Mobile device tracking and transportation mode detection

**Keywords:** Big Data, Mobility, Particle Filters, Tracking

# Introduction

In cooperation with a Dutch telecom provider, Statistics Netherlands has been developing a model for the tracking of mobile devices. Using multiple observations of the device of an employee, a probability distribution of the travelled path can be computed. This article serves as a proof of concept for the proposed methods.

The available data contains records of connections between antennas and the device. A separate data source contains properties of all antennas in the network. A signalling strength model translates the properties of each antenna into a probability distribution of the position of a device in a 100m by 100m grid cell. A Markov Chain Monte Carlo model uses these probability distributions as input in the form of observations.

Similar data has previously been used for tourism statistics [1].The proposed approach does not only result in an estimated travel path of the device, it also provides the estimation of transportation mode for each time step.

# References

1. M. Tennekes and M. Offermans and N. Heerschap, Determining an optimal time window for roaming data for tourism statistics, Statistics Netherlands 2017, 1-4.
2. Arulampalam, M. Sanjeev; Maskell, Simon; Gordon, Neil (2002). ["A Tutorial on Particle Filters for On-line Non-linear/Non-Gaussian Bayesian Tracking"](http://citeseerx.ist.psu.edu/viewdoc/summary?doi=10.1.1.117.1144). IEEE Transactions on Signal Processing. 50: 174–188. [doi](https://en.wikipedia.org/wiki/Digital_object_identifier):[10.1109/78.978374](https://doi.org/10.1109/78.978374).