MUSHROOM CLASSIFICATION PREDICTION

Low Level Design Document

Prepared By:
Binaya Kumar Pradhan

Abstract

The Mushroom Classifier Prediction Project aims to develop a robust machine learning model capable of accurately identifying and classifying mushroom species based on their features. This project is motivated by the critical need for reliable tools to differentiate between edible and poisonous mushrooms, considering the potential life-threatening consequences of consuming toxic varieties.

The project utilizes a diverse dataset containing various mushroom species, encompassing a wide range of shapes, colours, and textures. Leveraging state-of-the-art machine learning techniques, the goal is to train a classification model that can generalize well to unseen mushroom samples.

Table of Contents

1. Introduction

1.1. What is LLD?

The primary objective of this document is to provide an in-depth description of the Deep EHR System. It aims to elucidate the systems objectives and functionalities, outline its interfaces, define its core functions, address operational constraints, and detail its responses to external inputs. This document serves as a valuable resource for both stakeholders and developers involved in the systems development and is intended for submission to senior management for their approval.

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. Technical Specification
2.1.Dataset

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

Dataset Overview

The dataset includes descriptions of hypothetical samples corresponding to 23 species of gilled mushrooms in the Agaricus and Lepiota Family Mushroom drawn from The Audubon Society Field Guide to North American Mushrooms (1981). Each species is identified as definitely edible, definitely poisonous, or of unknown edibility and not recommended. This latter class was combined with the poisonous one. The Guide clearly states that there is no simple rule for determining the edibility of a mushroom; no rule like "leaflets three, let it be" for Poisonous Oak and Ivy.

Input Schema

Feature Name	Datatype	Null/Required
class	Object	Required
cap-shape	Object	Required
cap-surface	Object	Required
cap-color	Object	Required
bruises	Object	Required
odor	Object	Required
gill-attachment	Object	Required
gill-spacing	Object	Required
gill-size	Object	Required
gill-color	Object	Required
stalk-shape	Object	Required
stalk-root	Object	Required
stalk-surface-above-ring	Object	Required
stalk-surface-below-ring	Object	Required
stalk-color-above-ring	Object	Required

stalk-color-below-ring	Object	Required
veil-color	Object	Required
ring-number	Object	Required
ring-type	Object	Required
spore-print-color	Object	Required
population	Object	Required
habitat	Object	Required

2.2.Predicting Mushroom Class

- The system initiates by presenting a user interface with input fields.
- The user then provides the necessary information.
- Subsequently, the system is tasked with making a prediction regarding the likelihood of a given mushroom being poisonous or edible based on its features.

2.3.Logging

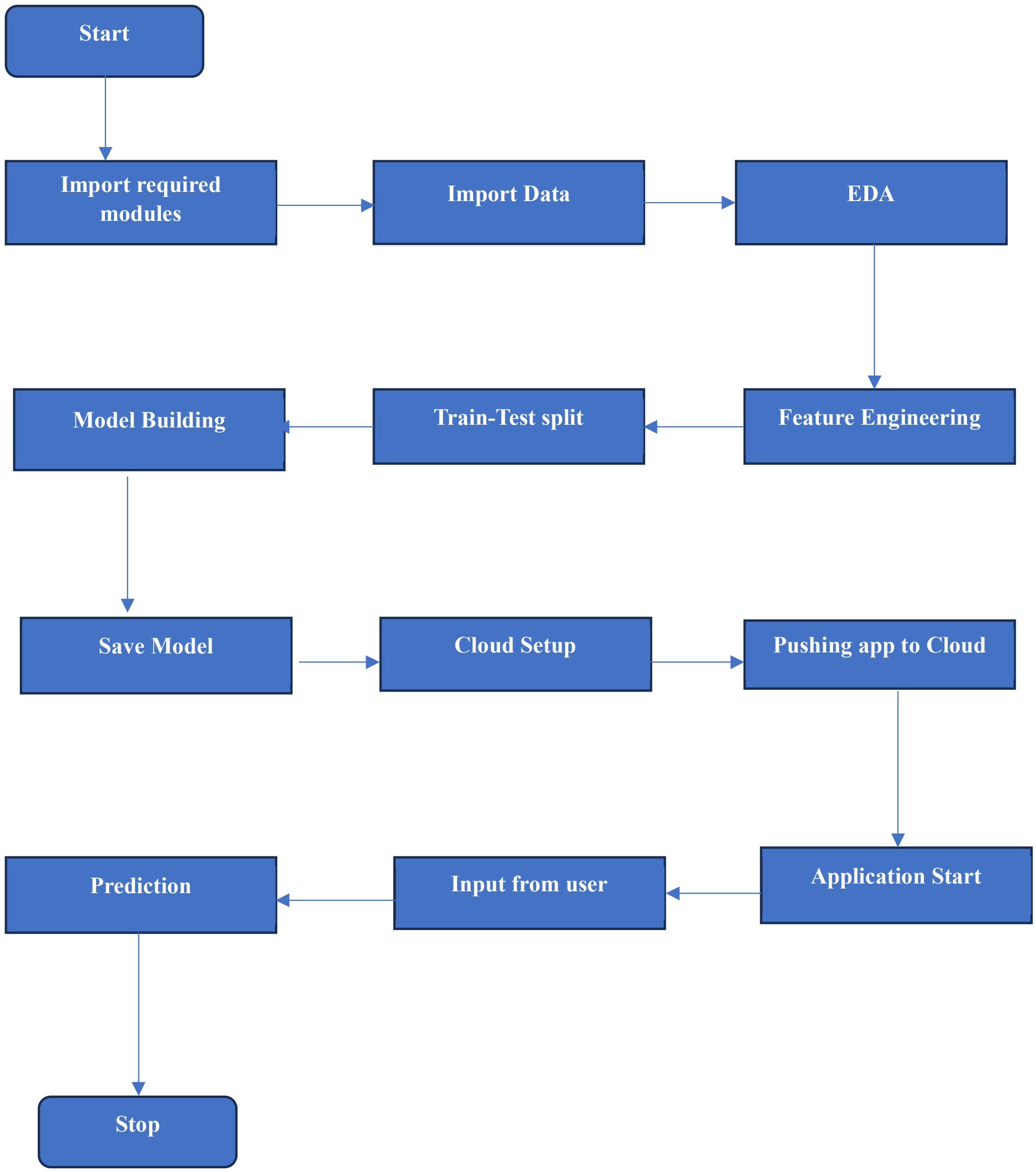
It's essential to maintain a comprehensive log of every user activity. The system autonomously recognizes the appropriate moments for logging.

- Logging is obligatory for all system processes and flows.
- Developers have the flexibility to select their preferred logging methods, whether its database logging or file logging.
- Importantly, the system must remain operational and not experience performance issues, even with extensive logging. This emphasis on logging is primarily for effective issue debugging and, thus, is a mandatory practice.

2.4.Deployment

Deployed in AWS Elastic Beanstalk

3. Architecture



4. Architecture Description

4.1. Data Description

This dataset includes descriptions of hypothetical samples corresponding to 23 species of gilled mushrooms in the Agaricus and Lepiota Family Mushroom drawn from The Audubon Society Field Guide to North American Mushrooms (1981). Each species is identified as definitely edible, definitely poisonous, or of unknown edibility and not recommended.

There are 23 variables:

- class:
    - 1= edible
    - 2= poisonous
- cap_shape:
    - 1=bell
    - 2=conical
    - 3=convex
    - 4=sunken
    - 5=flat
    - 6=knobbed
- cap_surface:
    - 1=fibrous
    - 2=grooves
    - 3=scaly
    - 4=smooth
- cap_color:
    - 1=brown
    - 2=buff
    - 3=cinnamon
    - 4=gray
    - 5=green
    - 6=pink
    - 7=purple
    - 8=red
    - 9=white
    - 10=yellow
- bruises:
    - 1=no
    - 2=yes
- odor:
    - 1=almond
    - 2=anise
    - 3=creosote
    - 4=fishy
    - 5=foul
    - 6=musty
    - 7=none

  - 8=pungent
  - 9=spicy
- gill_attachment:
  - 1 = attached
  - 2 = free
- gill_spacing:
  - 1=close
  - 2=crowded
- gill-size:
  - 1=broad
  - 2=narrow
- gill_color:
  - 1=black
  - 2=brown
  - 3=buff
  - 4=chocolate
  - 5=gray
  - 6=green
  - 7=orange
  - 8=pink
  - 9=purple
  - 10=red
  - 11=white
  - 12=yellow
- stalk_shape:
  - 1=enlarging
  - 2=tapering
- stalk_root:
  - 1=bulbous
  - 2=club
  - 3=equal
  - 4=rooted
- stalk-surface-above-ring:
  - 1=fibrous
  - 2=scaly
  - 3=silky
  - 4=smooth
- stalk-surface-below-ring:
  - 1=fibrous
  - 2=scaly
  - 3=silky
  - 4=smooth
- stalk-color-above-ring:
  - 1=brown
  - 2=buff
  - 3=cinnamon

  - 4=gray
  - 5=orange
  - 6=pink
  - 7=red
  - 8=white
  - 9=yellow
- stalk-color-below-ring:
  - 1=brown
  - 2=buff
  - 3=cinnamon
  - 4=gray
  - 5=orange
  - 6=pink
  - 7=red
  - 8=white
  - 9=yellow
- Veil-color:
  - 1=brown
  - 2=orange
  - 3=white
  - 4=yellow
- ring-number:
  - 1=none
  - 2=one
  - 3=two
- ring-type:
  - 1=evanescent
  - 2=flaring
  - 3=large
  - 4=none
  - 5=pendant
- spore-print-color:
  - 1=black
  - 2=brown
  - 3=buff
  - 4=chocolate
  - 5=green
  - 6=orange
  - 7=purple
  - 8=white
  - 9=yellow
- population:
  - 1=abundant
  - 2=clustered
  - 3=numerous
  - 4=scattered

    - 5=several
    - 6=solitary
- habitat:
    - 1=grasses
    - 2=leaves
    - 3=meadows
    - 4=paths
    - 5=urban
    - 6=waste
    - 7=woods

4.2.Data Exploration

We conduct a detailed exploration for each feature (categorical type), one at a time. Within each type, we systematically examine, visualize, and analyze each variable individually, documenting our findings. Additionally, we may make minor modifications to the data, such as renaming columns for improved clarity and ease of understanding.

4.3.Feature Engineering

Categorical variables have been encoded to facilitate data analysis and modelling

4.4.Train Test Split

The dataset has been divided into two subsets: a training set, which comprises 70% of the data, and a test set, which consists of the remaining 30%. This split allows for training and testing machine learning models.

4.5.Model Building

Several models have been constructed, and the dataset has been used to train and evaluate these models. The performance of each model has been thoroughly compared, and the best-performing model has been selected based on various evaluation metrics and criteria.

4.6.Save The Model

The selected model has been saved by converting it into a pickle file. This allows for easy storage and retrieval of the model for future use.

4.7.Cloud Setup & Pushing the App to The Cloud

AWS (Amazon Web Services) has been chosen as the deployment platform for the application. The application files have been loaded from the GitHub repository to the AWS environment, ensuring that the application is hosted and accessible on AWS infrastructure.

4.8. Application start & input data by user

The application has been initiated and is now ready for use. You can enter the required inputs into the application to perform the desired tasks.

4.9. Prediction

Once the user submits the features of a mushroom as an input, the mushroom classification application will execute the trained model to generate predictions. The output will be presented as a message, conveying information about whether the submitted mushroom is likely to be poisonous or edible based on its features.