

ABSTRACT

Relative humidity is one of the meteorological parameters that plays an important role in describing atmospheric conditions, particularly those related to water vapor dynamics, cloud formation, and rainfall events. Variations in relative humidity influenced by seasonal factors and weather conditions cause the data to be fluctuating and complex, thus requiring forecasting methods capable of optimally capturing both linear and nonlinear patterns. This study aims to forecast daily relative humidity data using time series and computational intelligence approaches. The data used consist of daily relative humidity observations in Semarang City from January 2025 to October 2025, obtained from the Meteorology, Climatology, and Geophysics Agency (BMKG) through the Central Java Climatology Station. The dataset was divided into 80% in-sample data for model training and 20% out-sample data for testing and performance evaluation. The forecasting methods employed in this study are the Autoregressive Integrated Moving Average (ARIMA), the Adaptive Neuro-Fuzzy Inference System (ANFIS), and the hybrid ARIMA–ANFIS method. The ARIMA model is used to model the linear components of the time series data, while ANFIS is applied to capture nonlinear relationships using lagged inputs. The hybrid model is constructed by combining both approaches through modeling the ARIMA residuals using ANFIS. The results show that the ARIMA method produces an sMAPE value of 8.38%, ANFIS yields 6.18%, and the hybrid ARIMA–ANFIS results in 8.37%. ANFIS provides the best forecasting results because it has the lowest out-of-sample sMAPE value of 5.67% among the compared methods.

Keywords: Relative humidity, Time series, Forecasting, ARIMA, ANFIS, Hybrid ARIMA–ANFIS, sMAPE

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Pembimbing I

Pembimbing II

Prof. Dr. Drs. Tarno, M.Si.
NIP. 196307061991021001

Deby Fakhriyana, S.Si., M.Stat.
NIP. 199405282022102001