

CELEBRATING
COMMERCIALISATION
YEAR 2014

iiindex 2014

AN INTERNATIONAL EXPOSITION ON RESEARCH AND INNOVATION

invention
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exposition 2014

INNOVATEUR
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2014

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UNIVERSITI TEKNOLOGI MARA
MALAYSIA

*Bridging
the valley of death :
advancing the
commercialisation
of research*

RESEARCH BOOK

iiindex2014

AN INTERNATIONAL EXPOSITION ON RESEARCH AND INNOVATION

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FOREWORD

The Honourable Minister of Science, Technology and Innovation (MOSTI) has launched 2014 as Malaysia Commercialisation Year 2014 (MCY2014) with the theme Science Technology and Innovation (STI) for Wealth Creation. In line with this theme, Invention, Innovation, Design & Exposition 2014 (iidex2014) is an annual exposition organized by UiTM and is the ultimate platform to highlight and commercialise new inventions and innovations. Researchers and inventors will exhibit their products which cater to the needs and wants of the community and the country.

The iidex2014 creates a new dimension by fusing two competitive concepts, a competition among innovative products and a competition to invite Innovateur Wannabes to perform live pitching of their products to the audience. The iidex2014 focuses on comprehensive commercialization and creating opportunities for entrepreneurs to carry out R&D as well as to provide avenue to commercialise their products. Through expositions such as iidex2014, MOSTI hopes to inculcate the culture of commercialisation of new technology designed and created by Malaysians.

I wish to congratulate all the participants of the iidex2014 and this is the opportunity for all researchers to show their ideas and exhibits their products and creativity. Apart from showcasing their products, innovators will have the opportunity to provide a window to the industry for business matching during the exposition.

Tan Sri Dato' Sri Sallehuddin Mohamed
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AUTOMATIC DATABASE OF ROBUST NEURAL NETWORK FORECASTING

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Neural network has been widely known by its function as a universal approximator. Neural network is an efficient tool for forecasting financial time series as well as many other areas and has shown a great success, outperforming other forecasting techniques. The backpropagation algorithm is one of the most famous algorithms to train neural network based on the mean square error (MSE) of ordinary least squares (OLS). However, this algorithm is not always so robust in the presence of outliers, and this may ruin the entire neural network fit. Therefore, this automatic database is designed to provide an alternative for robust neural network forecasting using statistical robust estimators of M-estimators, Iterated Least Median Square (ILMedS) and Particle Swarm Optimization on Least Median Square (PSO-LMedS), replacing the MSE cost function to handle time series data with missing values, outliers and noise, which always exist in real-life-time series data. Artificial neural network (ANN) was implemented in the system because it has been proven to outperform many other conventional forecasting techniques. However, the most popular backpropagation algorithm which is based on Widrow-Hoff delta learning rule is not completely robust in the presence of outliers and this may cause false prediction of future values. The problem of outliers is suggested to be the main concern of robust statistics where multiple methods are possible to deal with the problem that has been proposed (Huber, 1981; Hampel, Ronchetti, Rousseeuw & Stahel, 1986). The idea is simple, when an actual underlying model steers away from the assumptions made for example normal error distribution, then there emerges the role of robust statistics to work accordingly (Rusiecki, 2012). Robust estimators in this case are reliable and efficient in administering outlying data, where they perform credibly enough to sample from popular statistical methods which are not gravely impacted by small departures from assumptions of the model (Rusiecki, 2012). The direct idea of making the conventional neural network learning algorithm more powerful towards outlying data is by replacing the mean square error (MSE) with a different symmetric and continuous cost function. This will result in a nonlinear influence function (Rusiecki, 2012) with the capability to cater the influence of large errors. This can only be performed by making the loss functions robust using the statistical robust methods to reduce the impact of outliers issues (Rusiecki, 2012; El-Melegy, Essai & Ali, 2009), where the usual outliers occurrence in routine data ranges up to 10% or even more (Rusiecki, 2012; El-Melegy et al., 2009; Zhang, 1997)- this is the primary subject of this system. Most of the previous studies seek to improve the learning algorithm of backpropagation neural networks by adapting the M-estimators predominantly. All those previous endeavours focus only on the nonlinear autoregressive inputs artificial neural network (NAR-ANN) model. Not much work had considered using a robust approach in improving the nonlinear autoregressive moving average inputs artificial neural network (NARMA-ANN) model - here comes the novelty of this system. The overall performance of the NARMA model is better than the NAR model (Zhang, 1997). Therefore, we implemented all kinds of M-estimators, Iterative Least Median Squares (ILMedS) and Particle Swarm Optimization on Least Median Squared (PSO-LMedS) aiming to reduce the errors caused by outlying data in both NAR-ANN and NARMA-ANN models. It is expected that the improved robust neural network time series models can be applied on all type of time series data for future forecasting purposes.