Course Introduction
SYLLABUS HIGHLIGHTS
Syllabus Highlights

The syllabus is located on the course webpage:

http://www.cs.cmu.edu/~mgormley/courses/10601

The course policies are required reading.
Syllabus Highlights

- **Grading**: 40% homework, 15% exam 1, 15% exam 2, 25% final exam, 5% participation
- **Midterm Exam 1**: evening exam, Thu, Oct. 03
- **Midterm Exam 2**: evening exam, Thu, Nov. 14
- **Final Exam**: final exam week, date TBD
- **Homework**: ~3 written and ~5 programming
  - 6 grace days for homework assignments
  - Late submissions: 80% day 1, 60% day 2, 40% day 3, 20% day 4
  - No submissions accepted after 4 days w/o extension
  - Extension requests: see syllabus
- **Recitations**: Fridays (optional, interactive sessions)
- **Readings**: required, online PDFs, recommended for after lecture
- **Technologies**: Piazza (discussion), Autolab (programming), Canvas (quiz-style), Gradescope (open-ended)
- **Academic Integrity**:
  - Collaboration encouraged, but must be documented
  - Solutions must always be written independently
  - No re-use of found code / past assignments
  - Severe penalties (i.e. failure)
- **Office Hours**: posted on Google Calendar on “People” page
Lectures

• You should ask lots of questions
  – Interrupting (by raising a hand) to ask your question is strongly encouraged
  – Asking questions later (or in real time) on Piazza is also great

• When I ask a question…
  – I want you to answer
  – Even if you don’t answer, think it through as though I’m about to call on you

• Interaction improves learning (both in-class and at my office hours)
Textbooks

You are not *required* to read a textbook, but it will help immensely!
PREREQUISITES
Prerequisites

What they are:

- Significant programming experience (15-122)
  - Written programs of 100s of lines of code
  - Comfortable learning a new language
- Probability and statistics (36-217, 36-225, etc.)
- Mathematical maturity: discrete mathematics (21-127, 15-151), linear algebra, and calculus
Oh, the Places You'll Use Probability!

By Dr. Seuss
Oh, the Places You’ll Use Probability!

Supervised Classification

• Naïve Bayes

\[ p(y|x_1, x_2, \ldots, x_n) = \frac{1}{Z} p(y) \prod_{i=1}^{n} p(x_i|y) \]

• Logistic regression

\[
P(Y = y|X = x; \theta) = p(y|x; \theta) = \frac{\exp(\theta_y \cdot f(x))}{\sum_{y'} \exp(\theta_{y'} \cdot f(x))}
\]

Note: This is just motivation – we’ll cover these topics later!
Oh, the Places You’ll Use Probability!

ML Theory

(Example: Sample Complexity)

- **Goal**: $h$ has small error over $D$.

  True error: $\text{err}_D(h) = \Pr_{x \sim D} (h(x) \neq c^*(x))$

  - How often $h(x) \neq c^*(x)$ over future instances drawn at random from $D$

- **But, can only measure**:

  Training error: $\text{err}_S(h) = \frac{1}{m} \sum_i I(h(x_i) \neq c^*(x_i))$

  - How often $h(x) \neq c^*(x)$ over training instances

**Sample complexity**: bound $\text{err}_D(h)$ in terms of $\text{err}_S(h)$

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Deep Learning
(Example: Deep Bi-directional RNN)

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Graphical Models

• Hidden Markov Model (HMM)

• Conditional Random Field (CRF)

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Prerequisites

What if I’m not sure whether I meet them?
• Don’t worry: we’re not sure either
• However, we’ve designed a way to assess your background knowledge so that you know what to study!

(see instructions of Canvas portion of HW1)
Reminders

• Homework 1: Background
  – Out: Wed, Aug. 28 (2nd lecture)
  – Due: Wed, Sep. 04 at 11:59pm
  – Two parts:
    1. written part to Gradescope,
    2. programming part to Autolab
  – unique policy for this assignment:
    1. **two submissions** for written (see writeup for details)
    2. **unlimited submissions** for programming (i.e. keep submitting until you get 100%),
Q&A