Supervisor's Name	Xiaohui Yu
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Supervisor's Department	School of Information Technology
Project Title	Urban Big Data Analytics for Location-Based Services

Description of Research Project (1500 characters maximum)

The widespread use of smartphones, sensors and other IoT devices in cities worldwide has given rise to a huge volume of urban spatio-temporal data, which often present themselves as high-velocity continuous streams with considerable noise and uncertainties. These data record a vast amount of movement information of people, vehicles, etc., and also include contextual information such as personal attributes, road networks, and points of interest. They serve as the backbone of a plethora of applications, such as location-based services, urban traffic management, road network planning, and environmental monitoring. However, it is a very challenging task to design highly efficient data structures and algorithms to manage the large spatio-temporal data and release the tremendous potential of these data.

In this project, we tackle the research challenges arising from two fronts. On the data management side, a fundamental challenge is how to handle the vast volume of concurrent queries over large spatio-temporal data, using a distributed computing paradigm. On the data mining side, a challenge is how to learn human mobility patterns by modeling the interactions of personal, spatial and temporal aspects in a unified way, which serves as a basis for better understanding of the semantics of the patterns.

The research results will not only advance the state-of-the-art, but also benefit governments, businesses and others alike. For example, location-based social networks (e.g., Foursquare, Gowalla) could also use the technologies to manage a large volume of check-in data and
tap into their potential for tremendous business value.

Undergraduate Student Responsibilities (1500 characters maximum)

Students working on the project will not only gain research experience in big data management and mining, but will also develop an in-depth understanding of recent advances in many areas of information technology. The research will be experimental and implementation oriented, providing students with extensive experience on systems design and implementation, which is desirable for students who will later move on to work in the relevant industry as well as academia. Students are expected to write a report on their findings, and are encouraged to submit papers to and attend the premiere conferences in the database/data mining field (with travel expenses reimbursed), which will help develop their writing and presentation skills, as well as help increase their exposure to advances in the community.

Qualifications Required (750 characters maximum)

Essential:

* Excellent programming skills with working knowledge of data structures, or
* Good programming skills, plus working knowledge of probability/statistics and linear algebra.

Preferred:

* Prior project experience,
* Willingness to continue on to graduate studies at York.