

EE-605

**Statistical Sequence Processing**

Bourlard Hervé

Cursus	Sem.	Type
Electrical Engineering		Opt.

Language of teaching	English
Credits	4
Session	
Exam	During the semester
Workload	120h
<b>Hours</b>	<b>56</b>
Courses	28
TP	28
<b>Number of positions</b>	<b>20</b>

**Frequency**

Every 2 years

**Remark**

Next time: Spring 2022

**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

**Keywords**

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

**Learning Prerequisites****Recommended courses**

Undergraduate level statistics, linear algebra (matrix 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>