Traffic Analysis Project

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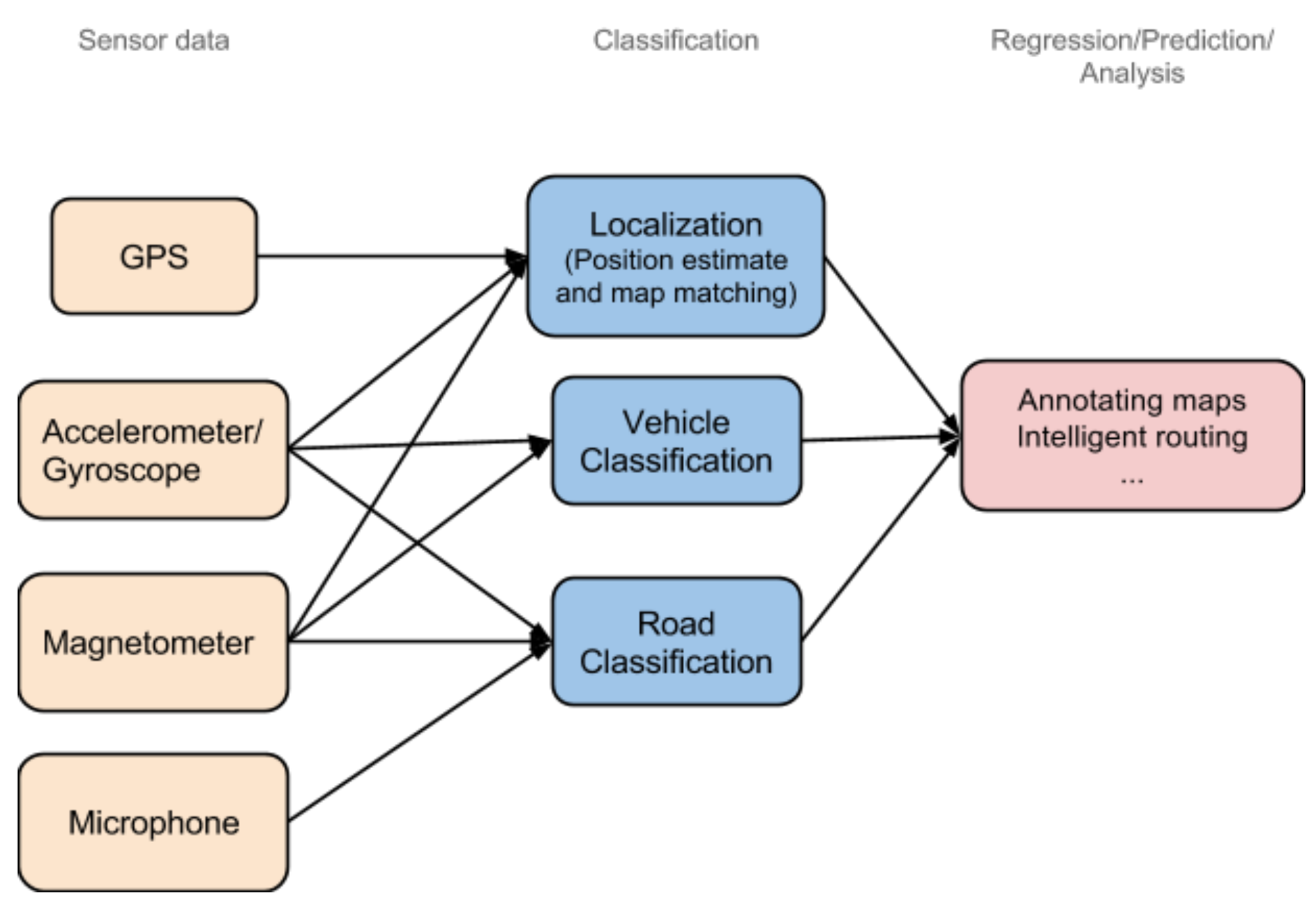
INTRODUCTION

The project aims to analyze and model road traffic conditions. The goal of such analysis is to be able to predict and learn how to issue traffic recommenda -tions for better and relaxed travel in India’s cities.



LITERATURE REVIEW

Various projects attempt to analyze traffic and road conditions. Some of them are listed below

Nericell **:** Using GPS, Accelerometer and Microphone on a smartphone, estimate road and traffic conditions. Identify potholes and bumps using simple threshold heuretic on accelerometer data after reorienting with respect to vehicle’s axes. Identify honking by checking for more than two energy spikes in frequency domain. Uses triggered sensing to save power.

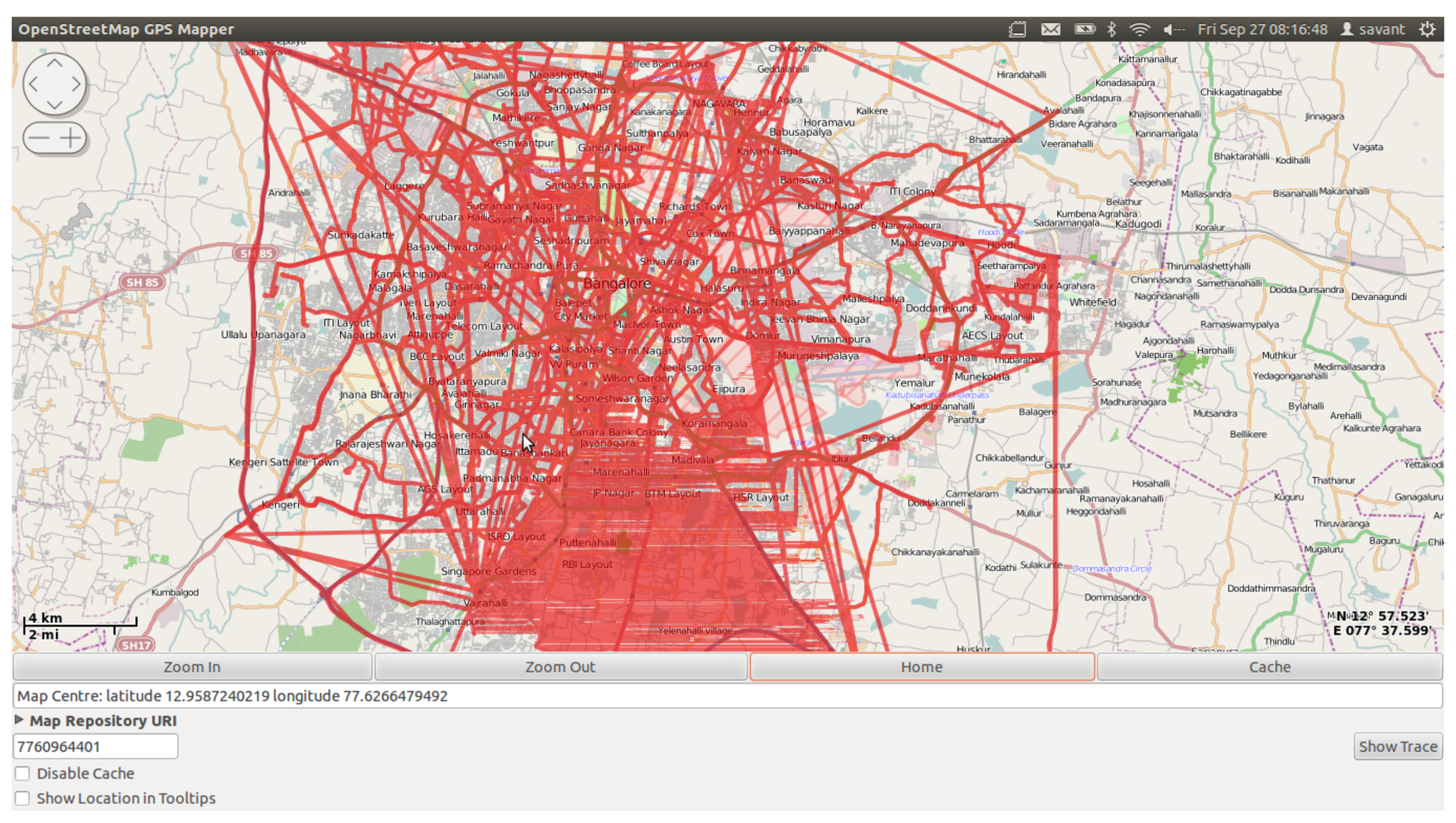
Wolverine **:** Uses similar approach as Nericell. Uses magnetometer for reorientation. Use machine learning techniques for identifying potholes/bumps. Initiallly partition the data using K-means clustering into two classes for labeling. Use SVM classifier to classify after training.

CloudAtlas **:** Use GPS traces for map building. Initially GPS points are matched to road segments using Viterbi algorithm. The system is modeled as a Hidden Markov Model. Infer whether the trace is matched or not. After repetition of unmatched traces new roads are infered.

Driving Coach **:** Obtains sensor data from CAN bus. Extract various features such as minimum, average and maximum of acceleration, velocity, instant fuel consumption and engine rpm, time vehicle has stopped. Classify into fuzzy outputs based on intuitive decision. For a specific set of driving hints, assign fuzzy likelihood values. Defuzzify using center average method and give the maximum likelihood hint.

VTrack **:** Uses sparse GPS and WiFi for delay estimation. Initially does HMM based map mathcing using Vitebi algorithm wih interpolation, outlier removal and bad zone detecion. Wardriving database is created and used to map WiFi APs to position estimates. Use the travel time estimates to detect hotspots and for real time route planning.

GPS TRACES ANALYSIS



FUTURE WORK

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Figure #1

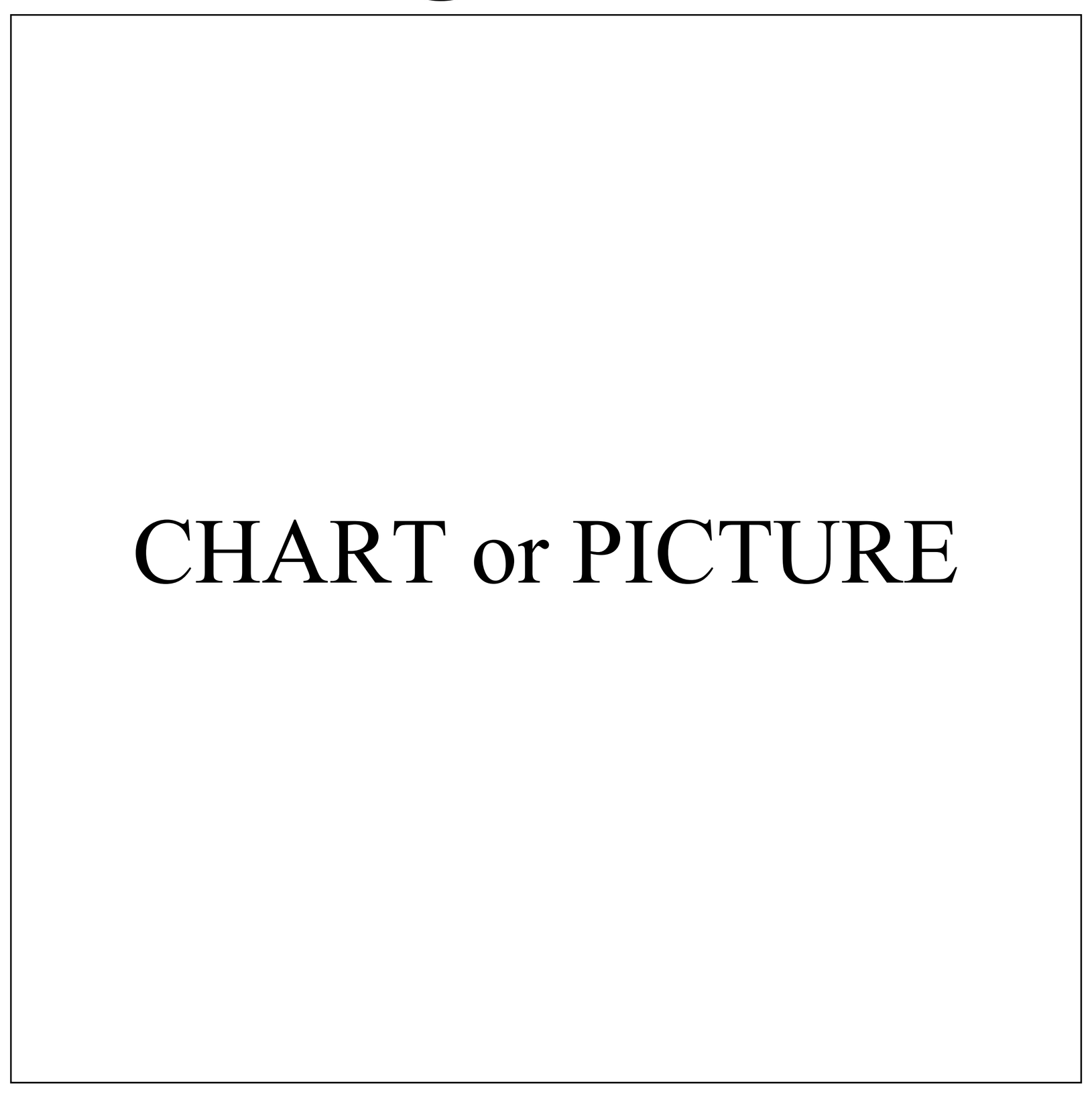
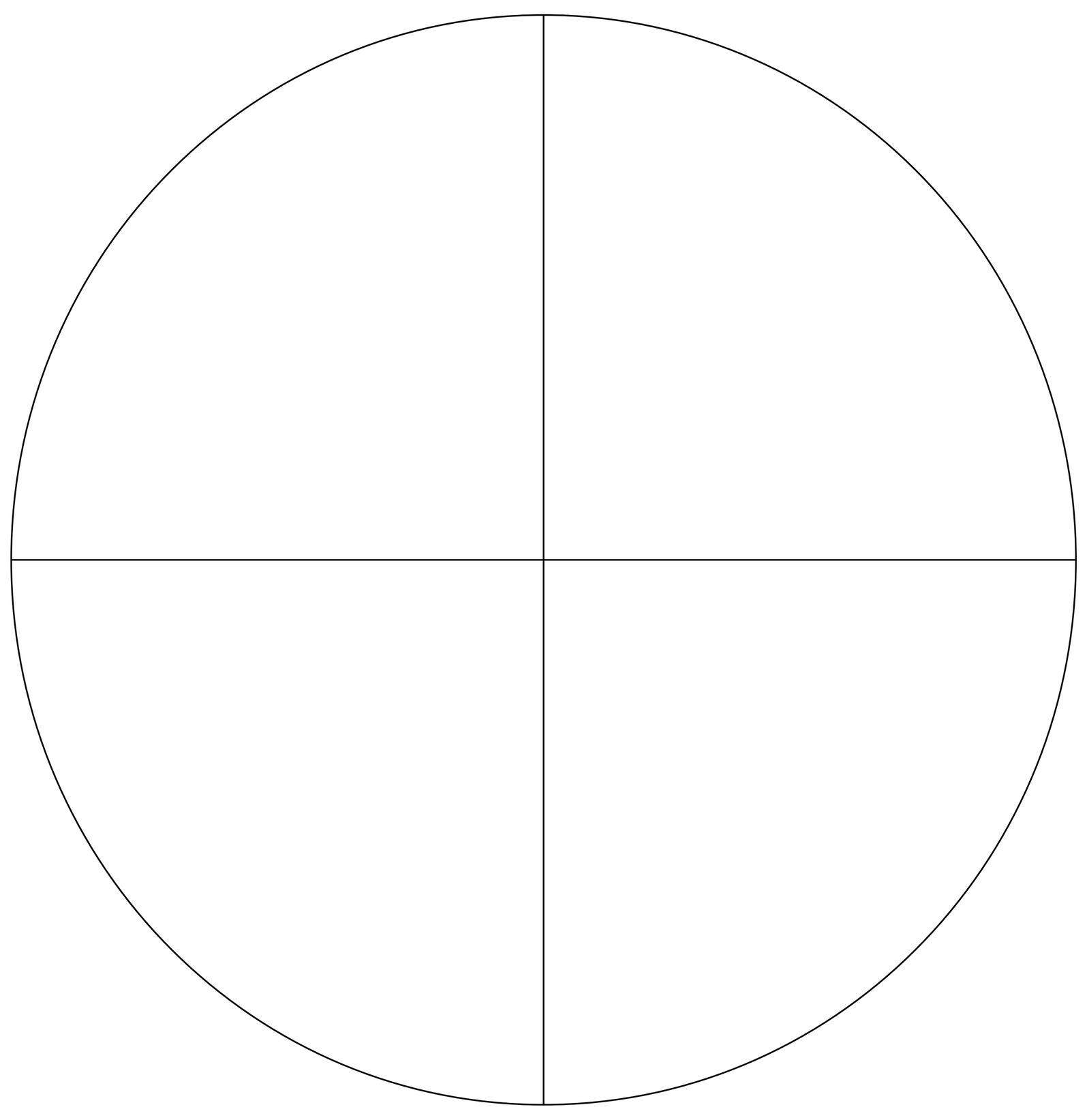


Figure #2



BIBLIOGRAPHY

- Mohan, Prashanth, Venkata N. Padmanabhan, and Ramachandran Ramjee. "Nericell: rich monitoring of road and traffic conditions using mobile smartphones." *Proceedings of the 6th ACM conference on Embedded network sensor systems*. ACM, 2008.
- Bhoraskar, Ravi, et al. "Wolverine: Traffic and road condition estimation using smartphone sensors." *Communication Systems and Networks (COMSNETS), 2012 Fourth International Conference on*. IEEE, 2012.
- Wang, Yin, et al. "CrowdAtlas: Self-Updating Maps for Cloud and Personal Use."
- Araújo, Rui, et al. "Driving coach: A smartphone application to evaluate driving efficient patterns." *Intelligent Vehicles Symposium (IV), 2012 IEEE*. IEEE, 2012.
- Araújo, Rui, et al. "Driving coach: A smartphone application to evaluate driving efficient patterns." *Intelligent Vehicles Symposium (IV), 2012 IEEE*. IEEE, 2012.
- Koukoumidis, Emmanouil, Li-Shiuan Peh, and Margaret Rose Martonosi. "SignalGuru: leveraging mobile phones for collaborative traffic signal schedule advisory." *Proceedings of the 9th international conference on Mobile systems, applications, and services*. ACM, 2011.
- Ban, Xuegang (Jeff, et al. "Delay pattern estimation for signalized intersections using sampled travel times." *Transportation Research Record: Journal of the Transportation Research Board* 2130.1 (2009): 109-119.
- Work, Daniel B., et al. "An ensemble Kalman filtering approach to highway traffic estimation using GPS enabled mobile devices." *Decision and Control, 2008. CDC 2008. 47th IEEE Conference on*. IEEE, 2008.
- Visualizing and analyzing GPS trace data : https://github.com/sksavant/traffic-analysis
- xlsx to csv converter : https://github.com/dilshod/xlsx2csv
- GTK widget for map display : https://github.com/nzjrs/osm-gps-map
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