Machine Learning Specialization

Welcome

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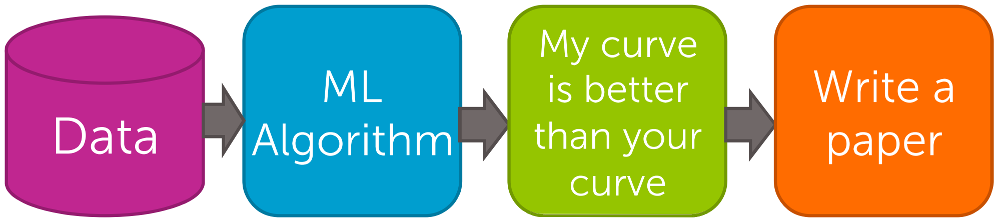
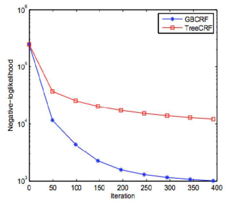
Machine Learning Specialization
University of Washington

Machine learning is changing the world

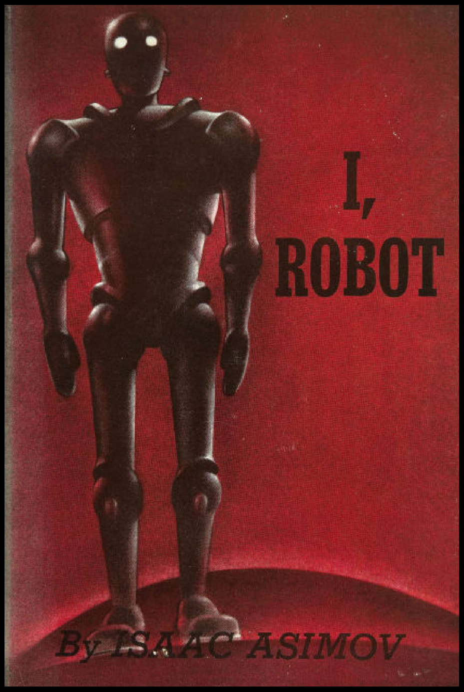
Old view of ML





Neural Information Processing Systems Foundation

ICML



amazon
Retail

Google PageRank
Search

livingsocial
Coupons

NETFLIX
Movie Distribution

LinkedIn
Networking

PANDORA
Music

Obama'08
Campaigning

Google Adsense
Advertising

Zillow
Real Estate

glassdoor
Human Resources

Avvo
Legal Advice

eHarmony
Dating

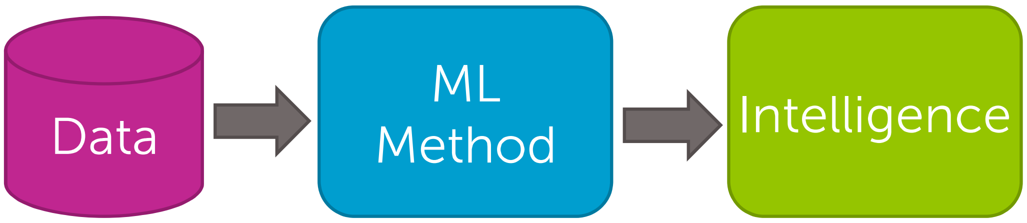
fitbit
Wearables

UBER
Taxis

RelateIQ
CRM

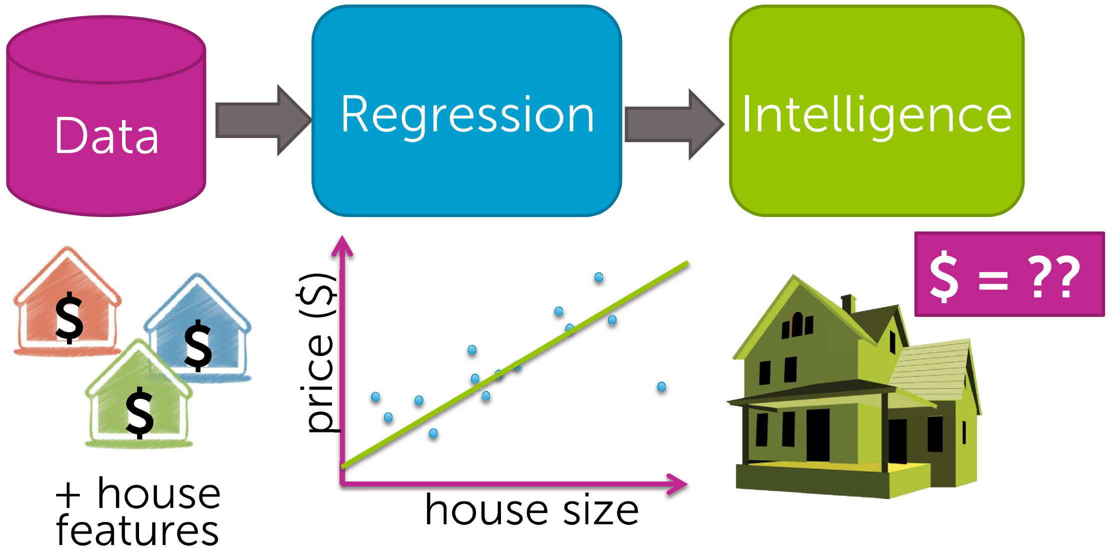
Disruptive companies
differentiated by
INTELLIGENT
APPLICATIONS
using
Machine Learning

The machine learning pipeline

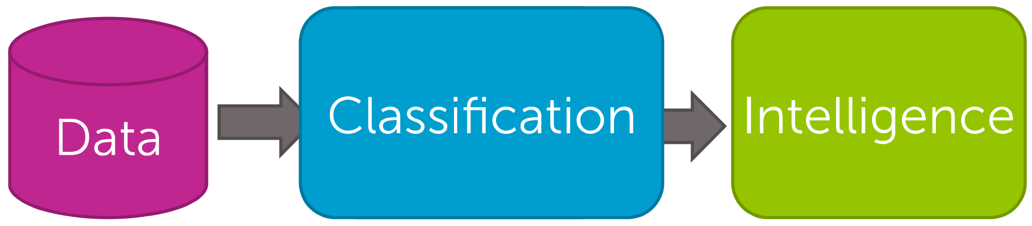


ML case studies

Case Study 1: Predicting house prices

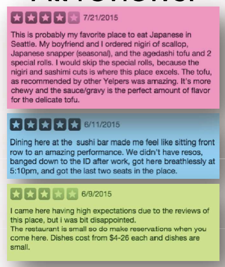


Case Study 2: Sentiment analysis



Sushi was <u>awesome</u>,
the food was <u>awesome</u>,
but the service was <u>awful</u>.

All reviews:


★★★★☆ 7/21/2015

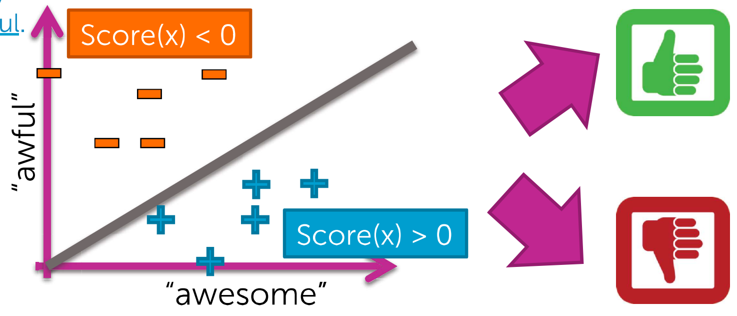
This is probably my favorite place to eat Japanese in Seattle. My boyfriend and I ordered nigiri of scallop, Japanese snapper (seasonal), and the agedashi tofu and 2 special rolls. I would skip the special rolls, because the nigiri and sashimi cuts is where this place excels. The tofu, as recommended by other Yelpers was amazing. It's more chewy and the sauce/gravy is the perfect amount of flavor for the delicate tofu.

★★★★★ 6/11/2015

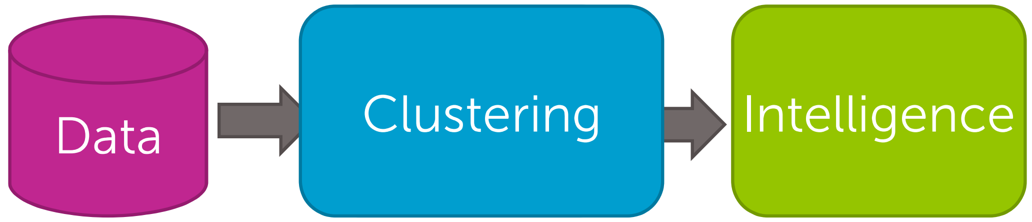
Dining here at the sushi bar made me feel like sitting front row to an amazing performance. We didn't have resos, banged down to the ID after work, got here breathlessly at 5:10pm, and got the last two seats in the place.

★★★☆☆ 6/9/2015

I came here having high expectations due to the reviews of this place, but i was bit disappointed.
The restaurant is small so do make reservations when you come here. Dishes cost from $4-26 each and dishes are small.

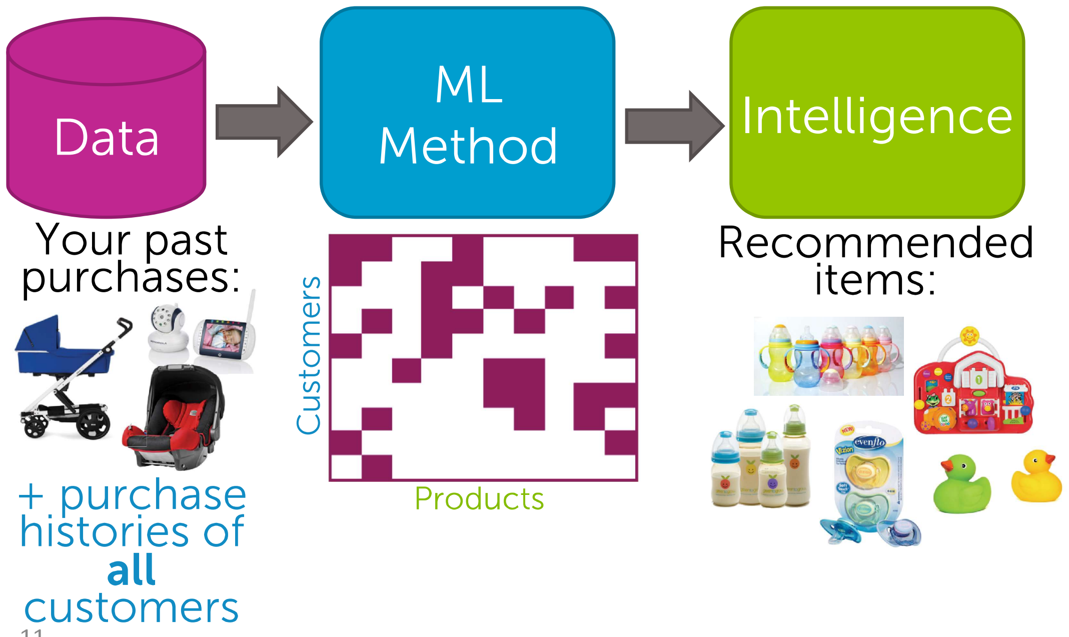


Case Study 3: Document retrieval

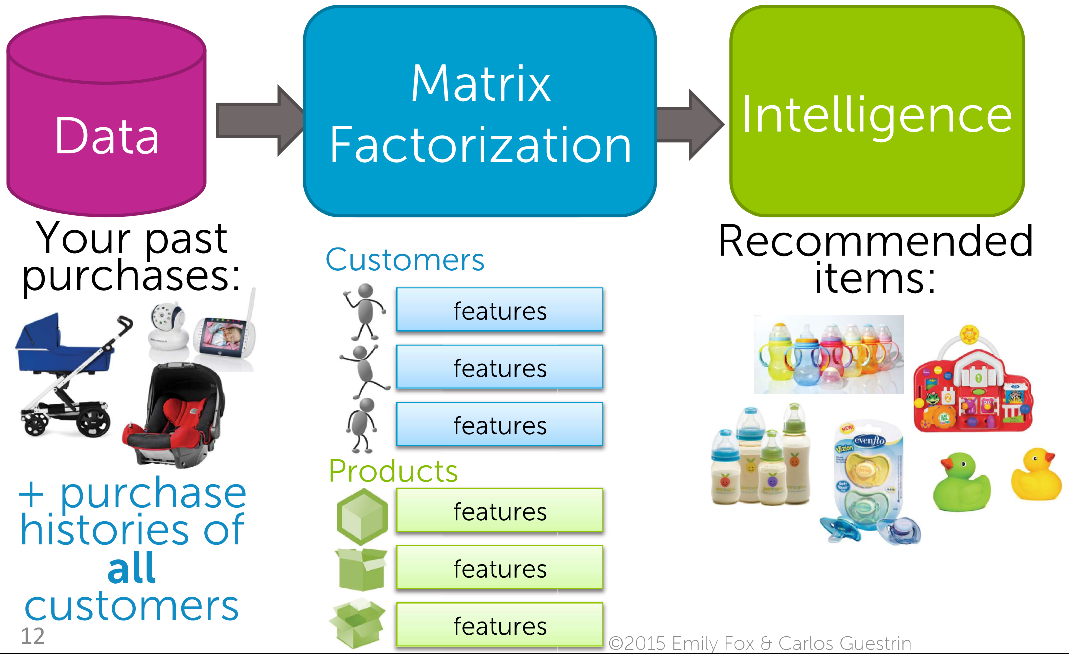


SPORTS
BBC WORLD NEWS
WORLD NEWS
ENTERTAINMENT
SCIENCE

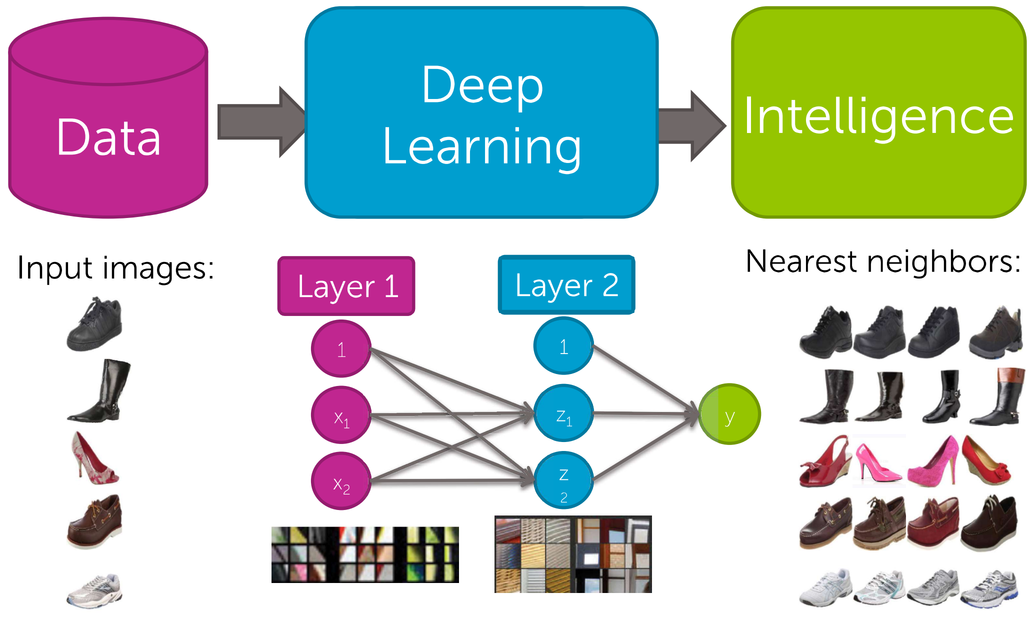
Case Study 4: Product recommendation



Case Study 4: Product recommendation



Case Study 5: Visual product recommender

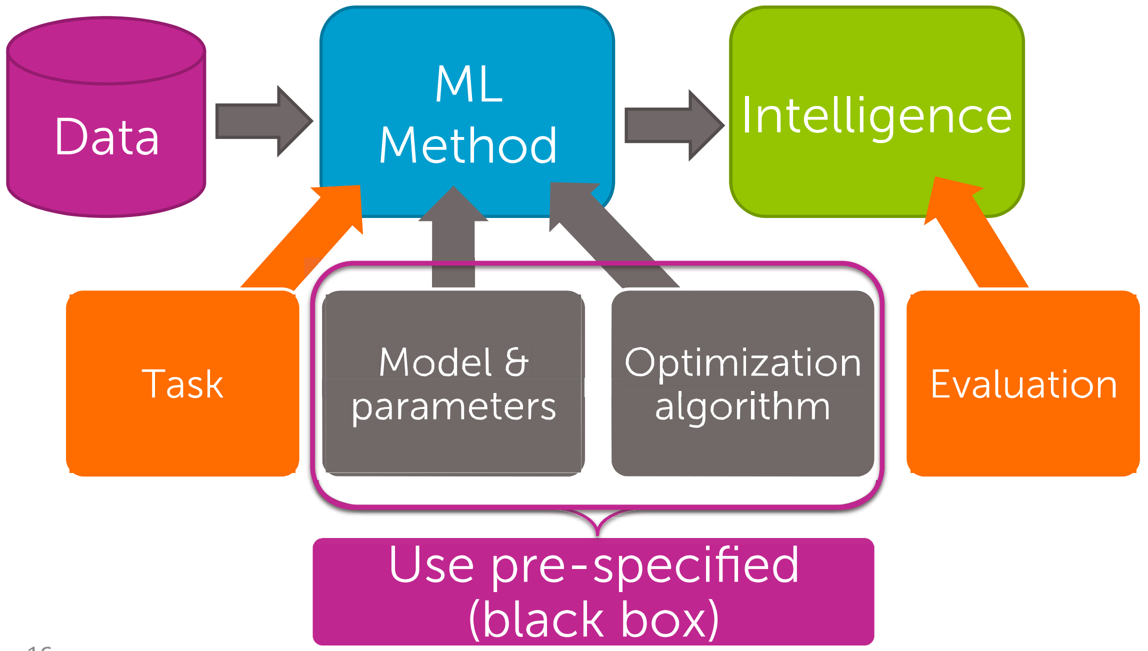


A unique ML specialization

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

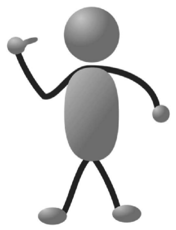
This specialization is for you if…

Level of the specialization

Motto:
tough concepts made intuitive
and applicable

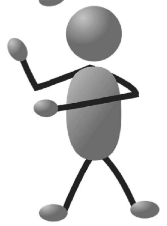
minimize prereq knowledge
maximize ability to develop and deploy
learn concepts through case studies

Target audience



Software engineer

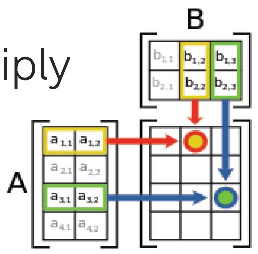
Scientist



Data enthusiast

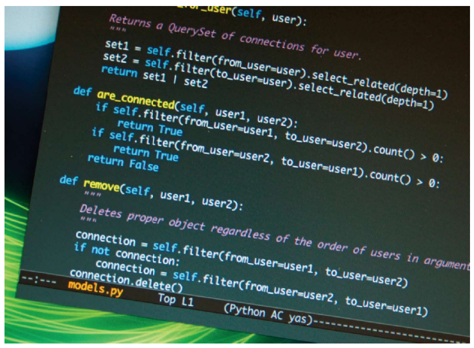
Math background

- 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



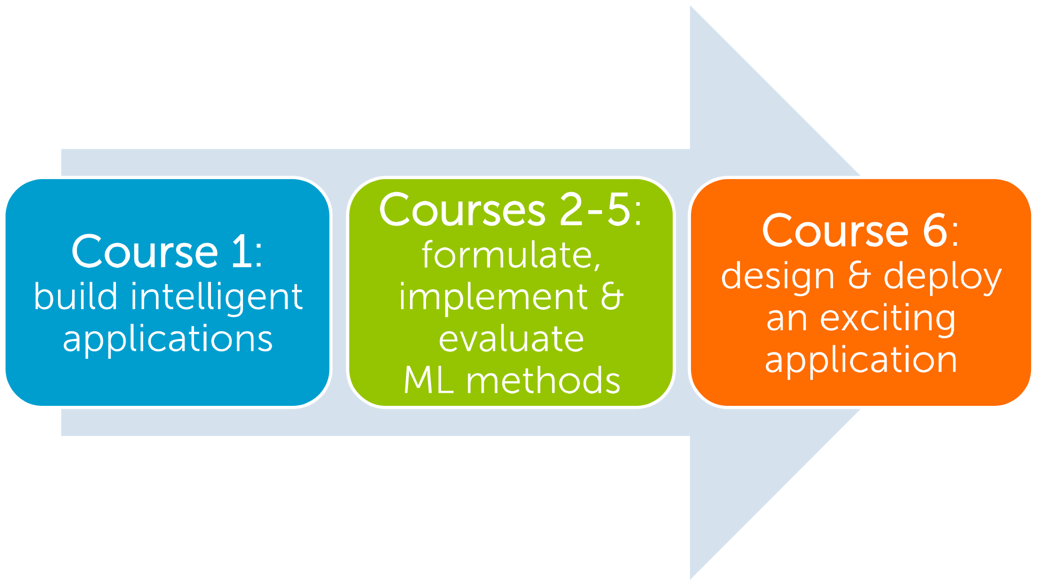
```
        Returns a QuerySet of connections for user.
        """
        set1 = self.filter(from_user=user).select_related(depth=1)
        set2 = self.filter(to_user=user).select_related(depth=1)
        return set1 | set2

    def are_connected(self, user1, user2):
        if self.filter(from_user=user1, to_user=user2).count() > 0:
            return True
        if self.filter(from_user=user2, to_user=user1).count() > 0:
            return True
        return False

    def remove(self, user1, user2):
        """
        Deletes proper object regardless of the order of users in argument
        """
        connection = self.filter(from_user=user1, to_user=user2)
        if not connection:
            connection = self.filter(from_user=user2, to_user=user1)
        connection.delete()
--:---  models.py      Top L1     (Python AC yas)-----------------------
```

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…

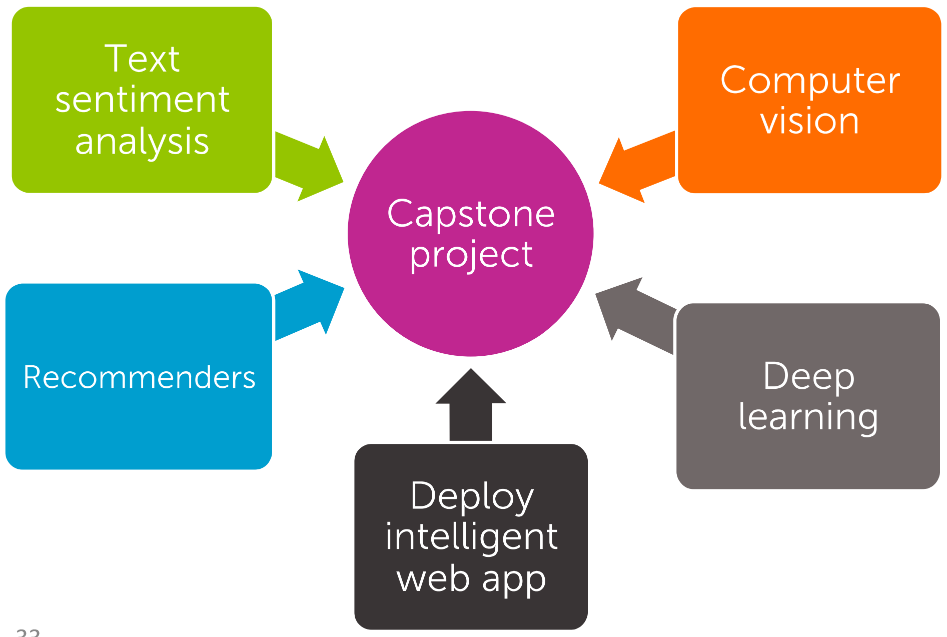
Our journey together…


Course 1: build intelligent applications
Courses 2-5: formulate, implement & evaluate ML methods
Course 6: design & deploy an exciting application

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…


Text sentiment analysis
Recommenders
Capstone project
Deploy intelligent web app
Computer vision
Deep learning