CSE 151: Machine Learning

Syllabus

I. Prediction problems
- Nearest neighbor
- A taxonomy of prediction tasks

II. Generative models for classification
- The generative approach to classification
- Gaussian generative models

III. Linear prediction
- Linear regression
- Logistic regression
- Perceptron and support vector machines
- Kernels
- Multiclass classification and structured output prediction

IV. Trees, forests, and ensembles
- Decision trees
- Boosting
- Bagging and random forests

V. Representation learning
- Clustering
- Linear projections: PCA and SVD
- Embeddings and manifold learning
- Autoencoders

VI. Deep learning
- Feedforward networks
- Convolutional networks
- Recurrent networks

Discussion sections

Wed 1-2p in CSE 2154

Prerequisites

1. Ability to write simple programs in Python: functions, control structures, string handling, arrays and dictionaries.

2. Familiarity with basic probability, at the level of CSE 21 or CSE 103.

3. Familiarity with basic linear algebra, at the level of Math 18 or Math 20F.

Course materials

1. Programming exercises should be done in Python. I recommend using Jupyter notebooks.

2. There is no required text for the course. But here are some useful references. The first is available as an e-book through the library website; the rest are on reserve at Geisel:
Trevor Hastie, Robert Tibshirani, and Jerome Friedman, *The elements of statistical learning* (2nd edition).
Gilbert Strang. *Linear algebra and its applications* .
Kevin Murphy, *Machine learning: a probabilistic perspective*.
Richard Duda, Peter Hart, and David Stork, *Pattern classification* (2nd edition).

Homeworks and evaluations

There will be regular homeworks, to be turned in (typed and in PDF format) on Gradescope. These will be a mix of mathematical exercises and programming projects.

No late homeworks will be accepted; however, the lowest homework score will be dropped.

There will be five in-class quizzes. There will be no makeup quizzes; however, the lowest quiz score will be dropped.

Grading

Homeworks: 50% (lowest score will be dropped)
Quizzes: 50% (lowest score will be dropped)