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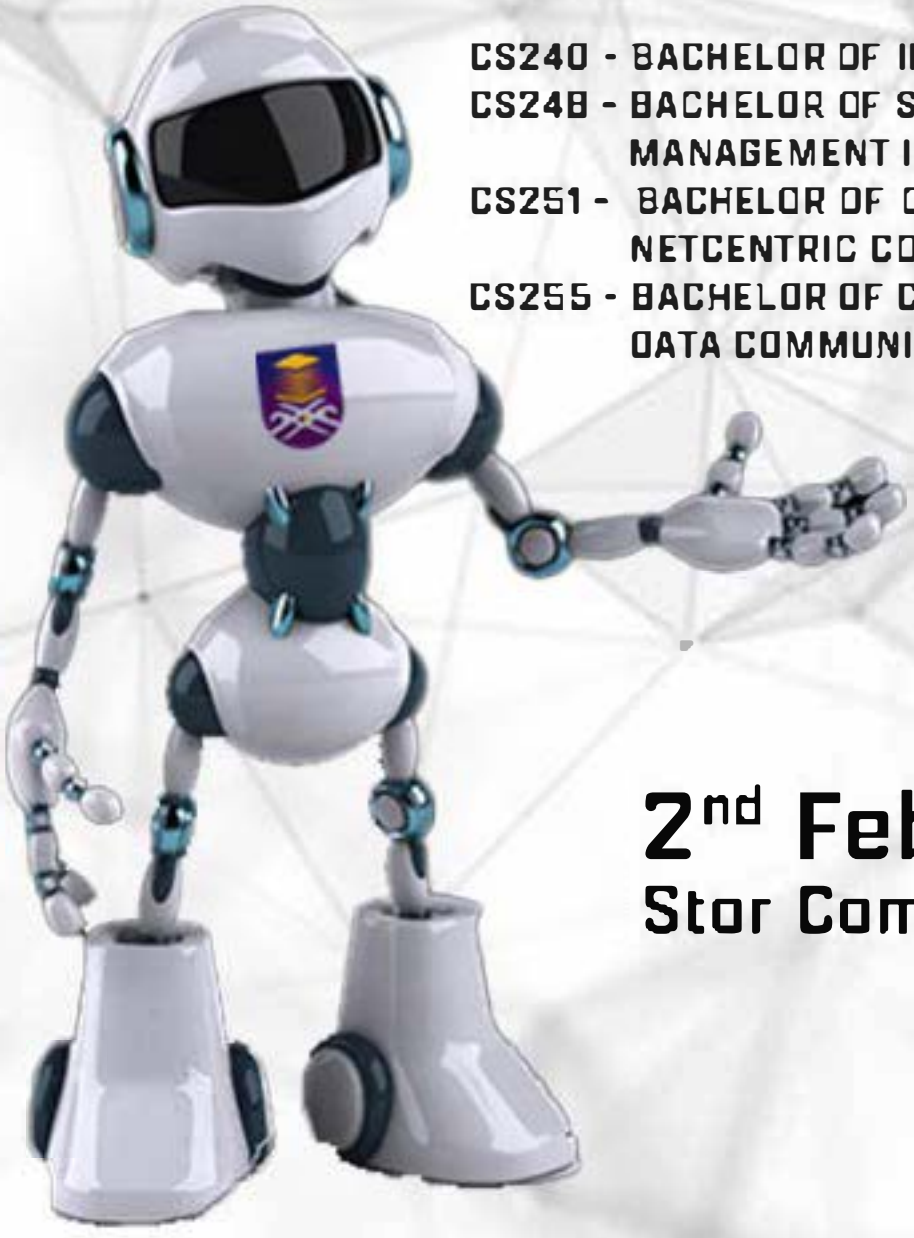
RESEARCH EXHIBITION IN MATHEMATICS & COMPUTER SCIENCES

REMACS 5.0



CS240 - BACHELOR OF INFORMATION TECHNOLOGY (HONS.)
CS248 - BACHELOR OF SCIENCES (HONS.)
MANAGEMENT IN MATHEMATICS
CS251 - BACHELOR OF COMPUTER SCIENCE (HONS)
NETCENTRIC COMPUTING
CS255 - BACHELOR OF COMPUTER SCIENCE (HONS)
DATA COMMUNICATION & NETWORKING

2nd Februory 2023

Stor Complex, UiTM Perlis

Organized by:
College of Computing, Informatics and Media
Universiti Teknologi MARA Perlis Branch

Research Exhibition in Mathematics and Computer Sciences (REMACS 5.0)

Research Exhibition in Mathematics and Computer Sciences (REMACS 5.0)

Editors
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e ISBN: 978-629-97934-0-3

Perpustakaan Negara Malaysia

Published by

MOHAMMAD HAFIZ BIN ISMAIL
Universiti Teknologi MARA
02600 Arau, Perlis
Tel: +604 988 2028

https://fskmperlis.uitm.edu.my/remacs50/

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Preface

It is with great pleasure that we present this extended abstract book, titled "The 5th Research Exhibition in Mathematics and Computer Sciences (REMACS 5.0)". This book is a collection of research work in the fields of Computer Science and Mathematics, contributed by the final year students from Universiti Teknologi MARA, Perlis Branch. The aim of this book is to showcase the diversity and depth of research in these two interrelated fields.

Mathematics and Computer Science are two fields that have seen tremendous growth and advancement in recent years. With the rise of new technologies and the increasing demand for data-driven solutions, researchers in these fields have been working hard to develop new theories, algorithms, and models that can help solve some of the most pressing problems of our time. This book is a testament to their hard work and dedication.

The abstracts in this book cover a wide range of topics, including algebra, analysis, logic, computer architecture, algorithms, artificial intelligence, machine learning, computer network, netcentric computing and many more. The work presented here is both theoretical and practical, and has the potential to impact many areas of society, from finance and healthcare to education and security.

We hope that this book will serve as a valuable resource for future students in the fields of Mathematics and Computer Science. We also hope that it will inspire more students to pursue innovative and groundbreaking research in these two fields. Finally, we would like to express our gratitude to all the contributors for their hard work and dedication, without which this book would not have been possible.

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REMACS 5.0

EVENT SCHEDULE

8:00 – 8:30 am
•Registration

8:00 am – 12:00 pm
•FYP Project Presentation

12:00 - 2:00pm
•Lunch Break

2:15 – 2:35 pm
•National & Wawasan Setia Anthems
•Doa Recitation

2:35 – 2:45 pm
•Welcoming Address by Director of REMACS 5.0

2:45 – 2:55 pm
•Officiating & Closing Remarks from Rector of UiTM Perlis

2:55 – 3:00 pm
•REMACS 5.0 Montage

3:00 – 4:00 pm
•Awarding of Winners:
•Best Poster
•Best Project Award

•Photo Session

•End of Ceremony

Dress Code: Formal / Corporate

List of Papers

RESEARCH EXHIBITION IN MATHEMATICS & COMPUTER SCIENCES

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EXTENDED ABSTRACTS

APPLICATION OF VANILLA LONG SHORT-TERM MEMORY NETWORKS (LSTM) AND AUTO-REGRESSIVE INTEGRATED MOVING AVERAGE (ARIMA) ON EXCHANGE RATE FORECASTING

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Abstract

Predicting foreign exchange rates is a difficult task in the area of financial forecasting. Changes in exchange rate affected the country's rate of economic growth. There are a lot of forecasting models used in order to predict the future value of the exchange rate. This study aims to determine the most accurate model between two different machine learning models which are Vanilla Long-Short Term Memory (LSTM) and Auto-Regressive Integrated Moving Average (ARIMA) in predicting the exchange rate of Malaysian Ringgit (MYR) and United State Dollar (USD). In addition, this study used a statistical package in Python software that uses machine learning to better handle the challenge of time series forecasting. Vanilla LSTM and ARIMA are trained using Python software in order to train the dataset. Coding programming in Python software runs to make better analysis to achieve the accurate model. Prediction is also made after the comparison of error measures of two models. The result of the comparison between the two models showed that the MSE and RMSE of the Vanilla LSTM is lower than the ARIMA model. The Vanilla LSTM model overcomes the ARIMA in forecasting the exchange rate. Therefore, the analysis of the study obtained that the vanilla LSTM model is the most accurate model to make predictions on the exchange rate with 0.0102 and 0.1011 for MSE and RMSE respectively. While for the ARIMA with 0.0113 and 0.1062 of MSE and RMSE respectively. The final prediction for July 2022 is RM 4.22.

Keywords*: ARIMA, Vanilla LSTM, Time Series Predictions, Machine Learning, Exchange Rate.*

1. Introduction

Predicting foreign exchange rates is a difficult task in the area of financial forecasting. Hence, the machine learning algorithms employed in this study are Vanilla Long-Short Term Memory (LSTM) and Auto-Regressive Integrated Moving Average (ARIMA) in predicting the exchange rate. The main objective of this study is to measure the performance of Vanilla LSTM and ARIMA models in forecasting the value of Malaysian Ringgit (MYR) exchange rate and make a prediction using the most accurate model obtained. The best model will be chosen by using Mean Squared Error (MSE) and Root Mean Squared Error (RMSE). The data is representing each month of the year from January 2010 to June 2022 with a total of 150 observations.

2. Methodology

The models were built by using python software. First, the data splitted into training and testing parts with a percentage ratio of 80:20. The data is adjusted to be stationary and the value of error measures are obtained in ARIMA model Next, for the LSTM model, the data is normalized within the range of 0 to 1 using the Min Max Normalization function. The parameter of vanilla LSTM is set to train the model, then obtain the value of error measure. The error measures of the two models are compared to decide the most accurate model. The model chosen is considered to predict the data in future.

3. Results and Discussion

For the ARIMA model, the data is stationary after performing a first order difference. Python had suggested 13 parameters and the ARIMA (1,1,0) is the best model suggested with lowest Akaike information criterion (AIC). Next, vanilla LSTM trained the training data for 50 epochs to fit the model. The lower epochs reach to the last epochs, which is better for the model. The LSTM model is a good fit model where the train loss decreases. Lastly, the comparison between the two models showed that the MSE and RMSE of Vanilla LSTM is lower than the ARIMA model. The Vanilla LSTM model overcomes the ARIMA in forecasting the exchange rate. Therefore, the analysis of the study obtained that the vanilla LSTM model is the most accurate model to make predictions on the exchange rate. Comparison between nonlinear (vanilla LSTM model) and linear (ARIMA model) is a good example to see the difference of outcome from the two models.

4. Novelty of Research / Product

Forecasting work has been applied in a variety of fields over the years, including science, economics, engineering, transportation, medical and others (Somboonsak, 2019). According to the researcher also, time series of linear and nonlinear varieties are widely used to forecast what will happen in the future. Time series analysis is used to forecast future data that will be advantageous for a variety of purposes. Nevertheless, these approaches usually have extremely high prediction errors (Labiad et al., 2018). As a result, this study used a statistical package in Python software that uses machine learning to better handle the challenge of time series forecasting. Besides, the vanilla LSTM is one of the most widely used network options. LSTM is well suited to handle time series prediction like exchange rate data. In addition, the auto-regressive integrated moving average (ARIMA) model is used to fit time series analysis data to assist in better understanding or forecasting (Yamak et al.,2019). Vanilla LSTM and ARIMA are trained using Python software in order to train the data. Coding programming in Python software run to make better analysis to achieve the accurate model. Predictions are also made after the comparison of error measures of two models.

5. Conclusion

In conclusion, the vanilla LSTM model is better than the ARIMA model. The vanilla LSTM model showed the best performance to predict the exchange rate with the lowest number of error measures. The LSTM model can be a good model to make a forecast on the exchange rate.

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Research Exhibition in Mathematics and Computer Sciences: REMACS 5.0

e ISBN 978-629-97934-0-3