

## AUEB STATISTICS SEMINAR SERIES APRIL 2018

### SHORT COURSE

**Helene Massam**  
Professor, Department of Mathematics and Statistics  
York University, Canada

### A short Course on GRAPHICAL MODELS

Lecture 1	Introduction and Basic Notions	Monday	16 April 2018	12.00-15.00
Lecture 2	Graphical Gaussian models	Tuesday	17 April 2018	9.00-12.00
Lecture 3	Discrete graphical and hierarchical models	Wednesday	18 April 2018	9.00-12.00
Lecture 4	Model selection and learning for graphical Gaussian models	Thursday	19 April 2018	9.00-12.00
Lecture 5	Model selection and learning for discrete graphical models	Friday	20 April 2018	9.00-12.00

All lectures will be placed in Room 802, 8<sup>th</sup> floor of the Postgraduate Building of Athens University of Economics and Business (Evelpidon & Lefkados).

- The course is financed by the M.Sc. in Statistics of Athens University of Economics and Business.
- A limited number of positions (~20) will be available for other participants (outside the Full time program of the M.Sc. of Statistics) with preference given to Ph.D. students and M.Sc. Students and graduates (with this order).
- Free Registration is available for a limited number until 30/3/2018 or earlier if the positions are covered at <https://qoo.ql/forms/WBf92k7FHVBO3v2>
- Your position will be secured only after official notification by the Postgraduate office of Statistics of AUEB.
- Certificate of attendance will be provided (electronically) to all participants attending at least 4 out of 5 lectures.

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#### **Detailed Structure of the Course**

- 1. Lecture 1: Introduction and Basic notions**
  - a. (a) graph theory,
  - b. (b) conditional independence and Markov properties
  - c. (c) exponential families
  - d. Elementary examples of graphical models.
- 2. Lecture 2: Graphical Gaussian models:**
  - a. Undirected decomposable and non decomposable models, directed models.
  - b. The Wishart distribution.
  - c. Parameter estimation through maximum likelihood and Bayesian methods.
  - d. Sampling from conjugate priors.
- 3. Lecture 3: Discrete graphical and hierarchical models**
  - a. Undirected decomposable and non decomposable models, directed models.
  - b. The Dirichlet distribution.
  - c. Parameter estimation through maximum likelihood and Bayesian methods.
  - d. Sampling from conjugate priors.
- 4. Lecture 4: Model selection and learning for graphical Gaussian models.**
  - a. Basic model selection methodology from the frequentist point of view: the G-Lasso.
  - b. Basic model selection methodology from the Bayesian point of view: The Bayes factor; computation of the normalizing constant in Gaussian models, travelling through the set of graphs.
  - c. A review of sampling methods for sampling from the G-Wishart.
- 5. Lecture 5: Model selection and learning for discrete graphical models.**
  - a. Computation of the normalizing constant in discrete graphical models
  - b. A review of sampling methods for sampling from the G-Wishart and the generalized hyper- Dirichlet.
  - c. Moving away from Bayes factors for model selection: a survey of

recent methods for model selection.

## References

- Graphical models by Steffen Lauritzen, Oxford Science publications, 1996.
- Probabilistic graphical models by Kohler and Friedman, Springer, 2009.

These references and the ones listed below are only for guidance. All lectures will be based on my lecture notes.