

# APPLIED MACHINE LEARNING

## LOGISTICS

ROBERT UTTERBACK, (HEAVILY) BASED ON SLIDES BY  
ANDREAS MULLER

08/22/18

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2.1

## SYLLABUS

- Course website:  
<https://robertutterback.github.io/courses/comp350ml/>
- As usual, everything is there
- Read the policies, look at the schedule, etc.

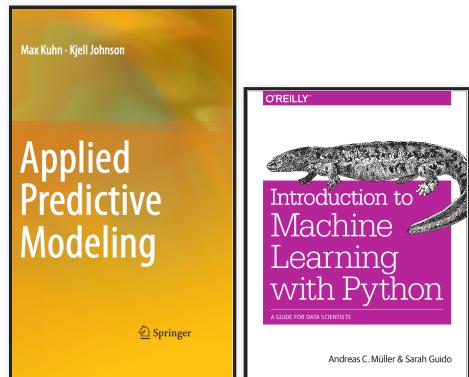
## GRADING

- 1 midterm, 20%, 1 final, 20%
- participation: 10% (Socrative)
- 5–7 homework assignments, 50% of total grade
- Most (all?) will involve programming in Python
- 5 late days to apply to assignments (at most 2 for any individual assignment)

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## BOOKS



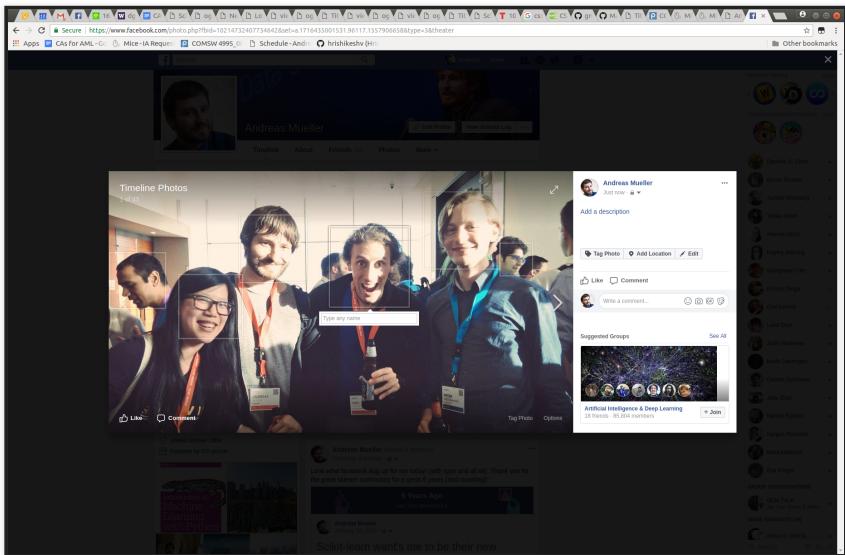
## WHAT AND WHY OF MACHINE LEARNING

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## WHAT IS MACHINE LEARNING?

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The screenshot shows the Spotify mobile application interface. At the top, there's a search bar and a navigation menu with icons for 'Browse', 'Radio', 'Your Music', 'Playlists', 'Discover Weekly', 'Your Top Songs 2016', 'Recent Activity', 'Rammstein', 'DUBSTEP', 'System Of A Down', and 'Electronic World Transmissions'. Below the search bar, the main content area features the 'Rammstein' artist profile. It includes a large album cover image, a 'PLAY' button, and a 'FOLLOWING' button. Below the cover are sections for 'Latest Release' (XXI - Kicker, 11 Nov 2016), 'Popular' songs (Du hast, Some, Feuer Frei, AMERIKA, Ich Will), 'Related Artists' (Oomph!, Eisbrecher, Megahertz, Static-X, Emigrate, Marilyn Manson, Rob Zombie), and 'Friend activity' (Martin Kwasniak, Sven-David Leyva, etc.). On the right side, there's a sidebar titled 'More Friends' listing friends like Martin Kwasniak, Sven-David Leyva, and others.

The screenshot shows the Amazon website search results for 'machine learning'. The search bar at the top contains the query 'machine learning'. The results page displays a grid of products, primarily books, related to machine learning. Some visible titles include 'Practical Machine Learning: Innovations in Recommendation' by Ted Dunning and Ellen Friedman, 'Machine Learning: The Art and Science of Algorithms That Make Sense of Data' by Peter Flach, 'Understanding Machine Learning: From Theory to Algorithms' by Shai Shalev-Shwartz and Shai Ben-David, and 'Learning From Data' by Yaser S. Abu-Mostafa, Malik Magdon-Ismail, and Hsuan-Tien Lin. Each product listing includes the title, author, price, and a brief description.

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3.7

**Introduction to Machine Learning with Python: A Guide for Data Scientists** 1st Edition

by Andreas C. Müller (Author), Sarah Guido (Author)

★★★★★ 9 customer reviews

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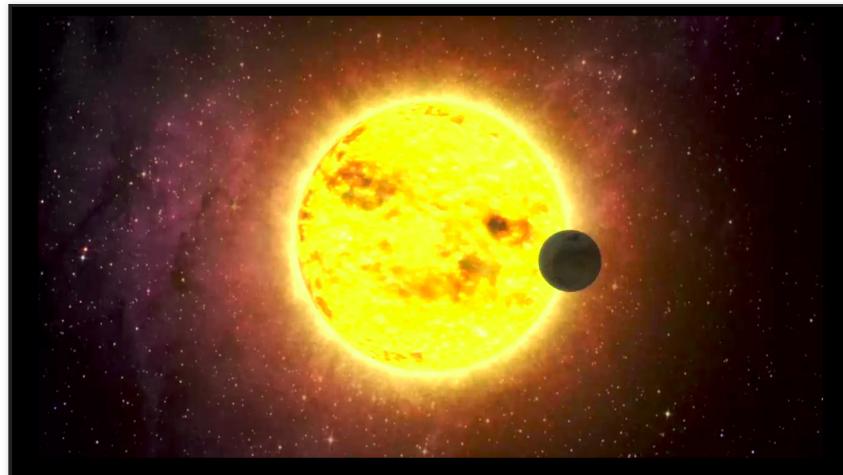
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Add all three to List

3 . 8



## TYPES OF MACHINE LEARNING

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4 . 1

## SUPERVISED LEARNING

### TYPES OF MACHINE LEARNING

- Supervised
- Unsupervised
- Reinforcement

$$(x_i, y_i) \propto p(x, y) \text{ i.i.d}$$

$$x_i \in \mathbb{R}^p$$

$$y_i \in \mathbb{R}$$

$$f(x_i) \approx y_i$$

4 . 2

4 . 3

### EXAMPLES OF SUPERVISED LEARNING

- Testing for diabetes
- Classifying terrain of satellite image
- Automate manual labor

### UNSUPERVISED LEARNING

$$x_i \propto p(x) \text{ i.i.d}$$

Learn about  $p$ .

4 . 4

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## REINFORCEMENT LEARNING



## REINFORCEMENT LEARNING

- Working with an environment, not a dataset
- Action influence the environment
- Can't look at all possible situation
- no separate data collection and learning

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## OTHER KINDS OF LEARNING

- Semi-supervised
- Active Learning
- Forecasting
- ...

## SUPERVISED LEARNING

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## CLASSIFICATION AND REGRESSION

### Classification

- target y discrete
- Will you pass the class?

### Regression

- Target y continuous
- How many points will you get on the final?

## GENERALIZATION

Not only  $f(x_i) \approx y_i$ ,  
also for new data:  $f(x) \approx y$

5 . 2

5 . 3

## RELATIONSHIP TO STATISTICS

### Statistics

- model first
- inference emphasis

### Machine Learning

- data first
- prediction emphasis

## OVERVIEW OF THE COURSE

- Infrastructure and basic tools
- Basics of Supervised Learning
- Data Preparation
- Non-linear ML
- Model evaluation
- Decomposition Methods
- Clustering
- Outlier Detection
- Text Data
- Neural Networks
- Time Series Data

5 . 4

6 . 1

# QUESTIONS?

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