

## Estimation and Identification from Spatio-Temporal Data: Case Studies in Engineering, Healthcare and Social Science

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**Abstract:** Monitoring and identifying the behaviours of dynamic systems now require the analysis of large amounts of data that are derived from advanced data acquisition systems driven by cheap and ubiquitous sensors and information networks. The focus of the talk is on spatio-temporal processes that are observed in space and time that may not necessarily be regularly sampled. Three case studies are used to illustrate the methodologies used for modeling and identification from spatio-temporal data.

The talk begins with an overview of estimation and identification problems and methods used in the statistical signal processing literature. Then, the engineering case study is considered first. Here, the problems of estimating the wind velocity and pressure fields from LIDAR-type sensor measurements are addressed. The second case study addresses the problem of developing a patient-specific model from intracranial EEG array signal for healthcare application. The final case study uses conflict event spatio-temporal data to develop a predictive model of the dynamics of conflicts.



**Bio sketch of the speaker:** Visakan Kadiramanathan obtained his B.A in Electrical and Information Sciences at Cambridge University Engineering Department and went on to complete his PhD in Information Engineering at the same institution. Following brief post-doctoral research positions at the Universities of Surrey and Cambridge, he was appointed Lecturer at the Department of Automatic Control & Systems Engineering at the University of Sheffield. He rose through the ranks there to his current position of Professor in Signal and Information Processing. He was also the Head of Department from 2009-2014.

He is the Director of the Rolls-Royce University Technology Centre for Control and Monitoring Systems Engineering at Sheffield since 2012. His research interests are in the area of modeling and identification of complex dynamic systems and signal processing applications in aerospace and biomedical sciences including fault diagnosis. He has published more than 170 papers in peer reviewed journals and conferences. He was awarded the prestigious PNAS Cozzarelli Prize in 2013 for his pioneering paper on modelling the dynamics of conflicts.

His professional activities include being the Co-Editor-in-Chief of the International Journal of Systems Science. He has delivered a number of invited plenary presentations at international conferences and was Conference Chair of the IAPR International Conference on Pattern Recognition in Bioinformatics.