



General Information:

Lecture (3 SWS): Mon 08.15 – 09:45 (H16) and Tue 08.15 – 09.45 (H16)
Exercises (1 SWS): Wed 12.15 – 13.45 (09.150) and Thu 12.15 – 13.45 (09.150)
Certificate: Oral exam at the end of the semester
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Pattern Recognition - Revisited

Exercise 1 Bayesian Classifier

- What is the difference between discriminative and generative modeling?
- What is the decision rule of the Bayesian classifier?
- Simplify the decision rule if there is no prior knowledge about the occurrence of the classes available.
- Show the optimality of the Bayesian classifier for the $(0, 1)$ loss function.

Exercise 2 Naive Bayes

- Which independency assumption is used for naive Bayes?
- What is the decision rule of naive Bayes?
- What is the structure of the covariance matrix of normal-distributed classes in naive Bayes?

Exercise 3 Sigmoid Function

- Write down the Sigmoid function $g(x)$.
- Show that the derivative $g'(x)$ of the sigmoid function fulfills the property $g'(x) = g(x)(1 - g(x))$
- Write down the posteriors for a two class problem ($y = \pm 1$) for a given decision boundary $F(\mathbf{x})$ in terms of a logistic function.

Exercise 4 Gaussian mixture models and EM

- Write down the general form of a Gaussian mixture model (GMM).
- Which parameters of the GMM can be estimated using the EM algorithm?
- How do you initialize the EM algorithm?
- Describe the basic steps of the EM algorithm for GMMs.