02457 NON-LINEAR SIGNAL PROCESSING

Plan and readings August-December 2016

INTRODUCTION

29/08 Course introduction. Statistical foundations. **Reading:** Bishop Ch. 1.2, 1.5
01/09 Exercise 1
05/09 Multivariate densities. Correlation. 2D normal distribution. Principal components
Math foundations: linear algebra and matrices. **Reading:** Bishop Ch. 1.2, 2.3, 12.1, appendix C.
08/09 Exercise 2

MACHINE LEARNING

12/09 The likelihood function, supervised learning, linear models.
Reading: Bishop Ch. 1.2,3.1,4.1.
15/09 Exercise 3
19/09 Generalization. Measuring test errors, asymptotics, and penalties.
Reading: Bishop Ch. 1.1,1.3,1.4,3.2
22/09 Exercise 4

NON-LINEAR MODELS

26/09 Neural networks, backpropagation. **Reading:** Bishop Ch. 5.1-5.4.
29/09 Exercise 5
03/10 Signal detection with neural networks. **Reading:** Bishop Ch. 4.2,4.3.4,5.1-5.4,
06/10 Exercise 6
10/10 The EM algorithm. K-means. **Reading:** Bishop Ch. 9
13/10 Exercise 7
17/10 Autumn break
20/10 Autumn break
24/10 Radial Basis Functions. **Reading:** Bishop Ch. 6.3.
27/10 Exercise 8
31/10 Nonparametric methods: Nearest neighbors. **Reading:** Bishop Ch. 2.5.
03/11 Exercise 9
07/11 Nonparametric methods: Kernels, GP, and SVM.
Reading: Bishop Ch. 6.1, 6.2, 6.4.1-6.4.3, 7.1.1-7.1.2.
10/11 Exercise 10
14/11 Sequential estimation, on-line learning
Reading: Bishop Ch. 2.3.5, 3.1.3.
17/11 Exercise 11
21/11 Speech and real-time audio classification. **Reading:** Bishop Ch. 13.0, note.
24/11 Exercise 12
28/11 Review lecture
01/12 QnA and remaining exercises

Lars Kai Hansen, Ole Winther, DTU Compute, August 2016.