



# Machine Learning Using Graphical Models

18-19 August 2009

Presenter: Dr Tiberio Caetano

Parkview Hotel  
562 St Kilda Rd, Melbourne VIC

## Teaching Arrangements:

The course will be conducted from 9.00am to 5.00pm. Morning tea will be available at approximately 10.00am to 10.30am, lunch from 12.30pm to 1.30pm and afternoon tea at approximately 3.00pm to 3.30pm.

**Registration Fee:**  
AU\$1320 (including GST)

Group and PhD student discounts available. Please enquire.

## How to Register

To register fill out the registration form (overleaf) and fax it to +61-8-8343-8711 or scan and email it to [industryeducation@nicta.com.au](mailto:industryeducation@nicta.com.au).

## Cancellation Policy

At least **4 weeks** notice is required for cancellation of a place in a short course for full reimbursement. If cancellation is later than 4 weeks then the place can either be given to another person or the registrant can be provided with a credit towards other NICTA training.

For details of further courses please see our web site:

[www.nicta.com.au/short\\_courses](http://www.nicta.com.au/short_courses)

or contact the NICTA Industry Education Manager.

## About Machine Learning Using Graphical Models

This 2-day course describes the basics of the theory and algorithms of probabilistic graphical models, such as Bayesian Networks and Markov random fields. The basic theory of how such structured probabilistic models can be constructed from conditional independence relations between random variables will be presented. The basic algorithms used to perform probabilistic inference in such models will be described, including Belief Propagation and Junction Tree algorithms, as well as the closed-form solutions for the case where the random variables have a Gaussian distribution. The course will also cover learning in Graphical Models, or how to estimate the parameters of a model when training data is available. In this context the EM algorithm will be presented as a general framework for learning in Graphical Models. Specific algorithms for parameter estimation will be presented, as well as the more recent discriminative Graphical Models, or Conditional Random Fields. A series of real-world examples will be presented in order to illustrate the usefulness of Graphical Models in modeling and solving real problems in areas as diverse as Image Processing, Bioinformatics and Natural Language Processing.

## Target Audience

The course is ideal for engineers, statisticians, applied mathematicians, computer scientists, and even social scientists (mainly economists) and biological scientists with a more quantitative background.

## Brief Course Outline

### Day 1:

- Basic Theory of Graphical Models
- Markov random fields and Bayesian Networks
- Inference in Graphical Models: Exact Methods
- Inference in Graphical Models: Approximate Methods

### Day 2:

- Exponential Families and the EM algorithm
- Conditional Random Fields
- Learning in Graphical Models: Other methods
- Applications of Graphical Models

## Assumed Knowledge

Attendants should have very elementary understanding of probability theory and linear algebra and elementary understanding of calculus.

## Course Outcomes

After completing the course attendees will:

- Understand theory and algorithms underlying the framework of Probabilistic Graphical Models.
- Learn to identify real-world problems which can be modelled and solved within such framework.
- Learn to model a real-world problem within this framework and characterize which algorithms should be used to solve the problem.

## Presenters: Dr Tiberio Caetano

Dr Tiberio Caetano is a senior researcher at NICTA's Canberra Laboratory, where he is a member of the Statistical Machine Learning research group. His research interests are in the areas of pattern recognition, machine learning, computer vision, document analysis and bioinformatics.

## About NICTA and Short Course Program

National ICT Australia (NICTA) is Australia's ICT Centre of Excellence and was established to drive innovation through high quality research, research training and technology transfer. As a world-class research institute NICTA uniquely combines excellence in research, education, commercialisation and collaboration. We are working to ensure that Australia is well placed to benefit from the significant opportunities that ICT research delivers.

NICTA is funded by the Australian Government as represented by the Department of Communications, Information Technology and the Arts and the Australian Research Council through *Backing Australia's Ability* and the ICT Centre of Excellence program. NICTA members are the Australian Capital Territory Government, the New South Wales Government, the University of New South Wales and the Australian National University.

NICTA short courses offer scientists, engineers and managers technical training with a leading edge in areas such as telecommunications, transport, security, defence, logistics, e-government, mining, finance and biotechnology.

There will be ample opportunities for discussion and questions and answers. Morning and afternoon tea/coffee and a light lunch will be provided. Extensive workshop materials will be made available to participants.

### How to register

Please complete the registration form below and

- Fax it to +61-8-8343-8711 or
- Scan and email it to [industryeducation@nicta.com.au](mailto:industryeducation@nicta.com.au).

**Send the form as soon as possible to secure your place.**

For further information please contact  
Anne-Marie Eliseo  
Industry Education Manager  
Telephone: +61-8-8343-8710  
Email: [anne-marie.eliseo@nicta.com.au](mailto:anne-marie.eliseo@nicta.com.au)

## Registration Form and Tax Invoice\* ABN 62 102 206 173

\*Upon completion of this form, including the relevant payment, this form will become a Tax Invoice.

**Please register me for Machine Learning Using Graphical Models on 18-19 August 2009.**

PLEASE PRINT

Date: \_\_\_\_\_

Title: \_\_\_\_\_ First Name: \_\_\_\_\_ Surname: \_\_\_\_\_

Position: \_\_\_\_\_ Organisation/Division: \_\_\_\_\_

Postal Address: \_\_\_\_\_

Telephone No: \_\_\_\_\_ Facsimile No: \_\_\_\_\_ Email: \_\_\_\_\_

Dietary preference: \_\_\_\_\_

Course Fees:  Full fee: AU\$1320 (incl. GST)  
(Register before **Aug 4<sup>th</sup>, 2009.**)

### Method of Payment (please tick below):

Cheque (payable to National ICT Australia Ltd)  
Forward the cheque and a copy of THIS registration form to:  
Anne-Marie Eliseo, Industry Education Manager, NICTA, Innovation House, First Avenue, Mawson Lakes SA 5095, Australia.

Credit Card: Credit Card No.: \_\_\_\_\_ Expiry Date: \_\_\_\_\_

Visa  Master Card Name on card: \_\_\_\_\_

Amount: AU\$ \_\_\_\_\_ Signature: \_\_\_\_\_  Tick if receipt required

Email address of card holder: \_\_\_\_\_

Electronic Funds Transfer  
**Please advise by email to Annette Van Bramer**  
[annette.vanbramer@nicta.com.au](mailto:annette.vanbramer@nicta.com.au)  
**when payment is made**

BANK	Commonwealth Bank of Australia
ACCOUNT NAME	National ICT Australia Limited
BSB	062 900
ACCOUNT NUMBER	1032 4576
REFERENCE NUMBER	180809

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- Send an email to [comments@nicta.com.au](mailto:comments@nicta.com.au) or
- Phone NICTA's Industry Education Manager on +61 8 8343 8710.