**Project Design Phase**

**Solution Architecture**

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| Date | 16 July 2025 |
| Team ID | LTVIP2025TMID44001 |
| Project Name | TrafficTelligence: Advanced Traffic Volume Estimation with Machine Learning |
| Maximum Marks | 4 Marks |

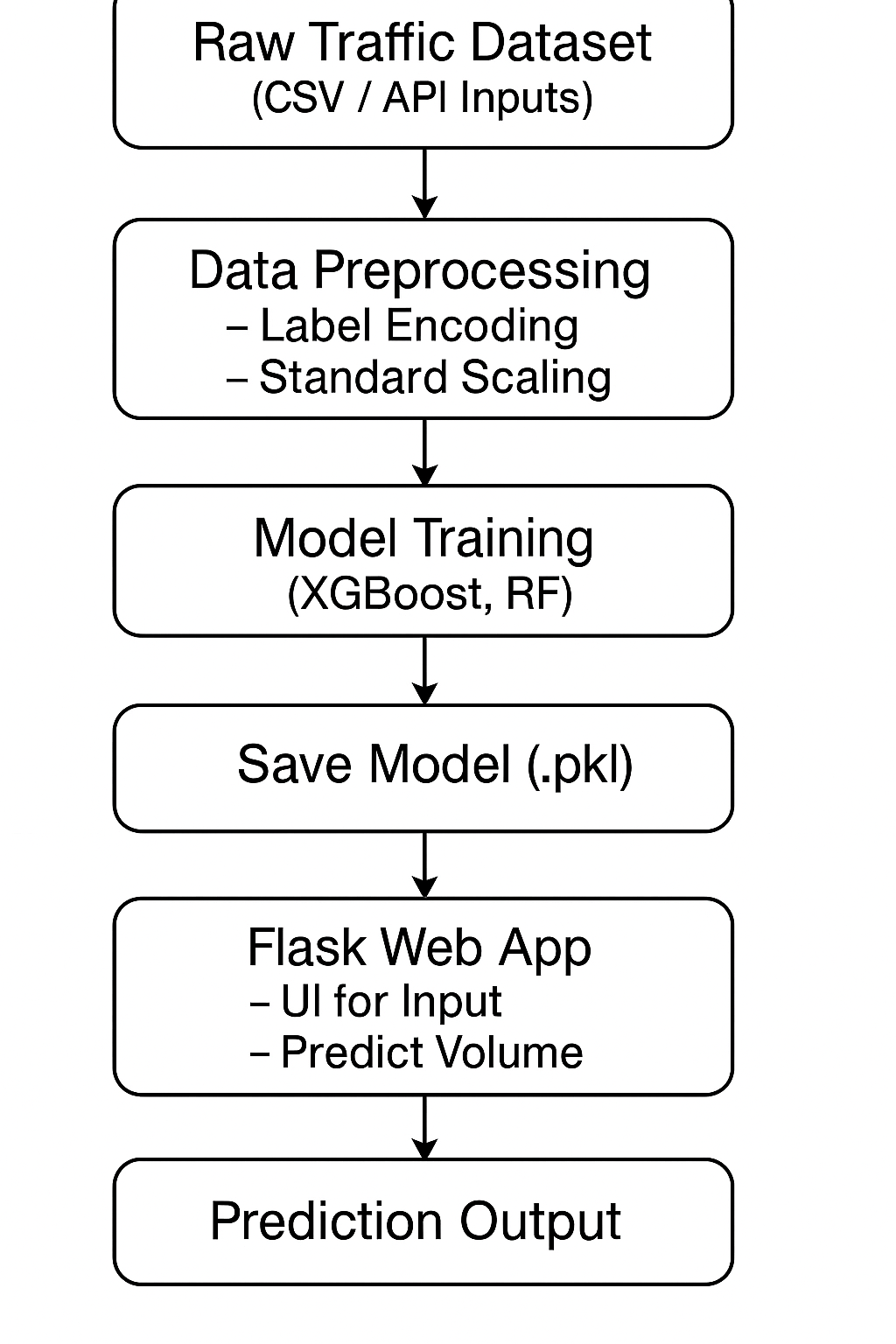
**Solution Architecture:**TrafficTelligence uses supervised machine learning models to estimate traffic volume based on real-world data inputs like weather, date, and holidays. The solution architecture integrates data ingestion, preprocessing, model training, prediction service, and a Flask web interface to deliver insights.

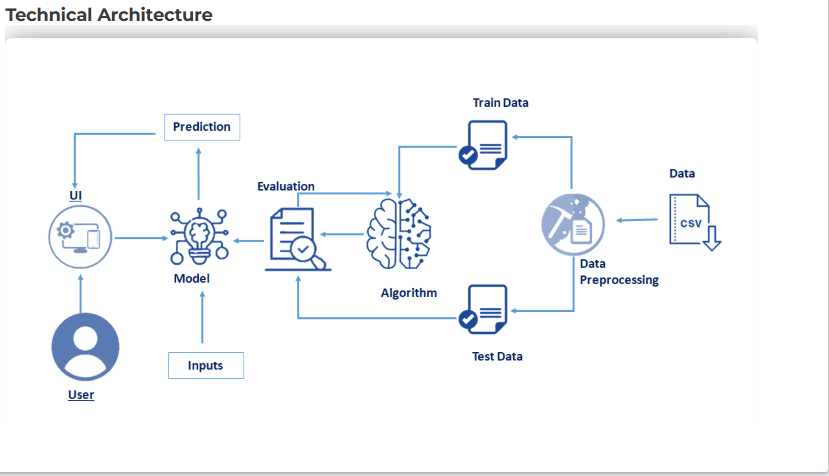
**Key Goals Achieved by the Architecture:**

* Identifies the best ML models (e.g., XGBoost, Random Forest) for accurate traffic volume prediction.
* Bridges business problem (traffic congestion) with a scalable, automated, and web-deployable tech solution.
* Clearly defines the end-to-end flow from data to prediction interface.
* Modularizes each layer — enabling future enhancements like real-time data ingestion or map integration**.**

**Architecture Components:**

1. Data Ingestion
   * CSV/Real-time data from sensors, weather APIs, or traffic logs.
2. Data Preprocessing
   * Label Encoding (categorical features)
   * Standard Scaling (continuous features)
   * Feature selection: temp, rain, snow, holiday, weather, day, month, year
3. Model Training
   * Models: Linear Regression, Decision Tree, Random Forest, SVR, XGBoost
   * Evaluation: R², MAE, MSE, RMSE
4. Model Persistence
   * Trained model + Scalers stored using pickle
5. Flask Web Interface
   * User input form → prediction endpoint → predicted traffic volume
6. Deployment
   * Hosted locally (127.0.0.1) or deployable on cloud/Heroku/Render for production

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