Project Overview

This project uses **MLflow** to track and optimize the training of an **Artificial Neural Network (ANN)** for predicting **wine quality scores**. The model is trained on the **White Wine Quality dataset**, and multiple **experiments** are conducted with different **hyperparameters** to identify the best-performing configuration.

With **MLflow Tracking**, every training run, hyperparameter choice, and evaluation metric is logged. The **best model** is then **registered and served** as an **MLflow REST API**, enabling real-time predictions.

MLflow Experimentation & Results

Number of Experiments Conducted

A total of **4 hyperparameter tuning runs** were executed using **Hyperopt**, optimizing:

- **Learning Rate (lr)**
- **Momentum (momentum)**

Hyperparameter Optimization Approach

- **Search Algorithm:** Tree-structured Parzen Estimator (**TPE**)
- **Evaluation Metric:** Root Mean Squared Error (**RMSE**)

Comparing Results in MLflow UI

Each experiment's **hyperparameters, loss function, and evaluation metrics** were logged into **MLflow**. The MLflow UI was used to compare different runs and select the best-performing model based on the **lowest RMSE**.

Best Model Results

- **Best Learning Rate (lr)**: Identified from MLflow comparisons
- **Best Momentum (momentum)**: Tuned with Hyperopt
- **Final RMSE Score on Validation Set:** Best score achieved from experiments

The best model was then **registered in MLflow's Model Registry**.