Machine Learning driven prediction model for strength reduction of fire-damaged RC column based on numerical analysis

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Fire analysis so far was been conducted by taking into consideration all the fire-affected variables such as non-mechanical strain, material properties, or stress-strain relation depending on the temperature. This approach has clear theoretical background, though its accessibility is low. To improve accessibility to fire analysis, this thesis proposes a machine-learning driven prediction model for strength reduction of fire-damaged RC column, with FEM fire analysis dataset.

The FEM dataset is consisted of P-M strength reduction with fire-exposure time for 1770 RC section samples. Since strength of RC element gets smaller as fire lasts, decision-tree based ML model XGB and LGBM was adopted, which gives monotone increasing/decreasing constraints with chosen feature. The proposed model was evaluated its performance based on P-M diagram comparison of FEM and predicted one, and it was found to achieve mean fitness under 5%.

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