

Ti5213100 Introduction to Machine Vision and Machine Learning

Lecture 14: Bayesian Learning and ML Part
Recapitulation

Lecture 14 Contents

- i. Bayesian thinking
- ii. Bayes optimal classifier
- iii. Naive Bayes classifier
- iv. Advanced topic: Estimating Real-Valued Probability Density Functions*
- v. Conclusions
- vi. Recapitulation

i.-iii. Bayesian Thinking...

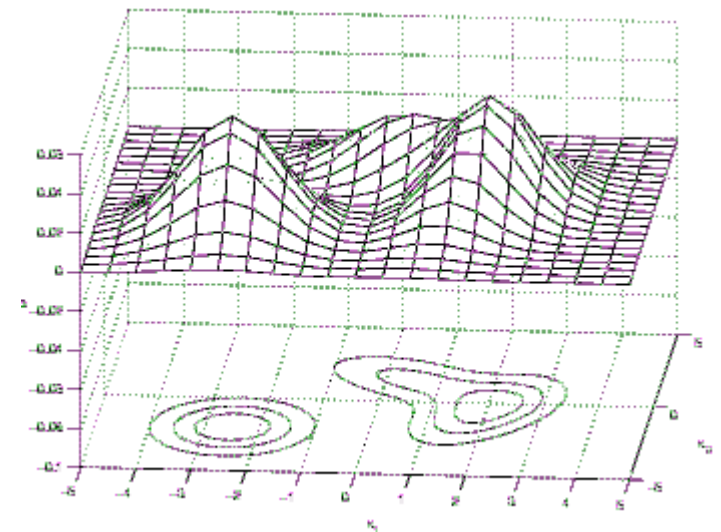
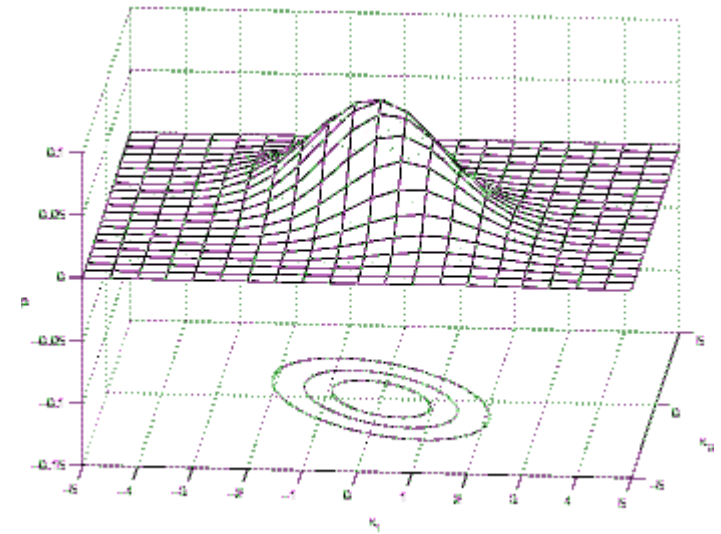


REV. T. BAYES

Source: <http://www.york.ac.uk>

iv. *Estimating Real-Valued Probability Density Functions*

- Often a single D-^(adv.) dimensional Gaussian for each class succeeds
- In multi-modal cases Gaussian mixture models must be used
 - EM estimation



Lecture 14 Conclusions

- Bayes classification is based on a posteriori probabilities
- Bayes establishes a strong framework for machine learning
 - No other method can beat Bayes on average
- *A central problem is probability density function (pdf) estimation*

v.1. Recap.: Machine Learning

- How do you define machine learning (T,E,P)?
- Based on your definition define Task, Experience and Performance measure for a given task, e.g.,
 - Patient diagnosis based on their lab tests
 - Estimating output value based on inputs
 - Classification vs. prediction
- Different Models of Learning and their Learning Methods

v.2. Recap.: Concept Learning and Decision Trees

- What is the difference between concept learning and decision tree learning?
 - FIND-S, LIST-THEN-ELIMINATE
 - ID3 (Information Gain, entropy)
- Their pros and cons
- Study to represent them graphically!

v.3. Recap.: Unsupervised Learning and Clustering

- How do they differ from other ML methods?
- C-means
- SOM
- How would you use them in, for example,
 - Identifying future criminals

v.4. Recap.: Learning set of rules

- PROLOG: how it works and for what it is good?

v.5. Recap.: Black-Box Methods and Genetic Algorithms

- Why called as “black-box”
- Perceptron and MLP
- Basic principles of genetic algorithms (evolutionary algorithms)

v.6. Recap.: Bayesian Learning

- A priori probability
- A posterior probability
- MAP classifying principle

Required in Exam

- Grading principle:
 - 1: Basic knowledge, poor understanding
 - 3: High knowledge, average understanding
 - 5: High knowledge and understanding
- Please, bring your brains with you and turn them on!