Machine Learning Spring 2018
Topics for Test 2

Clustering
- Understand algorithms used in Project 1.
- Derive FCM from objective function — given objective function
- Explain sampling model of GMM — what is latent variable
- Understand and be able to explain Kohonen updating rule — in self organizing map (SOM)
- Be able to write k-means algorithm using pseudo-code

Kernels
- What is a Hilbert Space? — a.k.a. inner product space
- What are Mercer Kernels? (Mathematical Definition) — a function of two variables inner product of phi(x) and phi(y)

Kernel PCA
- Mathematical derivation of algorithm
- How can you use it to reduce dimensionality

Kernel Regression and Classification
- RVM
  - Derivation of Bayesian Linear Regression for univariate case
  - Explain the posterior
  - Explain the outputs
  - Where does sparsity come from? — the prior on the prior parameters makes the sparsity happen
  - Advantages and Disadvantages
- SVM

P530
  - Understand Objective Function
  - Given Dual, explain where sparsity comes from — slackness
  - What optimization algorithm is used to minimize the objective function
- Gaussian Processes
  - What are they?
  - Explain the Predictive Mean and Variance — where the variance being high/low
  - What regions in feature space would you expect the predictive variance to be high or to be low?
  - Advantages and Disadvantages

- Cross-validation
  - Explain how it works and why it is done

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- Mystery Question (I may ask you to apply kernel concepts to some other algorithm)