FORECASTING TECHNIQUES FOR AIR POLLUTION: UTILIZING EXPONENTIAL SMOOTHING AND ARIMA METHODS

MOHAMMAD NUZUL HAKIMI BIN MAT ZAIN

Thesis Submitted in Fulfilment of the Requirement for
Bachelor of Science (Hons.) Mathematical Modelling and Analytics
College of Computing, Informatics and Mathematics
Universiti Teknologi MARA

January 2024

ABSTRACT

Air pollution poses a significant threat to public health and the environment, necessitating the development of effective forecasting techniques to aid in pollution management and mitigation efforts. This study conducts a comparative analysis of two prominent time series forecasting methods, namely Exponential Smoothing and Autoregressive Integrated Moving Average (ARIMA), to predict air pollution levels. The primary objective is to evaluate the performance and accuracy of these methods in capturing the dynamic and complex patterns inherent in air quality data.The findings reveal that, in this specific context, the Exponential Smoothing method, particularly Holt-Winters, consistently demonstrates a lower Root Mean Squared Error (RMSE) compared to ARIMA. This suggests that Holt-Winters Exponential Smoothing provides more accurate predictions for air pollution levels.

ACKNOWLEDGEMENT

Alhamdulillah. Firstly, I would like to express my sincere gratitude to Allah SWT for His blessings and guidance, which have enabled me to complete this report successfully.

Moreover, I would like to express my sincere gratitude to my supervisor, Madam Rohayati binti Mat Ripin, for her invaluable guidance and advice throughout the preparation of this report. Madam Rohayati's expertise and knowledge in mathematics were invaluable to me, and her willingness to help me whenever I needed it was greatly appreciated.

I also would like to extend my gratitude and thanks to Dr Mohd Rivaie Bin Mohd Ali, the Coordinator of Final Year Report, for his guidance in finishing this report.

Furthermore, my dear parents, for their sacrifices and moral support that have helped me to succeed. My parents have always been there for me, both financially and emotionally. They have sacrificed a lot so that I could have a good education, and their support has been instrumental in my success.

Last but not least, I would also like to take this opportunity to apologize to anyone whom I may have offended during the preparation of this report. I am still learning, and I am always striving to improve my writing skills. If I have made any mistakes, I hope that you will forgive me.

TABLE OF CONTENT