



Northeastern University

Electrical & Computer Engineering

Title: From big data to big insights: Processing large data streams by compact representations

Speaker: Dr. Justin Dauwels

Date: Wednesday, April 20, 2016

Time: 11:00-12:00

Location: DANA 442

Abstract

Nowadays, huge volumes of data are being generated every split second: bank transactions, Tweets, web browsing histories, GPS logs, environmental recordings, surveillance camera footage, etc. With this abundance of data, a new challenge arises: How to extract relevant information and make inferences from terabytes of data in a short amount of time?

In this talk, I will describe three approaches to process large data streams. The first approach is matrix and tensor decomposition. By such algebraic decompositions, large amounts of data can be compressed quite effectively. I will illustrate this technique for the problem of large-scale prediction of traffic speed in transportation networks.

Graphical models provide another avenue to handle large data streams. Inference in graphical models is a fruitful approach to handling large volumes of noisy and incomplete data. Graphical models provide a statistical framework to encapsulate our knowledge of a system and to infer from incomplete information. I will describe efficient algorithms for learning graphical models with hidden variables, and will demonstrate this approach for the monthly stock returns of the S&P 100 stock index.

At last, a third method to quickly extract information from large data streams is template matching. I will illustrate this approach by the example of detecting epileptic spikes in electroencephalograms via semi-automatic and fully automatic algorithms.

Biography

Justin DAUWELS is an Associate Professor with the School of Electrical & Electronic Engineering at Nanyang Technological University (NTU). He is also the Deputy Director of ST Engineering-NTU Corporate Lab and the Director of Neuroengineering Program at the School of EEE. His research interests are in Bayesian statistics, iterative signal processing, machine learning and computational neuroscience.

Prior to joining NTU, Justin was a research scientist during 2008-2010 in the Stochastic Systems Group (SSG) at the Massachusetts Institute of Technology, led by Prof. Alan Willsky. He received postdoctoral training during 2006-2007 under the guidance of Prof. Shun-ichi Amari and Prof. Andrzej Cichocki at the RIKEN Brain Science Institute in Wako-shi, Japan. He obtained his PhD degree in electrical engineering from the Swiss Polytechnical Institute of Technology (ETH) in Zurich in December 2005.

The research of his lab has been featured by BBC Click/World News, Singapore Straits Times, national TV, and various other media. Outcomes include real-time algorithms for large-scale urban traffic prediction; real-time algorithms for analysing human social behaviour; real-time noise-resilient algorithms for phase imaging; novel data analytics for biomedical signals; tools for large-scale modelling of extreme events. Justin's research is supported by national funding agencies including MOE, NRF, MINDEF, and DSO, and private companies, including ST Engineering, BMW, NXP, Courex, Quantum Inventions, and others.

