Using Data Extracts from an Electric Bicycle Fleet for Defining Mobility Hotspots

and Evaluating Operational Quality
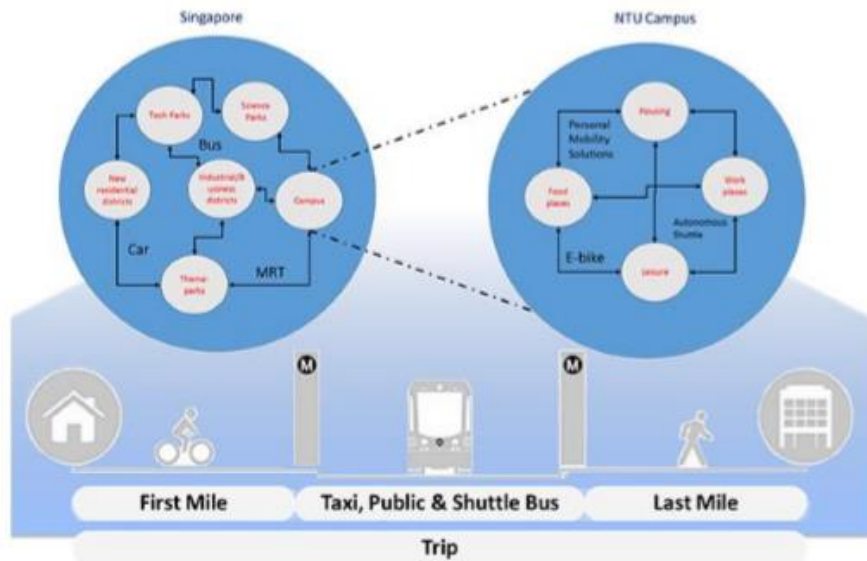
Master's Thesis of Shyam Sundar Rampalli

Supervisors:
Dr. rer. nat. Andreas Keler (TUM)
M. Sc. Georgios Grigoropoulous (TUM)

External Mentoring:
Dr. Aravind Muthiah (Eri@n, NTU)

Source: http://ecocampus.ntu.edu.sg/Current-Projects/Pages/Personal-Mobility-Solution-Research-for-Campus-and-Beyond.aspx
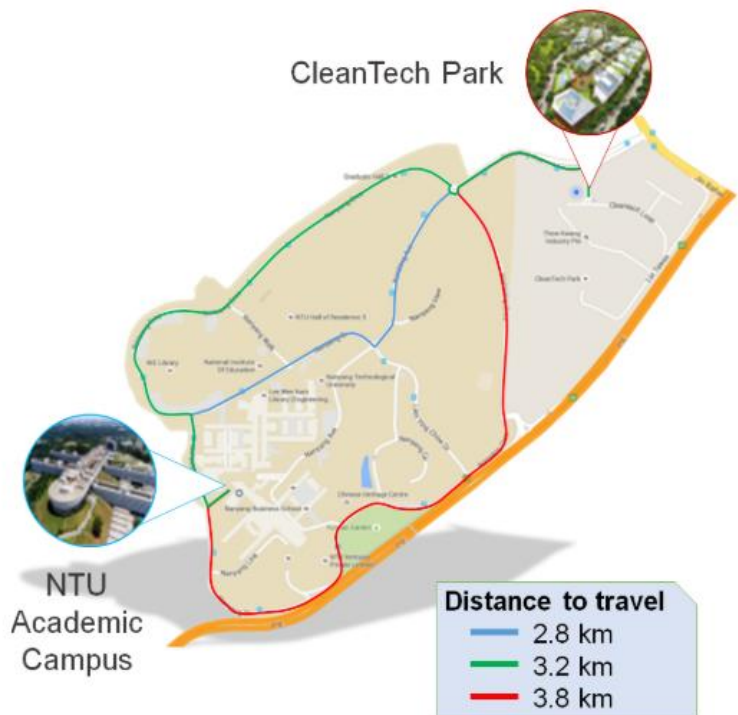
Bike sharing data analysis overview

Bicycle-sharing services can benefit to the variety of daily transport modes in urban environments. Conceived as being an alternative for taxi services and public transport, bicycle-sharing services are used by daily commuters, as well as tourists. Liberal data sharing policies in the US allow data scientists to make use of relatively detailed and anonymized data extracts of, often station-based, bicycle-sharing services. Since decades the representations as origin destination matrices (OD matrices) allow the representation of flows, while leaving out detailed information on the specific trajectory and the traffic control that influence individual movements. Data set for this thesis as been used from the research project which is an free floating electric-bike sharing experimentation in the campus of Nanyang Technological University, Singapore.

Source: http://ecocampus.ntu.edu.sg/Current-Projects/Pages/Personal-Mobility-Solution-Research-for-Campus-and-Beyond.aspx
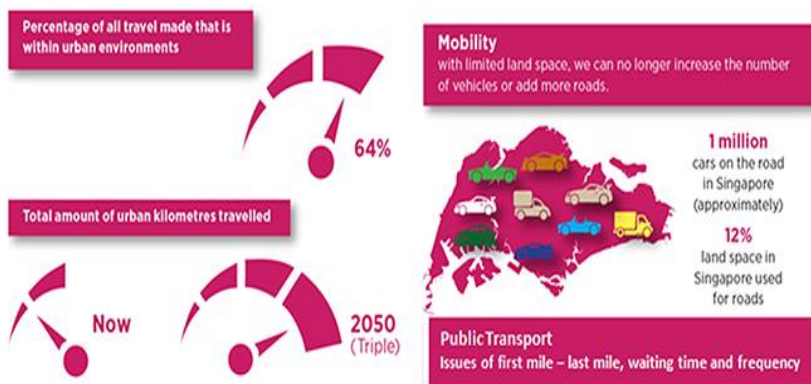
Objective:

The Aim of this thesis work is to analyze bicycle O-D data to develop further insights also in relation to other modes of transport.

Methodology:

Certain clustering algorithms with combinations have been used to define hotspots with the bicycle trip OD data. Zones of low bicycle trip activity have been obtained with the help of graduated heatmaps. KPIs have been presented with a classification amongst them followed by a short discussion on usage differences between traditional and electric bike.

Source: http://ecocampus.ntu.edu.sg/Current-Projects/Pages/Personal-Mobility-Solution-Research-for-Campus-and-Beyond.aspx

Discussion of results

Rather than using individual clustering methods, combining clustering algorithms has improved the results with clusters looking more definite indicating a potential location. Method developed to determine the zone of less bicycle activity has proved to be effective considering from an operator's perspective. Performance evaluation measures (KPIs) with classification gave a clear understanding of which values are valuable for an operator and which to an bike sharing system planner.

April 2019

Technische Universität München
Lehrstuhl für Verkehrstechnik
Univ.-Prof. Dr.-Ing. Fritz Busch