

Optimization of Planet Earth Afternoon

Saturday 9th February

Novotel Newcastle Beach

King Street, Newcastle

RSVP to Juliane.Turner@newcastle.edu.au

Time	Presenter	Title
2:00 – 3:00	Keith Devlin, Stanford University	Keynote: Analyzing <i>Little Red Riding Hood</i> and the movie <i>Memento</i> , to keep the USA safe from terrorists
3:00 – 3:20	Heinz Bauschke UBC-O, Kelowna, Canada	Projection Methods and Road Design
3:20 – 3:40	Helmut Maurer, University of Muenster, Germany	Policy Scenarios in a Model of Optimal Economic Growth and Climate Change
3:40 – 4:00	Radu Ioan Bot, Chemnitz University of Technology, Germany	Convex Analysis in Imaging
4:00 – 4:20	Irene Lena Hudson, University of Newcastle, NSW	Modelling and Prediction of Dynamic, Temporal Phenomena – Many Questions, Some Answers, Many Methods – an Overview
4:20 – 4:40	Russell Luke, University of Goettingen, Germany	Optimization in complex environments: when feasibility is enough
4:40 – 5:00	Mike Meylan, University of Newcastle, NSW	Modelling Wave Scattering in the Marginal Ice Zone
5:00 – 7:00	MPE Reception – Novotel Newcastle Beach	

On **Saturday 9th February**, as part of Australian [Mathematics of Planet Earth 2013](#) activities, we will host an outreach afternoon highlighting Optimization's many applications to the man-made and to the natural world. **Keith Devlin (Stanford) --- and NPR's `Math Guy` --- will give the plenary lecture.** Other confirmed speakers include Heinz Bauschke (Kelowna), Radu Bot (Chemnitz), Irene Hudson (Newcastle), Russell Luke (Gottingen), H. Maurer (Munster), Mike Meylan (Newcastle).

2.00-3.00 Keynote: Analyzing *Little Red Riding Hood* and the movie *Memento*, to keep the USA safe from terrorists

Keith Devlin, Stanford

Abstract: Many of today's problems are too complex, and involve too many factors that are unknown or not well understood, to allow for traditional mathematical modeling. Though such problems may not permit useful mathematical solutions, they can benefit from mathematical thinking. In 2009-10, I participated in a project for a subcontractor to the US intelligence community to develop a technology and an associated operating protocol to improve the acquisition of actionable information from intelligence data, including text, surveillance video, and satellite imagery. The task facing the intelligence analyst is to take the data and fuse it into a coherent story, with the goal of answering the question, "What was/is going on and what is likely to happen next?"

3.00-3.20 Projection Methods and Road Design

Heinz Bauschke UBC-O, Kelowna, Canada

Abstract: Projection methods are easy-to-understand algorithms for solving certain classes of optimization problems where one wants to find a solution satisfying all constraints. In this talk I will explain how these methods work and how they can be used in the optimization of road designs.

3.20-3.40 Policy Scenarios in a Model of Optimal Economic Growth and Climate Change

Helmut Maurer, University of Muenster, Germany

Abstract: We consider a well-known dynamic model of economic growth and climate change consisting of three ordinary differential equations. We determine optimal controls (policies) in various scenarios, where either temperature constraints are prescribed (Copenhagen agreement) or constraints for CO₂ concentration have to be fulfilled (Kyoto protocol). We study the impact of such constraints on optimal consumption and abatement policies which are considered as guidance to practical policy options. Numerical solutions are obtained by solving large-scale optimization problems.

3.40-4.00 Convex Analysis in Imaging

Radu Ioan Bot, Chemnitz University of Technology, Germany

Abstract: We emphasize the role played by convex analysis when addressing different tasks in imaging. By employing suitable convex regularization approaches, we obtain and solve nonsmooth convex optimization problems. The theory is applied to concrete applications in image denoising, image deblurring and image inpainting.

4.00-4.20 Modelling and Prediction of Dynamic, Temporal Phenomena – Many Questions, Some Answers, Many Methods – an Overview

Irene Lena Hudson, University of Newcastle, NSW

Abstract: Modelling and prediction of dynamic, spatiotemporal phenomena and often multiagent systems, such as invasive species diffusion, bird migration, ocean spatial impacts of climate change, flowering phenology and poverty mapping need optimal computational and inferential methods which are robust and interpretable. We discuss the questions which arise and methods to obtain answers.

4.20-4.40 Optimization in complex environments: when feasibility is enough

Russell Luke, University of Goettingen, Germany

Abstract: Many mathematical approaches to planning and control seek among several options a "best" course of action. What is best, of course, depends on your priorities. Many mathematical models in current applications make requests that are mathematically difficult to analyse and compute. A family of numerical algorithms, known as projection methods, however, has proved surprisingly resilient for such difficult modern applications. The secret to these algorithms is, arguably, reduced expectations: they merely seek a FEASIBLE solution instead of a unique BEST solution. We will present examples of these algorithms in remote sensing and computational quantum chemistry that point to their potential for helping to address the challenges of a changing climate.

4.40-5.0 Modelling Wave Scattering in the Marginal Ice Zone

Mike Meylan, University of Newcastle, NSW

There is a complex relationship between ocean waves and sea ice. At the boundary between the continuous pack ice and the open ocean is an interfacial region called the marginal ice zone. This region consists of ice floes formed when waves break the pack but it also attenuates wave energy protecting the pack ice from further breaking. Understanding this process has a number of important applications in geophysics and climate modelling. In this talk I will discuss the mathematical challenges of modelling wave scattering by floating ice.

5.00-7.00 Reception - Novotel Newcastle Beach