ICT PHD

Research project for a PhD curriculum in ICT – Computer Engineering and Science

**Tutor**: Laura Po

**(\*) Italian [Industrial] Co-tutor:**

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**Proposed Title of the research:**

*[Traffic Modelling and Simulation for Smart Mobility](http://www.ijmo.org/papers/126-C022.pdf)*

**Keywords: (5)**

Intelligent Transportation System (ITS)

Sensor Data Management and Outlier Detection

Simulation Model

Big Data Analysis and Integration within Smart Cities

Geographical and Visual Data Exploration

**Research objectives: --(max 10 rows)**

Traffic congestion is the problem affecting all modern cities. In Intelligent Transportation System (ITS), traffic flow modelling, prediction and the study of the emission generated are important research issues.

This proposal is focused on the management and analysis of huge amount of heterogeneous urban data streams focus on vehicle related information. It aims to couple the efforts from several large research areas (modelling, semantics, statistics and data integration) for developing techniques and tools for creating dynamic real-time traffic models and for analysing emission models integrated to traffic simulators.

The proposal includes the study and the implementation of techniques for

* Data series management: sensors data collection, analysis, and outlier detection
* Data integration
* Data cleaning
* Data analysis
* Traffic modelling
* Traffic flow prediction
* Dimension reduction applied on traffic data
* Emission modelling

The techniques will be complemented with a visualization engine allowing people to retrieve geographical data of interest from it.

As a case study the techniques will be applied in the city of Modena to improve traffic analysis and mitigation.

**Proposed research activity -- (max 10 rows)**

The research activity is carried out in the TRAFAIR project, a project funded by European Commission (CEF TELECOM) that aims at studying the correlation among traffic emission and air pollution dispersion in an urban context.

The project is led by UNIMORE and involved other 8 partners: the City of Modena, the Regional Company LepidaSpA, the University of Florence, the Tuscany Region, the University of Santiago de Compostela, the City of Santiago de Compostela, the Supercomputing Center of Galicia (CESGA), the University of Zaragoza.

The main activities can include:

• Survey and Analysis of the different traffic models and emission models

• Urban sensor data analysis, management, and querying

• Outlier detection on Sensor Data Series

• Analysis of the existing best practices, standards, metadata and services for releasing sensor data, traffic flow data and emission data

• Analysis and use of HPC technologies to store the different source of data and to elaborate statistics and simulations on scalable datasets

• Development of policies and tools for the effective monitoring of the current situation of pollutants and traffic flows within the city

• Development of a tool for the effective display of traffic flow maps

In particular, these activities will be implemented in the urban context of the city of Modena and compared to the other 5 urban areas.

**Supporting research projects (and Department)**

"TRAFAIR - Understanding Traffic Flows to Improve Air quality" project (2017-EU-IA-0167) funded under the CEF Telecom Call 2017-3 on Public Open Data by the European Commission

**Possible connections with research groups, companies, universities.**

Universidade de Santiago de Compostela (Prof. José Ramón Ríos Viqueira );

Universidad de Zaragoza (Spain – Prof. Raquel Trillo Lado )

Fundación Centro Tecnológico de Supercomputación de Galicia, CESGA (Spain- Dr. Ignacio López Cabido)

LepidaSpA (Regional company)

(\*) optional

(\*\*) optional/to be completed on the second year