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Short-Term Load Forecasting 2019 Short-Term Load Forecasting by Artificial Intelligent Technologies Recurrent Neural Networks for Short-Term Load Forecasting Applied Mathematics for Restructured Electric Power Systems Electrical Load Forecasting Long-term Load Forecasting in Electric Power Industry Forecasting and Assessing Risk of Individual Electricity Peaks Short Term Load Forecasting Using Artificial Neural Networks Comparative Models for Electrical Load Forecasting Short Term Load Forecasting Short-term Electric Load Forecasting by Using Multi-layer Feed-forward Neural Network A Very Short Term Load Forecasting Power System Short Term Load Forecasting Short Term Load Forecasting Short-Term Load Forecasting 2019 Short Term Load Forecasting Development of a short-term load forecasting model Intelligent Systems'2014 An Approach to Distribution Short-term Load Forecasting Short-term Electrical Load Forecasting for an Institutional/industrial Power System Using an Artificial Neural Network Short-term Load Forecasting Using Fuzzy Neural Networks Region-based Short-term Load Forecasting of Power Systems Short Term Load Forecasting Using Computational Intelligence Methods Short-term Load Forecasting in an Electric Power System On Short-Term Load Forecasting Using Machine Learning Techniques Short-term Load Forecasting A Generalized ANN-based Model for Short-term Load Forecasting Modeling and Forecasting Electricity Demand Modeling of Short Term Load Forecasting for Khartuom State Using ANN Short Term Load Forecasting Using a Neural Network Based Time Series Approach A Generalized Rule-based Short-term Load Forecasting Technique Short Term Load Forecasting Using Artificial Neural Networks Applications of Neural Networks to Electric Short Term Load Forecasting Probabilistic Short-Term Load Forecasting Using Conditioned Normalizing Flows Commercial, Industrial and Household Electrical Load Modelling and Short-term Load

Forecasting Using Fuzzy Neural Network to Solve Short-term Load Forecasting Problelms Very Short-term Load Forecasting for Automatic Generation Control of Electric Power Systems Short-term Load Forecasting by Using Neural and Wavelet Neural Networks Short Term Load Forecasting Using Artificial Neural Networks A Method for Utility Load Management Using Short Term Load Forecasting

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this book is a printed edition of the special issue short term load forecasting by artificial intelligent technologies that was published in energies since electricity plays a crucial role in industrial infrastructures of countries power companies are trying to monitor and control infrastructures to improve energy management scheduling and develop efficiency plans smart grids are an example of critical infrastructure which can lead to huge advantages such as providing higher resilience and reducing maintenance cost due to the nonlinear nature of electric load data there are high levels of uncertainties in predicting future load accurate forecasting is a critical task for stable and efficient energy supply where load and supply are matched however this non linear nature of loads presents significant challenges for forecasting many studies have been carried out on different algorithms for electricity load forecasting including deep neural networks regression based methods arima and seasonal arima sarima which among the most popular ones this thesis discusses various algorithms analyze their performance for short term load forecasting in addition a new hybrid deep learning model which combines long short term memory lstm and a convolutional neural network cnn has been proposed to carry out load forecasting without using any exogenous variables the difference between our proposed model and previously hybrid cnn lstm models is that in those models cnn is usually used to extract features while our proposed model focuses on the existing connection between lstm and cnn this methodology helps to increase the model s accuracy since the trend analysis and feature extraction process are accomplished respectively and they have no effect on each other during these processes two real world data sets namely hourly load consumption of malaysia as well as daily power electric consumption of germany are used to test and compare the presented models to evaluate the performance of the tested models root mean squared error rmse mean absolute percentage error mape and r squared were used the results show that deep neural networks models are good candidates for being used as short term prediction tools moreover the proposed model improved the accuracy from 83 17 for lstm to 91 18 for the

german data likewise the proposed model s accuracy in malaysian case is 98 23 which is an excellent result in load forecasting in total this thesis is divided into two parts first part tries to find the best technique for short term load forecasting and then in second part the performance of the best technique is discussed since the proposed model has the best performance in the first part this model is challenged to predict the load data of next day next two days and next 10 days of malaysian data set as well as next 7 days next 10 days and next 30 days of german data set the results show that the proposed model also has performed well where the accuracy of 10 days ahead of malaysian data is 94 16 and 30 days ahead of german data is 82 19 since both german and malaysian data sets are highly aggregated data a data set from a research building in france is used to challenge the proposed model s performance the average accuracy from the french experiment is almost 77 which is reasonable for such a complex data without using any auxiliary variables however as malaysian data and french data includes hourly weather data the performance of the model after adding weather is evaluated to compare them before using weather data results show that weather data can have a positive influence on the model these results show the strength of the proposed model and how much it is stable in front of some challenging tasks such as forecasting in different time horizons using two different data sets and working with complex data takes a practical look at how short term forecasting has actually been undertaken and is being developed in public utility organizations the overarching aim of this open access book is to present self contained theory and algorithms for investigation and prediction of electric demand peaks a cross section of popular demand forecasting algorithms from statistics machine learning and mathematics is presented followed by extreme value theory techniques with examples in order to achieve carbon targets good forecasts of peaks are essential for instance shifting demand or charging battery depends on correct demand predictions in time majority of forecasting algorithms historically were focused on average load prediction in order to model the peaks methods from extreme value theory are applied

this allows us to study extremes without making any assumption on the central parts of demand distribution and to predict beyond the range of available data while applied on individual loads the techniques described in this book can be extended naturally to substations or to commercial settings extreme value theory techniques presented can be also used across other disciplines for example for predicting heavy rainfalls wind speed solar radiation and extreme weather events the book is intended for students academics engineers and professionals that are interested in short term load prediction energy data analytics battery control demand side response and data science in general this paper reports on the developments and findings of the distribution short term load forecaster dstlf research activity the objective of this research is to develop a distribution short term load forecasting technology consisting of a forecasting method development methodology theories necessary to support required technical components and the hardware and software tools required to perform the forecast the dstlf consists of four major components monitored endpoint load forecaster melf nonmonitored endpoint load forecaster nelf topological integration forecaster tif and a dynamic tuner these components interact to provide short term forecasts at various points in the distribution system eg feeder line section and endpoint this paper discusses the dstlf methodology and melf component melf based on artificial neural network technology predicts distribution endpoint loads for an hour a day and a week in advance predictions are developed using time calendar historical load and weather data the overall dstlf architecture and a prototype melf module for retail endpoints have been developed future work will be focused on refining and extending melf and developing nelf and tif capabilities short term load forecasting stlf plays a key role in the formulation of economic reliable and secure operating strategies planning scheduling maintenance and control processes among others for a power system and will be significant in the future however there is still much to do in these research areas the deployment of enabling technologies e g smart meters has made high granularity data available for many customer segments and to approach many issues for instance to make

forecasting tasks feasible at several demand aggregation levels the first challenge is the improvement of stlf models and their performance at new aggregation levels moreover the mix of renewables in the power system and the necessity to include more flexibility through demand response initiatives have introduced greater uncertainties which means new challenges for stlf in a more dynamic power system in the 2030 50 horizon many techniques have been proposed and applied for stlf including traditional statistical models and ai techniques besides distribution planning needs as well as grid modernization have initiated the development of hierarchical load forecasting analogously the need to face new sources of uncertainty in the power system is giving more importance to probabilistic load forecasting this special issue deals with both fundamental research and practical application research on stlf methodologies to face the challenges of a more distributed and customer centered power system succinct and understandable this book is a step by step guide to the mathematics and construction of electrical load forecasting models written by one of the world s foremost experts on the subject electrical load forecasting provides a brief discussion of algorithms their advantages and disadvantages and when they are best utilized the book begins with a good description of the basic theory and models needed to truly understand how the models are prepared so that they are not just blindly plugging and chugging numbers this is followed by a clear and rigorous exposition of the statistical techniques and algorithms such as regression neural networks fuzzy logic and expert systems the book is also supported by an online computer program that allows readers to construct validate and run short and long term models step by step guide to model construction construct verify and run short and long term models accurately evaluate load shape and pricing creat regional specific electrical load models for optimal power system operation electrical generation must follow electrical load demand the generation transmission and distribution utilities require some means to forecast the electrical load so they can utilize their electrical infrastructure efficiently securely and economically the short term load forecast stlf

represents the electric load forecast for a time interval of a few hours to a few days this thesis will define stlf as a 24 hour ahead load forecast whose results will provide an hourly electric load forecast in kilowatts kw for the future 24 hours a 24 hour load profile this thesis will use the method of artificial neural networks ann to create a stlf algorithm for the u s department of energy s oak ridge national laboratory ornl ornl s power system can be described as an institutional industrial type electrical load the ann is a mathematical tool that mimics the thought processes of the human brain the ann can be created and trained to receive historical load and future weather forecasts as input and produce a load forecast as its output most anns in the literature are used to forecast the next day 24 hour load profile for a transmission level system with resulting load forecast errors ranging from approximately 1 to 3 this research will show that an ann can be used to forecast the smaller more chaotic load profile of an institutional industrial type power system and results in a similar forecast error range in addition the operating bounds of the ornl electric load will be analyzed along with the weather profiles for the site correlations between load and weather and load and calendar descriptors such as day of week and month will be used as predictor inputs to the ann to optimize is size and accuracy short term load forecasting stlf plays a key role in the formulation of economic reliable and secure operating strategies planning scheduling maintenance and control processes among others for a power system and will be significant in the future however there is still much to do in these research areas the deployment of enabling technologies e g smart meters has made high granularity data available for many customer segments and to approach many issues for instance to make forecasting tasks feasible at several demand aggregation levels the first challenge is the improvement of stlf models and their performance at new aggregation levels moreover the mix of renewables in the power system and the necessity to include more flexibility through demand response initiatives have introduced greater uncertainties which means new challenges for stlf in a more dynamic power system in the 2030 50 horizon many techniques have been

proposed and applied for stlf including traditional statistical models and ai techniques besides distribution planning needs as well as grid modernization have initiated the development of hierarchical load forecasting analogously the need to face new sources of uncertainty in the power system is giving more importance to probabilistic load forecasting this special issue deals with both fundamental research and practical application research on stlf methodologies to face the challenges of a more distributed and customer centered power system this two volume set of books constitutes the proceedings of the 2014 7th ieee international conference intelligent systems is or ieee is 2014 for short held on september 24 26 2014 in warsaw poland moreover it contains some selected papers from the collocated iwifsgn 2014 thirteenth international workshop on intuitionistic fuzzy sets and generalized nets the conference was organized by the systems research institute polish academy of sciences department iv of engineering sciences polish academy of sciences and industrial institute of automation and measurements piap the papers included in the two proceedings volumes have been subject to a thorough review process by three highly qualified peer reviewers comments and suggestions from them have considerable helped improve the quality of the papers but also the division of the volumes into parts and assignment of the papers to the best suited parts several models for forecasting short term utility system loads are examined a hybrid linear model is developed and used to simulate improvements to a utility load factor by providing the basis for scheduling deferred loads tes results of simulations for 1976 1977 on a vermont utility yielded average hourly forecast errors of 5 author the key component in forecasting demand and consumption of resources in a supply network is an accurate prediction of real valued time series indeed both service interruptions and resource waste can be reduced with the implementation of an effective forecasting system significant research has thus been devoted to the design and development of methodologies for short term load forecasting over the past decades a class of mathematical models called recurrent neural networks are nowadays gaining renewed interest

among researchers and they are replacing many practical implementations of the forecasting systems previously based on static methods despite the undeniable expressive power of these architectures their recurrent nature complicates their understanding and poses challenges in the training procedures recently new important families of recurrent architectures have emerged and their applicability in the context of load forecasting has not been investigated completely yet this work performs a comparative study on the problem of short term load forecast by using different classes of state of the art recurrent neural networks the authors test the reviewed models first on controlled synthetic tasks and then on different real datasets covering important practical cases of study the text also provides a general overview of the most important architectures and defines guidelines for configuring the recurrent networks to predict real valued time series applied mathematics for restructured electric power systems optimization control and computational intelligence consists of chapters based on work presented at a national science foundation workshop organized in november 2003 the theme of the workshop was the use of applied mathematics to solve challenging power system problems the areas included control optimization and computational intelligence in addition to the introductory chapter this book includes 12 chapters written by renowned experts in their respected fields each chapter follows a three part format 1 a description of an important power system problem or problems 2 the current practice and or particular research approaches and 3 future research directions collectively the technical areas discussed are voltage and oscillatory stability power system security margins hierarchical and decentralized control stability monitoring embedded optimization neural network control with adaptive critic architecture control tuning using genetic algorithms and load forecasting and component prediction this volume is intended for power systems researchers and professionals charged with solving electric and power system problems load forecasting is very essential to the operation of electricity companies it enhances the energy efficient and reliable operation of a power system this

dissertation focuses on study of short term load forecasting using different types of computational intelligence methods it uses evolutionary algorithms i e genetic algorithm particle swarm optimization artificial immune system neural networks i e mlpnn rbfnn flann adalin mflnn wnn recurrent nn wilcoxon nn and fuzzy systems i e anfis the developed methods give load forecasts of one hour upto 24 hours in advance the algorithms and networks were have been demonstrated using simulation studies the power sector in orissa has undergone various structural and organizational changes in recent past the main focus of all the changes initiated is to make the power system more efficient economically viable and better service oriented all these can happen if among other vital factors there is a good and accurate system in place for forecasting the load that would be in demand by electricity customers such forecasts will be highly useful in proper system planning operations the techniques proposed in this thesis have been simulated using data obtained from state load dispatch centre orissa for the duration september 2006 to august 2007 the master thesis of kevin berk develops a stochastic model for the electricity demand of small and medium sized companies that is flexible enough so that it can be used for various business sectors the model incorporates the grid load as an exogenous factor and seasonalities on a daily weekly and yearly basis it is demonstrated how the model can be used e g for estimating the risk of retail contracts the uncertainty of electricity demand is an important risk factor for customers as well as for utilities and retailers as a consequence forecasting electricity load and its risk is now an integral component of the risk management for all market participants in this thesis a transfer function based load model is determined for commercial and industrial load this model is derived from the composite load model which consist of an induction motor and static load this developed model is compared to composite load model by considering two cases 1 a small motor composition load or commercial load and 2 higher motor composition load or industrial load the research is conducted through matlab simulink simulation in order to compare the dynamic response of developed model a

comparative study has been done between the two models in addition the influence of voltage and frequency dependency terms on the overall model accuracy for developed model has been evaluated through several case studies considering both voltage and frequency dependency disturbances a short term load forecast model is developed for an electrically heated house this research work is based on experimental data collected by installing current sensors in a house in st johns newfoundland canada the data was collected for three years and only one year data is used for this model the model is based on recurrent neural network rnn with wavelet transform the proposed model is verified by comparing other developed models in the literature through matlab deep learning toolbox and wavelet toolbox the proposed model can more accurately forecast the load