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A Gated Recurrent Unit Neural Network-based Predictive Maintenance Approach for Machinery Maintenance in the Apparel Industry

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Abstract

The Sri Lankan garment industry has been garnering attention by bringing the country a huge income over the past years. The role of well-functioning machinery is a crucial factor in producing flawless products in this industry. Hence it is a must for machinery equipment to work regularly thereby providing the engineering crew a minimum hassle. Therefore this research paper presents a Predictive Maintenance based methodology designed with the aid of a type of deep learning model, a Gated Recurrent Unit Neural Network (GRU) to predict a machinery breakdown due to component failures. Machinery data were used to create data models which gave the component malfunctioning as a multiclass classification output. While researching, to handle the class imbalance problem, Synthetic Minority Oversampling Technique (SMOTE) mechanism was also used to obtain a balanced data distribution. Various combinations of basic deep learning models and models based on Recurrent Neural networks, GRU, and Long Short-Term Memory networks were used to train the data models, where the GRU-SMOTE model outperformed the other models that had an accuracy of 98.77% along with fine scores for macro average precision, macro average recall, and macro average f1-score. These early hand predictions can be therefore utilized to face sudden machinery failures that will allow the mechanical crews to plan and schedule maintenance work efficiently preventing the expenditure of unnecessary time and resource wastages.

Keywords: *Deep learning, Gated Recurrent Unit Networks, Multi-class classification, Predictive maintenance*