■ Wine Quality Insights Report

Analyzed Regions: Santorini — Island region, notable for Assyrtiko. Volcanic island producing Assyrtiko with unique minerality.
Date Range: 2024–2028

■ Model Performance Metrics

• R^2 Score: 0.893
• RMSE: 0.295
• MAE: 0.182

■ Summary of Key Drivers

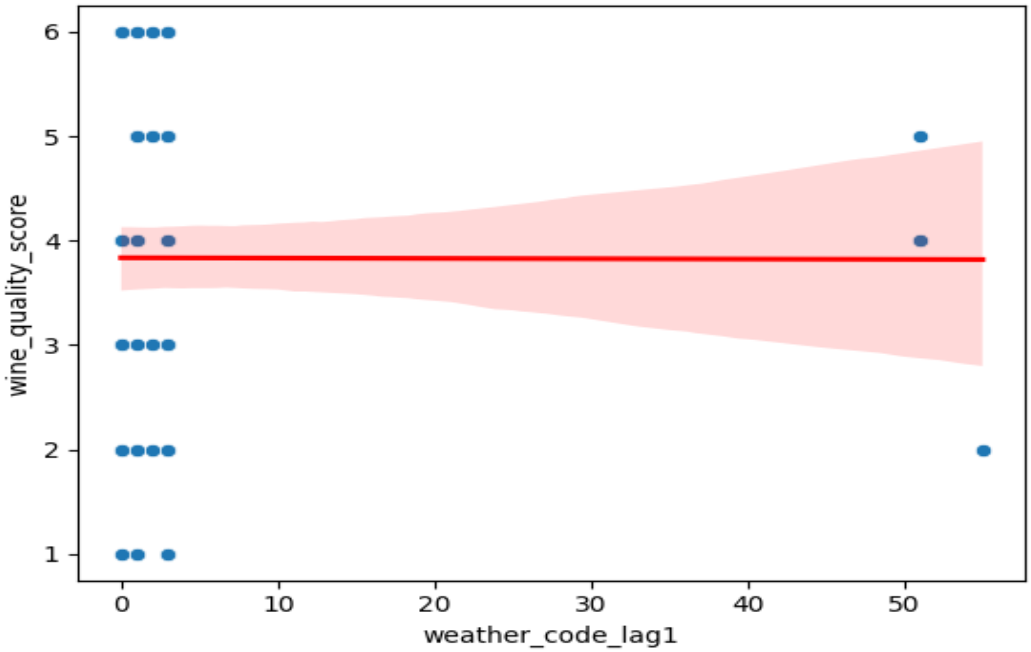
Key climate indicators influencing wine quality include:
• Relative Humidity 2M (Percentage of moisture in air compared to max capacity) — positively correlated (r = 0.817, normal: 40–70%, unit: %)
• Wind Speed 10M Rollmean7 (N/A) — negatively correlated (r = -0.728, normal: , unit:)
• Wind Speed 10M Rollmean3 (N/A) — negatively correlated (r = -0.722, normal: , unit:)

■ Top Correlated Features (r ≥ 0.5)

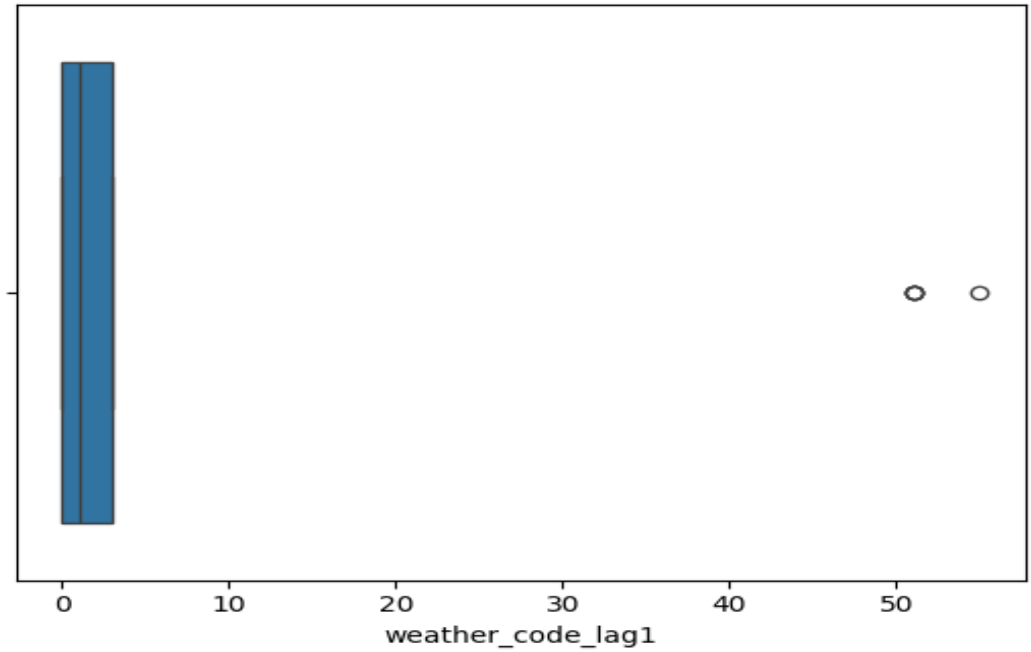
Feature	Correlation	Description	Unit	Normal Range
relative humidity 2m	0.817	Percentage of moisture in air compared to max capacity	%	40–70%
wind speed 10m rollmean7	-0.728	N/A	—	—
wind speed 10m rollmean3	-0.722	N/A	—	—
wind speed 10m lag1	-0.716	N/A	—	—
wind speed 10m lag7	-0.715	N/A	—	—
relative humidity 2m rollmean7	0.700	N/A	—	—
relative humidity 2m rollmean3	0.689	N/A	—	—
wind speed 10m	-0.685	Horizontal wind speed at 10 meters	m/s	1–6 m/s
relative humidity 2m lag1	0.682	N/A	—	—
et0 fao evapotranspiration	-0.673	FAO Penman-Monteith evapotranspiration estimate	mm/day	2–6 mm/day
et0 fao evapotranspiration rollmean7	-0.672	N/A	—	—
et0 fao evapotranspiration rollmean3	-0.672	N/A	—	—
temperature 2m mean rollmean7	0.667	N/A	—	—
temperature 2m mean rollmean3	0.667	N/A	—	—
temperature 2m mean	0.666	Average daily air temperature at 2 meters	°C	15–25°C
temperature 2m	0.642	Standard air temperature at 2 meters above surface	°C	10–30°C
temperature 2m lag1	0.632	N/A	—	—
relative humidity 2m lag7	0.630	N/A	—	—
temperature 2m rollmean3	0.624	N/A	—	—

temperature 2m rollmean7	0.611	N/A	—	—

■ Correlation Scatter Plot



■ KPI Box Plot



■ 4. Methodology

This report analyzes the correlation between meteorological variables and wine quality using Pearson correlation (r). Features with $|r| \geq 0.5$ are considered significant. Scatter and box plots visualize relationships with the target variable.

■ 5. References

• Baltzakis, T., 'Wine Quality Forecasting under Climate Variability', 2024
• scikit-learn documentation
• XGBoost documentation
• ReportLab documentation

■ Appendix: Full Correlation Matrix

Feature	Correlation
temperature_2m_mean	0.6655163631432498
precipitation_sum	0.280319665682982
et0_fao_evapotranspiration	-0.6727302192872996
temperature_2m	0.6418630874814794
precipitation	0.2019138753371917
wind_speed_10m	-0.6848095736320705
relative_humidity_2m	0.8171105597492634
temperature_2m_mean_rollmean3	0.6673720602601234
temperature_2m_mean_rollmean7	0.6673720602601234
precipitation_sum_rollmean3	0.280100917882467
precipitation_sum_rollmean7	0.280100917882467
et0_fao_evapotranspiration_rollmean3	-0.6716403870569002
et0_fao_evapotranspiration_rollmean7	-0.6716403870569002
temperature_2m_lag1	0.6320964061462885
temperature_2m_lag7	0.5968837799473179
temperature_2m_rollmean3	0.6238663928215766
temperature_2m_rollmean7	0.6114308433013548
precipitation_lag1	-0.12576270109129553
precipitation_lag7	0.01361458085520212
precipitation_rollmean3	-0.1110338115272537
precipitation_rollmean7	-0.10868048337318537
weather_code_lag1	-0.002710829008506413
weather_code_lag7	-0.01813191507011106
weather_code_rollmean3	0.011773008352287255
weather_code_rollmean7	-0.027323109057152156
wind_speed_10m_lag1	-0.7157166966961779
wind_speed_10m_lag7	-0.7149499119490426
wind_speed_10m_rollmean3	-0.7215297481945127
wind_speed_10m_rollmean7	-0.7284268361702348
relative_humidity_2m_lag1	0.6818563877826272
relative_humidity_2m_lag7	0.6297460640293249
relative_humidity_2m_rollmean3	0.6891496788104251
relative_humidity_2m_rollmean7	0.7004016765751343

■ Streamlit Dashboard Access

https://xgboost-forecasting.streamlit.app/

■■■ Report generated by Baltzakis Themistoklis
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