UNDERGRADUATE THESIS

PREDICTION OF AIR TEMPERATURE IN SURABAYA CITY USING PROPHET WITH GRID SEARCH HYPERPARAMETER OPTIMIZATION

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APPROVAL SHEET

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STATEMENT OF ORIGINALITY

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Hereby declares that this undergraduate thesis contains no part of any other scientific work that has been submitted to obtain an academic degree at any higher education institution. Furthermore, it does not contain any work or opinions previously written or published by others, except for those which are explicitly cited in this thesis and listed completely in references.

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ABSTRACT

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Thesis Title:	Prediction Of Air Temperature in Surabaya City Using Prophet With Grid Search Hyperparameter Optimization
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Global climate change has led to rising air temperatures with significant impacts on urban areas such as Surabaya, particularly due to the Urban Heat Island phenomenon. These conditions necessitate accurate temperature prediction methods to support informed decision-making. This study aims to analyze the performance of the Prophet model and to measure the effect of hyperparameter optimization using the Grid Search method on the accuracy of daily air temperature prediction in Surabaya. The data utilized consist of daily average temperatures covering the period from January 1, 2020 to December 31, 2025, obtained from timeanddate.com. This study employs a time series approach within the OSEMN framework, encompassing data acquisition, data cleaning, exploration, modeling, and interpretation. The Prophet model was first constructed as a baseline, and subsequently optimized using Grid Search across the parameters changepoint_prior_scale, seasonality_prior_scale, and seasonality_mode. Model performance was evaluated using the RMSE, MAE, and MAPE metrics. The default Prophet baseline model yielded an RMSE of 0.8684°C, an MAE of 0.6602°C, and a MAPE of 2.3259%. Following Grid Search optimization with the best-performing configuration of changepoint_prior_scale = 0.1, seasonality_prior_scale = 20, and seasonality_mode = additive, the optimized model produced an RMSE of 0.8584°C, an MAE of 0.6580°C, and a MAPE of 2.3114%. The results demonstrate that the optimized model outperforms the default model, as evidenced by a reduction in error values across all evaluation metrics. The best-performing model proved more capable of capturing temperature trend and seasonal patterns, thereby producing predictions that are more stable and adaptive to the data. It is therefore concluded that hyperparameter optimization via Grid Search consistently improves the predictive performance of the Prophet model across all evaluation metrics, although the magnitude of improvement is incremental, given the already stable performance of the Prophet baseline model.

Keywords: Air Temperature, Time Series, Prophet, Grid Search, Prediction

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The author acknowledges that this thesis is not without its limitations and shortcomings. Constructive criticism and suggestions from all parties are therefore greatly welcomed in the interest of further improvement. It is the author's sincere hope that this work may prove beneficial to the academic community at large, and to the author in particular.

Surabaya, May 26th 2026

Author

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