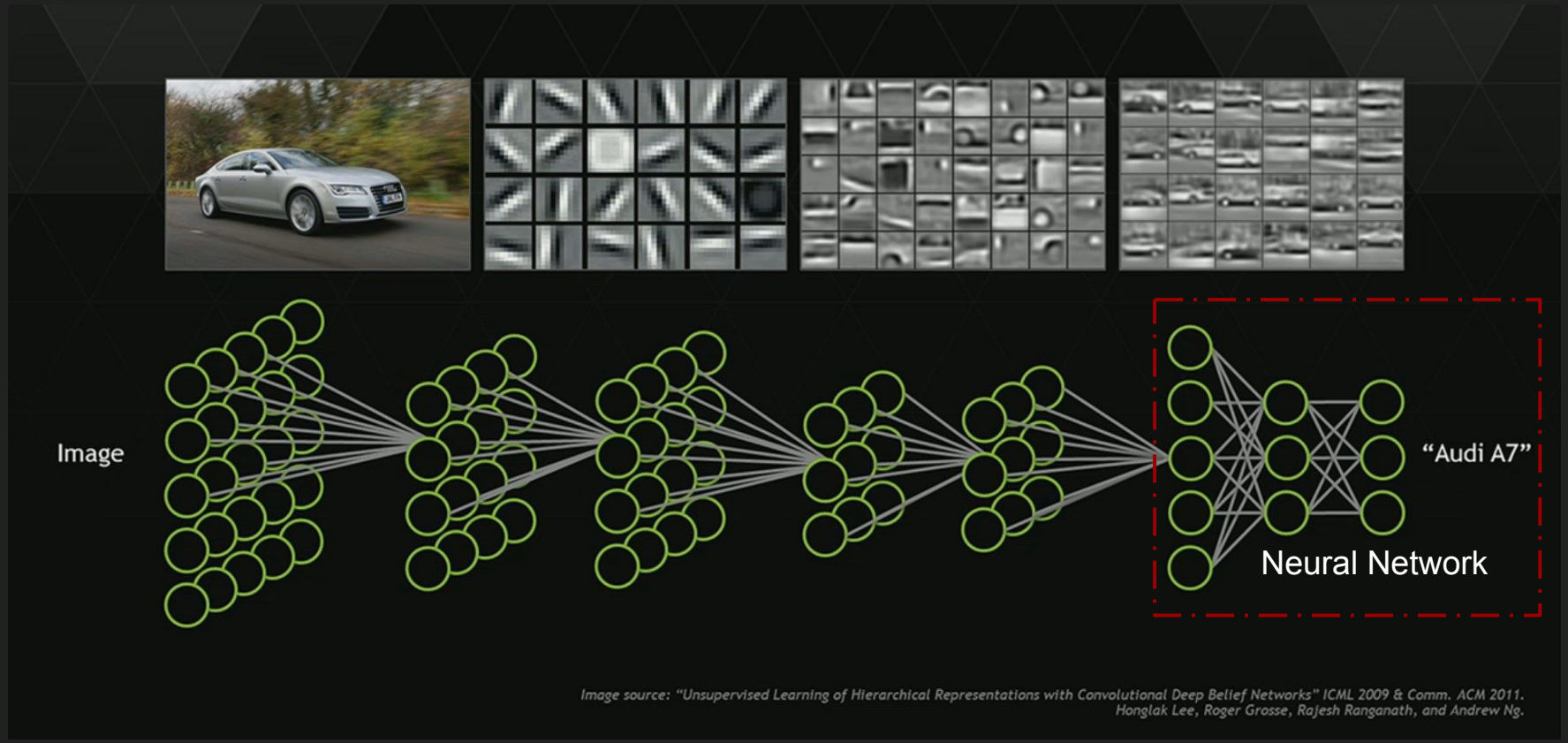


Image source: "Unsupervised Learning of Hierarchical Representations with Convolutional Deep Belief Networks" ICML 2009 & Comm. ACM 2011. Honglak Lee, Roger Grosse, Rajesh Ranganath, and Andrew Ng.

https://github.com/OS2G/tensorflow