Project Design Phase
Solution Architecture
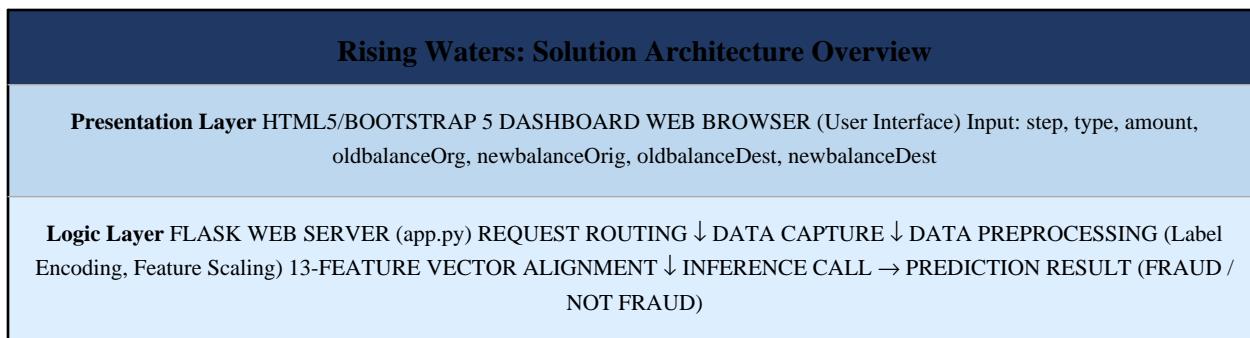
Date	31 January 2026
Team ID	LTVIP2026TMIDS55701
Project Name	Online Payment Fraud Detection using Machine Learning
Maximum Marks	4 Marks

Solution Architecture:

Solution architecture is a complex process – with many sub-processes – that bridges the gap between business problems and technology solutions. Its goals are to:

• **Structural Components**: The system is built on a **3-tier architecture**:

  • **Presentation Layer**: HTML5/Bootstrap 5 interface for user transaction input.

  • **Logic Layer**: Flask server (**app.py**) managing data flow, Label Encoding, Feature Scaling, and model inference.

  • **Data/Model Layer**: Pickle-serialized SVM/Random Forest model and CSV training dataset.

• **Behavior**: When a user inputs transaction data (type, amount, account balances), the system performs **Label Encoding** on the transaction type and **Feature Scaling** before passing a 7-feature vector to the model for real-time classification as FRAUD or NOT FRAUD.

• **Specifications**: The solution is delivered as a local web application running on port **5000**, requiring Python packages like **scikit-learn**, **Flask**, **pandas**, **numpy**, and **pickle**.

Example - Solution Architecture Diagram:

Rising Waters: Solution Architecture Overview
Presentation Layer HTML5/BOOTSTRAP 5 DASHBOARD WEB BROWSER (User Interface) Input: step, type, amount, oldbalanceOrg, newbalanceOrig, oldbalanceDest, newbalanceDest
Logic Layer FLASK WEB SERVER (app.py) REQUEST ROUTING ↓ DATA CAPTURE ↓ DATA PREPROCESSING (Label Encoding, Feature Scaling) 13-FEATURE VECTOR ALIGNMENT ↓ INFERENCE CALL → PREDICTION RESULT (FRAUD / NOT FRAUD)

Data / Model Layer fraud_dataset.csv (Training Data) → ML MODEL (model.pkl) Random Forest / SVM Classifier PREPROCESSING ASSETS (scaler.pkl, label_encoder.pkl)

EXTERNAL INTERFACES BOOTSTRAP CDN (Responsive UI Styles)

Fig. 6: Online Payment Fraud Detection – Solution Architecture Diagram. This diagram illustrates the 3-tier architecture, data flow, and technology stack for the fraud prediction system, from user input to real-time classification.