**One-Class SVM Based Anomaly Detection for LSTM-Based**

**Radiation Prediction**

Si Hyun LEE, Rae Hyun LEE

Chosun University, Gwangju , Korea

This study emphasizes the importance of identifying pollutants and their effects on our environment through environmental monitoring. Environmental monitoring aims to continuously monitor various environmental factors such as air, water quality, and radiation, and to prevent and solve environmental problems by collecting and analyzing information on environmental changes.  
 In this study, we confirmed that a multivariate data model including both radiation dose rate and weather data is required for radiation dose rate prediction. To this end, LSTM was used for seasonal data prediction, and the performance of the model was improved by removing abnormal values of dose rate using one-class SVM.

The One-Class SVM learns using only one class data, which sets the dose rate to one class and finds the hyperplane. The hyperplane aims to maximize the area where dose rate data is located and to maximize the margin with other data.  
 Anomaly detection model learns with dose rate data only and models the distribution of dose rate data using one-class SVM. This model is used to classify new data, and data located on one side of the hyperplane is determined to be outliers. Therefore, by detecting and removing outlier data for dose rates, the performance of the radiation dose prediction model can be improved.

After detecting and removing outliers using the One-Class SVM, the radiation dose rate was predicted using the LSTM. A model that uses input data and previous states to predict the next state. You can consider the temporal dependence of the input data by remembering the information that occurred in the previous state and considering it in the next state. This was to predict seasonal radiation dose rate data.

Finally, the performance of the radiation dose rate prediction model using one-class SVM and LSTM was evaluated. The performance of the One-Class SVM and LSTM models was evaluated through various metrics such as MSE and confusion matrix, accuracy, precision, reproduction rate, and F1 score, and the performance of the One-Class SVM was 89.87%, accuracy of 1.0, reproduction rate of 0.8987, and F1 score of 0.9467. The MSE of the LSTM was 0.00156, which showed a lower value than that of the model without the One-Class SVM. Therefore, One-Class SVM performed well in removing outliers from radiation dose rate data through outlier detection, and LSTM performed well in predicting seasonal radiation dose rate data considering time dependence. Therefore, this study demonstrated that the radiation dose rate prediction model combining one-class SVM and LSTM has high performance.

Through this study, we developed a dose rate prediction model that combines one-class SVM and LSTM using real-time ambient radiation dose and weather information data. By leveraging one-class SVMs that improve predictive performance by detecting and eliminating outliers and LSTM that predicts seasonal data considering time dependence, we demonstrate that efficient dose rate prediction is possible. These findings provide important information to prevent and resolve the various problems that arise from environmental monitoring, and in the future, they can contribute to preventing and solving environmental problems by actively utilizing predictive models in this way.

Topic number: 4 (Environmental Radiation Measurement and Assessment)

Presentation: Poster

Student competition: Yes

Telephone: +82-010-9604-5210

e-mail: [tlgus7668@naver.com](mailto:tlgus7668@naver.com)

\* This study is a research project conducted with the support of the Nuclear Basic Research Support Project organized by the Korea Research Foundation. (No. 2022M2D2A2016341)