上海交通大学自动化系
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系统控制与信息处理教育部重点实验室
Key Laboratory of System Control and Information Processing, Ministry of Education

学术报告会

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地　点：电院群楼2-410会议室

Learning Predictive Models from Observed Network Equilibria: From Transportation to Metabolic Networks

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Abstract:

Equilibrium modeling is common in a variety of fields such as game theory, transportation science, and cell metabolism. The inputs to these models, however, are often difficult to estimate, while their outputs, i.e., the equilibria they are meant to describe, are often directly observable. By combining ideas from inverse optimization with the theory of variational inequalities, I will present an efficient, data-driven technique for estimating the parameters of these models from observed equilibria. Our framework allows for both parametric and non-parametric estimation and provides probabilistic guarantees on the quality of the estimated quantities.

I will present applications in two seemingly distinct areas. In transportation networks we use these techniques to estimate the congestion function, which determines users' route selection. Using actual traffic data from the Boston area, we have been able to quantify the inefficiency of drivers' selfish behavior compared to a socially optimal solution, also called the price of anarchy.

In biochemical networks, Flux Balance Analysis (FBA) is a widely used predictive model which computes a cell's steady-state chemical reaction fluxes as a solution to an optimization problem. FBA, however, assumes a certain global cellular objective function which is not necessarily known. We will use our new method to estimate such an objective. This enables us to elucidate the cellular metabolic network control mechanisms and infer important information regarding an organism's evolution.

Biography:

Prof. Ioannis Ch. Paschalidis is a Professor in the College of Engineering at Boston University with joint appointments in the Department of Electrical and Computer Engineering, the Division of Systems Engineering, and the Department of Biomedical Engineering.He is the Director of the

Center for Information and Systems Engineering (CISE)– a Boston University research center with 39 affiliated faculty and more than $6.6 million of annual research expenditures. He is also affiliated with the BioMolecular Engineering Research Center (BMERC), the Clinical & Translational Science Institute (CTSI), the Precision Diagnostics Center (PDC), and the Rafik B. Hariri Institute for Computing and Computational Science & Engineering. He completed his graduate education at the Massachusetts Institute of Technology (MIT) receiving an MS (1993) and a PhD (1996) degree, both in Electrical Engineering and Computer Science. In September 1996 he joined Boston University where he has been ever since. He has held visiting appointments with MIT and Columbia University.