***Abstract No: 39*** ***ICT, Mathematics and Statistics***

# NOVEL COMPARATIVE MACHINE LEARNING APPROACH FOR AIR QUALITY FORECASTING

**H.M.H.K. Herath*** **and H.T.K. Abeysundara**

*Department of Statistics and Computer Science, Faculty of Science, University of Peradeniya, Peradeniya, Sri Lanka*
**hasinih@sci.pdn.ac.lk*

Air quality forecasting which provides reliable information on future pollution status, is useful in managing effective air pollution and planning preventive measures. However, air quality forecasting is a challenging task due to rapidly changing weather and pollutant levels. Therefore, accurate forecasting algorithms are needed to regulate the air quality for mitigation plans and early warning purposes. Among the various air pollutants, fine particulate matter with an aerodynamic diameter lesser than 2.5 µm ($PM_{2.5}$) has been associated with adversarial health effects and a major threat to the living environment. A comparative study is presented using deep learning models to forecast surface $PM_{2.5}$ concentration. The study was divided into two categories: standard deep learning models and hybrid deep learning models. Multivariate Long Short-Term Memory (LSTM), Gated Recurrent Unit (GRU), and Convolutional Neural Network (CNN) models were chosen as the standard models. Subsequently, two hybrid models, namely CNN-LSTM, which combines 1D-CNN and LSTM, and CBGRU, which combines 1D-CNN and Bidirectional GRU, are established for forecasting $PM_{2.5}$ concentration. The experiment was carried out using the air quality dataset in Beijing, China. Model evaluation was carried out on multiple evaluation metrics such as Root Mean Squared Error (RMSE) and the Mean Absolute Error (MAE). The hybrid models outperformed the standard models. Research findings signify that the model CBGRU (RMSE = 27.12, MAE = 13.95) provided an accurate prediction performance with the lowest errors by efficiently extracting the inherent feature trends of the latent air contaminants and meteorological input data associated with $PM_{2.5}$.

**Keywords:** Air quality forecasting, Convolutional Neural Network, Deep Learning, Gated Recurrent Unit