

# Large Deviations, Congested Queues, Large Games and Congested Avenues

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Tuesday, 25 July 2017, 3:00pm – 4:00pm

Venue: Think Tank 20 (building 2 level 3 room 2.305)

**Abstract:** We present two projects. The first one is about congestion in queues, the second one is about the impact of shared mobility on traffic congestion.

In the queueing context we consider an abstract single server queue where customers arrive sequentially, each requiring a random amount of service time. We employ techniques from large deviations theory to derive approximations to severe congestion times, that is the amount of time the queue length stays continuously above a high threshold. Our approximations apply in a setting where service requirements are heavy tailed. That is, the distribution of the service requirements puts higher mass on large events than any exponential distribution.

Congestion due to motor traffic is the second subject. There are large quantities of excess seat capacity spread throughout privately owned vehicles given traditional usage patterns. Often a car is used only a short fraction of time per day, and typically only one out of five seats is filled when the car is traveling. New platform based businesses are creating a market for this excess capacity. There are promising studies regarding the algorithmic and engineering challenges of making ride sharing among strangers feasible, in particular highlighting the potential reduction in traffic volume if cars are used more efficiently. However, by studying an abstract model for such a ride sharing platform, we caution that the change in demand for rides in response to the sharing platform might nullify any reduction in congestion and potentially increase traffic volume.

**Speaker Bio:** Harald is a final year PhD student at the Singapore University of Technology and Design. Prior to joining SUTD, he obtained a Master (2013) and Bachelor degree (2012) in Mathematics from ETH Zürich. His research interests circle around applied probability, stochastic modeling, game theory, and their application in management and economics. He also worked as Intern with Quantitative Research at J.P. Morgan, Singapore, in 2016.

