Machine Learning Specialization

Welcome

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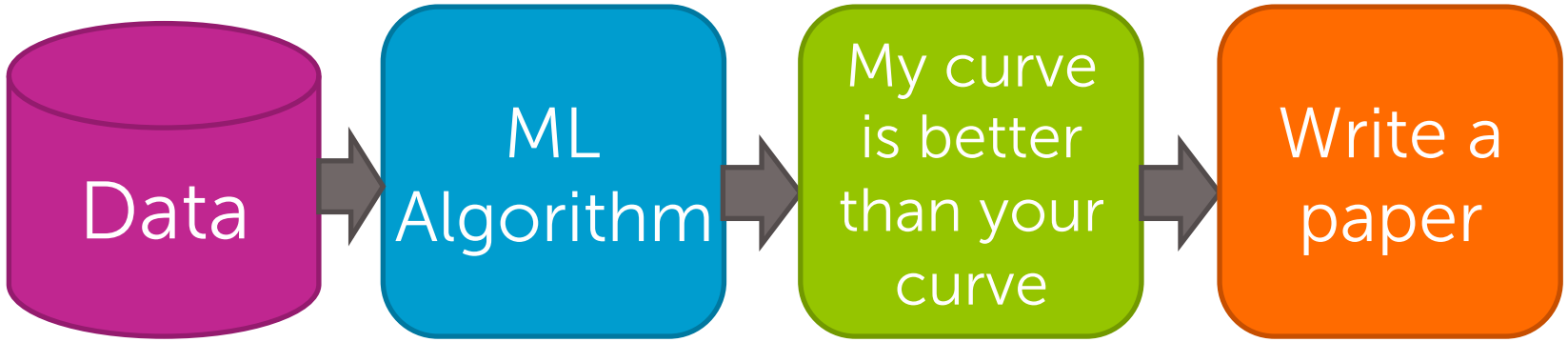
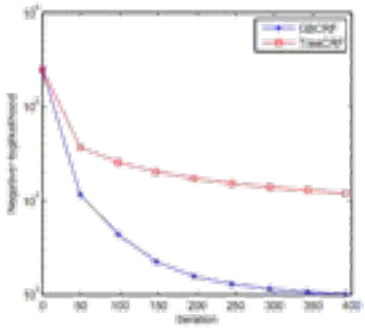
Machine Learning Specialization

University of Washington

Machine learning is changing the world

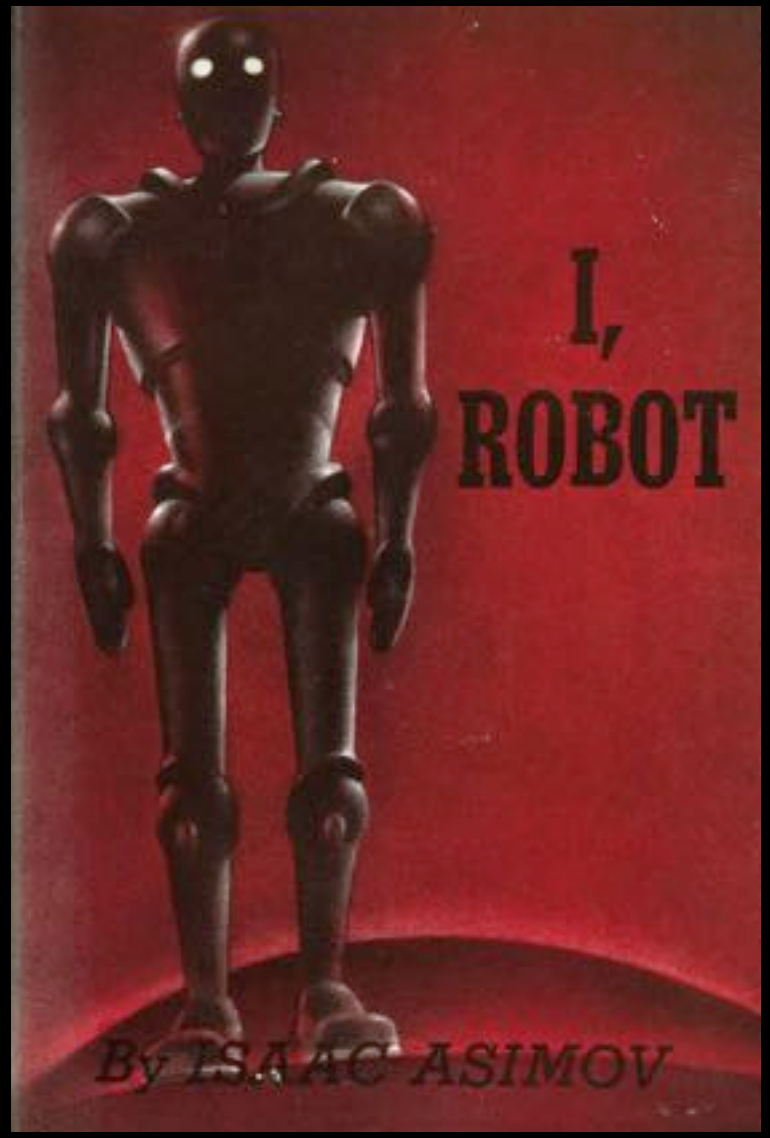
Old view of ML





Neural Information Processing Systems Foundation

ICML

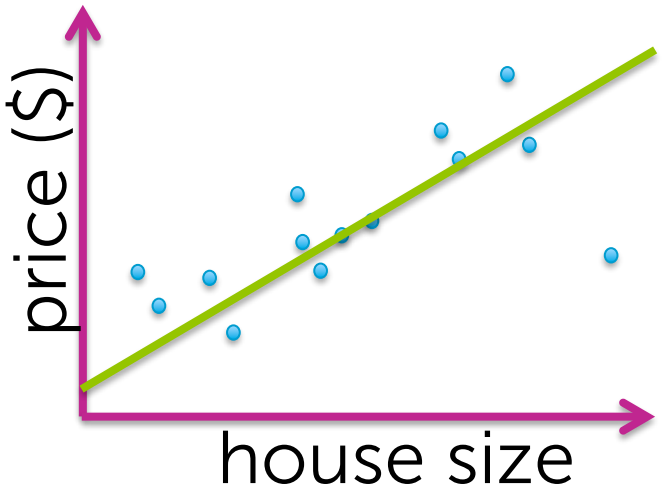


The machine learning pipeline

ML case studies

Case Study 1: Predicting house prices

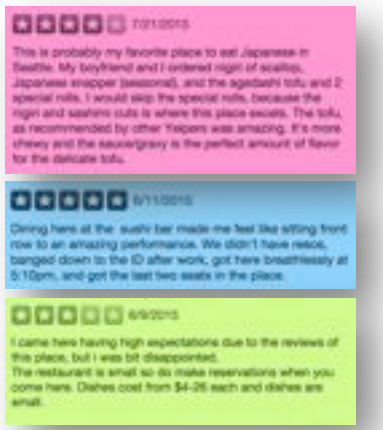
+ house features

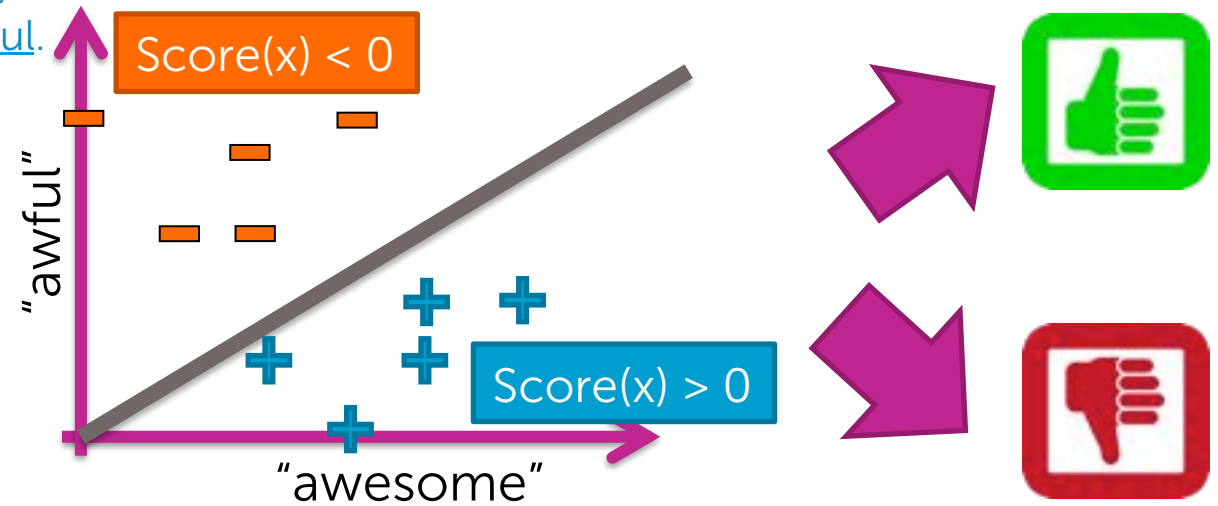


Case Study 2: Sentiment analysis

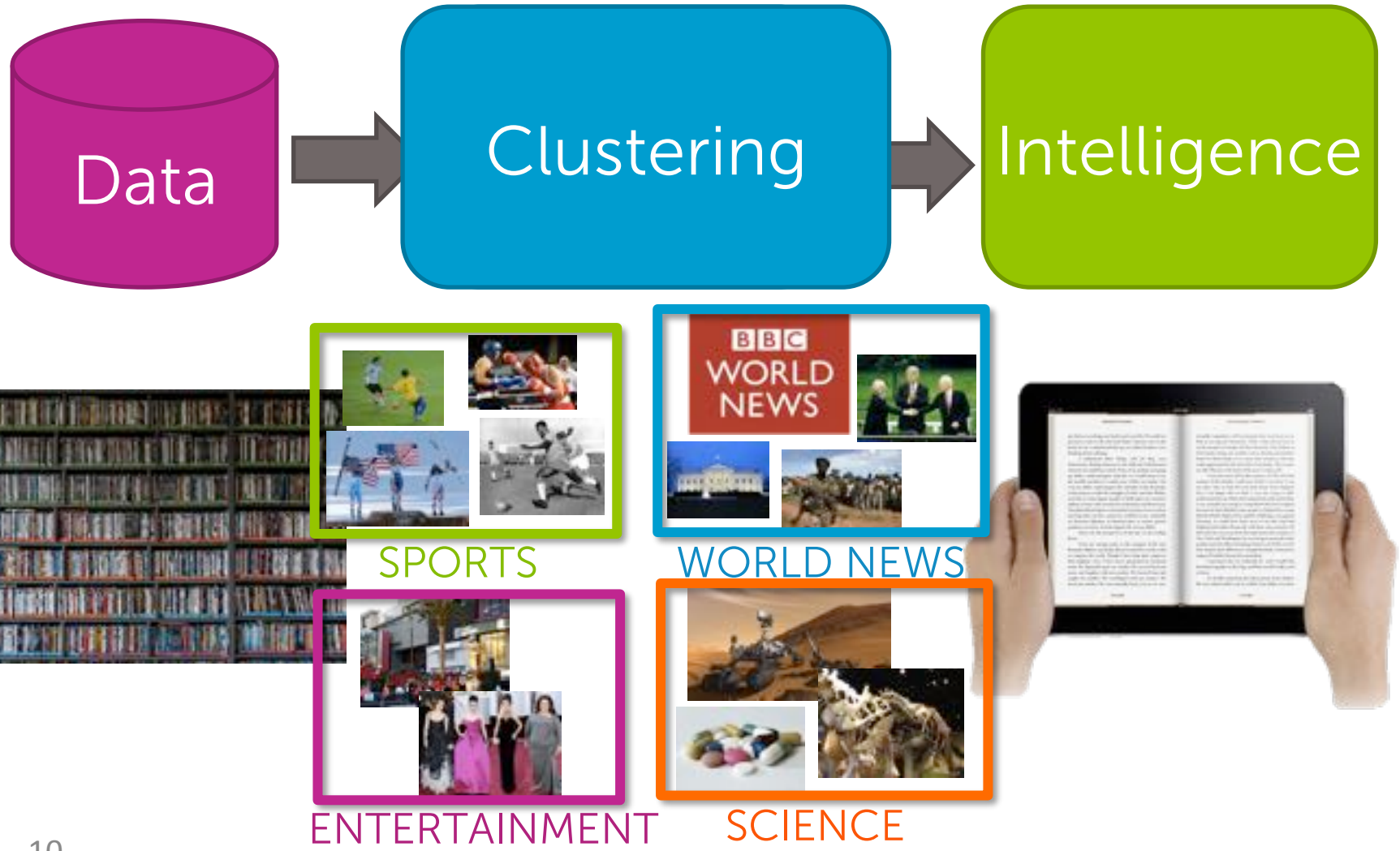
Sushi was awesome,
the food was awesome,
but the service was awful.

All reviews:

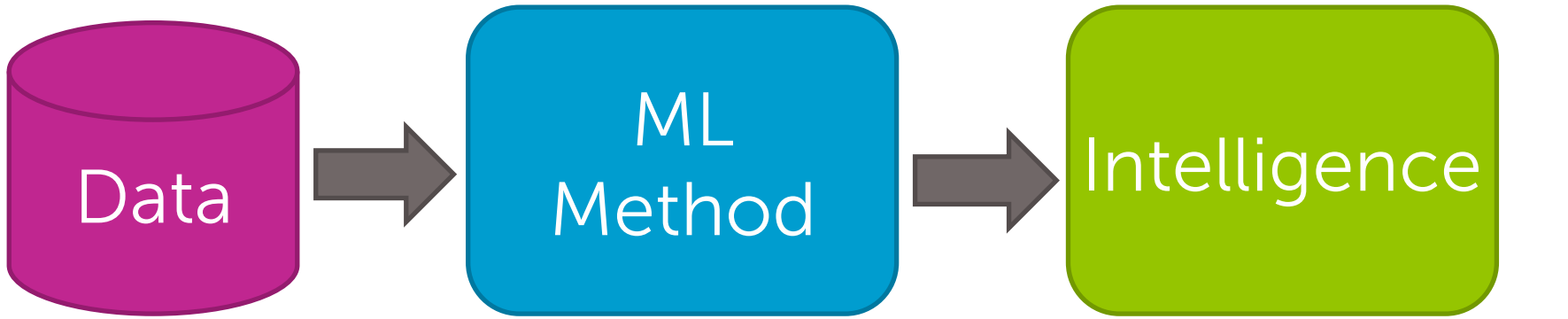




Case Study 3: Document retrieval



Case Study 4: Product recommendation



Your past purchases:

+ purchase histories of **all** customers

Recommended items:

Case Study 4: Product recommendation

Your past purchases:

+ purchase histories of **all** customers

Customers

features

features

features

Products

features

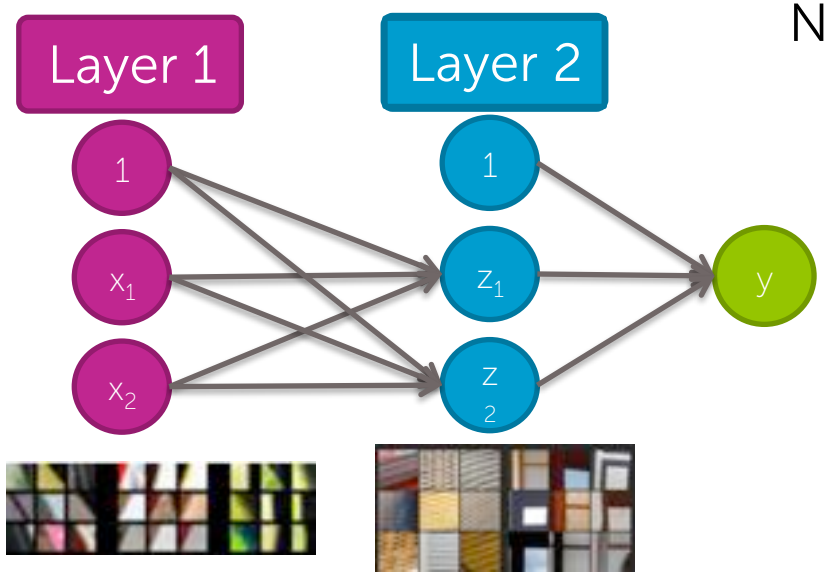
features

features

Recommended items:

Case Study 5: Visual product recommender

Input images:



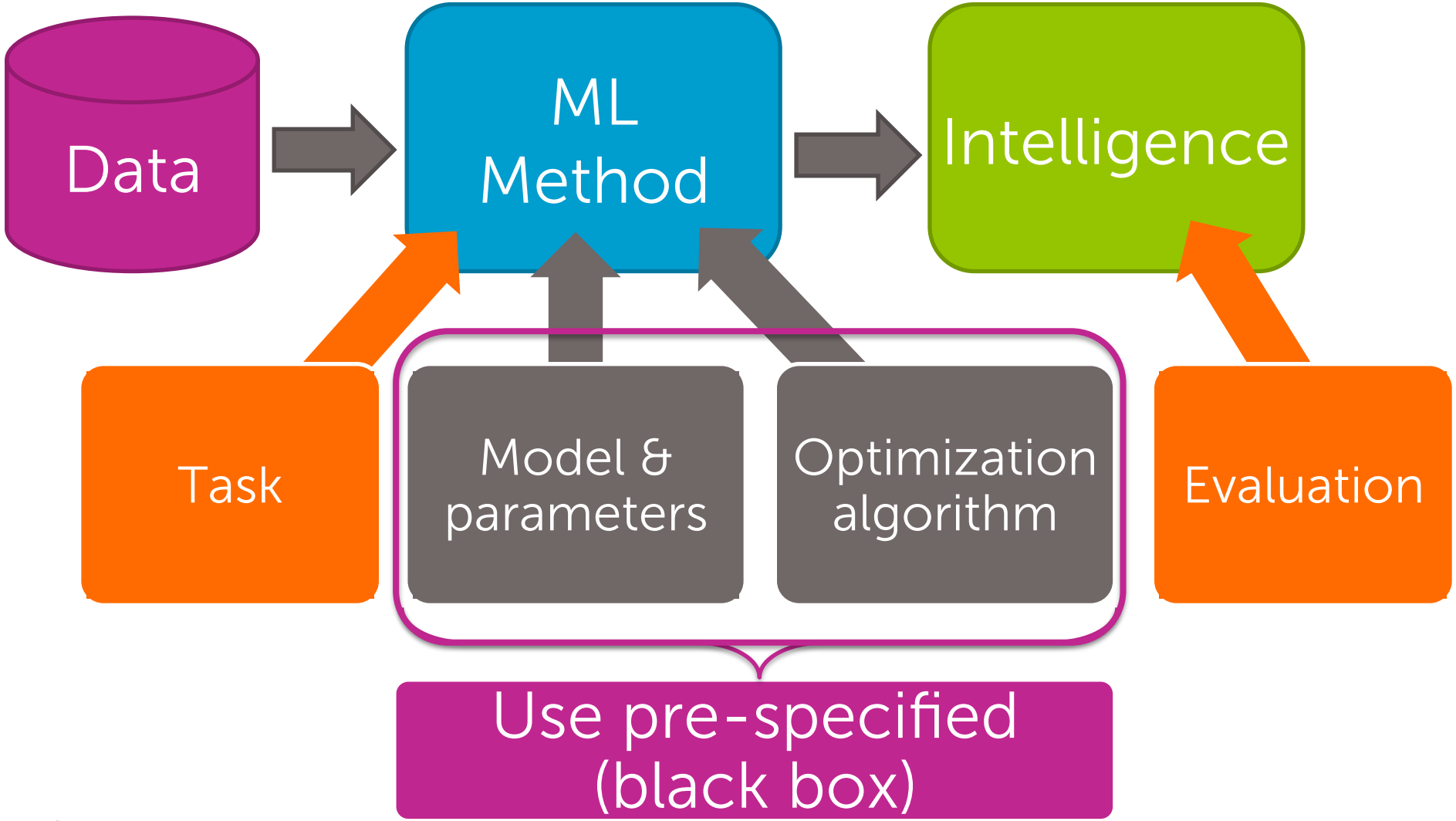
Nearest neighbors:

A unique ML specialization

Not like other ML courses out there…

From use cases to models & algorithms

First course is about building, evaluating and deploying *intelligence in each case study*...



Subsequent courses provide depth in models & algorithms, but still use case studies

2. Regression
3. Classification
4. Clustering & Retrieval
5. Matrix Factorization & Dimensionality Reduction
6. *Capstone:* Build an Intelligent Application with Deep Learning

2. Regression

Case study: Predicting house prices

Models

- Linear regression
- Regularization: Ridge (L2), Lasso (L1)

Algorithms

- Gradient descent
- Coordinate descent

Concepts

- Loss functions, bias-variance tradeoff, cross-validation, sparsity, overfitting, model selection

3. Classification

Case study: Analyzing sentiment

Models

- Linear classifiers (logistic regression, SVMs, perceptron)
- Kernels
- Decision trees

Algorithms

- Stochastic gradient descent
- Boosting

Concepts

- Decision boundaries, MLE, ensemble methods, random forests, CART, online learning

4. Clustering & Retrieval

Case study: Finding documents

Models

- Nearest neighbors
- Clustering, mixtures of Gaussians
- Latent Dirichlet allocation (LDA)

Algorithms

- KD-trees, locality-sensitive hashing (LSH)
- K-means
- Expectation-maximization (EM)

Concepts

- Distance metrics, approximation algorithms, hashing, sampling algorithms, scaling up with map-reduce

5. Matrix Factorization & Dimensionality Reduction

Case study: Recommending Products

Models

- Collaborative filtering
- Matrix factorization
- PCA

Algorithms

- Coordinate descent
- Eigen decomposition
- SVD

Concepts

- Matrix completion, eigenvalues, random projections, cold-start problem, diversity, scaling up

6. *Capstone:*

An intelligent application using deep learning

Build & deploy
a recommender using
product images and
text sentiment

This specialization is for you if…

Level of the specialization

Motto:

tough concepts made intuitive
and applicable

minimize prereq knowledge
maximize ability to develop and deploy
learn concepts through case studies

Target audience

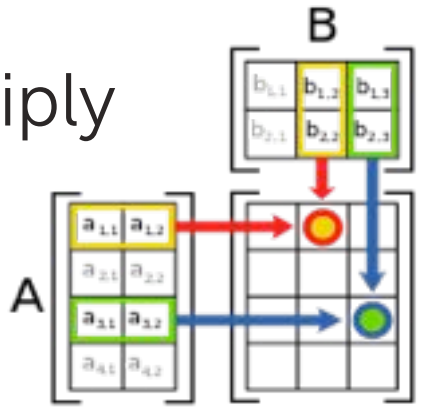
Software engineer

Scientist

Data enthusiast

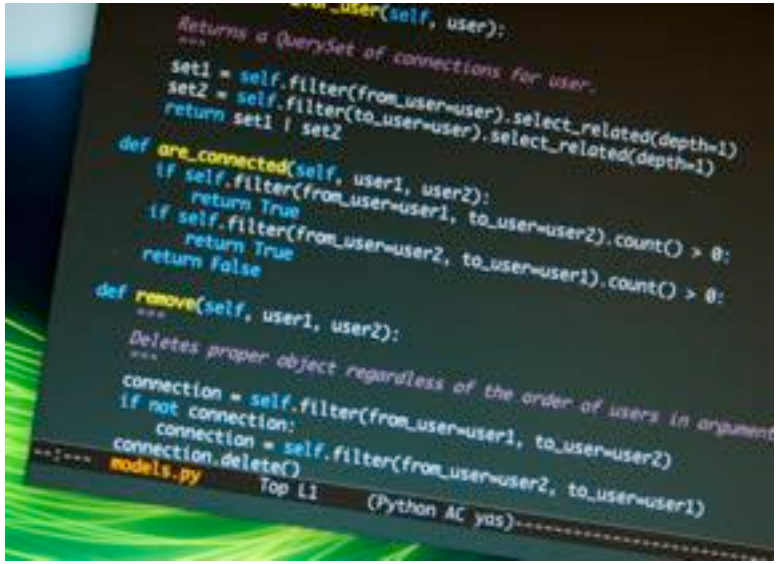
Math background

- Basic calculus
  - Concept of derivatives
- Basic linear algebra
  - Vectors
  - Matrices
  - Matrix multiply



Programming experience

- Basic Python used
  - Can pick up along the way if knowledge of other language

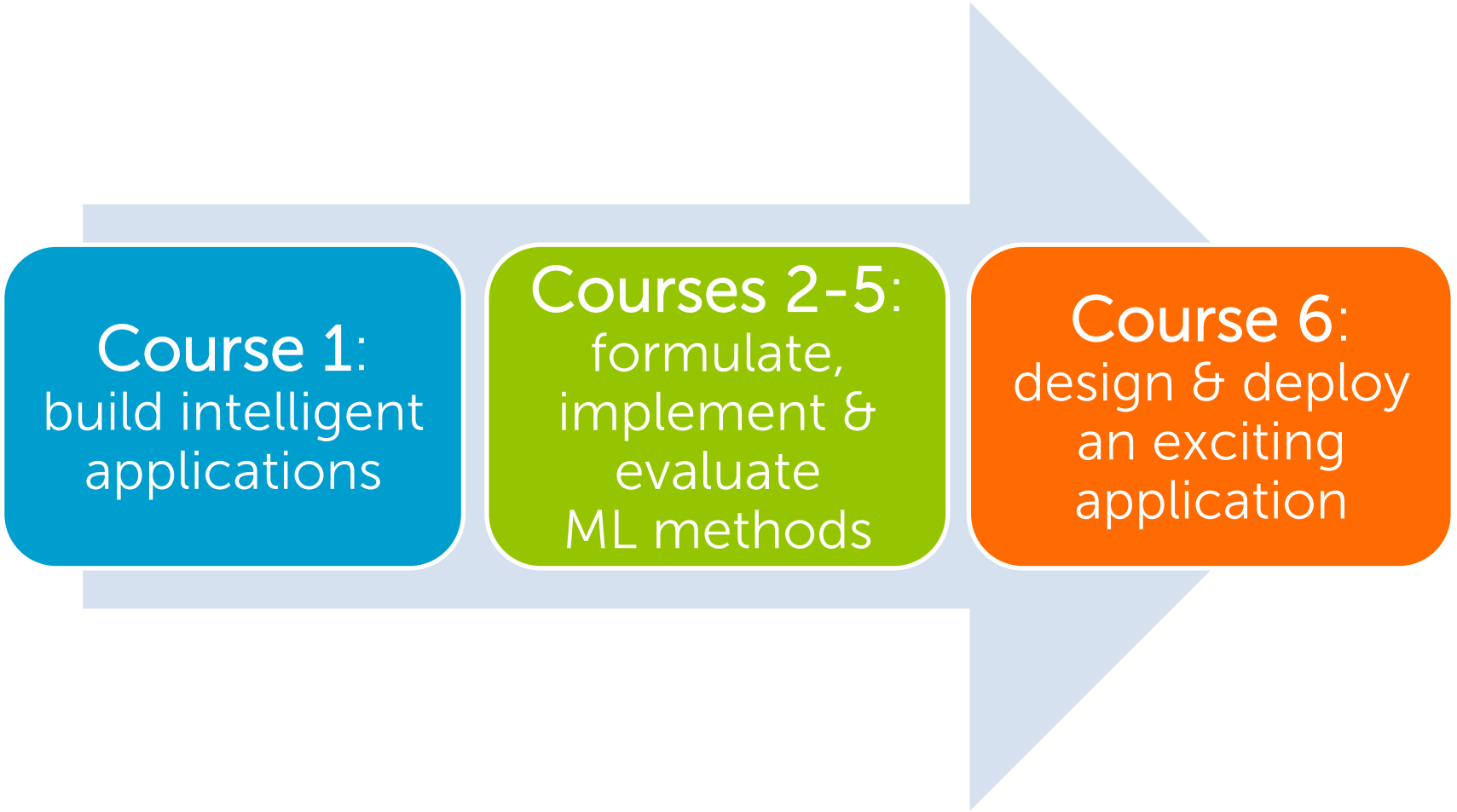


Computing needs

- Basic desktop or laptop
- Access to internet
- Ability to:
  - Install and run Python
  - Store a few GB of data

You'll be able to do amazing things…

Our journey together…



The Capstone Project:
Build and deploy an intelligent application with deep learning

An intelligent recommender using images & text

We will do something even more exciting...