

# Concrete Compressive Strength

Successfully Predicted with High Accuracy

#Inorganic #Chemical #Material Science #Material Informatics #High-precision predictions #Explainable AI

Predicting concrete compressive strength from material composition is crucial in civil engineering. Accurate predictions enhance safety, reduce environmental impact, lower costs, and speed up development. AIZOTH Inc. developed a predictive model using neural network analysis with Multi-Sigma™ based on the Kaggle database and compared its accuracy with multiple linear regression and support vector regression (SVR) models. Data Source: <https://www.kaggle.com/datasets/pritech/concrete-compressive-strength>

## Challenge

This dataset includes the quantities of each material per cubic meter of concrete, the number of days since production, and the compressive strength of the concrete.

**Explanatory Variables:** Cement (kg/m<sup>3</sup>), Fly ash (kg/m<sup>3</sup>), Slag (kg/m<sup>3</sup>), Water (kg/m<sup>3</sup>), Coarse aggregate (kg/m<sup>3</sup>), Fine aggregate (kg/m<sup>3</sup>), Superplasticizer (kg/m<sup>3</sup>), Age (days)

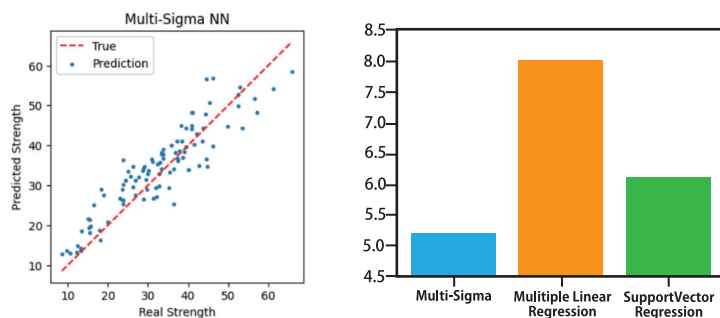
**Target Variable:** Compressive strength of concrete (MPa).

## Solution

We trained the model with 930 data points and predicted and validated 100 cases using the explanatory and target variables mentioned above.

## Result

**High Accuracy Prediction and Lowest prediction errors (RMSE):**



**Factor Analysis:** The following factors are particularly important for concrete compressive strength.

**Age:** Concrete strength increases over time.

**Cement and Slag:** Higher proportions increase concrete strength.

**Water:** Lower proportions increase concrete strength.



AIZOTH provides AI services such as Multi-Sigma, AI consulting, spot support to optimize manufacturing conditions, and commissioned R&D.

Multi-Sigma is the cloud-based AI software for R&D to reduce the effort of experiment drastically and also to help researchers finding the innovative solutions for their actual problems with minimum experimental dataset. For more information, visit <https://aizoth.com/en/>.

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