CS281 Midterm Topics

The exam will be open-book and open-note. No electronic devices will be permitted.

1. Probability Basics
    (a) Conditional Probability
    (b) Marginalization
    (c) Bayes' Rule
    (d) Transformations of Random Variables
    (e) Entropy, KL Divergence, Mutual Information
2. Bayesian Reasoning
    (a) Posterior Predictive
    (b) Marginal Likelihood and Model Selection
    (c) MAP Estimation
    (d) Credible Intervals
    (e) Bayesian Decision Theory
3. Discrete Models
    (a) Bernoulli, Binomial, Multinomial Distributions
    (b) Poisson Distributions
    (c) Beta and Dirichlet Distributions
4. Gaussian Models
    (a) Geometry of Gaussian Distributions
    (b) Manipulating/Transforming Gaussian R.V.s
    (c) Normal Inverse Gamma Distribution
5. Linear Regression
    (a) Ridge Regression
    (b) Conjugate Bayesian Inference
6. Linear Classification
    (a) Logistic Regression

(b) Linear Discriminant Analysis
(c) Multiclass Logistic Regression
(d) Laplace Approximation

7. Exponential Families
   (a) Maximum Likelihood Estimation
   (b) Bayesian Inference and Conjugate Priors
8. Graphical Models
   (a) Conditional Independence
   (b) Undirected Graphical Models
   (c) Factor Graphs
   (d) Directed Graphical Models
9. Latent Variable Modeling
   (a) Mixture Models
   (b) Principal Component Analysis
   (c) Expectation Maximization
   (d) Jensen's Inequality
10. Sparsity
    (a) Spike and Slab
    (b) ℓ_1 Regularization
11. Exact Inference
    (a) Variable Elimination
    (b) Sum-Product Message Passing