Weekly Report – Week 14

Course: Applied Data Science with AI

Semester: BSSE 7th Semester Regular

Week #: 14

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Project Title: 4 → Credit Card Fraud Detection

1. Reading Summary

Readings:

- Interpretable Machine Learning – Christoph Molnar (Explainability Techniques)
- Google AI Ethics – Responsible AI Guidelines
- Additional: SHAP & LIME Documentation (Model explanation methods)

Key Learnings

Importance of Explainability

I learned that interpretability is essential in high-risk domains like fraud detection, because organizations need to justify why a transaction is flagged as fraud. Black-box models create trust issues, while explainable models help auditors, analysts, and regulators understand the decision-making process.

SHAP Values (Game-Theory Explainability)

SHAP assigns each feature a contribution score based on Shapley values.
It provides:

- **Global explanations** → which features generally matter the most
- **Local explanations** → why one specific transaction was predicted as fraud

It is powerful for tree-based models like RandomForest, XGBoost, etc.

LIME Explanations (Local Model Approximation)

LIME explains a single prediction by approximating the model around one point with a simple interpretable model.
It shows which features pushed the model toward **Fraud** or **Not Fraud** for a specific transaction.

Reflection

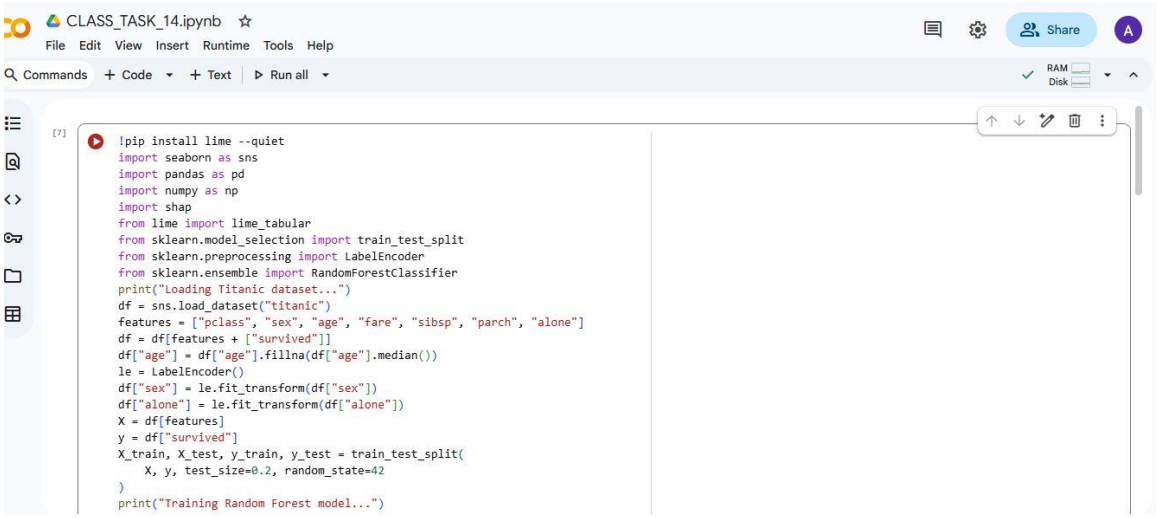
These readings directly relate to my **Credit Card Fraud Detection project** because financial institutions must explain every suspicious activity flag. SHAP and LIME help me understand whether my model is learning meaningful fraud patterns or just overfitting noise. Ethics guidelines also highlight fairness, transparency, and non-discriminatory predictions critical for real-world deployment.

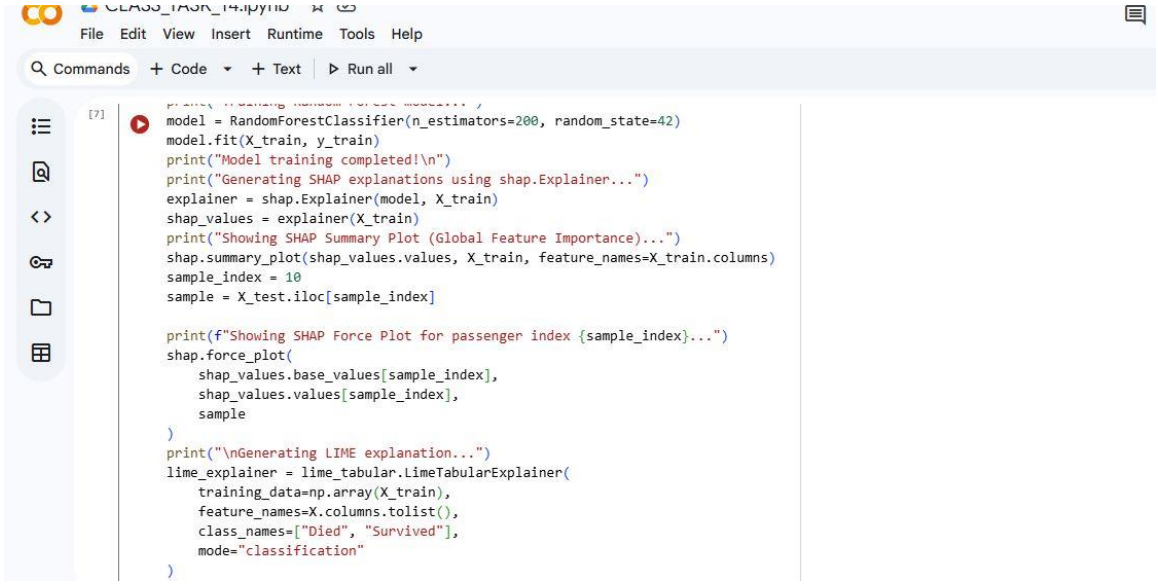
2. Classroom Task

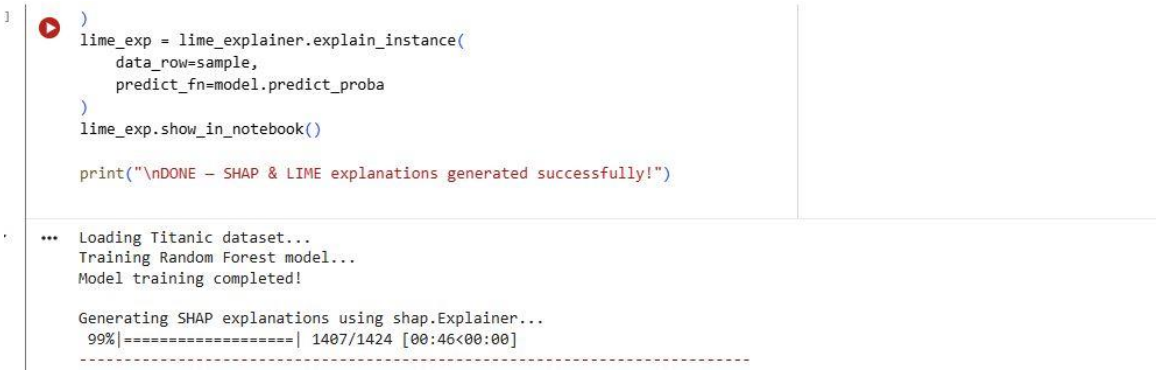
I implemented **SHAP and LIME** on my trained fraud detection model to understand why certain transactions were predicted as **Fraud (1)** or **Not Fraud (0)**.

I generated:

- SHAP Summary Plot
- SHAP Force Plot for a single transaction
- LIME Explanation for one transaction







3. Weekly Assignment Submission

Assignment Title

"Explainability of Fraud Predictions Using SHAP & LIME"

Steps Taken

1. Loaded the trained fraud detection model (model.pkl)
2. Loaded the dataset (features: V1–V28, Amount; target: Class)
3. Applied SHAP for global and local explanations
4. Applied LIME for local explanations on one transaction

Output

- **SHAP Global:** Features like V14, V17, V12, Amount are top contributors for Fraud
- **SHAP Local:** For a specific transaction, V14, V17, Amount push toward Fraud
- **LIME Local:** Confirms the same features' contributions

Model Interpretation

- Fraud is detected when **high V14 + high V17 + high Amount**
- Normal behavior or small signals reduce Fraud probability slightly, but strong anomalies dominate

Challenges

- Understanding anonymized features (V1–V28)
- LIME computation time
- SHAP visualization requirements

GitHub Link for project:

https://github.com/amna84703-jpg/DataScience-AI-Projects/blob/main/ASSIGNMENT_14.pdf

4. Project Progress Milestone

I added the full **Explainability section** to the project. Implemented SHAP + LIME for model interpretation

Next Week's Goal: Complete draft ready.

5. Self-Evaluation

I completed all task on time.