## 

## CGU ODISHA - YouTube

Project Report On

“Wine Percentage Prediction”

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## Introduction

The Wine Percentage Prediction System is a web-based machine learning solution designed to predict the alcohol percentage in different types of wines based on chemical properties. This predictive tool offers an analytical approach that can aid winemakers, quality inspectors, and researchers in understanding and evaluating wine samples efficiently. The system is built using Django for web integration and employs powerful regression models to make accurate predictions.

## Objective

- To develop a machine learning model that predicts alcohol content in wine samples using physicochemical features.

- To provide a reliable and automated system that reduces manual testing efforts in wine quality assessment.

- To integrate the model into a web platform for real-time user interaction.

- To offer users a secure and role-based access environment for prediction and analysis.

## Scope

The system is useful for:

- Wine Producers: Predict wine alcohol content during various stages of fermentation.

- Quality Control Experts: Assess batch quality quickly using chemical data.

- Researchers: Conduct analytical research and benchmarking across wine types.

## Features

- Alcohol Prediction: Accepts chemical properties such as acidity, sugar, sulfates, etc., to predict alcohol percentage.

- CSV Upload: Users can upload wine data in bulk for batch prediction.

- Visualization Dashboard: Displays trends and prediction accuracy graphs.

- User Authentication: Role-based access for users and administrators.

- History Logs: Saves predictions and model results for review.

## Technology Stack

- Frontend: HTML, CSS, Bootstrap, JavaScript

- Backend: Django (Python)

- Database: PostgreSQL

- ML Tools: scikit-learn, pandas, NumPy, joblib

- Visualization: Matplotlib, Seaborn

## System Architecture

- Frontend Interface: User dashboard to input values and view results.

- Backend Services: Django handles routing, prediction APIs, and user management.

- ML Model Integration: Pre-trained regression model loaded with joblib.

- Database Layer: Stores user data and prediction logs in PostgreSQL.

## Dataset and Data Collection

- Source: UCI Machine Learning Repository – Wine Quality Dataset

- Entries: 4898 (white wine) + 1599 (red wine) samples

- Attributes: 11 chemical properties like pH, citric acid, residual sugar, etc.

- Target Variable: Alcohol percentage

- Preprocessing: Null value removal, standardization, feature selection

## Machine Learning Model

- Model Type: Linear Regression, Random Forest Regressor

- Evaluation Metrics: R² Score, MAE, RMSE

- Cross-Validation: 10-fold used for model reliability

- Deployment: Serialized using joblib, loaded via Django for real-time prediction

## System Interfaces

- User Dashboard: Form inputs for chemical data

- Batch Upload Page: CSV file submission and result view

- Admin Panel: User management and logs viewer

## Challenges

- Ensuring accuracy across diverse wine types

- Feature scaling and model generalization

- Real-time model integration with Django

- Handling outliers and skewed data

## Learnings

- Regression model tuning techniques

- Django-ML model integration

- Handling structured data for analysis

- Visualizing prediction insights

## Future Scope

- Mobile-friendly interface

- Integration with wine-making IoT sensors

- Predict other quality metrics like taste, aroma

- Support for multilingual user interface

## Conclusion

This Wine Percentage Prediction System bridges modern data science with traditional winemaking by offering fast, accurate, and scalable predictions of alcohol content. It reduces reliance on manual testing, enables rapid quality checks, and empowers winemakers and researchers with data-driven insights.

## References

- UCI Machine Learning Repository – Wine Quality Dataset

- Django Documentation: https://docs.djangoproject.com

- scikit-learn: https://scikit-learn.org

- PostgreSQL: https://www.postgresql.org

- joblib: https://joblib.readthedocs.io