

PhD Lecture

In partial fulfillment of the terms for obtaining the PhD degree, Saulius Samulevičius will give a lecture on the following subject:

Context-Aware Prediction Techniques with Applications in Mobile Broadband Networks

on Friday 8th of April 2016, 13:00, in room 0.2.90 at Selma Lagerlöfs Vej 300

Abstract:

This thesis describes a number of context-based prediction techniques as a part of business intelligence (BI) solutions. Computerized systems have influenced development and expansion of different domains. Decreasing computer size and increasing computational power allowed developing sensors for different tasks. Continuous sensor performance monitoring at regular intervals resulted that huge data volumes were generated. Persistently stored domain data from sensors allow designing and implementing BI solutions. BI solutions improve efficiency and effectiveness of the domain related operations using historical data analysis, mining, prediction, and other techniques. Historical data analysis showed high context-oriented data potential. The developed prediction techniques implemented standard time series data transformation into context-oriented data format. This thesis investigates prediction technique development and applicability challenges and makes the following contributions.

This thesis presents a concrete domain, i.e., mobile broadband network (MBN), which has evolved during the last 20 years and investigates how energy consumption and increasing CO₂ emissions in MBN could be optimized by applying prediction techniques. This thesis describes the *STEP (Spatio-Temporal Ensemble Prediction) framework, which is incrementally developed as a number of context definitions and ensemble prediction techniques: STEP (Spatio-Temporal Ensemble Prediction), LBSTEP (Lattice-Based Spatio-Temporal Ensemble Prediction), and OCiLBSTEP (Optimal Context in Lattice-Based Spatio-Temporal Ensemble Prediction). MOST (Mobile broadband network Optimization using planned Spatio-Temporal events) is developed combining STEP and third party information, i.e., planned spatio-temporal event knowledge. CnSC (Closed n-set Spatio-Temporal Classification) presents classification technique using closed n-set pattern mining.

The presented techniques are evaluated using real, generated, or both type datasets. The proposed prediction and classification techniques outperform the state-of-the-art techniques. The initial analysis of MBN optimization indicates app. 30% potential savings and experimental *STEP evaluation shows app. 20% savings. The presented MOST technique demonstrates high potential of the third party data and CnSC addresses the potential of NoSQL-based graph database.

Members of the assessment committee are Professor Laurent Schumacher, University of Namur, Belgium, Associate Professor Sandra Bringay, Université Montpellier 2, France, and Associate Professor Simonas Šaltenis, Aalborg University. Professor Torben Bach Pedersen and Associate Professor Troels Bundgaard Sørensen are Saulius Samulevičius supervisors. Moderator Professor Christian S. Jensen.

All interested parties are welcome. After the defense the department will be hosting a small reception in cluster 3.