DATA ANOMALY DETECTION IN MARITIME TRAFFIC MANAGEMENT USING DEEP LEARNING

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DECLARATION

Approval for Examination

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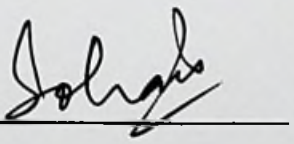
Registration No. **57901** Program of Study: **MS (Software Engineering)** Thesis Title: **Data Anomaly Detection in Maritime Traffic Management using Deep Learning** It is to certify that the above scholar's thesis has been completed to my satisfaction and, to my belief, its standard is appropriate for submission for examination. I have also conducted plagiarism test of this thesis using HEC prescribed software and found similarity index_____% that is within the permissible limit set by the HEC for the MS degree thesis. I have also found the thesis in a format recognized by the BU for the MS thesis.

Principal Supervisor's Signature: 

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ABSTRACT

Pandemics and the current world situation affected overall world business. The maritime industry currently depends on different vessel management systems that use Automatic Identification System (AIS) messages to manage Ship activities. AIS messages include both Static and Dynamic data, which contains information related to the position, Heading, and Ship features as AIS data is in massive volume, so the possibility of missing data and anomalous information is present. Different Machine Learning and deep learning algorithms are used to train and detect anomalies to identify those anomalies related to ship classification and ship messages.

CCN, SVM, Random Forest and other deep learning algorithm are used to identify anomalies regarding the position and ship flows. While SQL, PostGre are used for storage purposes. The main goal is to identify which Database is best to store AIS data and which deep learning algorithm performs better to identify anomalies in Ship classification and transceiver class data.

This thesis proposes a solution regarding the storage of AIS data to MongoDB database and identifying anomalies in ship classification and Transceiver class using Deep Learning Algorithm. This approach includes Long Short-Term Memory (LSTM), Convolution Neural Network (CNN), and Artificial Neural Network (ANN) deep Learning algorithm for identifying anomalies in Maritime Traffic Management System.

So, we can conclude that the CNN model provides the highest accuracy, approximately 81%, while other deep learning algorithms like LSTM have 72% and ANN have 79.95% accuracy. The total time consumed to get 1658575 rows takes approximately 0.04sec using MongoDB cloud Database.

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