Predicting customer churn using machine learning to uncover hidden patterns

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GitHub Link:

1.Problem Statement

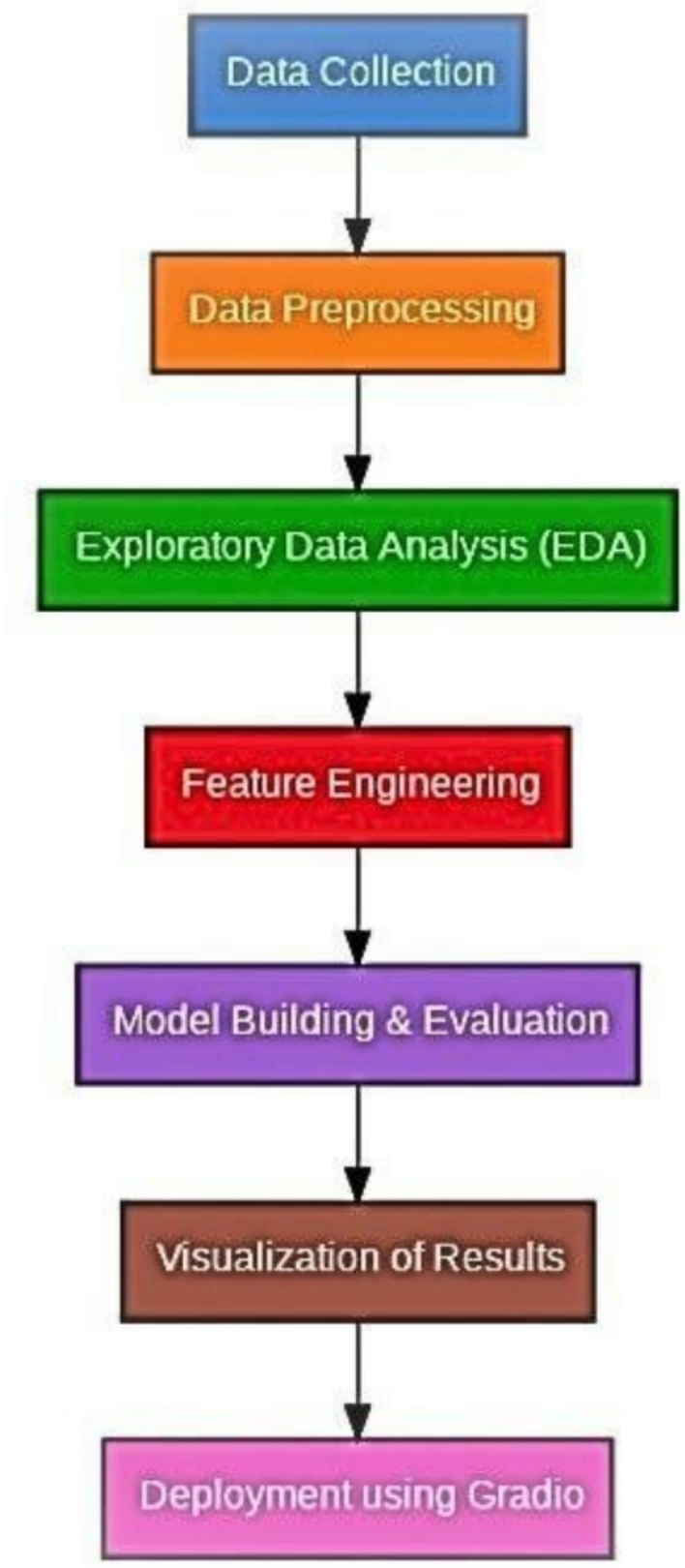
The objective of this project is to develop a machine learning- based solution that can
accurately predict customer churn by analyzing historical customer data. By uncovering
underlying patterns and risk factors associated with churn, the system w enable businesses to
peroactively engage at-risk customers, tailor retention
strategies, and ultimately improve
customer loyalty and revenue stability.

2.Project Objectives

- To analyze customer behavior data.
- To build a predictive model that classifies whether customer will churn.
- To uncover hidden patterns through exploratory data analysis and feature engineering.

- To provide actionable insights for reducing churn.

3.Flowchart of the Project Workflow



4.Data Description

- Target Variable: Churn (Yes/No)

- Features: Customer demographics, usage patterns, service subscriptions, tenu billing, and support interactions.- Example Distributions:
  - Gender: 50% Male, 50% Female
  - Internet Service: 70% Fiber Optic, 30% DSL
  - Churn Rate: ~27%

-Datasetlink: https://www.kaggle.com/datasets/blastchar/telco-customer-churn

5.Data Preprocessing

- Handling missing values
  - Encoding categorical variables
  - Scaling numerical features
  - Addressing class imbalance using techniques like SMOTE or under-sampling)

6.Exploratory Data Analysis(EDA)

- Correlation heatmaps
  - Churn vs. Tenure, MonthlyCharges, Contract type
  - Histograms and boxplots to understand distributions and outliers

7.Feature Engineering

- Creation of new features (e.g., total charges per tenure)
- Binning of numerical variables
- Feature selection using mutual information and recursive feature elimination

8.Model Building

- Algorithms used: Logistic Regression, Decision Tree, Random Forest, XGBoost
- Performance metrics: Accuracy, Precision, Recall, F1-score, ROC-AUC
- Cross-validation for robust evaluation

9.Visualization of Results & Model Insights

- Confusion matrix

- ROC Curve
- Feature importance plots
- SHAP values for interpretability

10.Toolsand Technologies Used

- Programming Language: Python
- Libraries: pandas, numpy, matplotlib, seaborn, scikit-learn, xgboost, shap
- IDE: Jupyter Notebook / VS Code
- Version Control: Git & GitHub

11.Team Members and Contributions

AMRINBANU.S	Contribution
UMAMAHESHWARI.R	Data preprocessing, model building
AATHISH.S	EDA, visualization, feature engineering
DHANUSH.A	Report writing, GitHub management