

Backend Technologies

Technology	Why It Was Chosen
Python	The undisputed industry standard for AI, data science, and machine learning, with an unparalleled ecosystem of powerful libraries.
FastAPI	A modern, high-performance web framework that provides exceptional speed, automatic API documentation, and robust data validation.
Socket.IO	Enables real-time, bidirectional communication, which is essential for instant notifications to customers and admins without page reloads.
SQLModel	Allows for a clean, type-safe, and Pythonic way to interact with the database, reducing errors and improving code clarity.

AI & Data Processing Stack

Technology	Why It Was Chosen
Scikit-learn	The go-to library for building reliable machine learning models. We use its RandomForestClassifier with balanced class weights for intelligent, nuanced predictions.
Pandas	The essential tool for all data manipulation tasks, from cleaning the initial Kaggle training dataset to preparing real-time application data for the AI model.
Pytesseract & OpenCV	A powerful combination for document analysis. OpenCV pre-processes images (cleans noise, improves contrast), and Pytesseract (Google's Tesseract engine) extracts the text with high accuracy.
Pdfplumber	A specialized library chosen for its ability to extract structured tables and transactional data from PDF bank statements, which is critical for verifying financial health.

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HTML, CSS, Vanilla JS	This universal stack ensures the application is lightweight, incredibly fast, and requires no complex build process. It is easy to maintain and deploy.
Web Speech API	A built-in browser feature that provides powerful Text-to-Speech and Speech-to-Text capabilities, making the chatbot accessible to a wider range of users, including those with literacy challenges.