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Department	Electrical and Electronics Engineering
Master thesis title:	Power consumption forecasting using machine learning modelling.
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Thesis background:	Short term load forecasting (STLF) plays important role in energy management. Hence, more accurate load forecasting models are needed. A lot of papers and reports have been published in this area showing various approaches to electrical load forecasting. Madhusudanan [1] compared different prediction algorithms for energy consumption prediction. The methods applied were linear regression, polynomial regression, support vector regression and random forest regression. Plant area, production hours, number of employees, annual sales, the region of the facility and the annual temperature were used as independent, where the annual energy consumption was the dependent variable. The model contained a random forest feature that identified the most important variable from the dataset. The variables plant area and production hours were found to be the most important variables. The model was validated by applying the k-fold cross-validation and was shown that the approaches proposed by the author were consistently better than the conventional approaches by 20-23%. Furthermore, the validation showed that polynomial regression performed better than linear regression and that the support vector regression performed the worst for energy consumption prediction. Palchak [2] applied forecasting algorithms that provide the participation of the end-user to manage its energy consumption. Actual data was used to present a realistic scenario using ANN architecture (Multilayer perceptron) in

	the real-time forecast. Then, based on the load forecast, an energy management set of actions was developed that is based on controllable assets on the CSU campus. This showed that the actions of the operator can be better determined when taken in the context of the predicted load profile and that the value of those actions can be evaluated more accurately than applying a subjective cost-benefit analysis. Čupeljić [3] presented a model for forecasting day-ahead electricity demand. Two models were proposed single-equation model and the multi equation model. The single-equation model estimated all hours using a single equation, while for the multi-equation model each hour was treated as an individual time series to model the hourly electricity demand. Applying error measurements (mean error, mean absolute, error, mean absolute percentage error, and Theil's U- statistic) the multi-equation was determined to be the better model. Sabi [4] applied autoregressive regression integrated moving average model, exponential smoothing, and the multi-seasonal exponential smoothing method to predict the day-ahead energy demand. The result showed that the method could accurately predict future energy demand by applying specific techniques depending on the data. However, one disadvantage is that the analysis needs to be performed manually so that the best model could be determined.
Thesis objective:	The objective of this thesis is the investigation of Short-term power consumption forecasting models using machine learning modelling: the case of BiH. Different regression algorithms will be investigated and compared for the prediction task using R score, mean absolute error, root mean square error, etc. Furthermore, the most important input variables will be identified from the historical available data related to the energy consumption in the previous periods. Load curve data analysis will be performed as well. Lastly, the most adequate short-term prediction approach will be proposed. The energy prediction is very important step for the development of energy management system in Smart Grid.

Literature:

Reference:

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