



**UNDERGRADUATE THESIS**

**OPTIMIZATION OF LONG SHORT-TERM  
MEMORY ALGORITHM USING PARTICLE  
SWARM OPTIMIZATION FOR RAINFALL  
PREDICTION IN PASURUAN REGENCY**

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SURABAYA  
2026**

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PREDICTION IN PASURUAN REGENCY

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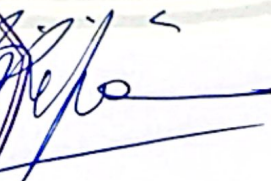

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**APPROVAL SHEET**

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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	Optimization of the Long Short-Term Memory Algorithm Using Particle Swarm Optimization for Rainfall Prediction in Pasuruan Regency
Advisor	1. Eva Yulia Puspaningrum, S.Kom., M.Kom. 2. Ardhon Rakhmadi, S.Tr.T., M.Kom.

Pasuruan Regency is a region in East Java that is highly vulnerable to hydrometeorological disasters, a condition exacerbated by increasing rainfall intensity and the limitations of existing forecasting systems. This study develops a daily rainfall prediction model using the Long Short-Term Memory (LSTM) algorithm optimized with Particle Swarm Optimization (PSO). The dataset was obtained from the Pasuruan Geophysical Station of the BMKG, consisting of daily temperature, humidity, and rainfall data from January 1, 2021, to December 31, 2025 (1,815 records). Data preprocessing included missing value handling using Random Forest Imputation, normalization using the Min-Max Scaler, and transformation through the sliding window technique. PSO was employed to optimize the LSTM hyperparameters through ten experimental scenarios with variations in inertia weight, cognitive coefficient, and social coefficient. The best-performing model was obtained in the LSTM-PSO7 scenario, with a configuration of 192 neurons in the first layer, 103 neurons in the second layer, a learning rate of 0.009126, and a batch size of 16. Evaluation results showed that LSTM-PSO7 achieved an RMSE of 18.023, MAE of 12.413, and NSE of 0.134, outperforming the standard LSTM, GRU, ARIMA, and TES models. The final model was implemented as an interactive Streamlit-based web application to support disaster mitigation decision-making in Pasuruan Regency.

**Keywords: Rainfall Prediction, Long Short-Term Memory, Particle Swarm Optimization, Deep Learning, Pasuruan Regency.**

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Surabaya, June 24<sup>th</sup> 2026



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