Machine Learning Spring 2018
Topics for Test 1
Friday, March 16 2018

Probability Distributions
- Don't have to memorize formulas
- Know how to calculate expected value and variance of
  - Beta
  - Binomial
  - Gamma
  - Multinomial
  - Multivariate Gaussian
  - Univariate Gaussian

Understand the general concepts and specifics for all above distributions (except the conjugate prior of covariance matrices for Multivariate Gaussians).
- Conjugate Priors
- Likelihood
- MAP
- MLE
- Negative Log-Likelihood
- Posterior Predictive Distribution
- Posteriors
- Priors

Know definition and use of Naïve Bayes

Quadratic Discriminant Analysis
- Derive from Gaussian
- How to use as decision functions
- Advantages and Disadvantages

Linear Discriminant Analysis
- Derive from Gaussian
- How to use as decision functions
- Advantages and Disadvantages

MLE for Linear Regression
- Derive Solution using Matrix Algebra
- Understand potential numerical problems

Ridge Regression
- Derive Solution using Matrix Algebra
- Understand potential numerical problems

Logistic Regression
- Derive Gradient and Hessian
- Steepest descent model fitting
- IRLS (don't memorize, just understand)

Fisher's Linear Discriminant
- Understand concept
- Know definition of scatter matrices
- Explain the objective function: $J(w) = \frac{w^T S_B w}{w^T S_W w}$
- Use the assumption that $w^T S_W w = 1$ to derive the generalized eigenvalue problem that needs to be solved to calculate the weights for Fisher's Linear Discriminant.