AI-POWERED LOAN ELIGIBILITY ADVISOR

PROBLEM STATEMENT / PURPOSE

- Traditional loan approval is:
  - Time-consuming
  - Rule-based and inflexible
  - Lacks transparency for applicants
- Applicants do not understand:
  - Why a loan is approved/rejected
  - Which factors affect eligibility

Purpose

- Automate loan eligibility prediction
- Provide accurate, fast, and explainable decisions
- Improve user trust using AI explanations

PROPOSED SOLUTION

We propose an AI-driven loan eligibility system that automates the process of evaluating loan applications using machine learning. The system predicts the probability of loan approval based on applicant financial and personal data using an XGBoost model. To ensure transparency and user trust, SHAP (Explainable AI) is used to explain how each feature influences the prediction. Additionally, the system generates detailed, downloadable PDF reports summarizing the eligibility result and explanations. A chatbot is also integrated to assist users by answering common loan-related queries, improving user experience and accessibility. The frontend is developed using React with Vite for a fast and responsive interface, while FastAPI is used in the backend to handle prediction, explanation, and report generation efficiently.

SYSTEM ARCHITECTURE

Frontend & Backend Layer

- React + Vite frontend for user input and dashboards
- FastAPI backend for authentication & APIs
- Handles prediction requests and report generation

Machine Learning & Data Layer

- Trained XGBoost model for loan eligibility prediction
- Feature preprocessing before model inference
- Database stores user profiles and loan records

Explainability & Output Layer

- SHAP module explains model decisions
- PDF report generation with prediction details
- Chatbot provides loan-related assistance

User → Frontend → Backend → ML Model → Explanation → Report / Chatbot

MILESTONES

- Dataset collection & preprocessing
- Feature engineering
- Model training & hyperparameter tuning
- Backend API development
- Frontend UI development
- Explainability integration (SHAP)
- PDF report generation
- Chatbot Integration
- Testing & deployment

MODEL DEVELOPMENT

Dataset

Contains loan applicant details such as income, dependents, credit history, loan amount, and tenure. These features reflect the applicant's financial stability and repayment ability.

Preprocessing

Missing values are handled to avoid data loss.
Categorical variables are encoded into numerical form.
Feature scaling is applied for uniform model training.

Model Used

XGBoost model is chosen for high accuracy.
Effectively handles non-linear relationships in loan data. Provides reliable performance with reduced overfitting.

HYPERPARAMETER TUNING & ACCURACY

Hyperparameters tuned:

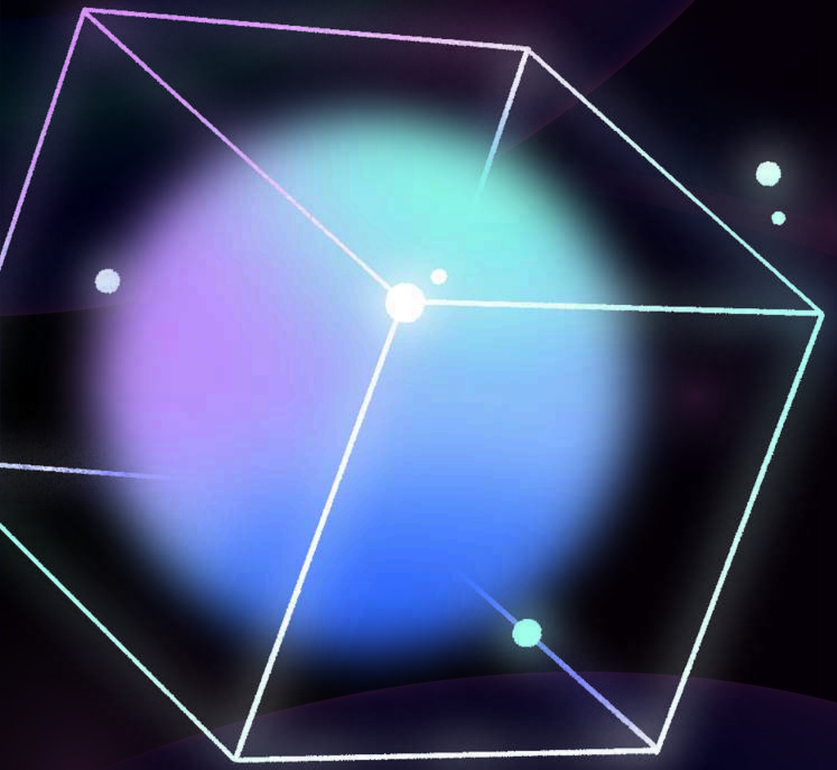
- Learning rate
- Number of estimators
- Max depth

Achieved:

- High prediction accuracy
- Reduced overfitting

Evaluation Metrics

- Accuracy
- Precision
- Recall
- F1-Score
- Confusion Matrix



EXPLAINABILITY (SHAP)

What is SHAP

SHAP (SHapley Additive exPlanations) is used to explain ML model predictions.
It assigns importance values to each input feature.

How SHAP Explains Decisions

Shows which features caused loan approval or rejection.
Explains the impact of income, credit history & loan amount.

Benefits of Using SHAP

Makes AI decisions transparent and understandable.
Increases user trust in the loan eligibility system.

CHATBOT - TRAINING & EVALUATION

Hybrid approach:

- Predefined financial responses
- Model-based predictions

Handles:

- Credit score questions
- EMI queries
- Rejection reasons

Tested for accuracy & response relevance

PDF REPORT GENERATION

Applicant Details

The PDF report includes complete applicant information such as income, loan amount, dependents, and credit history. This ensures all input data used for prediction is clearly documented.

Prediction Result

The report displays the loan eligibility outcome as Approved or Rejected along with prediction confidence. It provides a clear summary of the model's decision for the applicant.

Feature Contribution Explanation

SHAP-based explanations are included to show how each feature influenced the decision. This helps users understand key risk factors affecting their loan eligibility.

DEPLOYMENT

Backend Deployment

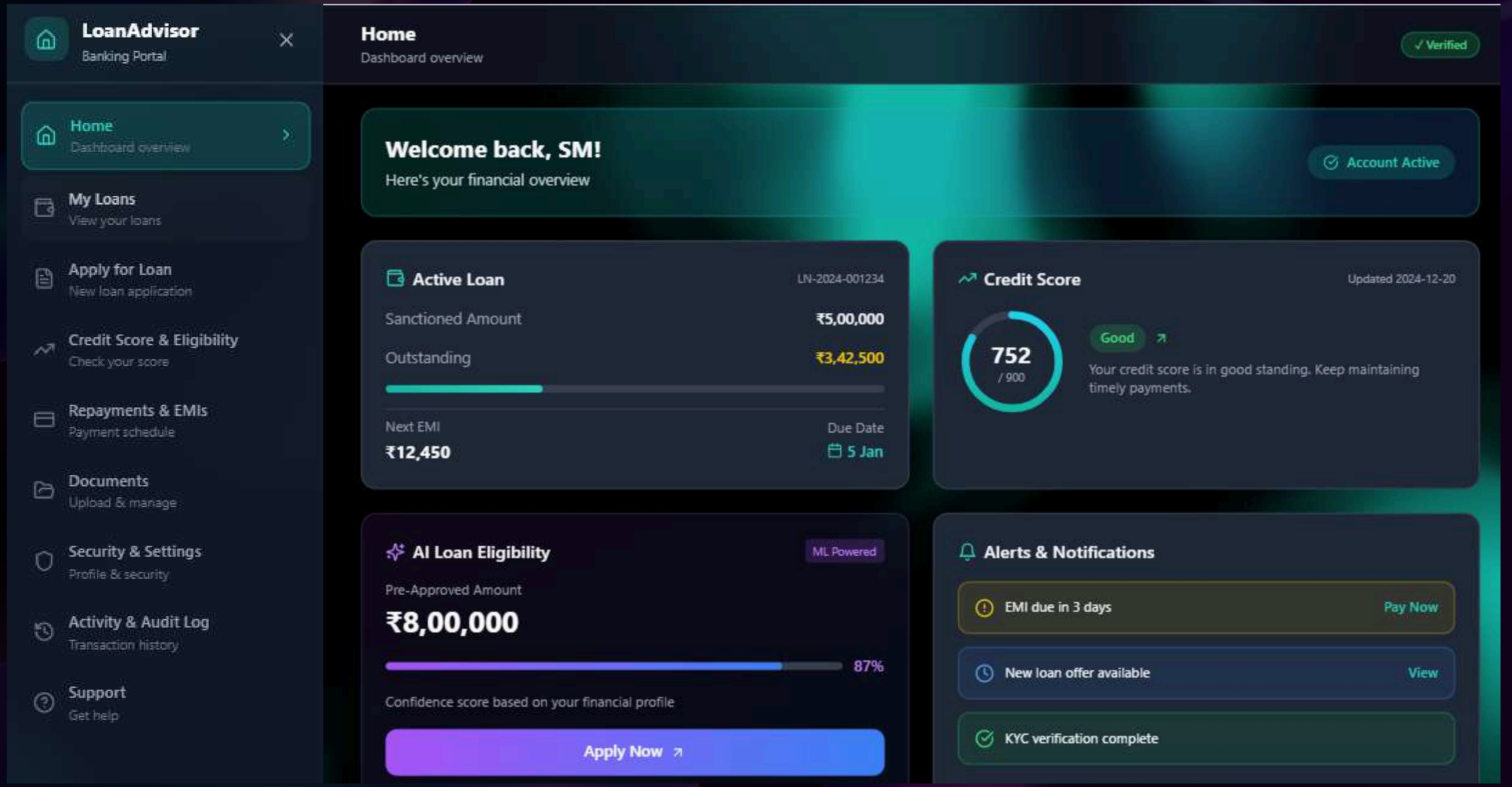
The backend is deployed using FastAPI to handle API requests efficiently. It manages authentication, predictions, and report generation.

Frontend Deployment

The frontend is built and deployed using React with Vite for fast performance. Provides a responsive and user-friendly interface for applicants.

Model and Security

The trained ML model is loaded at runtime for real-time predictions. Sensitive configuration details are protected using environment variables.


LoanAdvisor
Banking Portal
Home
Dashboard overview
My Loans
View your loans
Apply for Loan
New loan application
Credit Score & Eligibility
Check your score
Repayments & EMIs
Payment schedule
Documents
Upload & manage
Security & Settings
Profile & security
Activity & Audit Log
Transaction history
Support
Get help
Home
Dashboard overview
✓ Verified
Welcome back, SM!
Here's your financial overview
Account Active
Active Loan
LN-2024-001234
Sanctioned Amount
₹5,00,000
Outstanding
₹3,42,500
Next EMI
₹12,450
Due Date
5 Jan
Credit Score
Updated 2024-12-20
752
/ 900
Good
Your credit score is in good standing. Keep maintaining timely payments.
AI Loan Eligibility
ML Powered
Pre-Approved Amount
₹8,00,000
87%
Confidence score based on your financial profile
Apply Now
Alerts & Notifications
EMI due in 3 days
Pay Now
New loan offer available
View
KYC verification complete

Challenges

- **Real-World Data Variability**
  User financial data may differ from training data, impacting prediction accuracy.
- **Model Performance Degradation**
  Changing loan policies and economic conditions can reduce model effectiveness over time.
- **Scalability & High User Load**
  Multiple concurrent users may slow prediction processing and PDF generation.
- **Regulatory & Data Privacy Compliance**
  Financial applications must comply with banking regulations and data protection laws.

Challenges Can Be Overcome

- **Continuous Model Retraining**
  Regularly retrain the model using updated real-world data to maintain accuracy.
- **Performance Monitoring & Evaluation**
  Track model predictions and recalibrate thresholds based on current trends.
- **Scalable Cloud Deployment**
  Use cloud infrastructure, load balancing, and optimized backend services.
- **Strong Security & Compliance Measures**
  Implement encryption, secure authentication, and proper data handling policies.

FUTURE ENHANCEMENTS

- Support for multiple loan types
- Bank admin dashboard
- Real-time bank API integration
- Advanced NLP chatbot
- Mobile application
- Continuous model retraining
- Credit risk scoring system

CONCLUSION

- Successfully built an AI-based Loan Eligibility Advisor
- Accurate, fast, and explainable predictions
- Improves transparency & user trust
- Demonstrates practical application of ML in finance
- User-friendly UI and PDF reports

THANK YOU!