**HIGH LEVEL DOCUMENT**

**CEMENT CONCRETE STRENGTH PREDICTION**

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**Abstract**

In this paper, an intelligent approach based on the machine learning technique is proposed for predicting the [compressive strength](https://www.sciencedirect.com/topics/materials-science/compressive-strength) of concrete. This approach employs the adaptive boosting algorithm to construct a strong learner by integrating several weak learners, which can find the mapping between the input data and output data. The weak learner whose predicting error is small will have a larger weight in the entire system, thus the overall accuracy of the strong learner will be enhanced. A total of 1030 sets of concrete compressive strength tests is collected to train and test the learners, in which the concrete mixture components (e.g., coarse/fine aggregates, cement, water, additive, etc.) and the curing time are set as the input data while the compressive strength value is set as the output data.

**1 Introduction**

Concrete is the most widely used building material around the world due to its various advantages over other materials, e.g., integrity, durability, modularity, economy, etc. For better understanding the behaviour of concrete-made structures under external loadings and developing corresponding design methodologies, it is of great importance to study the mechanical properties of concrete. Among the various indices of properties of concrete, compressive strength is the most fundamental one since it is directly related to the safety of the structures, and it is required in the performance determination of the structures during the whole life-cycle, from new structural design to old structural assessment. However, as it is known to all, concrete is made up of different components, e.g., coarse/fine aggregates, cement pastes, additional mixtures, etc., and these components are randomly distributed over the entire concrete matrix.

**1.1 Why this High-Level Design Document?**

The main purpose of this HLD documentation is to feature the required details of the project and supply the outline of the machine learning model and the written code. This additionally provides the careful description on however the complete project has been designed end-to-end.

**1.2 Description**

**Problem Perspective**

I am building a model to predict **Concrete compressive strength** based on several attributes from the given data.

**1.3 Problem Statement**

The most goal of the project is to form a programme that predicts the **Concrete compressive strength** cement, blast, fly ash, water, superlasticize, age etc

**1.4. Project Solution**

Project requires the desired input of user from the created interface and method all the provided information to satisfy the wants of the machine learning model and at last show the expected output.

**1.5 Answer enhancements**

we will predict the Concrete compressive strength

**1.6 Technical needs**

There are not any hardware needs needed for victimization this application, the user should have AN interactive device that has access to the web and should have the fundamental understanding of providing the input. And for the backend half the server should run all the package that's needed for the process and provided information to show the results.

**1.7 Information needs**

The info demand is totally supported the matter statement and the information set is accessible on the UCI within the type of standout sheet(.data), because the main theme of the project is to induce the expertise of real time issues, we tend to once more mercantilism {the information into the prophetess data base and commerce it into csv format.

**1.8 Tools Used**

* Python 3.8 is employed because the programming language and frame works like numpy, pandas, sklearn and alternative modules for building the model.
* Vscode is employed as IDE(integrated development environment).
* For visualizations seaborn and components of matplotlib are getting used.
* For information assortment prophetess info is getting used.
* Front end development is completed victimization HTML/CSS.
* Flask is employed for each information and backend readying.
* GitHub is employed for version management.
* AWS Beanstalk for deployment.

**1.9 Constraints**

The Concrete compressive strength should be user friendly, as automatic as attainable and the user should not be needed to understand any of the operating.

**1.10 Assumptions**

The most objective of the project is to implement the utilization cases as for the new dataset that user provides through the programme. Machine learning model is employed for process the on top of computer file. It's additionally assumed that each one aspects of this project have the flexibility to figure along within the approach as the designer is expecting.

**2.3 Logging**

Each step is being logged within the system that runs internally, that shows the date time and therefore the processed that has been performed, work is completed in several layers as information, DEBUG, ERROR, WARNINGS. this provides US the perceive of the logged info.

**2.4 Error Handling**

Once ever a slip is occurred, the reason is logged in its several log file, in order that the developer will rectify the error.

**3 Performance analysis**

**3.1 Reusability**

Elements of the code written is accustomed different applications and therefore the rest is changed and be reused.

**3.2 Application Compatibility**

The various parts for this project are exploitation python as associate interface between them. every element can have its own tasks to perform, and it's the work of the python to make sure correct transfer of data.

**3.3 Resource Utilization**

Once any task is performed, it'll doubtless; use all the process power offered till that performs is finished.

**Conclusion**

The **Concrete compressive strength** will predict the worth supported the trained knowledge set within the rule. therefore, the user will know the income of any person.