

Discovering and Predicting Human Behaviour Patterns

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The fast development of advanced mobile technologies opens up new possibilities for analysis of humans' behaviour. Location-acquisition technologies such as GPS in combination with intelligent mobile applications allow us to collect huge spatio-temporal datasets of human mobility. These datasets contain trajectories that are performed by individuals during the day. Each trajectory is determined by sequence of visited geographical points and corresponding timestamps.

These datasets give us the opportunity to discover movement behavior and form users' behavior patterns. Each pattern consists of visited locations and routes among them. It also contains time and distance annotations that describe users' behavior in the more detailed manner. A pattern location is enriched by additional semantics information that is acquired from *Foursquare Venues API*.

The behavior patterns are naturally being performed in repetitive manner. We utilize this to predict the actions of the users in the future. The ability to predict users' actions is crucial in fields such as physical activity recommendation, where we need to recommend the activities in advance so the users can adjust their schedules and plans.

We utilize existing pattern mining techniques [2,3,4] and introduce their enhancements. Even though people naturally repeat similar behavior patterns over and over again, the humans' behavior changes over the time. It can be caused by different year season or change of the timetable at the university. Our method takes that into the consideration and uses *time degradation* parameter that determines how quickly method adapts to the recent behavior of the user.

Our solution is integrated into the fitness app called Fitly (*formerly known as Move2Play*) [1]. Discovering and predicting human behavior can be used as a basis for physical activity recommendation. You can see system overview of our prototype on Figures 1. It consists of client mobile application that is responsible for activity tracking, pattern construction and prediction. The activity recommendation module tries to identify transitions that are suitable for physical activity. Server side is

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responsible for collaborative features that help overcome problems with cold start so the user can receive meaningful recommendations from the begging.

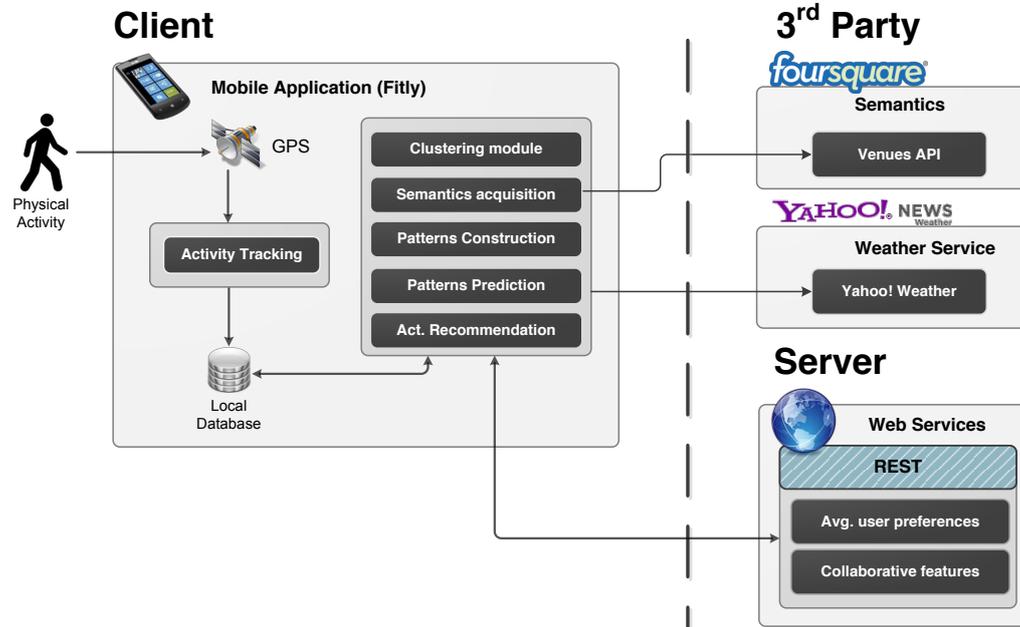


Figure 1. System overview.

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