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## MASTER'S THESIS

for

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### **Semantic labeling of places using feature extraction from multimodal smartphone data in combination with 3rd party location information**

#### Problem description:

In today's mobile applications, user assisting functionalities take an increasingly important role driving the need for more accurate user context awareness (e.g. user is at work, shopping, at a restaurant, at a gym etc.). Current applications often conceive context primarily from a user's geographic location. However, as many activities take place indoors, a precise localization is oftentimes difficult. Especially in (multi-floor) areas with a dense accumulation of different types of places, an inaccurate localization might lead to false conclusions. This thesis aims to encompass this shortcoming by taking additional smartphone data into consideration [1].

In the scope of this master's thesis a comprehensive semantic labeling classifier based on supervised machine learning will be implemented. Thereby, the classifier is supposed to consider geographic information derived from a 3rd party provider, such as Foursquare, Google, Facebook or Yelp, as well as multimodal smartphone data. Smartphone data will include, but is not limited to, GPS, GSM and Wifi data, accelerometer and gyroscope data and bluetooth activity. In addition, the classifier should also take other validity properties into account, such as timing (e.g. shopping at times after stores are closed unlikely) and sequence of activities (e.g. eating at two restaurants in a row unlikely).

#### Tasks:

- Literature overview on Semantic Places Labeling.
- Design of a semantic labeling classifier using supervised machine learning based on multimodal smartphone data and external location information.
- Evaluation and comparison with similar approaches, such as [2] and [3].

#### Bibliography:

- [1] A. Rivero-Rodriguez, H. Leppkoski, R. Pich. Semantic Labeling of Places based on Phone Usage Feature using Supervised Learning. *Ubiquitous Positioning Indoor Navigation and Location Based Service*, 2014.
- [2] A. Noulas, C. Mascolo and E. Frias-Martinez. Exploiting Foursquare and Cellular Data to Infer User Activity in Urban Environments. *IEEE 14th International Conference on Mobile Data Management*, 2013.
- [3] Y. Zhum E, Zhong, Z. Lu and Q. Yang. Feature Engineering for Place Category Classification. *Mobile Data Challenge*, 2012.

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