

# Low Level Design Document

## Cement Strength Prediction System

**Written By:** Jaideep Jaiswal  
**Document Version:** 1.0  
**Last Revised Date:** 02-04-2024

### Document Control

**Change Record:**

Version	Date	Author	Comments
1.0	02-04-2024	Jaideep Jaiswal	Initial version of LLDD

### Reviews

### Contents

- 1. Introduction
- 2. What is Low-Level Design Document?
- 3. Scope
- 4. Architecture
- 5. Data Description
- 6. Data Pre-processing
- 7. Model Building
- 8. Deployment

# 1. Introduction

The Cement Strength Prediction System aims to predict the compressive strength of concrete based on various input features. This document provides a low-level design detailing the internal logical design of the program code for the system.

## 2. What is Low-Level Design Document?

The Low-Level Design (LLD) document outlines the internal logical design of the actual program code. It describes the class diagrams, methods, and relations between classes to facilitate direct coding from the document.

## 3. Scope

Low-level design (LLD) involves a step-by-step refinement process for component-level design. It covers the design of data structures, software architecture, source code, and performance algorithms.

## 4. Architecture

### Architecture Description

The system follows a modular architecture consisting of the following components:

- Data Pre-processing Module
- Model Building Module
- Deployment Module

## 5. Data Description

The system utilizes a dataset containing information about concrete mixtures and their corresponding compressive strengths. Features include cement, slag, fly ash, water, superplasticizer, coarse aggregate, fine aggregate, and age.

## 6. Data Pre-processing

**Steps:**

1. Null value handling
2. Stop words removal
3. Punctuation removal
4. Tokenization
5. Lemmatization
6. TFIDF
7. Imbalanced dataset handling
8. Handling columns with standard deviation zero or below a threshold

## **7. Model Building**

### **Steps:**

1. Training machine learning models using preprocessed data
2. Hyperparameter tuning using Grid-Search
3. Model evaluation using standard regression metrics
4. Model serialization for deployment

## **8. Deployment**

The system is deployed using AWS or a similar cloud platform. The trained models are deployed as a prediction API using Flask or a similar framework.