**# What Is Machine Learning?**

\* Machines can perform tasks really fast

\* We give them instructions to do tasks and they do it for us

\* Computers used to mean people who do tasks that compute

Problem 1: How to get to David house using Google maps?

Imagine we had ten different routes to David house

Option 1: I measure each route one by one

Option 2: I program and tell the computer to calculate these 10 routes and find the shortest one.

Problem 2: Somebody left a review on Amazon. Is this person angry?

How can I describe to a computer what angry means?

We let machines take care of the easier part of which things we can describe

Things that are hard to just give instructions to, we let human do it

\* The goal of machine learning is to make machines act more and more like humans**.**

**# AI/Machine Learning/Data Science**

\* AI: machine that acts like human

\* Narrow AI: machine that acts like human at a specific task

\* General AI: machine that acts like human with multiple abilities

\* Machine Learning: a subset of AI

\* Machine Learning: an approach to achieve artificial intelligence through systems that can find patterns in a set of data

\* Machine Learning: the science of getting computers to act without being explicitly programmed

\* Deep Learning: a subset of Machine Learning

\* Deep Learning: one of the techniques for implementing machine learning

\* Data Science: Analyzing data and then doing something with a business goal

**# How Did We Get Here?**

* Goal: Make business decisions
* Spreadsheets -> Relational DB -> Big Data (NoSQL) -> Machine Learning
* Massive amounts of data
* Massive improvements in computation

# Steps in a full machine learning project

Data collection (hardest part) -> Data modelling -> Deployment

# **Data collection**

* + How to clean noisy data?
  + What can we grab data from?
  + How do we find data?
  + How do we clean it so we can actually learn from it?
  + How to turn data from useless to useful?

**# Data modelling**

* + Problem definition: What problem are we trying to solve?
  + Data: What data do we have?
  + Evaluation: What defines success?
  + Features: What features should we model?
  + Modelling: What kind of model should we use?
  + Experiments: What have we tried / What else can we try?

**#** [**Types of Machine Learning**](http://vas3k.com/blog/machine_learning/)

* Predict results based on incoming data
* Supervised: Data are labeled into categories
  + classification: is this an apple or is this a pear?
  + regression: based on input to predict stock prices
* Unsupervised: Data don't have labels
  + clustering: machine to create these groups
  + association rule learning: associate different things to predict what a customer might buy in the future
* Reinforcement: teach machines through trial and error
* Reinforcement: teach machines through rewards and punishment
  + skill acquisition
  + real time learning

**# What Is Machine Learning? Round 2**

* Now: Data -> machine learning algorithm -> pattern
* Future: New data -> Same algorithm (model) -> More patterns
* Normal algorithm: Starts with inputs and steps -> Makes output
* Machine learning algorithm
  + Starts with inputs and output -> Figures out the steps
* Data analysis is looking at a set of data and gain an understanding of it by comparing different examples, different features and making visualizations like graphs
* Data science is running experiments on a set of data with the hopes of finding actionable insights within it
  + One of these experiments is to build a machine learning model
* Data Science = Data analysis + Machine learning
* Section Review
  + Machine Learning lets computers make decisions about data
  + Machine Learning lets computers learn from data and they make predictions and decisions
  + Machine can learn from big data to predict future trends and make business decision