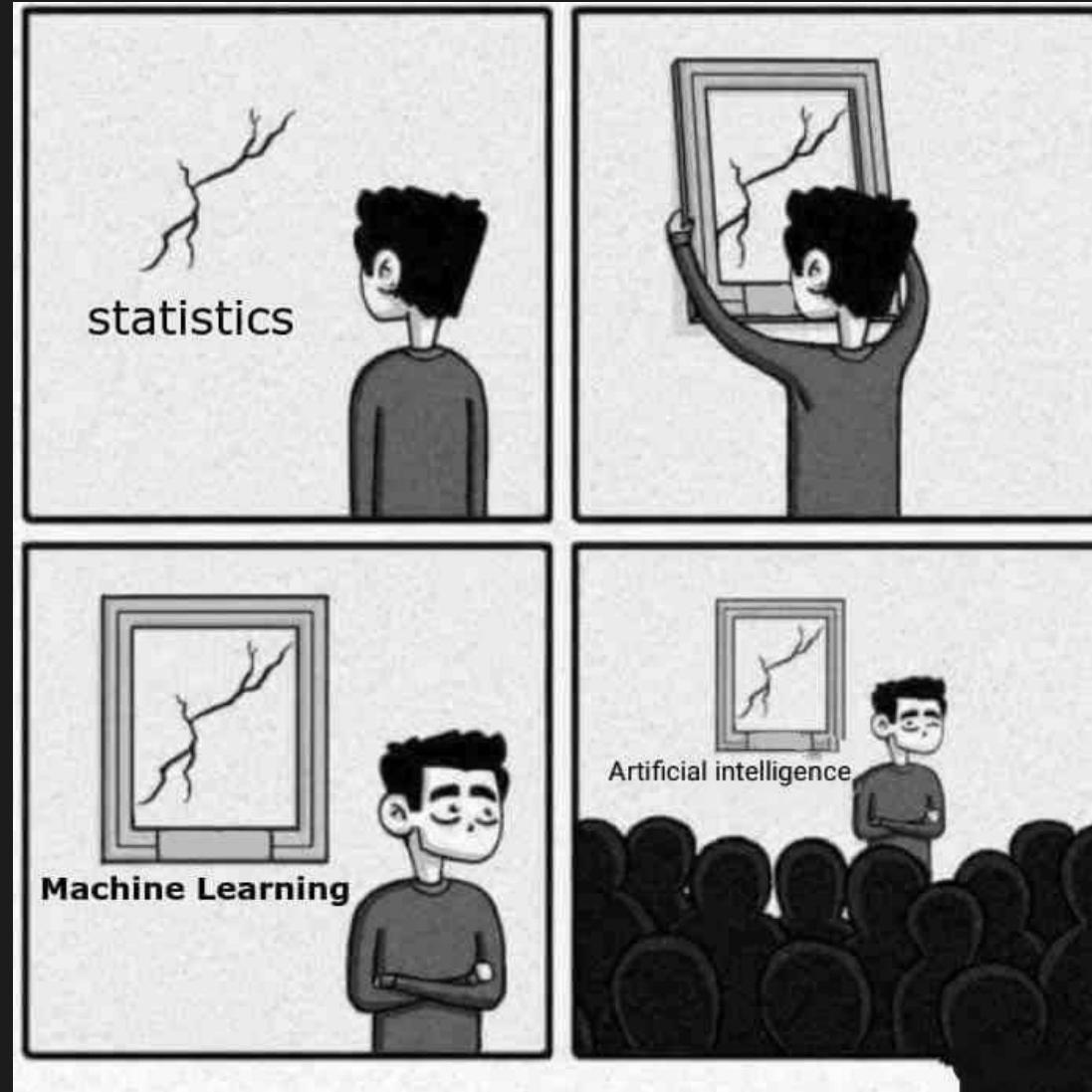


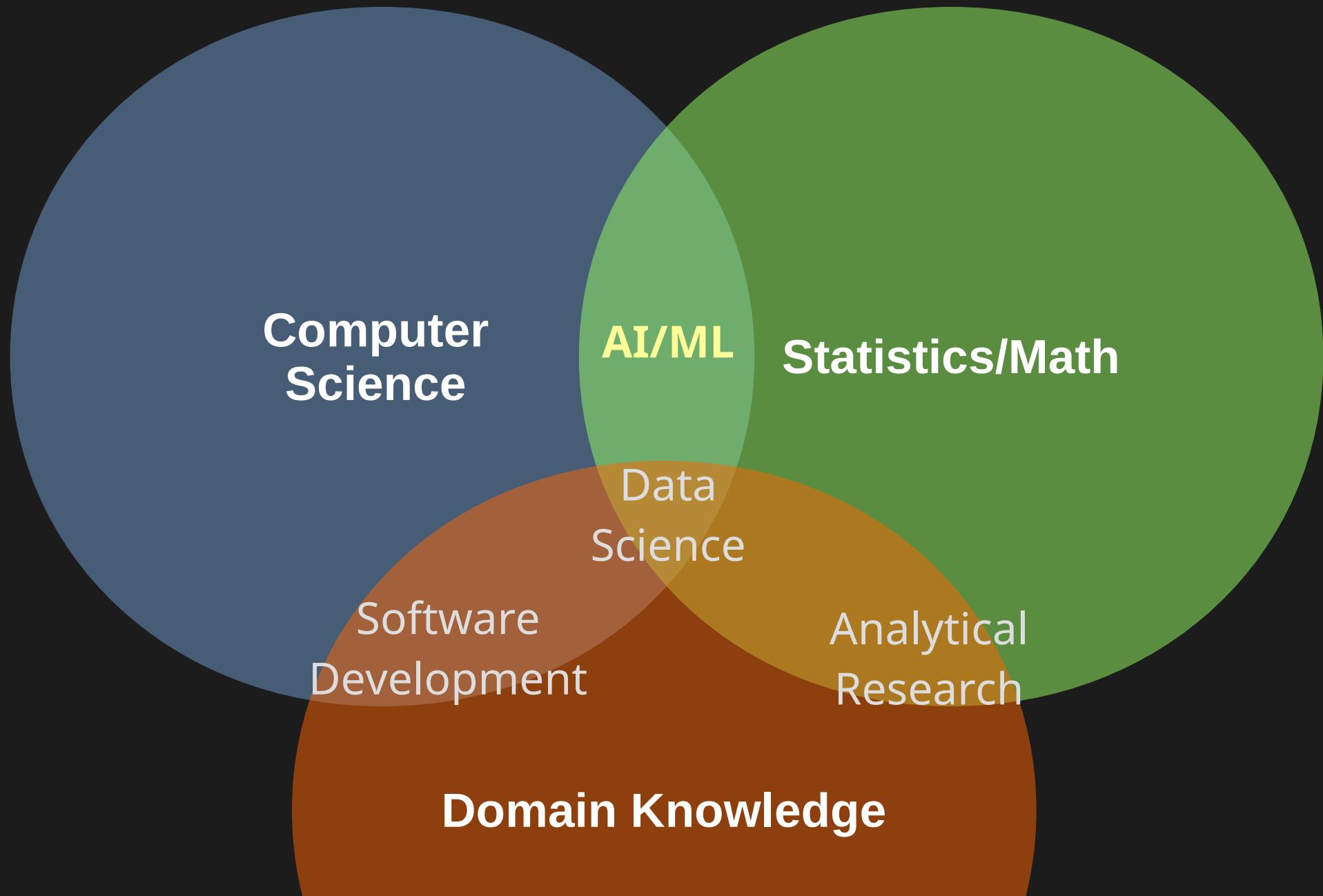
Introduction to Machine Learning

A Gentle Introduction

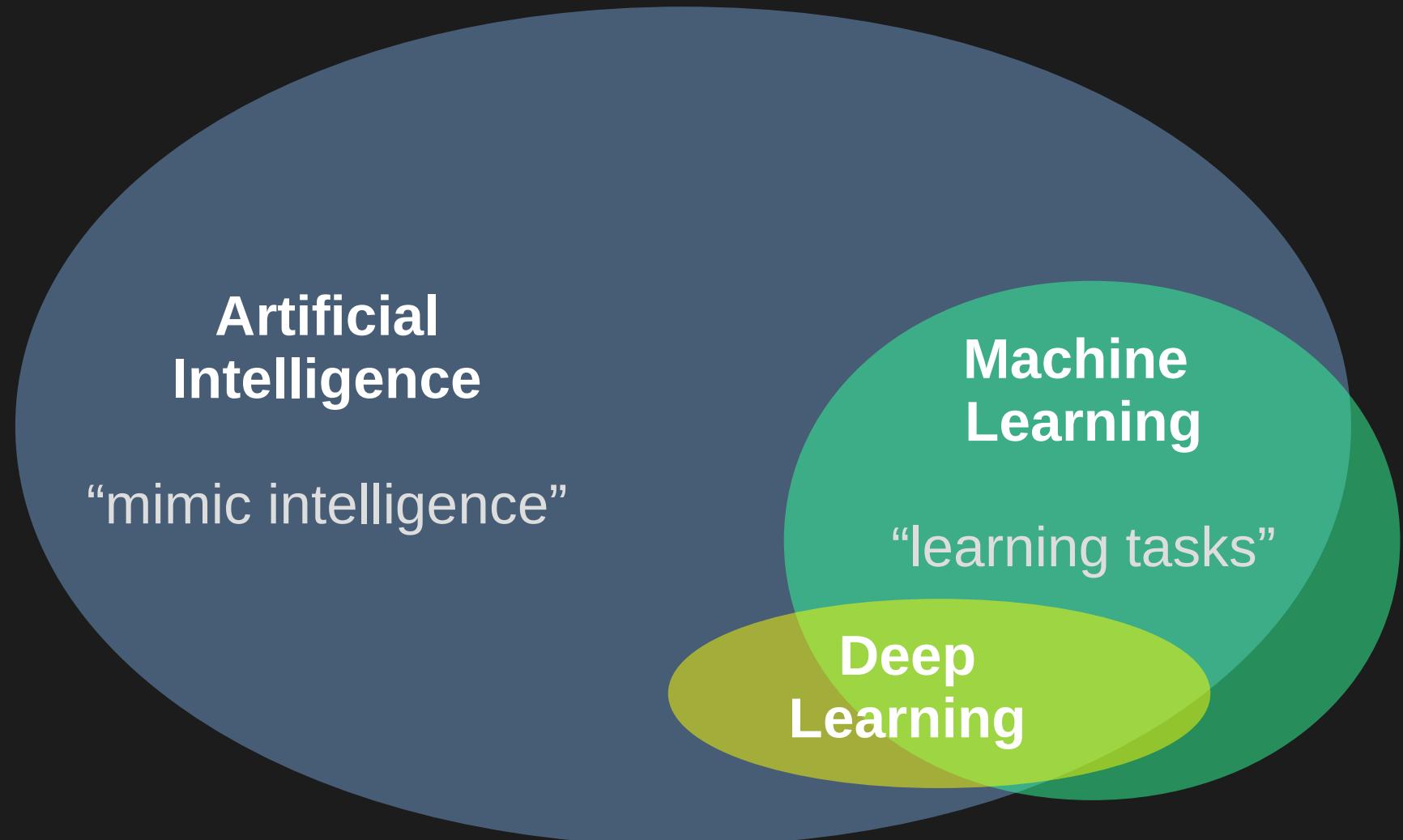
What is ML?



What is ML - in more detail



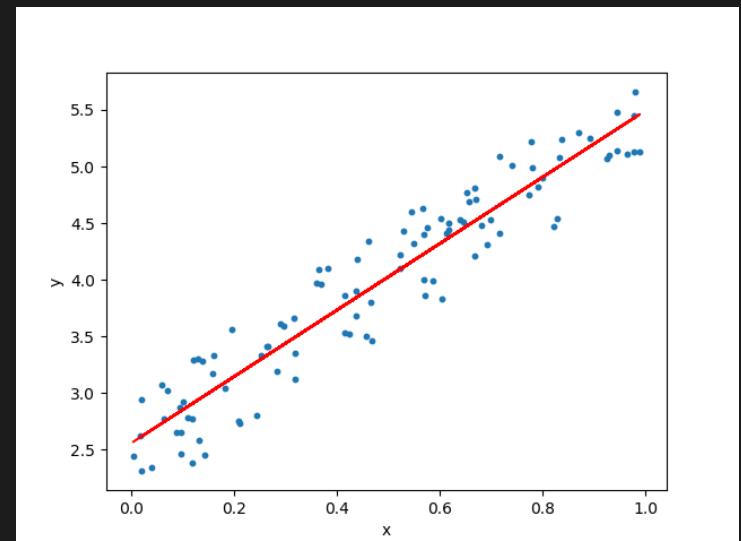
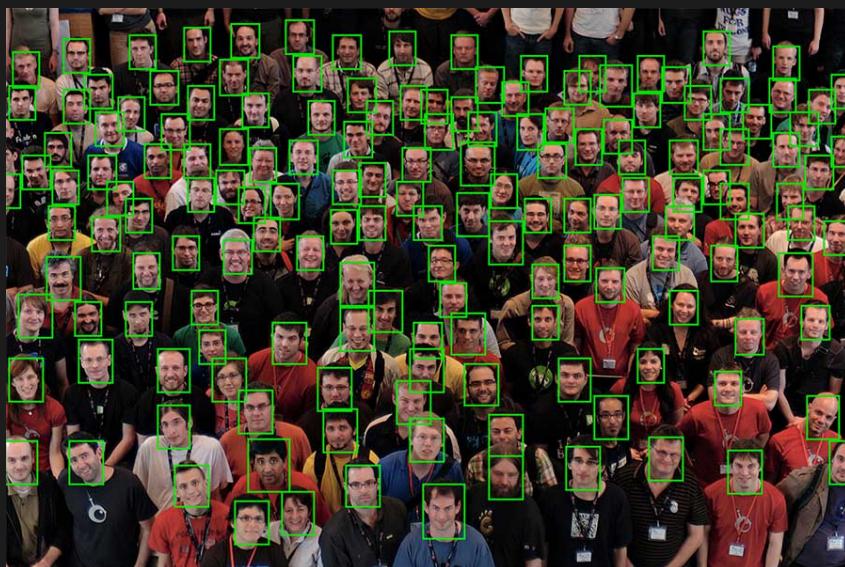
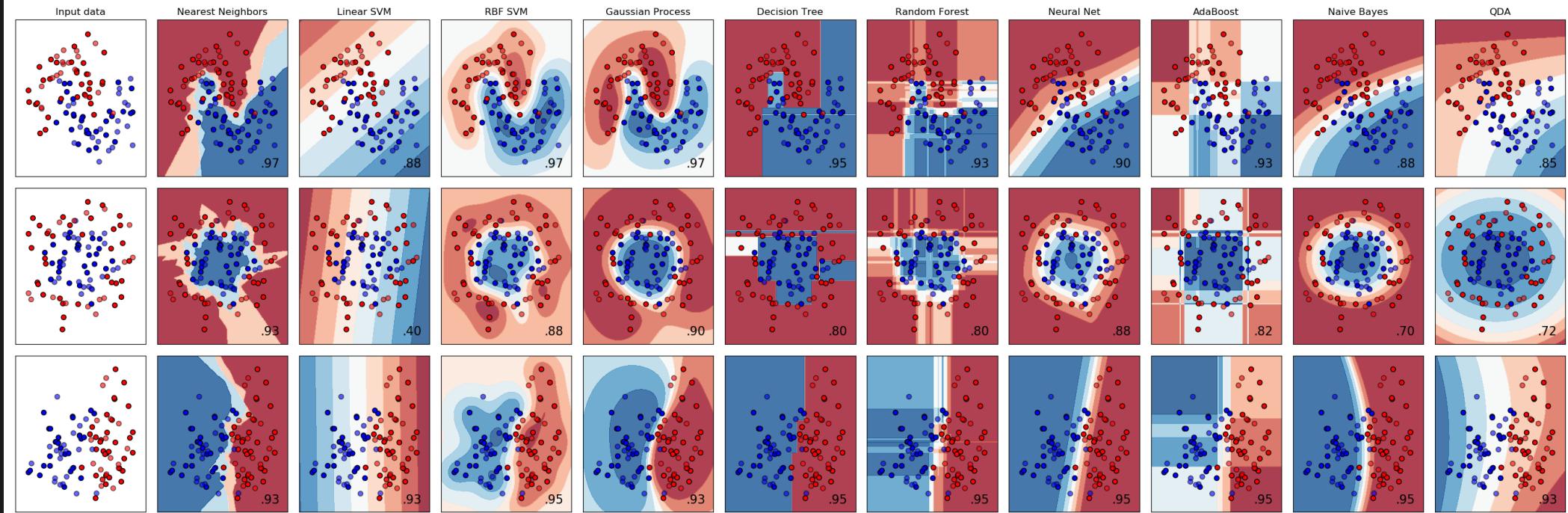
AI vs. ML?



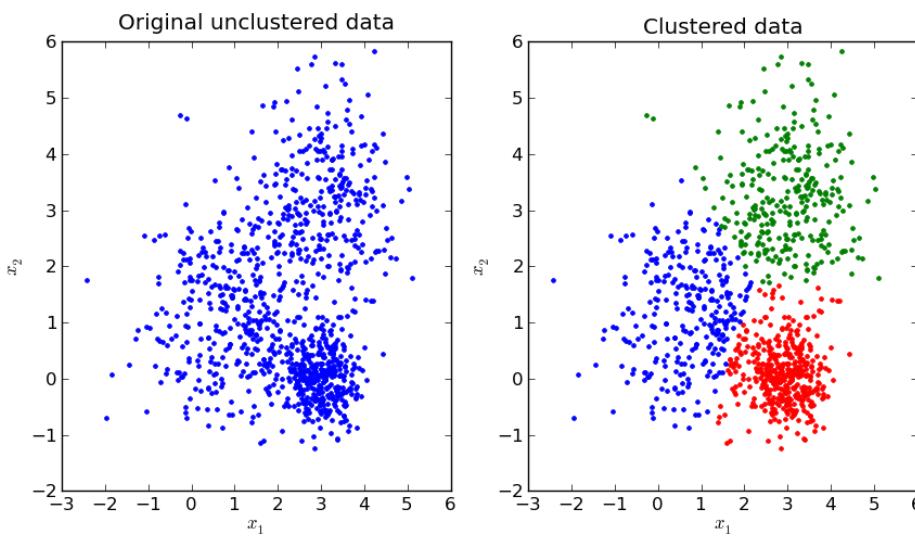
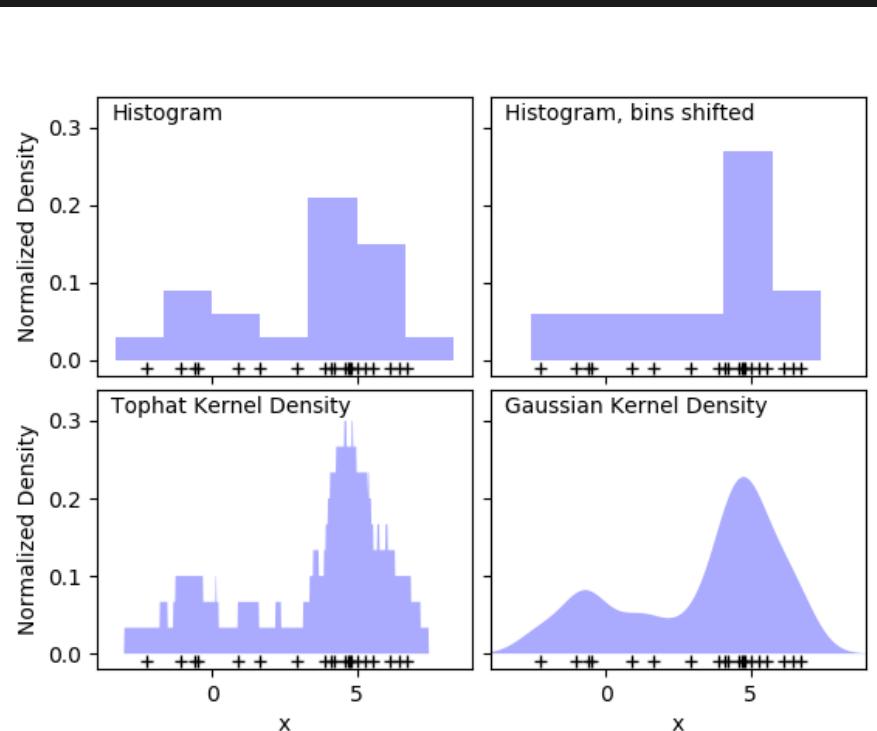
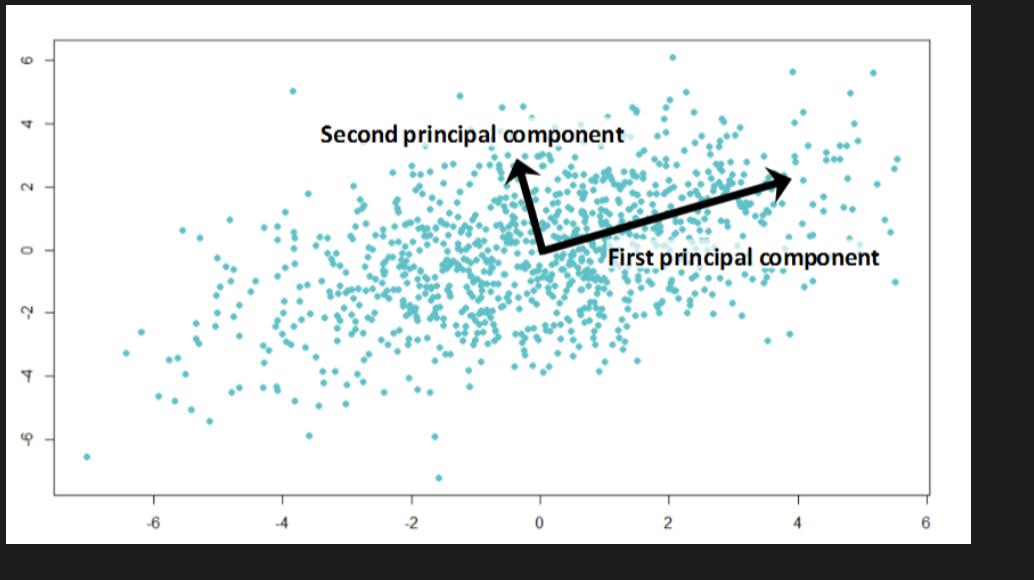
What tasks can ML solve?

- **Unsupervised Learning**
find structure in data (“insight”) without guidance
- **Supervised Learning**
predict (“target”) variable based on a “training sample”
 - Regression: predict continuous variable
 - Classification: predict discrete categories
- Reinforcement Learning
learn rules through rewards

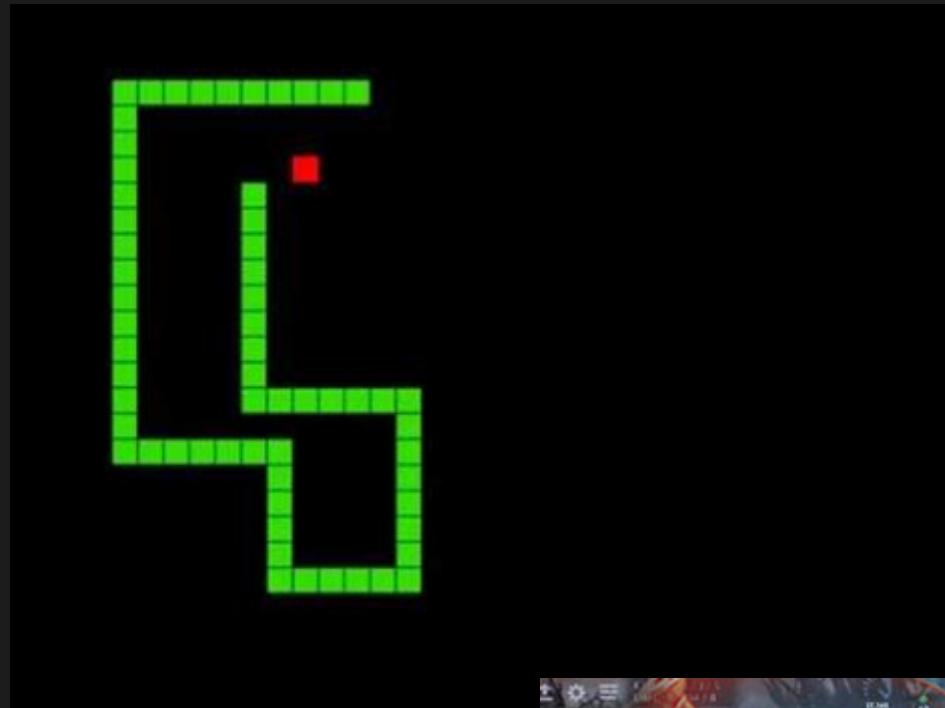
Supervised Learning: Examples



Unsupervised Learning: Examples



Reinforcement Learning: Examples



Snake



Chess



DOTA 2

Python Resources (Open Source)

- Data handling: **Pandas** (pandas.pydata.org)
flexible and convenient framework for working with large data sets
- Machine Learning: **Scikit-learn** (scikit-learn.org)
probably the largest ML library out there with excellent documentation, examples, and huge community
- Math framework for ML and Deep Learning:
pytorch (pytorch.org)
cuda-compatible framework to build your own models; autograd; specialized for computer vision

Scikit-learn

- Module structure
- Example data sets
- *.train, *.fit, *transform
- Random seeds
- a simple linear regression example
- See this notebook

Schedule for this Seminar

Unsupervised Learning Methods

- Clustering methods
- Kernel-density estimation
- Principal Component Analysis

November 22

Supervised Learning Concepts

- Data: training/test/validation data, iid
- Objective functions
- Metrics and Errors
- Regularization and Generalization
- Parameters and Hyperparameters

November 25

Supervised Learning Methods

- K-nearest neighbors
- Decision trees
- Ensemble methods: random forests
- Hyperparameter tuning

December 4

Deep Learning

- Neurons and perceptrons
- Multi-layer perceptrons
- Stochastic Gradient Descent and Backprop
- Convolutional Neural Networks
- Why Deep Learning is the hot stuff right now...

December 13