ECE 532 - lecture 22 - review for exam #2

Key topics (in one page!)

the SVD and matrix norms

- SVD definition and properties
- induced matrix norms
- thin/economy & full SVD
- Frobenius norm

regularization and trade-offs

- multiobjective optimization
- regularizations and their use (ridge/L2/Tikhonov, L1/lasso, Lαs)
- Pareto curves

convexity and iterative methods

- convexity definition(s). why is it useful to have convexity?
- principle of iterative techniques, why do we use them?
- Landweber, ISTA, gradient descent, subgradients, stochastic gradient method.

SVD applications

- least squares and linear equations: solutions, uniqueness, fundamental subspaces expressed in terms of SVD, pseudo inverse
- low-rank approximation using SVD, (Eckart-Young theorem).
- finding low-dimensional subspace that approximates a set of points (PCA)
- sensitivity of linear equations, characterizing error using ellipsoids

SVM classification

- hinge loss, compare to LS loss.
- comparison with least squares classification, e.g outlier rejection.
- compute SVM classifier for very simple cases.