Advisor's review of a master thesis

Prediction of energy load profiles

Author: Bc. Samuel Bartoš

Smart grids is an important research area for efficient energy production and consumption in near future. One of the most important topics in smart grids is prediction of electricity demands which is often used in optimization algorithms scheduling various types of devices. Task of the thesis is to compare various methods which can be used for prediction of electricity demands.

The submitted thesis studies methods for prediction of electricity in smart grids. Introduction, applications and literature overview of the studied research area are presented in the first four chapters. The following five chapters describe theoretical knowledge used in the thesis: State-space models, exponential smoothing methods, autoregressive moving average techniques and artificial neural networks. Chapter 10 presents methods for evaluation of experiments. Chapter 11 describes techniques and results of imputation. Results of all experiments are summarized in Chapter 12. The last chapter concludes the thesis and discusses possible directions for future research.

The student clearly showed his ability to understand various statistical (e.g. Exponential smoothing, Autoregressive moving average) and machine learning (Neural networks) methods and used them for data series prediction. I, as supervisor, must especially emphasise student's ability to independently work on a given topic. The student was able to independently find literature, choose appropriate methods, adequately combine various techniques, properly apply theoretical knowledge on practical data and describe his research in a comprehensive thesis.

The thesis shows a strong theoretical orientation of the student which is characteristic for the Faculty of Mathematics and Physics. First, a half of the thesis presents theoretical background of all methods applied in experiments. Second, the student decided to compare a lot of methods for data series prediction. Here, student spent a lot of time, so there was not enough time for tasks which are important for practical applications.

My main objection to the thesis is that all experiments were evaluated only on a single dataset of one house. Therefore, it is not clear whether results obtained from this single case study have general validity. Furthermore, many questions of practical importance remain open, e.g. whether presented methods can be used to predict energy demand of a single device, how fast presented methods able learn inhabitants behaviours, whether a higher model order or computationally more expensive algorithms improves the accuracy.

However, the thesis shows that the student understand the theoretical background and he is able to apply all techniques, so he should be capable to finish his research in short time and publish his results in an impacted journal or an international conference. The candidate clearly presented his readiness for a doctoral study.

Overall the student presented a very nice work and I recommend to accept it as a master thesis.

Prague, 25. 8. 2017

Jiří Fink
KTIML MFF UK