

LITHUANIAN COMPUTER SOCIETY
VILNIUS UNIVERSITY
INSTITUTE OF DATA SCIENCE AND DIGITAL TECHNOLOGIES
LITHUANIAN ACADEMY OF SCIENCES



11th International Workshop on
**DATA ANALYSIS
METHODS FOR
SOFTWARE
SYSTEMS**

Druskininkai, Lithuania, Hotel "Europa Royale"
<http://www.mii.lt/DAMSS>

November 28–30, 2019

VILNIUS UNIVERSITY PRESS
Vilnius, 2019

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<https://doi.org/10.15388/Proceedings.2019.8>

ISBN 978-609-07-0325-0 (digital PDF)

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Detecting Maritime Traffic Anomalies with Long-Short Term Memory Recurrent Neural Network

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Analysis and monitoring of Maritime domain awareness is a very important field of human activity. It helps to secure areas such as Oil Rigs, State borders, harbors, sea vessels, sea lanes, wind pow plants, and other off-shore structures. Marine vessel traffic intensity rises every year. A huge amount of big data is generated. To monitor and analyze such a quantity of data, human cognitive abilities are insufficient. On the other hand, traditional machine learning algorithms are not capable or unpractical to be used in this type of application. To solve such complex task, other approaches must be researched. In especial, deep neural networks can be considered as an alternative practical approach. In this research, a multi-stacked LSTM deep neural network is used for abnormal maritime vessel traffic detection. AIS data is prepared to form marine vessel movement multivariate multi-step time series sequences. The prepared sequences are fed to the LSM network and the marine vessel normal traffic model is trained. The error distribution with the covariance matrix is calculated to detect abnormal marine traffic against the normal model learned with the LSM network. The approach is tested with Denmark offshore vessel traffic big data. The results of experiments show the effectiveness of the proposed approach in comprehensive real-world data and should be investigated further for abnormal marine traffic detection.