Department of Electronics & Communication Engineering

and

PES CENTRE FOR INTELLIGENT SYSTEMS

present a lecture by

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on

Congestion in Large-Scale Transportation Networks: Analysis and Control Perspectives

Outline: Fluid-like models and their discretisations like the Cell Transmission Model (CTM) have proven successful in modelling traffic networks. However, given the complexity of the dynamics, it is not surprising that the stability properties of these models, especially in congested regimes, are not yet well characterised. The first half of this talk will propose a new modelling paradigm, where an analogy between discretised fluid-like traffic flow models and a class of chemical reaction networks is constructed by suitable relaxations of key conservation laws. This framework allows us to draw upon powerful structural results and entropy-like Lyapunov functions from chemical reaction network theory to study the existence and stability of congested steady states in networks with arbitrary topologies. The second half of this talk will motivate compositional design approaches to mitigate congestion in large-scale transportation networks by describing a scalable distributed design that uses only local information to limit the propagation of congestion in the network.

Sivaranjani is with the Department of Electrical and Computer Engineering, Texas A&M University. Her research focuses on distributed control of large-scale infrastructure networks, with emphasis on transportation networks and power grids. She obtained her PhD in the Department of Electrical Engineering at the University of Notre Dame in 2019, and her undergraduate and Master's degrees, both in electrical engineering, from the PES Institute of Technology, India and the Indian Institute of Science, India in 2011 and 2013 respectively. Sivaranjani has also been a research intern at GE Global Research, Bangalore (2011-13), and a visiting graduate student at the Simons Institute for the Theory of Computing at UC Berkeley (2018). She is a recipient of the prestigious international Schlumberger Foundation Faculty for the Future fellowship (2015-2018) and the Zonta International Amelia Earhart fellowship (2015-2016). She was also a Notre Dame (NSF) Ethical Leaders in STEM fellow for the year 2016-17, and was selected among the MIT Rising Stars in EECS in 2018.

Venue: B Block Room No. 502 (5th Floor), PES University
Date: 14 January 2020, 1430–1530 hours

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