Committee Innovation and TopQuants launch second College Tour on Data Analytics for Professionals

ANNOUNCEMENT

January 6, 2019

1 Announcement

The Committee Innovation of PWN (Platform Wiskunde Nederland), Utrecht University and TopQuants are proud to announce their second College Tour on data analytics for professionals. The college tour consists of a series of lectures on a number of related topics. Each topic is carefully selected to align with current developments and trends in analytics, data science and machine learning. During this second tour, each lecture consist of two parts. After a lecture you will have a deeper understanding of the topic and a number of practical pointers to explore further on your own.

The lectures are intended for professionals with a background in science interested in current trending topics, possibly working in, but not limited to, the financial sector. It is envisioned that the lectures and the networking afterwards facilitate a healthy dialogue between academia and industry to foster the sharing of knowledge.

The lectures will take place in the evening starting in March 2019. Catering will be provided during walk-in and afterwards participants are invited to join the informal networking part of program. Complementary drinks will be served.

The fee for the program is set at €480,- with everything included. An early bird fee of €420,- applies for registrations before February 1st, 2019. The number of tickets for the complete series of lectures is limited to 35. Seperate registration per lecture is also available for €240,-. The number of these tickets is limited to 5 per lecture.

2 Program

Details of the program are given below.

Location:	De Nieuwe Poort			
Schedule:	18:45	-	19:30	Walk-in
	19:30	-	21:30	Lecture
	21:30	-	23:00	Networking

Scheduled topics:

Day	Date	Topic	Lecturer
Tues	12-03-2019	Learning strategies for time series analysis - Part I	Prof. dr. S. (Sjoerd) Verduyn Lunel (UU)
Tues	19-03-2019	Learning strategies for time series analysis - Part II	Prof. dr. S. (Sjoerd) Verduyn Lunel (UU)
Tues	26-03-2019	Parallel computing - Part I	Prof. dr. R. (Rob) Bisseling (UU)
Tues	02-04-2019	Parallel algorithms for network analysis - Part II	Prof. dr. R. (Rob) Bisseling (UU)
Tues	09-04-2019	Inside the black-box of supervised and unsupervised learning - Part I	Dr. T. (Tristan) van Leeuwen (UU)
Tues	16-04-2019	Inside the black-box of supervised and unsupervised learning - Part II	Dr. T. (Tristan) van Leeuwen (UU)

kindly sponsored by ING

3 Registration

To register, please go to the TopQuants site.

4 Abstracts

Learning strategies for time series analysis - Part I and II. In the first lecture we discuss the mathematical foundation of machine learning and time series. We introduce the notion of function fitting (interpolation and extrapolation), architecture of networks (feedforward, convolutional and recurrent), and explain the nonlinear least square method. We continue with an introduction to time series.

In the second lecture we discuss a recent dynamical systems approach to change point detection in time series. We introduce the notion of attractor and measure, and explain the theory of attractor reconstruction from time series. We continue with an introduction to multidimensional scaling and explain how our new approach can be used to reveal functional relationships between the time series and change point detection (both from synthetic and real data). Several examples are given to illustrate our results.

Parallel computing - Part I. Today, every computer is a parallel computer, with two, four, or more processor cores simultaneously carrying out various tasks. We can harness this power to perform a large-scale demanding task by letting the cores work together, dividing the computational work evenly among them, while trying to limit the amount of communication between them.

In this lecture, I will present recent developments in the field of high-performance computing, such as hierarchical architectures with both shared and distributed memory, available libraries for parallel programming, and a number of basic examples of parallel algorithms such as sorting and sparse matrix-vector multiplication. A more advanced example is the training and deployment of an artificial neural network, which is directly related to sparse or dense matrix-vector multiplication. In my explanations, I will assume a simple model for parallel computation, the bulk synchronous parallel (BSP) model and a two-level extension, hybrid BSP.

Parallel algorithms for network analysis - Part II. Networks are everywhere: social networks such as Facebook and Twitter connect billions of people. The brain has billions of neurons. These people or neurons are the nodes in the network and typically they are connected to a limited set of neighbours, defined by either friendships, followers, or dendrites and axons. The network can change over time, by new friendships or new followers, deleted friendships, and in case of the brain due to its plasticity. Mathematically, networks are modelled as graphs, with vertices as the nodes of the network and edges as the connections.

In this lecture, I will present parallel algorithms for analysing large-scale networks. Counting triangles in a network is a widely used basic operation in network analytics, giving the so-called clustering coefficient, an important network characteristic. Triangle counting can be parallelised well and we will see how this is done. Another example algorithm is weighted graph matching, which is used in the realm of online dating (matchmaking) services, but also in less romantic applications such as assigning jobs to workers or detecting communities in social networks. in social networks.

Inside the black-box of supervised and unsupervised learning - Part I and II. Many algorithms are available for both supervised and unsupervised machine learning, and new algorithms are being published regularly. We see acronyms like SGD, AMSGrad, AdaMax, Nadam, PCA, SVD, RNN, ICA, NMF, but what is hidden inside the black box? In these two talks, I will sketch an overarching mathematical framework that encompasses many of these methods and discuss how several state-of-the-art methods can be easily understood as specific instances in this framework. By keeping the framework in mind, it is easier to compare algorithms and decide if it is worth switching to a new method. As background I will assume that everyone is familiar with basic notions from calculus (function, derivative, gradient) and linear algebra (matrix, vector, matrix multiplication, norm and inner product).

5 Biographies

Prof. dr. S. (Sjoerd) Veduyn Lunel

Sjoerd Verduyn Lunel studied Mathematics with Physics at the University of Amsterdam and received a PhD from Leiden University in 1988. He is currently Professor of Applied Analysis at Utrecht University. He held positions at Brown University, Georgia Institute of Technology, University of Amsterdam, Vrije Universiteit Amsterdam, and Leiden University. He was elected member of the Royal Holland Society of Sciences and Humanities in 2012 and is an honary member of the Indonesian Mathematical Society.

He was the Director of both the Mathematical Institute and the Leiden Institute of Advanced Computer Science at Leiden University from 2004 to 2007, and the Dean of the Faculty of Science at Leiden University from 2007 to 2012. Since 2015 he is the Secretary of the European Mathematical Society and one of the Directors of the Teylers Foundation. He is currently the Chair of the Board of the National Platform for Dutch Mathematics (PWN). The research of Sjoerd Verduyn Lunel is at the interface of Analysis and Dynamical Systems with applications to Data and Life Sciences.

Prof. dr. R. (Rob) Bisseling

Rob Bisseling is a full professor in Scientific Computing at the Mathematics Institute of Utrecht University. He is author of the book "Parallel scientific computation: a structured approach using BSP", Oxford University Press, 2004, with a second edition expected to appear Fall 2019.

Previously, he worked as a research mathematician at Shell Research, Amsterdam, where he investigated the application of parallel computing in oil refinery optimization and polymer modelling. He received a BSc degree in mathematics, physics, and astronomy in 1977 and an MSc degree in mathematics in 1981, both from the Catholic University of Nijmegen, and a PhD degree in theoretical chemistry in 1987 from the Hebrew University of Jerusalem, Israel.

He is co-author of the BSPlib standard (1997) for parallel computing using the BSP model and of several open-source software packages: Mondriaan for partitioning sparse matrices (2002); SAWdoubler for counting self-avoiding walks on a lattice (2012); and the BSP libraries MulticoreBSP for Java (2012), MulticoreBSP for C (2014), and Bulk for C++ (2018).

At Utrecht University, he teaches the MSc course Parallel Algorithms (every year since 1993); he has also taught courses on Networks, Scientific Computing, and Mathematics for Industry. His research interests are numerical and combinatorial scientific computing in general, and parallel algorithms, sparse matrix computations, graph algorithms, and their application in Big Data in particular.

dr. T. (Tristan) van Leeuwen

Tristan van Leeuwen received his BSc. and MSc. in Computational Science from Utrecht University. He obtained his PhD. in geophysics at Delft University in 2010. After spending some time as a postdoctoral researcher at the University of British Columbia in Vancouver, Canada and the Centrum Wiskunde & Informatica in Amsterdam, the Netherlands, he returned to Utrecht University in 2014 as an assistant professor at the mathematical institute. His research interests include: inverse problems, computational imaging, tomography and numerical optimization.