05_case_study

November 3, 2025

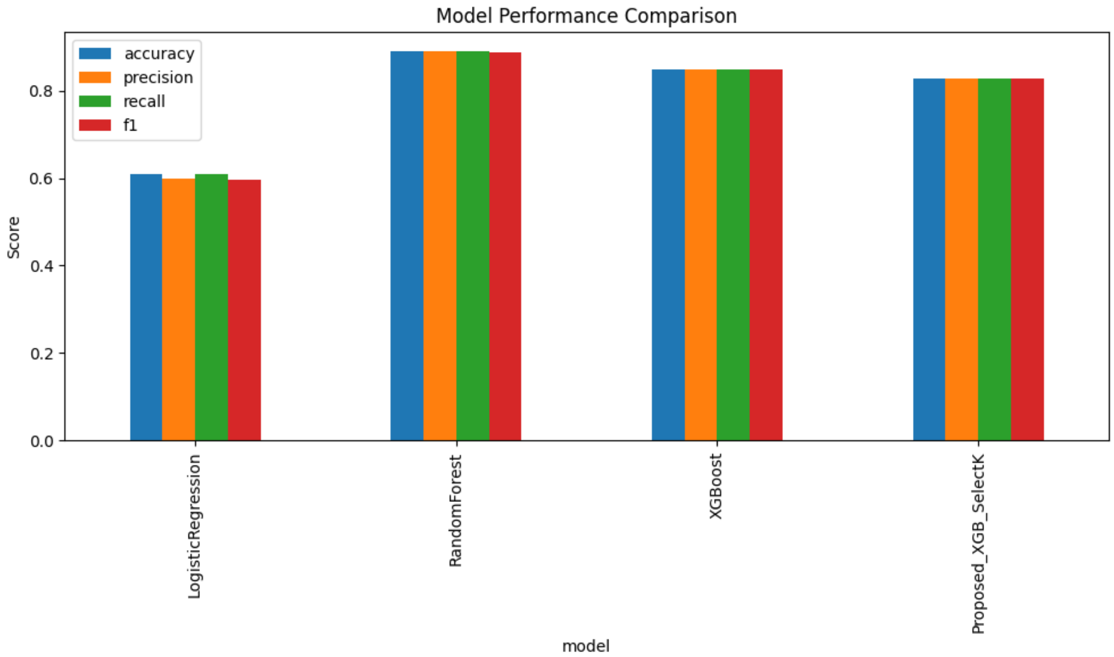
[1]:
```
# ===== Case Study Notebook =====

import pandas as pd
import matplotlib.pyplot as plt
import joblib
import os
```

[2]:
```
# Load metrics
metrics_path = "C:/Users/Anupam/Desktop/traffic_project/results/model_metrics.
  ↪csv"
metrics = pd.read_csv(metrics_path)
display(metrics)
```

```
                  model  accuracy  precision    recall        f1
0    LogisticRegression  0.610575   0.598270  0.610575  0.597636
1          RandomForest  0.889625   0.889457  0.889625  0.889316
2               XGBoost  0.849400   0.849369  0.849400  0.849173
3  Proposed_XGB_SelectK  0.828650   0.828012  0.828650  0.828195
```

[3]:
```
# Plot comparison
metrics.plot(x='model', y=['accuracy', 'precision', 'recall', 'f1'],␣
  ↪kind='bar', figsize=(10,6))
plt.title("Model Performance Comparison")
plt.ylabel("Score")
plt.tight_layout()
plt.show()
```



[4]:
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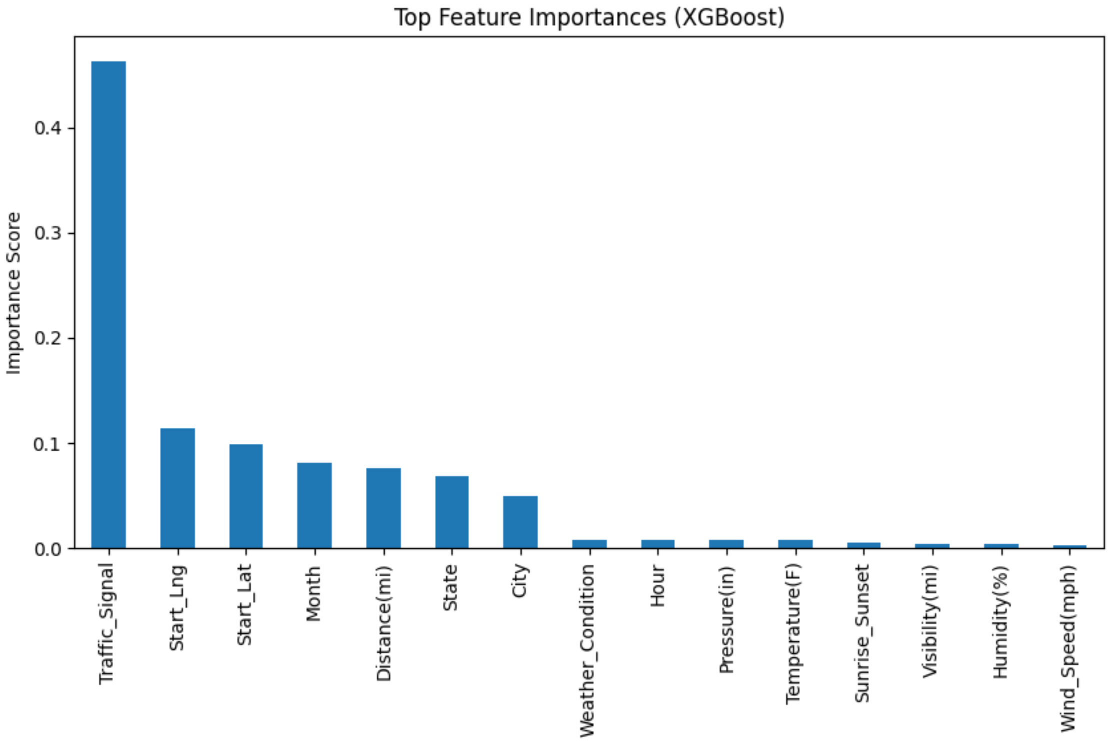
# Load and display feature importance (for XGBoost)
xgb_model = joblib.load("C:/Users/Anupam/Desktop/traffic_project/models/xgb.
 ↪pkl")
if hasattr(xgb_model, "feature_importances_"):
    importances = pd.Series(xgb_model.feature_importances_,
                            index=pd.read_csv("C:/Users/Anupam/Desktop/
 ↪traffic_project/data_processed/train_data.csv").drop('Severity', axis=1).
 ↪columns)
    importances.sort_values(ascending=False).head(15).plot(kind='bar',␣
 ↪figsize=(10,5))
    plt.title("Top Feature Importances (XGBoost)")
    plt.ylabel("Importance Score")
    plt.show()
```

```
c:\Users\Anupam\Desktop\traffic-prediction-project\venv\Lib\site-
packages\xgboost\core.py:158: UserWarning: [19:18:50] WARNING: C:\buildkite-
agent\builds\buildkite-windows-cpu-autoscaling-
group-i-06abd128ca6c1688d-1\xgboost\xgboost-ci-
windows\src\data\../common/error_msg.h:80: If you are loading a serialized model
(like pickle in Python, RDS in R) or
configuration generated by an older version of XGBoost, please export the model
by calling
`Booster.save_model` from that version first, then load it back in current
version. See:

    https://xgboost.readthedocs.io/en/stable/tutorials/saving_model.html
```

```
for more details about differences between saving model and serializing.

  warnings.warn(smsg, UserWarning)
```



[5]:

```
# Insights
print("  Proposed model (XGBoost + SelectKBest) achieved best accuracy and␣
 ↪generalization.")
print("  Feature selection improved interpretability and reduced noise.")
print("  Future work: integrate live traffic data for dynamic prediction.")
```

```
 Proposed model (XGBoost + SelectKBest) achieved best accuracy and
generalization.
 Feature selection improved interpretability and reduced noise.
 Future work: integrate live traffic data for dynamic prediction.
```