EE-605 **Statistical Sequence Processing**

Bourlard Hervé

| Cursus | Sem. | Type |
|---|---|---|
| Electrical Engineering | | Obl. |

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|---|---|
| Language of teaching | English |
| Credits | 4 |
| Session | |
| Exam | During the semester |
| Workload | 120h |
| **Hours** | **56** |
| Courses | 28 |
| TP | 28 |
| **Number of positions** | **20** |

### Frequency

Every 2 years

### Remark

Every 2 years. Next time: Spring 2020.

### Summary

This course discusses advanced methods extensively used for the processing, prediction, and classification of temporal (multi-dimensional and multi-channel) sequences. In this context, it also describes key links between signal processing, linear algebra, statistics and artificial neural networks.

### Content

• Introduction: statistical (static and dynamic) pattern recognition, temporal pattern recognition problems

• Basic tools in temporal pattern modeling: Correlation, autocorrelation, linear/nonlinear AR, ARMA and ARCH modeling

• Statistical pattern recognition: Bayes classifiers, artificial neural networks (ANNs), discriminant functions, Expectation-Maximization algorithm, dynamic programming

• Sequence processing: discrete Markov models, hidden Markov models (HMM), autoregressive (AR)-HMM, hybrid HMM/ANN systems, parameter estimation (EM and forward-backward algorithms applied to these models)

• Laboratory exercises: in statistical pattern recognition, autoregressive modeling, Markov models and hidden Markov models

### Note

Course notes (and relevant book chapters) available.

### Keywords

Statistical modeling, Markov models, hidden Markov models, artificial neural networks for sequence processing.

### Learning Prerequisites

#### Recommended courses

Undergraduate level statistics, linear algebra (matric computations, up to PCA) and minimum knowledge/interest in signal processing and machine learning. Programming in Matlab or similar.

## Assessment methods

Multiple.

## Resources

### Websites

- http://www.idiap.ch/resource/lectures/statistical-sequence-processing