UMC 203: AI&ML

References

1. [PC] Pattern Classification, Richard O. Duda, Peter E. Hart, David G
2. [PTPR] A Probabilistic Theory of Pattern Recognition, Luc DeVore, Laszlo Gyorfi, Gabor Lugosi
3. [PRML] Pattern Recognition and Machine Learning, Christopher Bishop
4. Kernel Methods for Pattern Analysis, John Shawe-Taylor, Nello Cristiani

Day 1: 9th Jan 2024

Topics: Introduction to Classification, Bayes Classifier

Day 2: 11th Jan 2024

Topics: Bayes Classifier, Multivariate Gaussians, Optimality

Day 3: 16th Jan 2024

Topics: Bayes Error rate

Day 4: 18th 2024

Topics: Bayes Error Rate continued, Discriminant functions

Day 5: 23rd Jan 2024

Topics: Fisher Discriminant, Perceptron Algorithm

Day 6: 25th Jan 2024

Topics: Perceptron Algorithm continued

Day 7: 1st Feb 2024

Topics: Generalization error of classifiers obtained from Perceptron Algorithm

(See notes and readings)

5th Feb 2024: Quiz

6th Feb: Primer on Convex Optimization: KKT conditions

8th Feb: Large margin classification

An excellent tutorial to supplement class notes

<https://www.di.ens.fr/~mallat/papiers/svmtutorial.pdf>

9th Feb: large margin classification: Wolfe Dual and Kernel trick

13th Feb: Kernel Definition and various operations

17th Feb: Midterm

27th Feb: Linear SVM classifiers for Linearly non-separable data: VC Dimension

29th Feb: Quadratic Programming formulation of soft margin SVM

4th March: Least squares and Ridge Regression for Linear Regression

5th March: Bias Variance Decomposition with applications to Least Squares

6th March: Bias Variance Decomposition with applications to Ridge Regression

7th March: Gaussian Process Regression

11th March: Quiz

12th March: Review of Maximum Likelihood estimation

14th March: Properties of Maximum Likelihood (Consistency, Normality, Efficiency, Bias)

18th March: EM Algorithm with Applications to Mixture distributions

21st March: Midterm –2

26th March: Boltzmann Machines

28th March: Mean-field Methods for Boltzmann Machines