End-to-End Project Implementation

This project follows a comprehensive end-to-end machine learning pipeline consisting of the following stages:

1. **Data Ingestion**
   Collecting and importing the necessary data for the project.
2. **Data Validation**
   Ensuring the integrity, quality, and consistency of the data.
3. **Data Transformation**
   Preprocessing the data, which include cleaning, normalization, encoding, or feature engineering.
4. **Model Training**
   Training the machine learning model on the preprocessed data. In this case, the **ElasticNet** algorithm is used with a fixed value for **alpha** and **l1_ratio**.
5. **Model Evaluation**
   Evaluating the performance of the model based on predefined metrics, such as rmse,mae, etc.

Case Study: Predicting Wine Quality

The goal of this case study is to predict the quality of wine based on various features, including:

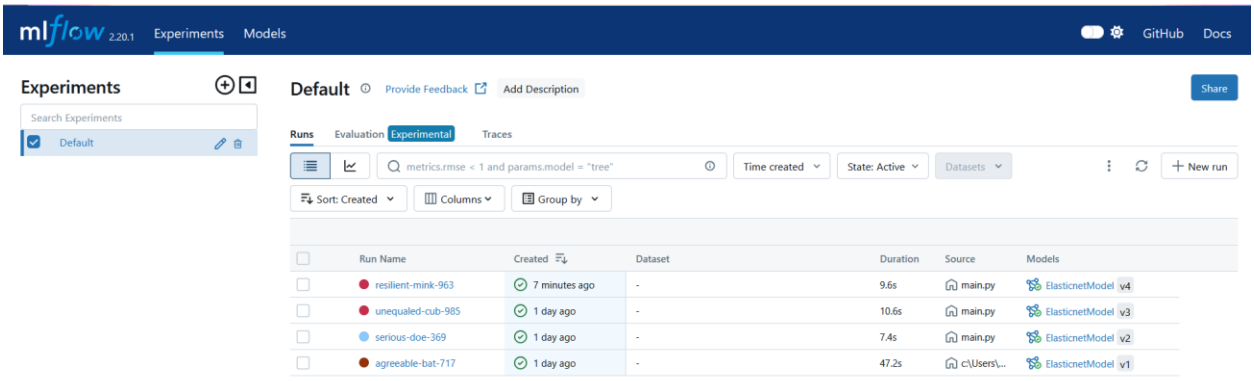
- Fixed Acidity
- Volatile Acidity
- Citric Acid
- Residual Sugar
- Chlorides
- Free Sulfur Dioxide
- Total Sulfur Dioxide
- Density
- pH
- Sulphates
- Alcohol

Machine Learning Model: ElasticNet

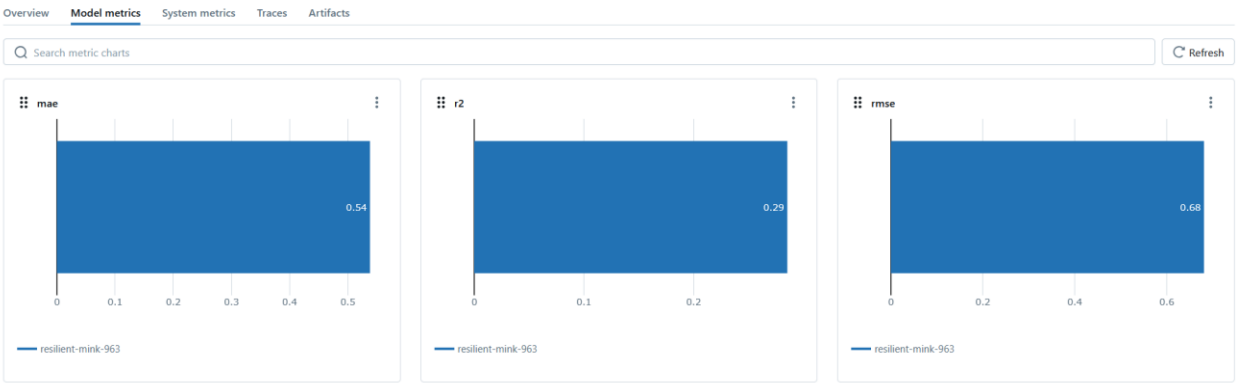
For this task, **ElasticNet** regression model is used, which combines both **L1** and **L2** regularization. A fixed value for **alpha** and **l1_ratio** is set to control the strength and type of regularization.

Experiment Tracking with MLflow

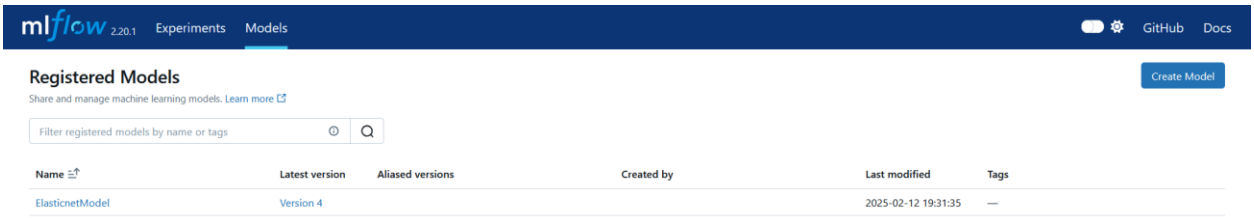
The entire experiment, including data preprocessing, model training, and evaluation, is tracked using **MLflow**. This allows for monitoring and managing the machine learning lifecycle, ensuring that results can be easily reproduced and compared across different runs.



Model metrics is captured in UI –

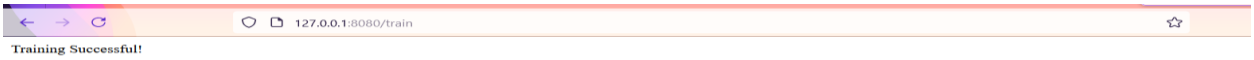


Registered Model –

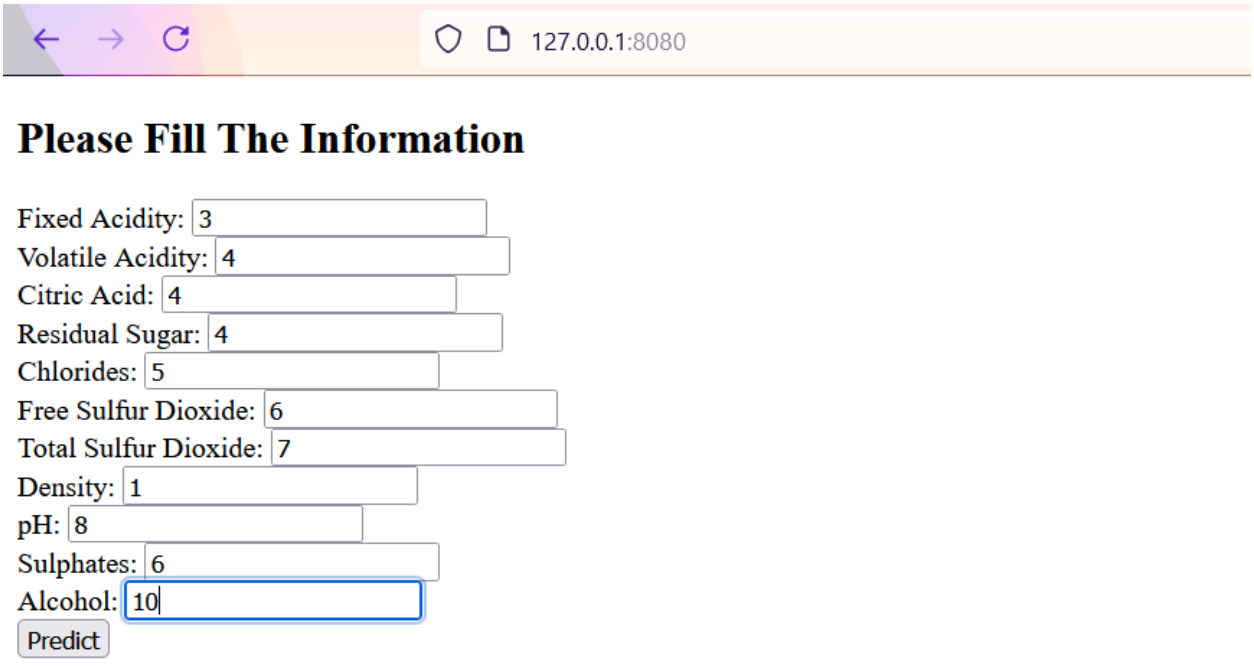


Model Training

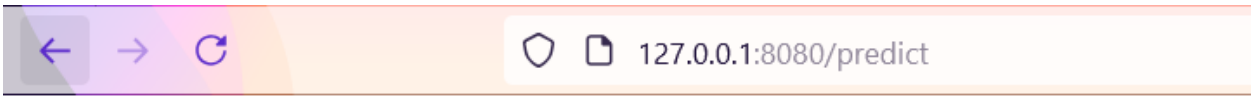
URL - http://127.0.0.1:8080/train



Prediction –



Output-



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