

WINE PREDICTION WITH MACHINE LEARNING

Exploring data analysis and predictive modeling to enhance wine selection and quality assessment in the industry.



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Presenter

WINE QUALITY PREDICTION

Enhancing Wine Quality with AI



ROLE OF MACHINE LEARNING

Machine learning revolutionizes wine quality prediction by analyzing complex data patterns.



IMPORTANCE FOR PRODUCERS & CONSUMERS

Accurate predictions help producers improve quality and consumers make informed choices.



ENHANCING PREDICTION ACCURACY

AI models provide higher accuracy, reducing guesswork and enhancing reliability.

Exploring issues in current wine quality assessments



Assessing wine quality manually is time-consuming and inconsistent.



Wine tasting is subjective, leading to varying results among tasters.



An objective, tech-based solution is needed for scalable wine quality assessment.



MODEL PERFORMANCE METRICS

Assessing Accuracy, Precision, Recall

ACCURACY

Measures closeness of predictions to actual scores.



PRECISION

Indicates model consistency in predicting specific levels.



RECALL

Assesses model's ability to identify all relevant cases.



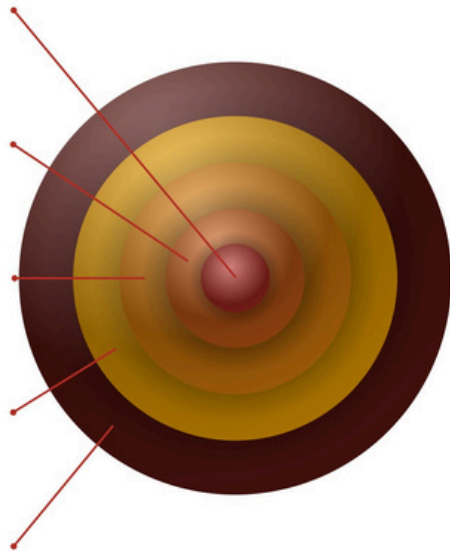
F1 SCORE

Balances precision and recall.



COMPUTATIONAL EFFICIENCY

Evaluates time and resources for training and prediction.



A decorative graphic in the bottom-left corner consisting of thin, light-brown lines that resemble a circuit board or a stylized tree structure, with small circles at the end of some branches.

DATASET OVERVIEW

Key Attributes and Structure

SOURCE OF THE DATASET

The dataset is sourced from the UCI Machine Learning Repository.

KEY ATTRIBUTES

Includes fixed acidity, volatile acidity, citric acid, residual sugar, chlorides, and more.

DATASET SIZE AND STRUCTURE

Comprises 1,599 entries, each with 12 features and a quality score.

DATA PREP & FEATURE SELECTION

Enhancing Model Performance through Data Techniques

HANDLING MISSING VALUES

Techniques to manage missing data and outliers effectively.

FEATURE SELECTION TECHNIQUES

Use correlation matrix and PCA to select key attributes.



NORMALIZATION & SCALING

Adjusting feature scales to enhance model performance.

PREPROCESSING IMPACT

Improves data quality and boosts model accuracy.

MACHINE LEARNING MODELS

Models for Classification & Non-linearity

DECISION TREES

Simple, interpretable models ideal for classification tasks.



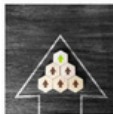
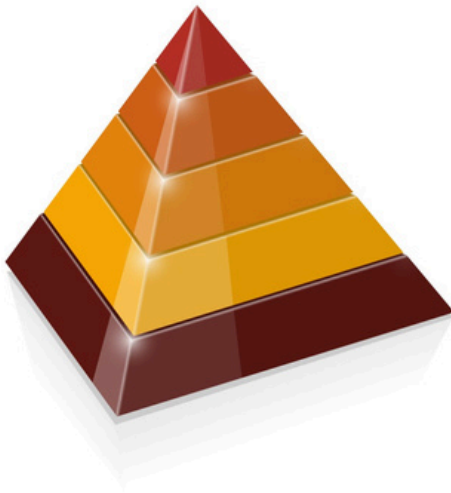
SUPPORT VECTOR MACHINES

Effective for high-dimensional spaces, uses hyperplanes.



SELECTION RATIONALE

Chosen for their ability to handle classification and non-linear data.



RANDOM FOREST

Ensemble of trees improving accuracy and reducing overfitting.



NEURAL NETWORKS

Mimics human brain, suitable for complex non-linear problems.

MODEL EVALUATION RESULTS

Cross-validation and key metrics analysis



CROSS- VALIDATION APPROACH

Used for assessing
model performance.



EVALUATION METRICS

Metrics: Accuracy,
precision, recall, F1
score.



RANDOM FOREST RESULTS

Achieved the highest
accuracy of 85%.



NEURAL NETWORKS RESULTS

Scored an accuracy of
83%.



VISUALIZATION METHODS

Includes precision-
recall curves,
confusion matrices.

COMPARATIVE ANALYSIS OF MODELS

Performance Metrics Comparison

MODEL	ACCURACY	PRECISION	RECALL	F1 SCORE
Decision Tree	78%	77%	79%	78%
Random Forest	85%	84%	86%	85%
Support Vector Machine	80%	79%	81%	80%
Neural Network	83%	82%	84%	83%

WINE QUALITY PREDICTION INSIGHTS

Findings from Model Performance Study

01

RANDOM FOREST MODEL EXCELLED.

Outperformed other models in predicting wine quality effectively.

02

FEATURE SELECTION IS CRUCIAL.

Enhances model performance significantly by choosing relevant features.

03

IMPLICATIONS FOR PRODUCERS.

Ensures more consistent quality predictions for wine producers.

04

AUTOMATION INTEGRATION POTENTIAL.

Can be integrated into automated wine production systems effectively.

FUTURE PROSPECTS IN WINE AI

Summary and Future Directions in Wine AI

EFFECTIVENESS OF MACHINE LEARNING

Machine learning has proven effective in predicting wine quality accurately.

ENHANCING MODEL ACCURACY

Future work includes using larger datasets and more features for improved accuracy.

EXPLORING DEEP LEARNING

Exploration of deep learning techniques could enhance prediction models further.

COLLABORATION WITH VITICULTURISTS

Potential collaboration with viticulturists to gain domain-specific insights.

REVOLUTIONIZE WINE WITH MACHINE LEARNING

Unlock the power of predictive analytics to enhance wine selection and ensure top-notch quality. Act now to stay ahead.

