Comparative study of estimation methods of carbon emission in blast furnace process using machine learning models

박태창, 김범석, 김태영, 여영구†
한양대학교
(ykyeo@hanyang.ac.kr†)

The reduction of carbon dioxide (CO2) emission has become a major issue for the mitigation of climate change. As an energy intensive industry, iron and steel industry is faced with the carbon emission reduction target. The blast furnace is main process of the iron and steel manufacturing, which emits over 70% of the CO2. This paper presents the development of machine learning models and their applications to estimate the carbon dioxide (CO2) and carbon monoxide (CO) in the blast furnace process. Four machine learning models that are gaussian process regression (GPR), support vector regression (SVR), decision tree regression (TR) and nearest neighbor classification (k-NN) are proposed to compare the estimation performance with each other. Results of estimations using GPR, SVR, TR and k-NN models are compared with actual process data and the root-mean square error (RMSE) for each model is calculated to be used as a criterion to evaluate the estimation performance. The RMSEs of GPR model with hyperparameter optimization method for CO2 and CO estimation were 0.320 and 0.541, respectively, which were turned out to be the best estimation.