

Machine Learning with Discriminative Models

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<http://acberg.com/ml>

CS 790-134 (Spring 2015)

Midterm, Take-Home Component

Goal

This component of the midterm contains exercises in fitting models and feature selection. Please hand in a PDF or MS Word file with your write-up on Sakai before class on Thursday. There will also be an in-class midterm component on Thursday.

1 Part 1 — Linear models and lasso

- Download X_1 , Y_1 from <http://acberg.com/ml/midterm/> (Note .mat for matlab version or .txt for a tab-delimited file version.)
- Build a linear model to predict Y_1 from X_1 (don't forget the bias term). Explain what you did, and evaluate how well it works.
- Use Lasso to select a subsets of the dimensions of X_1 for predicting Y_1 . Plot a measure of how well the fit works as the number of dimensions used for prediction goes from 0 to 1 to ... 20. Explain what you did.
- What can you say about this data? What features matter? What kind of noise is present?

2 Part 2 — Non-linear models

- Download X_2 , Y_2 .

- Build a linear model to predict Y2 from X2 (don't forget the bias term). How well does it work? Plot the error.
- Now build a piece-wise linear model to predict Y2 from X2. This involves splitting the range of values in X2 into intervals and fitting a linear model to each interval. How well does it work? Plot the error. Explain what you did.
- Download X3, Y3.
- Build an additive piece-wise linear model to predict Y3 from X3. Use intervals of 1 unit in each dimension of X3. Explain what you did and plot the error as an image. (You can arrange the errors into a 2D array, a , and use `imagesc(a)`.)

Honor Code

All students are expected to do their own work for the midterm. Cite any internet resources and do not discuss the midterm with others.