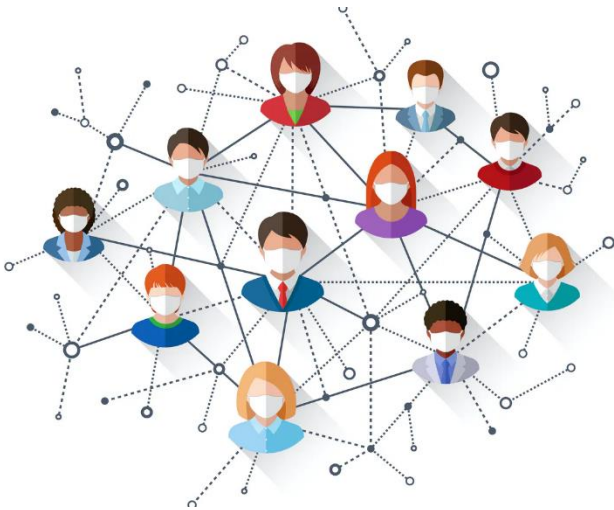# Dynamic contact graphs for epidemic modelling using smart card data

Problem description

Smartcard has been used extensively in the public transport industry for various applications. In a period where sharing and crowding are becoming a public health concern, the efficiency offered by mass transport becomes a potential peril. Smart card data allow us to (i) reconstruct the contact network reflecting the passengers' potential contacts during his/her public transport journey, and (ii) assess and assign probabilities to get infected from connections in the contact graph based on crowding estimates. The objective of this thesis is to further construct dynamic contact graphs that reflect the contacts of a person across multiple days and use that to build epidemic model that can quantify how quickly and adversely virus spreads within a public transport system under different scenarios.

Smart card data from the Stockholm region will be made available for this thesis. Passengers tap in on buses or at station gates in the case of metro and commuter train. No tap-outs are available, but they have been inferred in a previous project, making it possible to estimate trajectories and hence, potential contacts for each person. Moreover, this unique and rich dataset contains a unique id for each passenger, allowing tracing a passenger's trajectory across multiple days, and thus aid in building dynamic contact graphs.

Assignment
- Review the state-of-the-art in data-driven contact graph modelling
- Build time-dependent contact graphs from smart card data
- Apply epidemic modelling on the dynamic graphs
- Analyse different virus spreading and demand scenarios

The project will be performed in cooperation with Region Stockholm, the public transport authority of Stockholm County and KTH Royal Institute of Technology in Stockholm.

Candidate
- Should have coding skills in Python/MATLAB
- Should be comfortable working with large datasets

Research group
Department of Transport & Planning
Contact: Panchamy Krishnakumari p.k.krishnakumari@tudelft.nl, Oded Cats o.cats@tudelft.nl