Thesis Title: **SEMANTIC ANALYSIS OF TRAJECTORY TRACES TO EXPLORE HUMAN MOVEMENT BEHAVIOUR**

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Abstract: Analysing the mobility traces of moving agents (mobile users, GPS-equipped vehicles), call data records (CDRs) may help in interpreting the "human interests and intentions" behind the movements and thus facilitates diverse range of location-based applications. The trajectory analysis uncovers the connections, correlations and differences among individuals and their activities by exploring their mobility attributes. Specifically, analysing trajectories, GPS footprints both from individual and aggregate level provide personalized recommendation alerts, better resource allocation (both transit and cellular networks) and traffic flow analysis which helps in various interesting navigation applications.

The focus of our research work is to extract semantic knowledge of human movement behaviour and utilize it for location-based service provisioning. The work is motivated by the fact that human moves with an intent, and mapping the intent of the move with raw GPS log provides usable knowledge to build an effective system. The major contributions of this thesis are (1) proposing semantic knowledge extraction framework to model human movement patterns, categorizing users based on their mobility semantics, and transferring mobility knowledge from one region to other geographically dispersed region; (2) proposing mobility dynamics network and extracting mobility association rules (MARIO) for predicting travel demands and traffic dynamics in a city-region; (3) proposing activity-based mobility profiles of individuals for personalized activity recommendations; (4) developing mobility-aware cloud based framework (Traj-Cloud) and cloud-fog-edge-IoT collaborative framework (Mobi-IoST) to facilitate time-critical applications. Finally, we utilize the proposed frameworks in facilitating location-based services, such as, location prediction, health-emergency services and finding correlation among mobility and other contexts. The overall study has been carried out considering the mobility traces of people, taxi-rides and other contextual datasets, such as, activity datasets, health-profiles and academic performances of students of an academic campus. In future, we like to extend our proposed framework by incorporating blockchain since movement traces are sensitive in nature. Moreover, the cloud-fog-edge-IoT based framework can be extended to capture the cellular data usage patterns from such time-series data and prediction of location sequences may help to appropriately manage the power and bandwidth related resources.