Low Level Design

LC-50 Value Prediction

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Document Control

Change Record:

Version	Date	Author	Comments
0.1	19 – May - 2024	Ankur Das	Introduction & Architecture defined
0.2	20 – May - 2024	Rahul Pidkalwar	Architecture & Architecture Description appended and updated
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Reviews:

Version	Date	Reviewer	Comments
0.2	21 – May - 2021	Khusali	Document Content , Version Control and Unit Test Cases to be added

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Contents

1. Introduction

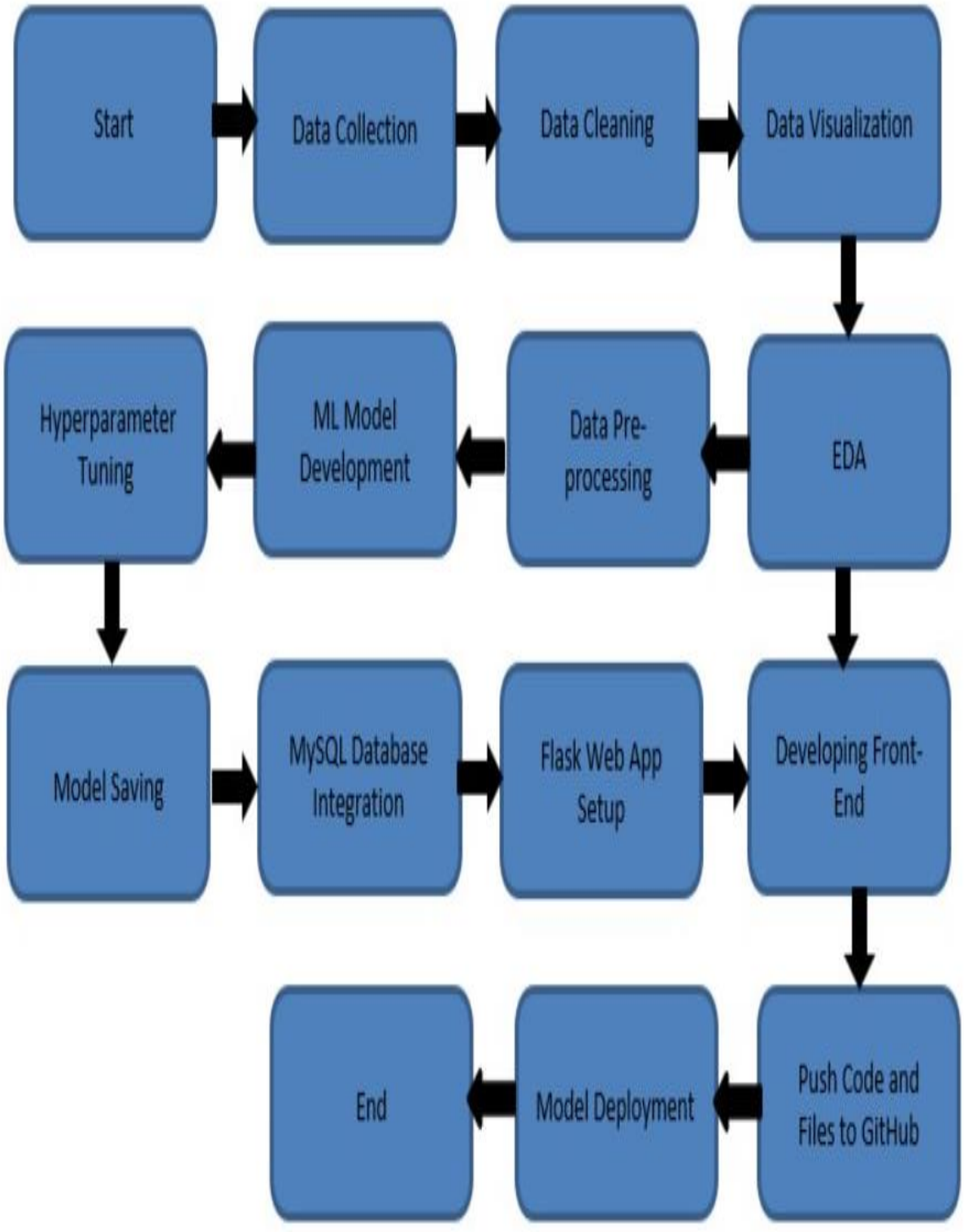
1.1. What is Low-Level design document?

The goal of LLD or a low-level design document (LLDD) is to give the internal logical design of the actual program code for Food Recommendation System. LLD describes the class diagrams with the methods and relations between classes and program specs. It describes the modules so that the programmer can directly code the program from the document.

1.2. Scope

Low-level design (LLD) is a component-level design process that follows a step-by-step refinement process. This process can be used for designing data structures, required software architecture, source code and ultimately, performance algorithms. Overall, the data organization may be defined during requirement analysis and then refined during data design work

2. Architecture



3. Architecture Description

3.1. Data Collection

A set of 908 chemicals based on 6 molecular descriptors.
LC50 data, which is the concentration that causes death in 50% of test fish over a test duration of 96 hours, was used as model response. The model comprised 6 molecular descriptors: MLOGP (molecular properties), ClC0 (information indices), GATS1i (2D autocorrelations), NdssC (atom-type counts), NdsCH ((atom-type counts), SM1_Dz(Z) (2D matrix-based descriptors).
Dataset: https://archive.ics.uci.edu/ml/datasets/QSAR+fish+toxicity

3.2. Data Cleaning

Data cleaning and transformation are crucial steps in a data science project that ensure data quality and usability. Data cleaning involves handling missing values by identifying and either imputing or removing them, removing duplicates, correcting inaccuracies such as typos and errors, and standardizing data formats. It also includes identifying and treating outliers that can skew analysis. Data transformation, on the other hand, involves scaling and normalizing data to ensure uniformity, encoding categorical variables, and creating new features through feature engineering. It also includes aggregating and grouping data, reducing dimensionality with techniques like PCA, and applying transformations such as logarithmic scaling to stabilize variance and improve the distribution of data for analysis. Together, these processes enhance the accuracy, efficiency, and performance of data analysis and machine learning models.

3.3. Data Transformation

Data transformation involves converting data into a suitable format or structure for analysis. This step enhances the data's usability and often involves changing the form or structure of the data to improve its compatibility with specific algorithms or analysis techniques

3.4. Data Insertion into Database

a. Database Creation and connection - Create a database with name passed. If the database is already created, open the connection to the database.
b. Table creation in the database.
c. Insertion of files in the table

3.5. Export Data from Database

Data Export from Database - The data in a stored database is exported as a CSV file to be used for Data Pre-processing and Model Training.

3.6. Data Pre-processing

Data Pre-processing steps we could use are Null value handling, stop words removal, punctuation removal, Tokenization, Lemmatization, TFIDF, Imbalanced data set handling, Handling columns with standard deviation zero or below a threshold, etc.

3.7. Data Clustering

K-Means algorithm will be used to create clusters in the pre-processed data. The optimum number of clusters is selected by plotting the elbow plot. The idea behind clustering is to implement different algorithms to train data in different clusters. The K-means model is trained over preprocessed data and the model is saved for further use in prediction

3.8 Model Building

After clusters are created, we will find the best model for each cluster. For each cluster, algorithms will be passed with the best parameters derived from Grid-Search. We will calculate the AUC scores for models and select the model with the best score. Similarly, the models will be selected for each cluster. All the models for every cluster will be saved for use in Recommendation.

3.10. Data from User

Here we will collect physiological data from user such as user height and weight, heart rate, burned calories, daily physical activity level; as well as information directly provided by the user such as daily food intake

3.11. Data Validation

Here Data Validation will be done, given by the user

3.12. User Data Inserting into Database

Collecting the data from the user and storing it into the database. The database can be either MySQL or Mongo DB.

3.13. Data Clustering

The model created during training will be loaded, and clusters for the user data will be predicted.

3.14. Model Call for Specific Cluster

Based on the cluster number, the respective model will be loaded and will be used to predict/Recommend the data for that cluster.

3.15. Value Prediction & Saving Output in Database

After calling model Recipe/Output will be recommended, this output will be saved in Database and it

will beused to show the same Output if other users provide the same data.

3.16. Deployment

We will be deploying the model to AWS.
This is a workflow diagram for the Recipe Recommendation..

4. Unit Test Cases

Test Case Description	Pre-Requisite	Expected Result
Verify whether the Application URL is accessible to the user	1. Application URL should be defined	Application URL should be accessible to the user
Verify whether the Application loads completely for the user when the URL is accessed	1. Application URL is accessible 2. Application is deployed	The Application should load completely for the user when the URL is accessed
Verify whether the User is able to sign up in the application	1. Application is accessible	The User should be able to sign up in the application
Verify whether user is able to successfully login to the application	1. Application is accessible 2. User is signed up to the application	User should be able to successfully login to the application
Verify whether user is able to see input fields on logging in	1. Application is accessible 2. User is signed up to the application 3. User is logged in to the application	User should be able to see input fields on logging in
Verify whether user is able to edit all input fields	1. Application is accessible 2. User is signed up to the application 3. User is logged in to the application	User should be able to edit all input fields
Verify whether user gets Submit button to submit the inputs	1. Application is accessible 2. User is signed up to the application 3. User is logged in to the application	User should get Submit button to submit the inputs
Verify whether user is presented with recommended results on clicking submit	1. Application is accessible 2. User is signed up to the application 3. User is logged in to the application	User should be presented with recommended results on clicking submit
Verify whether the recommended results are in accordance to the selections user made	1. Application is accessible 2. User is signed up to the application 3. User is logged in to the application	The recommended results should be in accordance to the selections user made
Verify whether user has options to filter the recommended results as well	1. Application is accessible 2. User is signed up	User should have options to filter the recommended results as well

	to the application 3. User is logged in to the application	
Verify whether KPIs modify as per the user inputs for the user's health	1. Application is accessible 2. User is signed up to the application 3. User is logged in to the application	KPIs should modify as per the user inputs for the user's health
Verify whether the KPIs indicate details of the suggested recipe	1. Application is accessible 2. User is signed up to the application 3. User is logged in to the application	The KPIs should indicate details of the suggested recipe