Model Development Phase Template

Date	23 September 2024
Team ID	LTVIP2024TMID24997
Project Title	Cereal Analysis Based on Ratings Using Machine Learning Techniques.
Maximum Marks	4 Marks

Initial Model Training Code, Model Validation and Evaluation Report

The initial model training code will be showcased in the future through a screenshot. The model validation and evaluation report will include classification reports, accuracy, and confusion matrices for multiple models, presented through respective screenshots.

Initial Model Training Code:

1. **Linear Regression:**

```python
# Linear Regression
y_pred_lr = lr.predict(X_test)
r2_lr = r2_score(y_test, y_pred_lr)
rmse_lr = mean_squared_error(y_test, y_pred_lr, squared=False)  # Square root for interpretability
mape_lr = mean_absolute_percentage_error(y_test, y_pred_lr) * 100  # Percentage error

print("\nModel: Linear Regression")
print(f"R-squared: {r2_lr:.4f}")
print(f"Root Mean Squared Error (RMSE): {rmse_lr:.4f}")
print(f"Mean Absolute Percentage Error (MAPE): {mape_lr:.4f}%")
```

2. **Lasso Regression:**

```python
# Lasso Regression
y_pred_l = l.predict(X_test)
r2_l = r2_score(y_test, y_pred_l)
rmse_l = mean_squared_error(y_test, y_pred_l, squared=False)  # Square root for interpretability
mape_l = mean_absolute_percentage_error(y_test, y_pred_l) * 100  # Percentage error

print("\nModel: Lasso Regression")
print(f"R-squared: {r2_l:.4f}")
print(f"Root Mean Squared Error (RMSE): {rmse_l:.4f}")
print(f"Mean Absolute Percentage Error (MAPE): {mape_l:.4f}%")
```

3. Ridge Regression:

```python
# Ridge Regression
y_pred_r = r.predict(X_test)
r2_r = r2_score(y_test, y_pred_r)
rmse_r = mean_squared_error(y_test, y_pred_r, squared=False)  # Square root for interpretability
mape_r = mean_absolute_percentage_error(y_test, y_pred_r) * 100  # Percentage error

print("\nModel: Ridge Regression")
print(f"R-squared: {r2_r:.4f}")
print(f"Root Mean Squared Error (RMSE): {rmse_r:.4f}")
print(f"Mean Absolute Percentage Error (MAPE): {mape_r:.4f}%")
```

4. Decision Tree Regressor:

```python
# Decision Tree Regressor
y_pred_dt = dt.predict(X_test)
r2_dt = r2_score(y_test, y_pred_dt)
rmse_dt = mean_squared_error(y_test, y_pred_dt, squared=False)  # Square root for interpretability
mape_dt = mean_absolute_percentage_error(y_test, y_pred_dt) * 100  # Percentage error

print("\nModel: Decision Tree Regressor")
print(f"R-squared: {r2_dt:.4f}")
print(f"Root Mean Squared Error (RMSE): {rmse_dt:.4f}")
print(f"Mean Absolute Percentage Error (MAPE): {mape_dt:.4f}%")
```

5. Random Forest Regressor:

```python
# Random Forest Regressor
y_pred_rf = rf.predict(X_test)
r2_rf = r2_score(y_test, y_pred_rf)
rmse_rf = mean_squared_error(y_test, y_pred_rf, squared=False)  # Square root for interpretability
mape_rf = mean_absolute_percentage_error(y_test, y_pred_rf) * 100  # Percentage error

print("\nModel: Random Forest Regressor")
print(f"R-squared: {r2_rf:.4f}")
print(f"Root Mean Squared Error (RMSE): {rmse_rf:.4f}")
print(f"Mean Absolute Percentage Error (MAPE): {mape_rf:.4f}%")
```

Model Validation and Evaluation Report:

Model	Evaluation Metric	R^2, RMSE, MAPE	Confusion Matrix
Linear Regression	R-squared, Root Mean Squared Error (RMSE), Mean Absolute Percentage Error (MAPE)	0.9948, 1.0677, 2.0383%	N/A
Ridge Regression	R-squared, Root Mean Squared Error (RMSE), Mean Absolute Percentage Error (MAPE)	0.9968, 0.8339, 1.8591%	N/A
Lasso Regression	R-squared, Root Mean Squared Error (RMSE), Mean Absolute Percentage Error (MAPE)	0.9949, 1.0597, 2.0259%	N/A
Decision Tree Regressor	R-squared, Root Mean Squared Error (RMSE), Mean Absolute Percentage Error (MAPE)	0.6522, 8.7411, 18.9059%	N/A
Random Forest Regressor	R-squared, Root Mean Squared Error (RMSE), Mean Absolute Percentage Error (MAPE)	0.8024, 6.5877, 16.3005%	N/A