Today:

- Tests
- Review of course organization
- “Traditional methods” vs “ML methods” example
- Machine learning core terms and concepts
First half of the course:

▶ Introduction (Aug 23–25)
▶ Regular expressions (Aug 28–30)
▶ Edit distance (Sept 1)
▶ Information theory (Sept 6-8)
▶ Language models (Sept 11–18)
▶ Parts of speech and HMMs (Sept 18–27)
▶ Parsing (Sept 29–Oct 4)
▶ Review (Oct 6–9)
▶ Midterm (Oct 11)

Second half of the course:

▶ Introduction (Oct 13–20)
▶ Naïve Bayes Classification (Oct 23–27)
▶ Stylometry (Oct 30–Nov3)
▶ Word embeddings (Nov 6–10)
▶ Neural nets (Nov 13–17)
▶ Machine translation (Nov 20–27)
▶ Text generation (Nov 29–Dec 1)
▶ Ethics (Dec 4–6)
Machine learning is a form of applied statistics with emphasis on the use of computers to statistically estimate complicated functions.

Goodfellow et al., Deep Learning, 2016. Pg 95.

Machine learning is the science (and art) of programming computers so they can learn from data. [In 1959, Arthur Samuel defined machine learning as the] field of study that gives computers the ability to learn without being explicitly programmed.


[Machine learning is] a set of methods that can automatically detect patterns in data and then use the uncovered patterns to predict future data or to perform other kinds of decision-making under uncertainty.

Machine learning main tasks:

- Regression, where the target type is $\mathbb{R}$
- Classification, where the target type is a finite set
  - Binary classification, where the target is $\{F, T\}$ (or $\{0, 1\}$ or $\{-1, 1\}$ . . . )
- Density estimation, where the target type is $[0, 1]$.

Other machine learning tasks (see Goodfellow, *Deep Learning*, pg 96–100):

- Transcription, where the observations are unstructured and the targets are text.
- Machine translation, where the observations and targets are text.
- Anomaly detection, where the targets are indicators of whether the observation is atypical.
- Synthesis and sampling, where there are no observations in deployment, but rather the program produces new observations similar to those in training.
- Denoising, where the targets are corrected versions of the observations.
Coming up:

- Fall break