

Pattern Classification and Machine Learning

FEN3202

Discussion Agenda and Exercises for Lecture 7

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I. DISCUSSION AGENDA

1) Kernel Methods **Chapter 6 of the text book.**

Discussion Points: Linear parametric models, memory-less and memory-based methods, dual representation, kernel function, equation 6.1, support vector machines, linear kernel, kernel substitution, stationary kernel, radial basis functions (page 291-292)

Dual representations (section 6.1), equation 6.2-6.9, equivalence of dual formulation and least-squares, high (infinite) dimensional advantage of kernel trick.

Constructing kernels (section 6.2), direct approach, alternative approach, equation 6.12, properties of kernels, equation 6.13-6.22, polynomial kernel, Gaussian kernel, equation 6.23-6.25, Gaussian kernel has infinite dimensionality

Gaussian Processes (section 6.4), what we did for linear regression in chapter 3, the key point of Gaussian process (dispense with the parametric model and instead define prior over functions directly), linear regression revisited (section 6.4.1), equation 6.49-6.54.

Gaussian processes for regression (section 6.4.2), equation 6.57-6.68.

II. EXERCISES

- 1) Exercise 6.1 (To verify the relation in equation 4.88).
- 2) Exercise 6.5-6.9 (Valid kernel constructions and properties)
- 3) Exercise 6.11 (To verify that Gaussian kernel is associated with infinite dimensional features).
- 4) Exercise 6.21