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

**Tools and Techniques for Advanced Traffic Analytics**

on Friday 8th of June 2018, 13:00, in room 0.2.13 at Selma Lagerlöfs Vej 300

Abstract:
Advanced traffic analytics is a topic attracting increasingly more focus within the technology and transportation industry and in the IT world. Terms and concepts like Smart City, connected vehicles, and increasing demands for optimizing and informing on traffic situations calls for new tools and techniques to perform traffic-related analyses. Continuous proliferating quantities and varieties of data has become available over the past decade, introducing terms like Big Data and the Vs of Big Data. Today GPS data is available from a broad range of sources, e.g., transportation companies monitoring their vehicles, research projects analyzing on driving behavior, and even private drivers exchanging their second-to-second GPS data for traffic information. In Denmark more than 66 thousand drivers daily provides more than 100 million GPS records in exchange for traffic information.

This industrial-oriented thesis works with the concepts of integrating and modeling large sets of GPS and fuel/energy consumption data with a broad variety of secondary data sources enabling advanced traffic analytics with multiple contextual aspects. For many companies within the transport industry two typical main key performance indicators (KPIs) exist: 1) reducing overall costs and 2) improving punctuality to complete transportations at time. These KPIs also applies for the demand-responsive transport company FlexDanmark. Annually FlexDanmark manages passenger transportations for more than 1 billion DKK and savings of 1% yields large economic potentials. Being able to quantify the impact on travel times from, e.g., weather, accidents, or local factors enable much greater insight in focusing on which fields potentially could be optimized. Second, the large focus on environment, CO₂ emissions, fuel consumption, and electric vehicles requires companies to prepare for potential future steps into a transport industry independent on fossil fuels. Analyses on usage and driving behaviors of both conventional and electric vehicles enable, e.g., haulers, to be comfortable with the capabilities and limitations of electric vehicles.

In this thesis advanced data management tools are developed for integrating and modeling a broad range of data sources, enriching data with additional dimensions. To visually present the novel analyses and techniques a set of graphical interactive tools are developed. These enable users to easy configure and optimize the systems for their own demands. Advanced dynamic spatio-temporal data models are defined, enabling interactive user-defined integrations of data at query-time.

The work of this thesis shows how to approach large sets of spatio-temporal data enabling traffic-related analyses. Such tools, techniques, and analyses enable valuable insight into how data should be processed, what caveats to be aware of, and what results can be expected if these are applied. The outcome of this thesis enables companies like FlexDanmark to focus on which factors to be aware of if any of the two main KPIs, concerning operational cost or punctuality, should be optimized.

Members of the assessment committee are Professor Christophe Clarumunt, Naval Academy Research Institute, France, Professor Mario A. Nascimento, University of Alberta, Canada, and Associate Professor Hua Lu, Aalborg University, Denmark.

Associate Professor Kristian Torp, Senior Consultant at FlexDanmark Finn Kock Sørensen, and CIO at FlexDanmark Henrik Bøjer Jensen are Ove Andersen supervisors. Moderator Associate Professor Christian Thomsen.

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