LOW LEVEL DESIGN (LLD)

MUSHROOM CLASSIFICATION

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1. <u>Abstract</u>

Mushrooms hold a timeless significance in human gastronomy, intertwined with both mystery and familiarity. Their name originates from French, linking them to fungi and mold, carrying an air of enigma. Today, mushrooms are valued for their nutrition, low calorie content, and absence of cholesterol, making them popular for health-conscious eaters.

This project introduces an advanced Mushroom Classification Machine Learning Model capable of accurately categorizing mushroom species as either poisonous or edible. Through a meticulously curated dataset and advanced neural networks, the model identifies distinctive patterns for precise classification. Its user-friendly interface accommodates users of all expertise levels, while its adaptability ensures robust performance across various conditions. This innovation not only revolutionizes mushroom classification but also provides a vital tool for mycologists, researchers, and enthusiasts. The report outlines the model's architecture, development, and real-world applicability, highlighting its significant contribution to the field of mycology.

2. Introduction

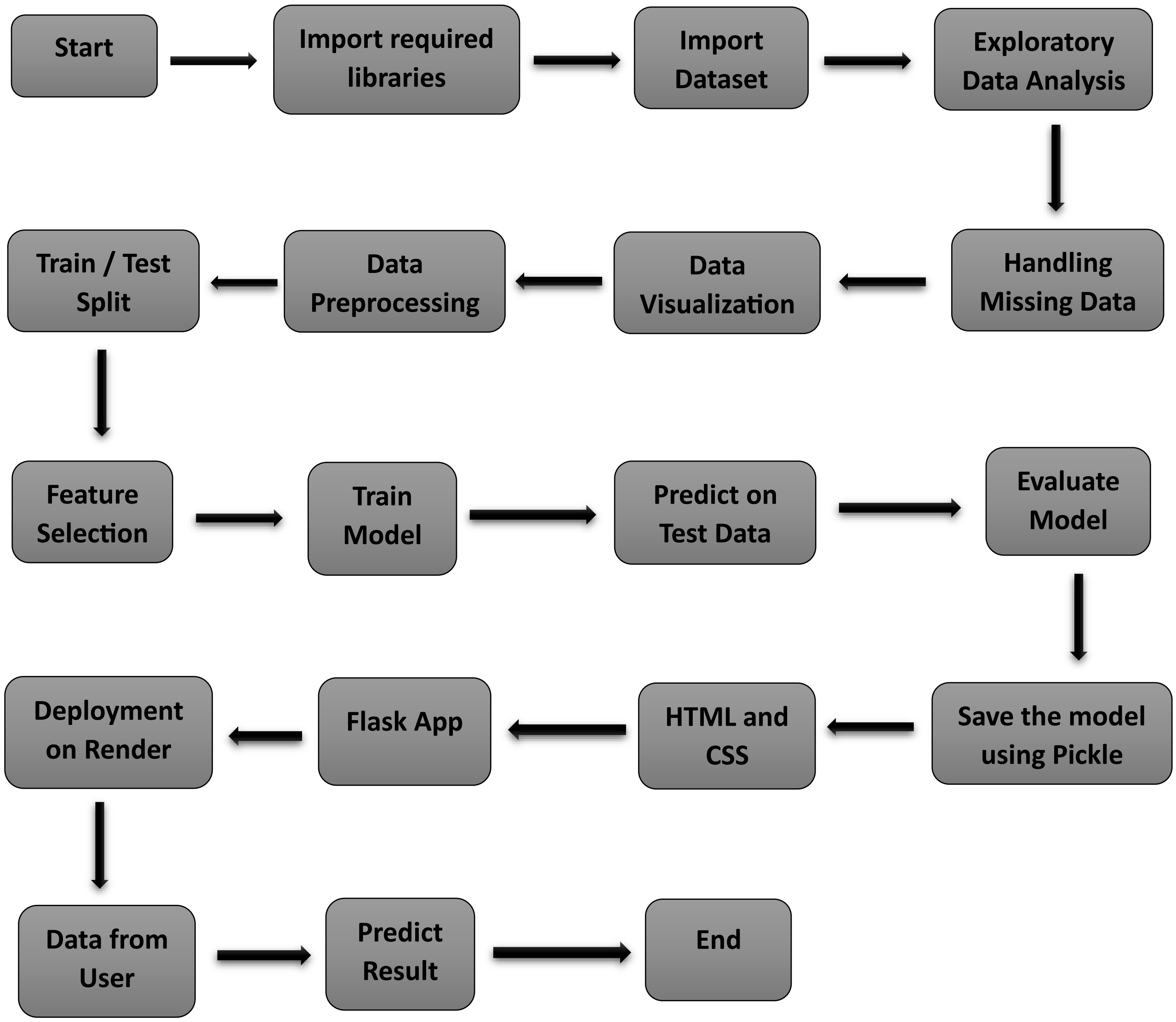
2.1 What is Low Level Design Document?

The objective of a Low-Level Design Document (LLDD) is to provide an in-depth internal logical blueprint of the program code for the Food Recommendation System. The LLDD elucidates class diagrams encompassing methods and interconnections between classes, alongside program specifications. This document delineates modules, enabling programmers to directly translate its contents into program code. The LLDD serves as a crucial bridge between conceptual design and practical implementation, facilitating a seamless transition from design to code for the Food Recommendation System.

2.2 Scope

Low-level design (LLD) constitutes a meticulous component-level design methodology that progresses through a systematic step-by-step refinement procedure. This iterative process serves as a foundation for designing integral elements such as data structures, essential software architecture, source code implementation, and, ultimately, optimized performance algorithms. Primarily, the framework for data organization is often established during the requirement analysis phase and further enhanced and detailed in the subsequent stages of data design. Through this incremental approach, LLD ensures a coherent and well-structured foundation for the development and implementation of complex software systems.

3. Architecture



4. Architecture Overview

At the core of this project lies a user-centric interface, ingeniously designed to empower users with the ability to discern the toxicity of mushrooms. This architecture orchestrates a symphony of data collection, exploration, preprocessing, modeling, and deployment, all harmonizing to craft a seamless and accurate prediction experience.

4.1 Data Procurement

The wellspring of data for this endeavor is drawn from a Kaggle Dataset, a repository renowned for its diversity and quality. The dataset, accessible through the following URL, encapsulates descriptions of hypothetical samples encompassing 23 distinct species of gilled mushrooms, derived from the esteemed "Audubon Society Field Guide to North American Mushrooms" (1981):

Dataset: https://www.kaggle.com/datasets/uciml/mushroom-classification

4.2 Data Insight

A symphony of mushroom taxonomy unfolds within this dataset, featuring 8124 records across 23 categorical attributes. A pivotal column emanates as the fulcrum of prediction—its contents resonating with the binary distinction of 'p' for poisonous and 'e' for edible. The data's equilibrium is palpable, with a nearly equivalent distribution of the two classes.

4.3 Illuminating Patterns

Navigating the data's intricacies, a canvas emerges through exploratory data analysis, exhibiting discernable trends and insights. To unveil the essence of the mushroom's classification, the focus narrows to selected features, a calculated subset from the ensemble. Visual narratives—count plots—effuse insights into the delicate balance of our classification target.

4.4 Filling the Gaps

Intricacies unravel further, as missing data demand attention. The keen eye identifies the 'stalk-root' column harboring these vacancies. Amidst this intricate tapestry, the question mark takes a semblance of imperfection. The remedy, an artful one—2490 instances of uncertainty yield to the crafted hand of the Simple Imputer, restoring coherence to this mosaic.

4.5 Visualizing Insights

Visualization, a bridge between numbers and understanding, becomes a quintessential endeavor. The chosen attributes resonate with the target column, each plot an incandescent glimpse into the mushroom's soul. Trends form, secrets emerge, and a deeper connection to the data is forged.

4.6 Crafting Preparedness

The journey through preprocessing begins with discernment—the 'veil-type' column, a monotonous echo, exits the stage. The target column transforms, the symbiotic embrace of Label Encoder yielding numerical reflection to categorical essence. Scaling emerges as the unifier, bringing disparate features to the harmonious cadence of a shared class.

4.7 The Quest for Relevance

With data primed, the feature selection phase illuminates—the SelectKBest method invokes chi-squared scrutiny, unraveling a constellation of 12 attributes that harmoniously resonate with our predictive goal. This ensemble, handpicked for its resonance with the target, shapes the essence of model training.

4.8 Orchestrators of Prophecy

Stepping forth as the quintessential arbiters of prescience, the Random Forest Classifier emerges as a beacon of predictive supremacy. From the dim recesses of data's labyrinth, it ascends with unparalleled swiftness. Mastery over the data's intricate dance culminates in an astonishing declaration—both training and test domains stand adorned with the resplendent mantle of 100% accuracy. The symphony of data science reaches its crescendo, the model's resounding harmonies resplendent in their assurance.

4.9 Illuminating the Virtual Realm

The apogee of our pursuit materializes, a virtual sanctuary fashioned through the deft artistry of HTML and CSS. This digital canvas, a realm unto itself, blossoms into the sanctum for our Flask web application. Like a newborn star, it embarks on its journey, from local incubation to the warm embrace of Render—a culmination that resounds with flawless deployment. Inputs tendered are met with the contemplative embrace of algorithms, yielding outcomes that mirror verity—a digital oracle meticulously bound with threads of precision.

In this intricate architecture, the harmonious choreography of data and technology entwines itself with the enigma of mushrooms' classification. A symphony of predictive finesse arises, its echoes resonating from the very core of data to the very touchpoints of users' engagement. This is an embrace of experience, where the nuanced interplay of insight and refinement coalesce, cocooning users in a realm that is as enlightening as it is elegant.

5. Unit Test Cases

Test Case Description	Pre - Requisites	Expected Results
Verify whether the Webpage is accessible to the User or not.	Webpage URL should be defined.	Webpage should be accessible to the User.
Verify whether the webpage loads completely for the User or not.	1. Webpage URL is accessible. 2. Webpage is deployed.	The Webpage should be able to load completely for the User when it is accessed.
Verify whether the user is able to select data in input fields or not.	1. Webpage URL is accessible. 2. Webpage is deployed. 3. Webpage input fields are editable.	The User is able to select data in input fields.
Verify whether the user is able to submit details or not.	1. Webpage URL is accessible. 2. Webpage is deployed. 3. Webpage input fields are editable.	The User is able to submit details to process.
Verify whether the user gets recommended results on submitting the details or not.	1. Webpage URL is accessible. 2. Webpage is deployed. 3. Webpage input fields are editable.	The User gets recommended results on submitting the details