

02457 NON-LINEAR SIGNAL PROCESSING

Plan and readings September-December 2017

INTRODUCTION

- 04/09 Course introduction. Statistical foundations. **Reading:** Bishop Ch. 1.2, 1.5
- 07/09 Exercise 1
- 11/09 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.
- 14/09 Exercise 2

MACHINE LEARNING

- 18/09 The likelihood function, supervised learning, linear models.
Reading: Bishop Ch. 1.2, 3.1, 4.1.
- 21/09 Exercise 3
- 25/09 Generalization. Measuring test errors, asymptotics, and penalties.
Reading: Bishop Ch. 1.1, 1.3, 1.4, 3.2
- 28/09 Exercise 4

NON-LINEAR MODELS

- 02/10 Neural networks, backpropagation. **Reading:** Bishop Ch. 5.1-5.4.
- 05/10 Exercise 5
- 09/10 Signal detection with neural networks. **Reading:** Bishop Ch. 4.2, 4.3.4, 5.1-5.4,
- 12/10 Exercise 6
- 16/10 Autumn break
- 19/10 Autumn break
- 23/10 The EM algorithm. K-means. **Reading:** Bishop Ch. 9
- 26/10 Exercise 7
- 30/10 Radial Basis Functions. **Reading:** Bishop Ch. 6.3.
- 02/11 Exercise 8
- 06/11 Nonparametric methods: Nearest neighbors. **Reading:** Bishop Ch. 2.5.
- 09/11 Exercise 9
- 13/11 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.
- 16/11 Exercise 10
- 20/11 Sequential estimation, on-line learning
Reading: Bishop Ch. 2.3.5, 3.1.3.
- 23/11 Exercise 11
- 27/11 Real-time audio classification. **Reading:** Bishop Ch. 13.0, note.
- 30/11 Exercise 12
- 04/12 Review lecture
- 07/12 QnA and remaining exercises

Lars Kai Hansen, Ole Winther, DTU Compute, August 2017.