TEMPLE UNIVERSITY
Department of Mathematics

Applied Mathematics and Scientific Computing Seminar

Room 617 Wachman Hall

Wednesday, 18 September 2013, 4:00 p.m.

Traffic Monitoring with Smartphones

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Abstract.

The recent and rapid growth smartphones is dramatically changing how traffic is monitored on our roadways. In addition to providing a significant increase in sensor coverage, data from these devices also poses new challenges in traffic modeling and data assimilation for the next generation of traffic management systems.

In the first part of the talk, I will describe the problem of estimating parameters of a scalar conservation law model of traffic from GPS data, which is a critical but cumbersome task. A poorly calibrated model leads to erroneous estimates in datapoor environments, and limited forecasting ability. I will present a method for calibrating model parameters for a discretized scalar conservation law using only velocity measurements. The method is based on a Markov Chain Monte Carlo technique, which is used to approximate statistics of the posterior distribution of the model parameters. Numerical experiments highlight the difficulty in estimating maximal densities, and suggest a new approach to improve performance of the sampling through re-parameterization of the model.

In the second part of the talk, I will describe a new approach to monitor traffic with cell phones, known as TrafficTurk. Inspired by Amazon's Mechanical Turk for crowd sourcing human intelligence tasks, TrafficTurk enables large-scale traffic sensor deployments to improve coverage during extreme congestion events. The system has been deployed for sporting events in Urbana-Champaign, and in New York following Superstorm Sandy.