



# SBI HACKATHON 2025

## PROTOTYPE PRESENTATION

INTELLIGENT LOAN RISK ASSESSMENT & TRACKING SYSTEM

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# THE PROBLEM STATEMENTS

01

## **Detect Fraudulent Activity:**

Predict fraudulent accounts/transactions using historical data

Ensure model explainability and resilience to adversarial mimicry

02

## **Infer Defaulters' Last Location:**

- Predict final tower/region using device/tower logs
- Visualize and justify prediction



# Introducing Our Prototype

The screenshot shows a MacBook Pro displaying the SBI Analytics Hub website at [localhost:5173/home](http://localhost:5173/home). The browser tab bar includes links for 'SBI Analytics Hub - Hackathon Project', '18°31'17.2"N 73°51'32.4"E - Google Maps', 'FastAPI - Swagger UI', and 'Two-Stage Fraud Detection API - Swagger UI'. The main content area features a header 'Welcome to SBI Analytics Hub' and a sub-header 'Advanced analytics and prediction tools for enhanced banking operations'. Below this are three cards: 'Defaulter Prediction' (analyze customer profiles), 'Last Known Location' (track customer location using tower logs), and 'Loan Approval Prediction' (assess user profiles). A dark blue footer section contains the SBI Analytics Hub logo, quick links (Home, Defaulter Prediction, Location Tracking, Loan Approval), banking services (Personal Banking, Corporate Banking, Digital Banking, Investment Services, Insurance Products), contact information (1800 425 3800, support@sbi.co.in, Mumbai, Maharashtra, www.sbi.co.in), and ISO 27001 certification.

SBI Analytics Hub - Hackathon Project | 18°31'17.2"N 73°51'32.4"E - Google Maps | FastAPI - Swagger UI | Two-Stage Fraud Detection API - Swagger UI | +

## Predicting loan defaulters

Get notified who can be a defaulter in upcoming months.

## Locating last known movement of defaulters

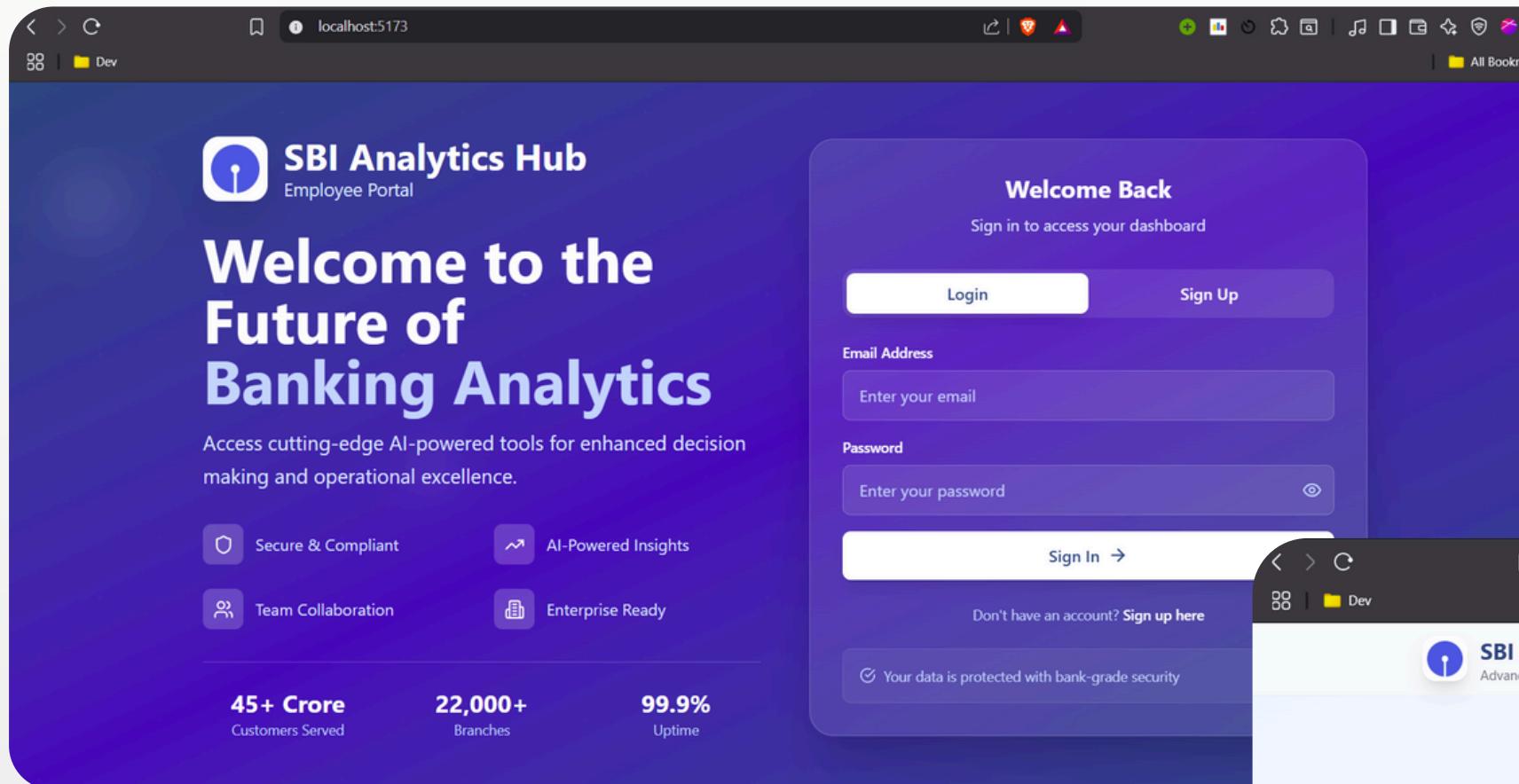
Predict the last possible location of the defaulter/probable defaulter by the tower logs of the user

## Approving loans based on explainable AI

For any existing user, get suggestion from AI for approving loans and be at minimum risk



# User Flow / System Access



Login/Signup

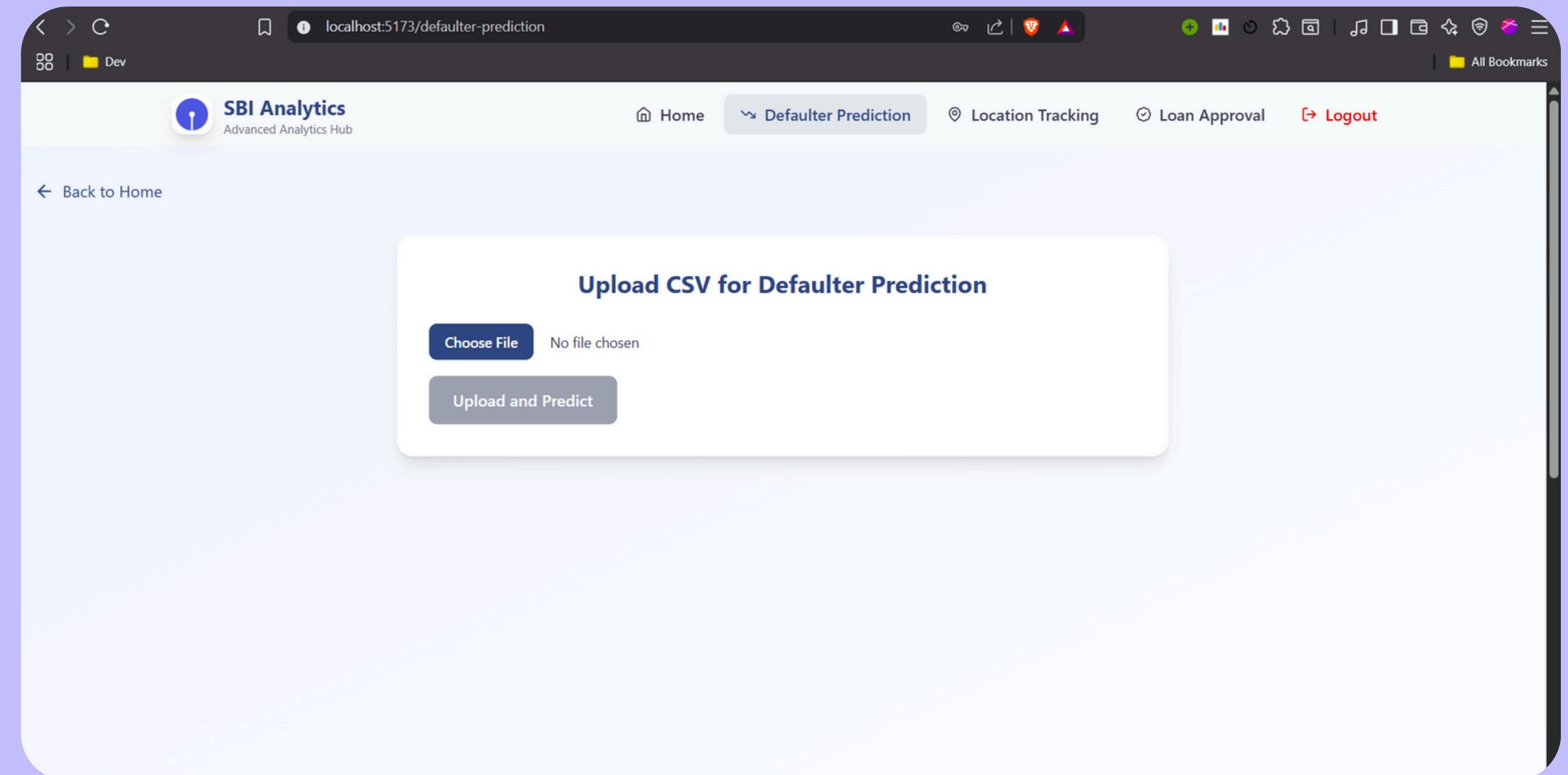
A screenshot of the "SBI Analytics Advanced Analytics Hub" dashboard. The top navigation bar includes links for "Home", "Defaulter Prediction", "Location Tracking", "Loan Approval", and "Logout". The main title is "Welcome to SBI Analytics Hub" with the subtitle "Advanced analytics and prediction tools for enhanced banking operations". Below this, there are three cards: "Defaulter Prediction" (with a downward arrow icon), "Last Known Location" (with a location pin icon), and "Loan Approval Prediction" (with a checkmark icon). Each card has a brief description and a "Get Started" button.



# Module 1

# Defaulter Prediction

ASKS FOR A .CSV FILE OF  
USERS AND THEIR BANKING  
DATA (FEATURES)





# Module 1

## Defaulter Prediction

### 0/1 PREDICTIONS

The predictions are generated from an ML API that we have hosted through the backend.

### Predicting last known location

The location button takes you to the window that predicts the last known location of the (probable or) defaulter

### Notify User

If you find that the user has been genuine and might have been flagged defaulter this time, SBI can notify the user via automated mail just by a click.

The screenshot shows a web browser window with the URL `localhost:5173/defaulter-prediction`. The page is titled "SBI Analytics Advanced Analytics Hub". The main content is a table titled "Predictions (Page 1/2)". The table has four columns: "UNIQUE\_ID", "Prediction", "Last Known Location", and "Notify User". The "Prediction" column contains values 1 or 0. The "Last Known Location" column contains a green location pin icon. The "Notify User" column contains a blue envelope icon. There are 10 rows of data in the table. At the bottom of the table, there are "Previous" and "Next" buttons.

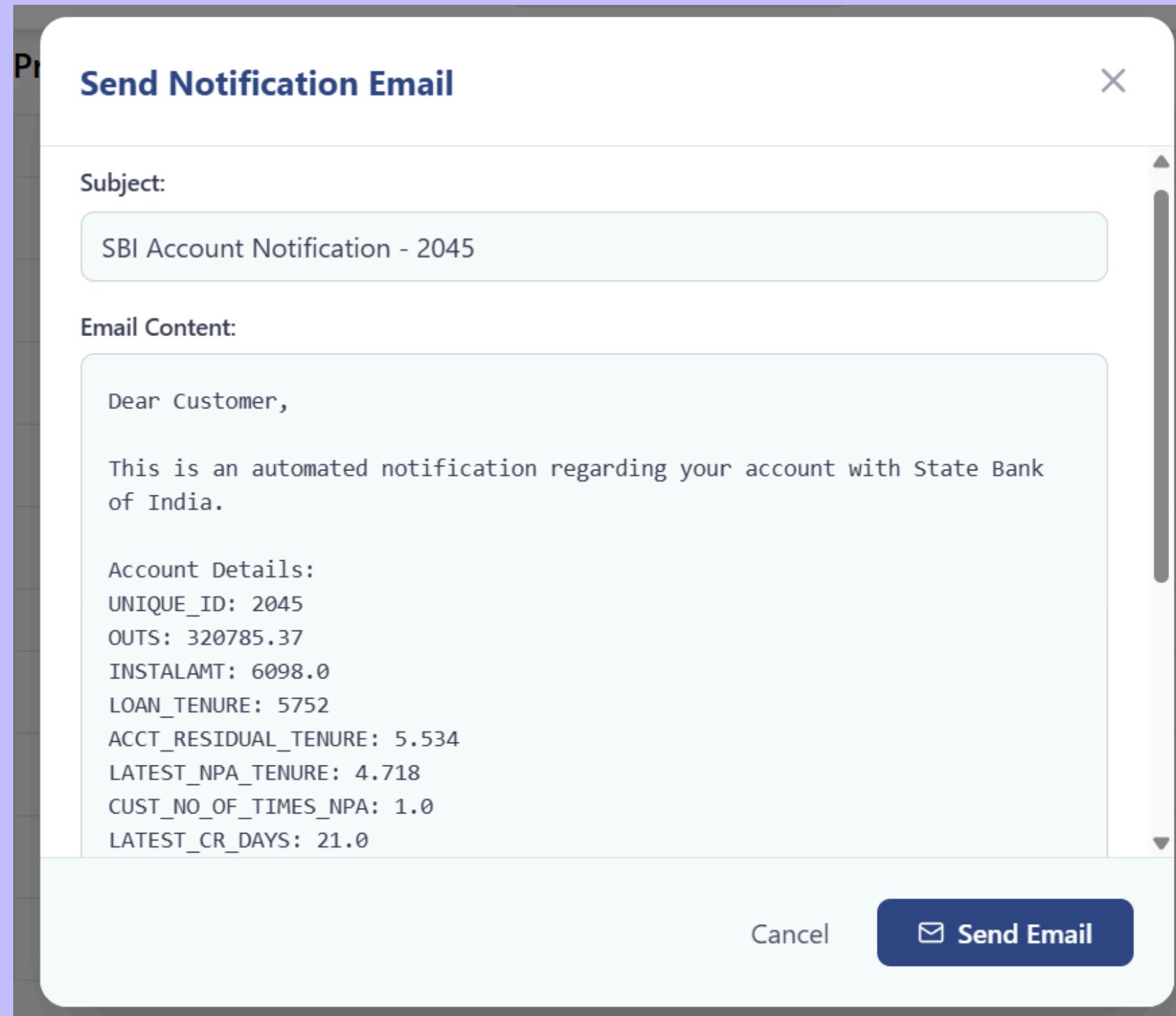
UNIQUE_ID	Prediction	Last Known Location	Notify User
2045	1	📍	✉️
4050	1	📍	✉️
8213	1	📍	✉️
8231	1	📍	✉️
10320	1	📍	✉️
10333	0	📍	✉️
2951	1	📍	✉️
2245	1	📍	✉️
2251	1	📍	✉️
468	1	📍	✉️

Previous Next



# Module 1

## Defaulter Prediction

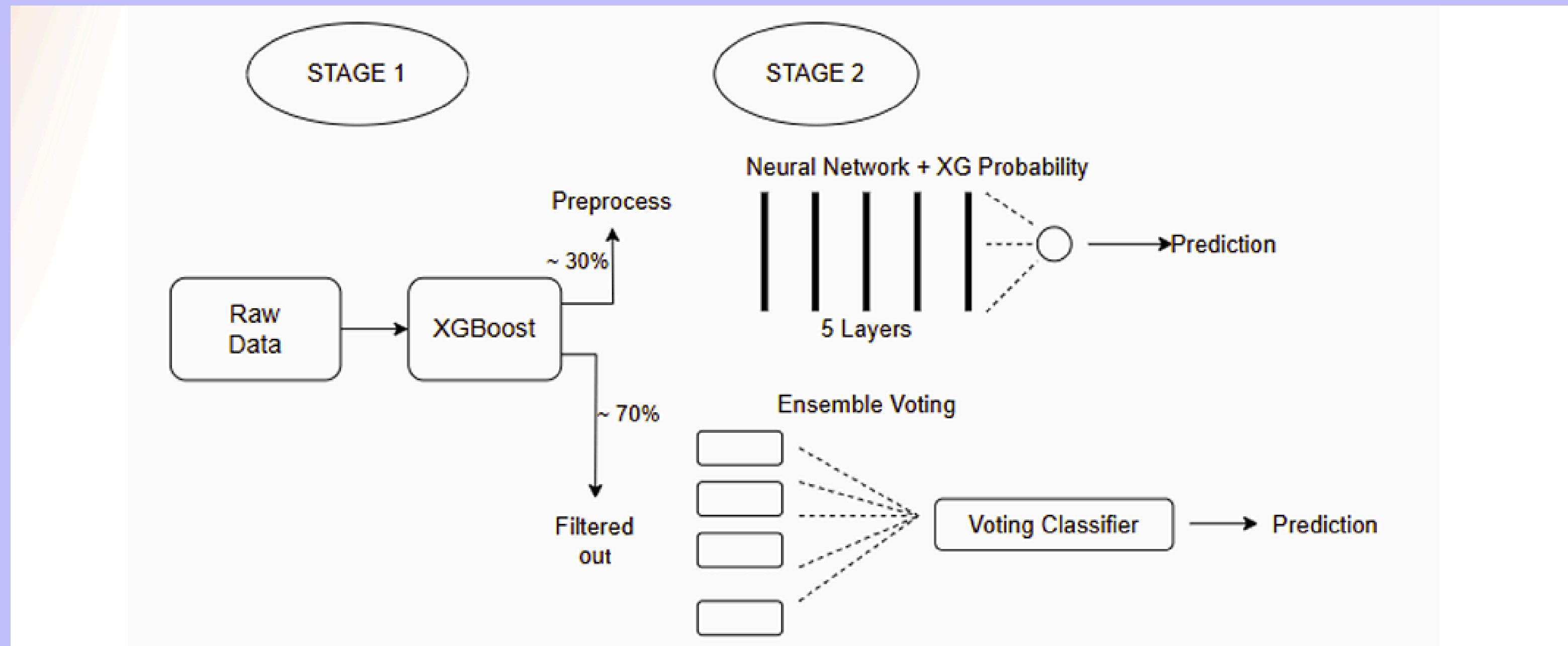


### Automated email notification

The email contains important metrics and account details that might be responsible for the delay by the user and just by a click the email will be fetched from the database and will be sent to the user.

# Module 1

## Approach Explanation





# Module 2

# Last Known Location Finder

**Asks unique Account Id and then  
predicts the location via 2 models**

The screenshot shows a web browser window with the URL `localhost:5173/last-known-location`. The page is titled "SBI Analytics Advanced Analytics Hub". The main content area is titled "Location Prediction" with the sub-instruction "Predict customer location using LSTM and GNN models". A form field labeled "Account ID" contains the value "20002". Below this, there are two prediction modules: "LSTM Prediction" (using Long Short-Term Memory neural network prediction) and "GNN Prediction" (using Graph Neural Network prediction). Each module has a "Predict with [Model]" button.

Screenshot of the SBI Analytics web application showing the Location Prediction feature. The page title is "SBI Analytics Advanced Analytics Hub". The main heading is "Location Prediction" with the sub-instruction "Predict customer location using LSTM and GNN models". An input field shows "Account ID: 20002". Below are two prediction modules: "LSTM Prediction" (using Long Short-Term Memory neural network prediction) and "GNN Prediction" (using Graph Neural Network prediction).



# Module 2

# Last Known Location Finder

The image shows a screenshot of the SBI Analytics dashboard, specifically the 'Last Known Location Finder' module. The dashboard is split into two main sections: 'LSTM Prediction' on the left and 'LSTM AND GNN Predictions' on the right.

**LSTM Prediction Section:**

- SBI Analytics Advanced Analytics Hub:** The top navigation bar includes links for Home, Defaulter Prediction, Location Tracking, Loan Approval, and Logout.
- LSTM Prediction:** A section titled 'LSTM Prediction' with the sub-section 'Long Short-Term Memory neural network prediction'. It features a button labeled 'Predict with LSTM'.
- LSTM Result:** A box showing the predicted tower ID 'TWR\_120', latitude '18.521451', and longitude '73.858993'. It also indicates the tower is located in Pune and was predicted at 7/31/2025, 10:46:10 AM. A 'View on Google Maps' button is present.
- LSTM Prediction:** A large bold heading at the bottom of this section.

**LSTM AND GNN Predictions Section:**

- SBI Analytics Advanced Analytics Hub:** The top navigation bar includes links for Home, Defaulter Prediction, Location Tracking (which is highlighted in blue), Loan Approval, and Logout.
- LSTM Prediction:** A section titled 'LSTM Prediction' with the sub-section 'Long Short-Term Memory neural network prediction'. It features a button labeled 'Predict with LSTM'.
- LSTM Result:** A box showing the predicted tower ID 'TWR\_120', latitude '18.521451', and longitude '73.858993'. It also indicates the tower is located in Pune and was predicted at 7/31/2025, 10:46:10 AM. A 'View on Google Maps' button is present.
- GNN Prediction:** A section titled 'GNN Prediction' with the sub-section 'Graph Neural Network prediction'. It features a button labeled 'Predict with GNN'.
- GNN Result:** A box showing the predicted tower ID 'TWR\_111', latitude '23.020221', and longitude '72.569296'. It also indicates the tower is located in Ahmedabad and was predicted at 7/31/2025, 10:46:30 AM. A 'View on Google Maps' button is present.
- LSTM AND GNN Predictions:** A large bold heading at the bottom of this section.

**LSTM AND GNN Predictions**



# Module 2

## Last Known Location Finder

Analytics

Home Dev

LSTM Prediction

Long Short-Term Memory neural network prediction

Predict with LSTM

**LSTM Result**

Predicted Tower ID: **TWR\_120**

Latitude: **18.521451** Longitude: **73.858993**

Tower Location: Pune

Predicted at: 7/31/2025, 10:46:10 AM

[View on Google Maps](#)

**Click** →

18°31'17.2"N 73°51'32.4"E  
18.521451, 73.858993

Directions Save Nearby Send to phone Share

GVC5+HHQ Pune, Maharashtra  
Add a missing place  
Add your business  
Add a label  
Your Maps activity

Layers

Restaurants Hotels Things to do Transit Parking Pharmacies ATMs

Shaniwar Wada  
Laal Mahaal  
Ganesha Temple  
Mote Mangal Karyalay Rd  
Veer Santaji Ghorpade Rd  
Agarwal Rd  
Dagadi Pool Rd  
Maharana Pratap Rd  
Nageshwar Rd  
Shivaji Pawar Path  
Baburaoji Sonawane Path  
Parage Chowk  
Lane No. 1  
Prabodhankar Thakare Chowk  
Shree Nageshwar Shiv Mandir  
Samarth Chowk  
Daruwala Pool Rd  
Jagtap Rd  
Ganesh Rd  
Kalika Devi Marg  
Gade Rd  
Sainath Path  
Main Rd  
100 m

This figure illustrates the workflow for finding a last known location. On the left, a screenshot of an 'LSTM Prediction' interface shows a 'Predict with LSTM' button, an 'LSTM Result' section with a predicted tower ID 'TWR\_120' and coordinates '18.521451, 73.858993', and a 'View on Google Maps' button. A large black arrow labeled 'Click' points from the 'View on Google Maps' button to the right side of the image. On the right, a screenshot of a Google Maps search results page for the coordinates '18°31'17.2"N 73°51'32.4"E' shows a red marker indicating the location. The map displays various streets and landmarks in Pune, India, including Shaniwar Wada, Laal Mahaal, and the Ganesha Temple.



# Module 2

# Last Known Location Finder

A screenshot of a web browser displaying the SBI Analytics platform at localhost:5173/last-known-location. The page title is "localhost:5173/last-known-location". The header includes the SBI Analytics logo, "Advanced Analytics Hub", and navigation links for "Home", "Defaulter Prediction", "Location Tracking" (which is highlighted in grey), "Loan Approval", and "Logout". Below the header, there are two cards for "View on Google Maps": one for the "LSTM Model" (TWR\_120, Pune) and one for the "GNN Model" (TWR\_111, Ahmedabad). A yellow warning bar at the bottom states "⚠ Models have different predictions".

Screenshot of the SBI Analytics web application showing model comparison results:

**Model Comparison**  
Compare predictions from both models

**LSTM Model**  
**TWR\_120**  
Pune

**GNN Model**  
**TWR\_111**  
Ahmedabad

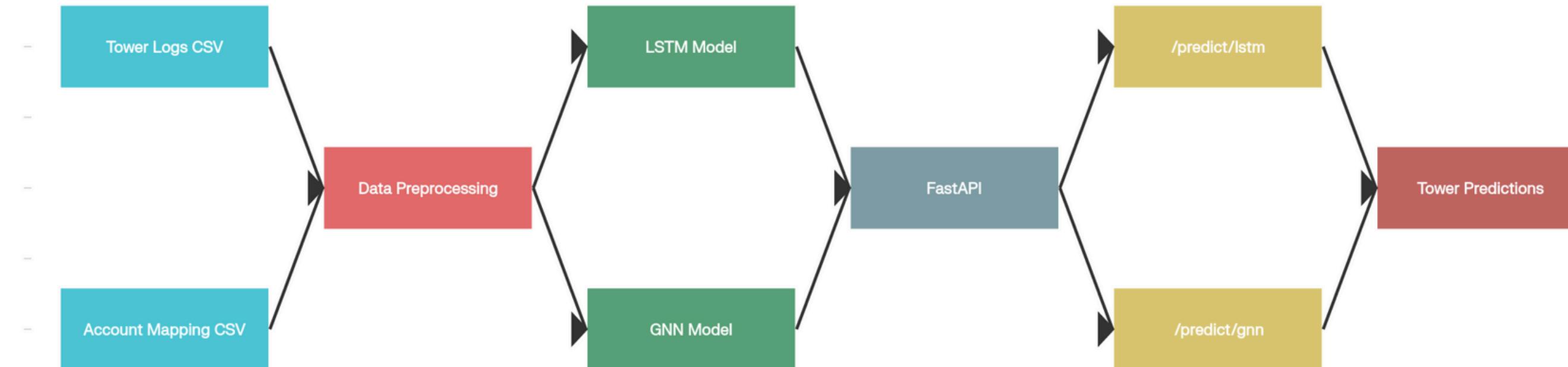
⚠ Models have different predictions

Model Comparisons

# Approach Explanation

## Defaulter Tracker System Architecture

■ Data Source ■ Processing ■ Model ■ Api ■ Endpoint ■ Output





# Approach Explanation

## LSTM vs GNN Tower Prediction Comparison

Category	LSTM	GNN
Model Type	Recurrent Neural Network	Graph Neural Network
Input Data	Sequential tower IDs (last 5)	Tower coordinates and connections
Pattern Recognition	Temporal patterns	Spatial relationships
Architecture Details	Time-series sequence processing	GraphSAGE with 2 layers
Prediction Method	Next tower in sequence	Graph-based neighbor prediction
Strengths	Captures movement history, temporal dependencies	Spatial awareness, network topology
Use Cases	Route prediction, habitual patterns	Geographic clustering, proximity-based prediction



# Module 3

# Loan Approval Predictor

A screenshot of a web browser displaying the "SBI Analytics Advanced Analytics Hub" website at "localhost:5173/loan-approval". The browser's address bar shows the URL. The page has a dark header with the SBI logo and navigation links for "Home", "Defaulter Prediction", "Location Tracking", "Loan Approval" (which is highlighted in blue), and "Logout". Below the header is a large, rounded rectangular form with a white background and a thin gray border. The form is titled "Loan Approver" in bold black text. It contains a text input field labeled "Enter User ID" with the placeholder "e.g., 123456". At the bottom of the form is a solid blue button with the word "Predict" in white. The rest of the page is a plain light gray color.

**For Transparent Loan  
Decisioning**

Asks for the Unique User Id  
in the database



# Module 3

# Loan Approval Predictor

The image shows a screenshot of a web browser displaying the SBI Analytics platform. The URL is `localhost:5173/loan-approval`. The page has a header with the SBI Analytics logo and navigation links for Home, Defaulter Prediction, Location Tracking, Loan Approval, and Logout. A large arrow points from the left side of the screen to a detailed view of the 'Loan Approver' section on the right.

**Loan Approver**

Enter Unique ID  
4050

Predict

**Prediction:** High Risk

- **Enter Unique ID** → Risk assessment
- **Output:** "Risky"/"Not Risky" with justification
- **Features:** SHAP-based explainability



# How it works?

- It works based on an API call to our cloud based Postgre SQL database service called Supabase
- The API can be used for performing CRUD operations on the database.
- Why cloud based Data base? Supabase has all cybersecurity features inbuilt to prevent hackers from accessing the database.( The recent tea app breach has exposed the vulnerabilities in firebase)
- Supabase has the option to directly upload our csv files in the database via their webpage.
- Our API returns target and Unique id as response in JSON format
- Based on the target value one can get the defaulter/non defaulter values without having to rerun the ML model api everytime.

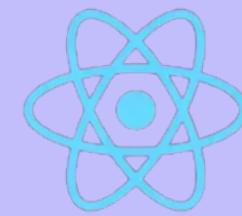
The screenshot shows the Supabase PostgreSQL interface. On the left, there's a sidebar with a schema dropdown set to 'public', a 'New table' button, and a search bar. Below that is a tree view showing a single table named 'loan\_accounts'. A button labeled 'RLS disabled' is visible next to the table name. The main area is a data grid with the following columns: UNI... (integer), ACCT... (float), LIMIT (float8), OUTS (float8), ACCT\_RESIDUAL\_TENURE (float8), LOAN\_TE... (integer), INSTAL... (float8), and SI\_FLG (varchar). The data grid contains approximately 20 rows of loan account information.

	UNI...	ACCT...	LIMIT	OUTS	ACCT_RESIDUAL_TENURE	LOAN_TE...	INSTAL...	SI_FLG
	468	3.217	107500	6242.58	-0.216	1096	3325	N
	2032	1.613	1005500	494161.89	0.89	914	38513	Y
	2033	1.783	1005500	428072.24	0.72	914	38513	Y
	2034	1.698	1005500	461364.1	0.805	914	38513	Y
	2035	9.127	1005500	1204287.25	17.878	9862	12736	Y
	2036	9.296	1005500	1203224.25	17.708	9862	12736	Y
	2037	1.175	193500	142361	1.826	1096	6385	Y
	2038	9.211	1005500	1205018.25	17.793	9862	12736	Y
	2040	0.668	1605500	1542328.27	4.332	1826	36242	Y
	2041	5.772	209500	249960	12.818	6789	2798	N
	2042	5.687	209500	253230	12.903	6789	2798	N
	2045	10.216	258217	320785.37	5.534	5752	6098	N
	2245	1.815	1445500	1210337.18	4.187	2192	27336	Y



# Tech Stack Used

- **Frontend:** React.js, TypeScript, Tailwind CSS, Vite
- **Backend:** FastAPI (Python)
- **Database:** Supabase (PostgreSQL)
- **Machine Learning Models:**
  - XGBoost, Random Forest, Logistic Regression
  - LSTM – For sequential modeling of user movement
  - GNN (Graph Neural Network) – For mobility graph-based defaulter tracking
- **Data Processing & Preprocessing:**
  - pandas, numpy, scikit-learn, KNNImputer, StandardScaler, imblearn (SMOTE)
- **Visualization:** matplotlib, seaborn





# Privacy and Security

## Implemented:

- Login with username and hashed passwords to prevent unauthorised access.
- Cloud based database which can prevent certain IP addresses from accessing the database.
- Route Protection to prevent unauthorised access.
- Database protected with a password.
- Immune to SQL injections.

## Future updates:

- API rate limiting to prevent DDOS attacks.
- Zero trust Authentication to prevent AI based malware tools.
- Two Factor Authentication.



# What this means for SBI?

- Cloud based DB allows a huge volume of data to be stored without performance issues on host device.
- Any authorised SBI employee can use this app at any location to track defaulters.
- Ability to manually change status of a customer in case of errors.
- Accurate predictions of potential defaulters with minimal false positives.
- Ability to track defaulters for better loan recovery.
- Instantly get reasons for why a customer is flagged as defaulter.
- FastAPI + Supabase ensures a scalable, secure, and cloud-compatible infrastructure for future deployments.



# Future scope

- Dynamically improve the training model as new customer data is added and fine tune it for location based trends in defaulters.
- Develop a companion app to help recovery agents view predicted defaulter locations and activity patterns.
- Adapt the system for use in insurance fraud, credit card anomaly detection, and rural loan defaulter analytics.
- Incorporate transformer-based models and spatio-temporal GNNs for improved accuracy and generalization.
- Customer Behaviour Analytics dashboard.



# Thank You

We Are Open To Questions Now