



## **NICTA "FOUNDATIONS OF ICT" SHORT COURSES**

As part of the RTN, Research Groups are offering short introductory courses to NICTA PhD students. The courses provide students with the opportunity to gain a broad understanding of each of NICTA's research areas and to assess whether these areas can be applied to students' own research topics.

**Duration:** Typically each courses will run over two days, with a component of self-directed lab work in some courses.

**Delivery mode:** Students can choose whether to attend the course in person at the relevant NICTA lab, to join the course via video conference at their nearest NICTA laboratory or to access the course via live streaming. **Please make your choice when registering for each course.** Students who choose to access the course via live streaming will be provided further details in due course.

Students are strongly encouraged to attend all courses.

### **PROGRAM**

<b>Course Title</b>	<b>Dates</b>	<b>Register By</b>	<b>Contact</b>
Introduction to Machine Learning	15 and 18 November	11 November 2011	<a href="#">Kimberly Owen</a>
Decision Support, Optimisation and MiniZinc	21 and 23 November	17 November 2011	<a href="#">Belinda Selig</a>
Introduction to Control and Signals Processing	28 and 29 November	24 November 2011	<a href="#">Annette McLeod</a>
Empirical Research in Software Systems	1 and 2 December	29 November 2011	<a href="#">Rema Zogabe</a>
Introduction to Computer Networks	6, 7 and 8 December	2 December 2011	<a href="#">Prashanthi Jay</a>
Introductory Course in Computer Vision and Image Understanding	15 and 16 December	13 December 2011	<a href="#">Kimberly Owen</a>

To register for each course, please email the relevant contact person the following information:

1. Student ID
2. Given Name
3. Surname
4. Email Address
5. Mode of Attendance, please choose one of the following
  - a. "I will be attending the course at the venue" (see descriptions on next page for venue details)
  - b. "I will be attending the course via video conference at my local lab" – please also advise your local lab – ATP / CRL / NRL / QRL / VRL
  - c. "I will be attending the course via the NICTA wiki" (details of link to follow)
  - d. "I will be attending the course off-site via live streaming" (details of link to follow)

If you have any further questions, please contact the Research Group Co-ordinator listed against the relevant course above.



## **BRIEF COURSE DESCRIPTIONS**

*Machine Learning Research Group*  
*"Introduction to Machine Learning" - 15 and 18 November*  
*Venue: Canberra Research Laboratory*

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This course provides students with the essential knowledge on key concepts and technologies in Machine Learning (ML), and how to apply them to solve given data, document or text processing tasks. The first component of this course will introduce basic concepts like regression, classification and clustering, illustrated by examples. It will also prepare the basic understanding about probabilities which the following lectures will use. The second component will introduce Graphical Models as modern tools for designing and solving ML tasks, and the third component will focus on applications of Graphical Models to solve tasks in computer vision. The final component will discuss the important topic of how to select appropriate models for ML which can be confidently applied to predict future information. This component will be complemented with applications of ML in Text and Document processing. During the tutorial sessions, the students will deepen their understanding of ML by solving data processing tasks using some characteristic data sets and algorithms. *Lecturers: Wray Buntine, Stephen Gould and Chris Webers (CRL), Tiberio Caetano (ATP)*

*Optimisation Research Group*  
*"Decision Support, Optimisation and MiniZinc" - 21 and 23 November*  
*Venue: Victoria Research Laboratory*

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This course provides an introduction to decision support systems, with a narrow focus on combinatorial optimisation. After an introduction to decision support, with some practical examples, we will discuss problem modelling, and the notion of algorithmic complexity. We will then introduce the MiniZinc language and illustrate its use in modelling a few example problems. Lastly we will survey four solvers: SAT, constraint propagation, linear programming and mixed integer programming, and compare their performance on some example problems. *Lecturer: Mark Wallace*

*Control and Signals Processing Research Group*  
*"Introduction to Control and Signals Processing" - 28 and 29 November*  
*Venue: Victoria Research Laboratory*

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The course will provide an overview of the important analytical tools and techniques required for research in the areas of Control and Signal processing being undertaken by CSP research group. The course will also outline the major problems being addressed in the areas of Large Scale Dynamical Systems and Life Sciences. *Lecturers: See Course Outline (to be provided after registration)*

*Software Systems Research Group*  
*"Empirical Research in Software Engineering" - 1 and 2 December*  
*Venue: Australian Technology Park AND/OR Neville Roach Research Laboratories - TBA*

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The objective of this course is to provide postgraduate students with the basic but essential knowledge on key concepts in conducting empirical research in software systems. This course will position empirical research methods in the general scientific research methods. It provides detailed coverage of the various types of empirical research methods, examples of the application of these methods, traps for the unwary and mechanisms to select the most appropriate methods. During the course, student exercises will provide students with

experiences in applying empirical methods to their research problems. The course will develop the student's interest and critical view of empirical research methods. *Lecturer: Liming Zhu*

*Networks Research Group*

*"Introduction to Computer Networks" - 6, 7 and 8 December*

*Venue: Australian Technology Park Research Laboratory*

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The objective of this course is to provide postgraduate students with the basic but essential knowledge on key concepts, currently used protocols, and emerging applications in networking systems. This course will adopt a theoretical and practical approach to networking, with a strong emphasis on the latter. Thus the first component of this course will follow a top down approach to introduce the concept of networking layers and protocols. This will allow students with former networking training to refresh their knowledge, and students without such training to gain the essential understanding of networking systems. The second component of this course will consist of an in-depth exploration of three topics at the application, the transport, and the network levels. This second component will be divided in three laboratory sessions, where the students will experiment with specific protocols and systems deployed on a real networking platform. These practical sessions will be designed to foster knowledge acquisition, and develop the student's interest and critical view of networking systems.

*Computer Vision Research Group*

*"Introductory course in Computer Vision and Image Understanding" - 15 and 16 December*

*Venue: Canberra Research Laboratory*

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Recently, techniques from computer vision, image understanding and pattern recognition have been used to develop a powerful array of applications in a number of fields, ranging from health to HCI and security. For instance, computer vision methods have been used for purposes of segmentation and grouping, tracking, image database indexing and retrieval and urban simulation and visualisation. The course is designed to give those students who are working in problems akin to computer vision, image understanding, pattern recognition and robotics an insight into the concepts, methods and tools essential for conducting effective research in machine vision and its applications. Upon successful completion of the course, the student will also have the knowledge required to understand the nature of these methods and the settings in which they are most effective. *Lecturer: Antonio Robles-Kelly*