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Prototyping Products with Data and AI
MSc in Business Analytics

Final PDAI Project:

Banking Copilot for AletaBank

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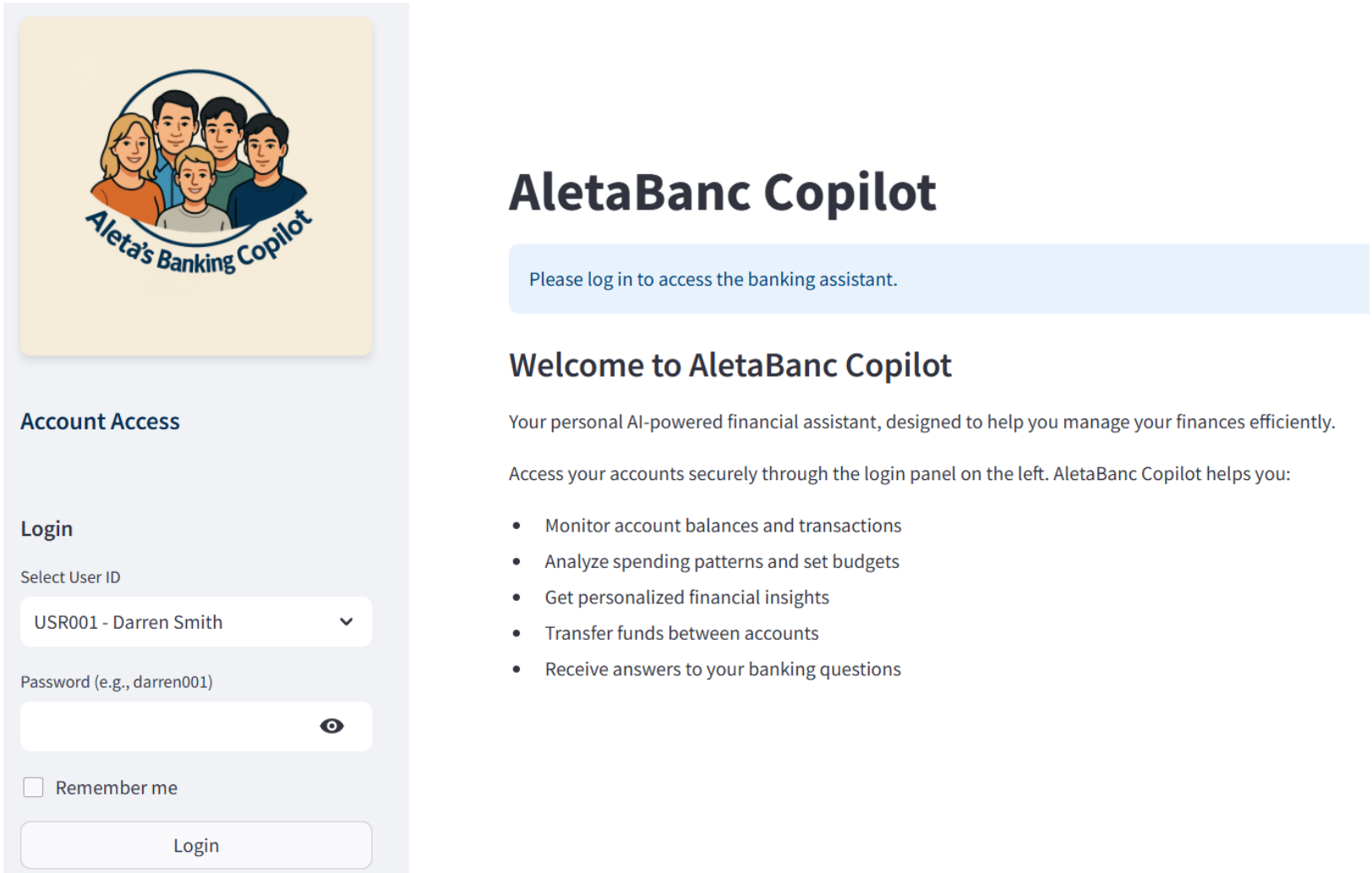
1. Introduction to Banking Copilot for AletaBanc

Login page overview



1. Introduction to Banking Copilot for AletaBank

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Our Minimum Viable Prototype:
A family-focused banking copilot designed to simplify and enhance household financial management.

Purpose:
Empower families to manage their finances together through a smart, conversational assistant that goes beyond basic chatbots.

Key Unique Selling Propositions for the App:

1. **Multimodal Interaction:** Supports both text and voice inputs for natural, hands-free communication.
2. **AI-Driven Insights:** Uses a Large Language Model for contextual, personalized responses and proactive financial advice.
3. **Family-Centric Design:** Facilitates role-based access so every family member (parents and kids) can interact safely with their tailored view of finances.

Product Value to Users:
Addresses the gap in the market where most banking assistants cater only to individuals, not providing a comprehensive co-piloting tool for family financial planning and oversight.

2. Business Case Overview – Market Gaps

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- **Limited evolution in banking copilots:** Most existing banking assistants are still basic chatbots. They follow scripted Q&A flows and often cannot handle natural conversation or perform complex tasks.
- **Individual-focused design:** Nearly all current solutions are designed for **single users**. There's a lack of copilots that support **multi-user financial environments**, like families managing shared and individual accounts.
- **Minimal conversational intelligence:** Many bots struggle to understand nuanced, contextual, or open-ended queries. They lack deep natural language understanding and produce rigid, repetitive responses.
- **Absence of voice/audio interaction:** Despite the rise of voice tech (e.g., Alexa, Siri), most banking copilots still operate **text-only**, missing opportunities for hands-free accessibility and natural dialogue.
- **Lack of proactive financial insight:** Current tools mostly respond reactively to user prompts. They don't proactively suggest budgeting advice, highlight spending issues, or summarize financial patterns in helpful ways.

2. Business Case Overview – Solution Fit

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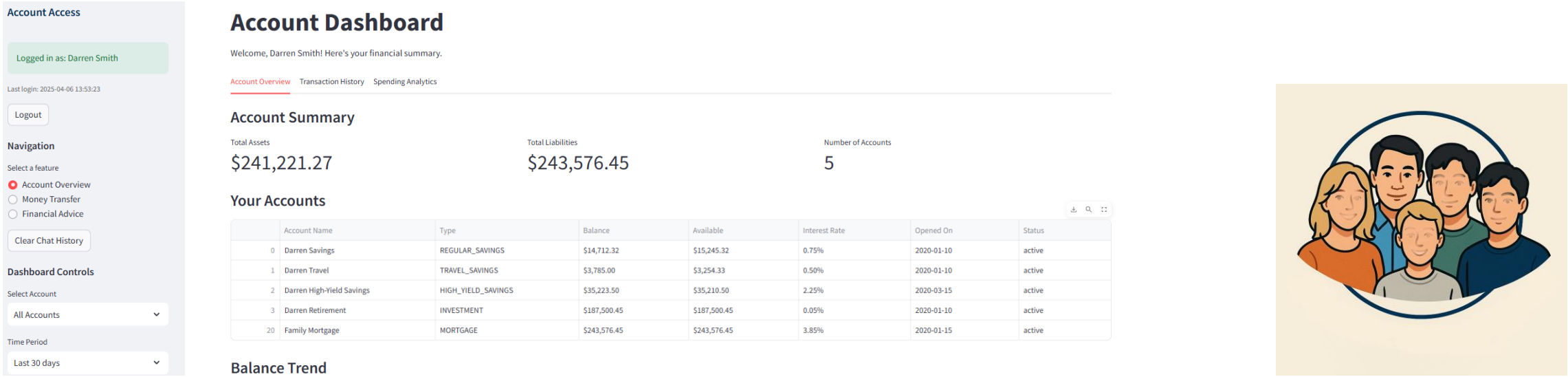
- **Family-focused design:** AletaBank is designed for **families**, not just individuals. It supports multiple users (parents and children), with customized access control and shared financial views—**a key market differentiator**.
- **Conversational and natural:** Powered by a **Large Language Model**, AletaBank understands and responds in natural language, adapting to complex and casual queries without sounding robotic.
- **Voice-first functionality:** Users can **speak to** the assistant and receive **audio replies**, enabling hands-free use. This is perfect for multitasking (e.g. checking bills while cooking) and accessibility.
- **True "copilot" behavior:** AletaBank can **perform actions**, such as simulated money transfers, checking account activity, or giving financial summaries—not just chat. This makes it a real assistant, not just a help bot.
- **Context-aware advice:** The copilot provides **personalized budgeting tips and proactive insights** using the user's financial data. It feels more like a smart advisor than a support rep.

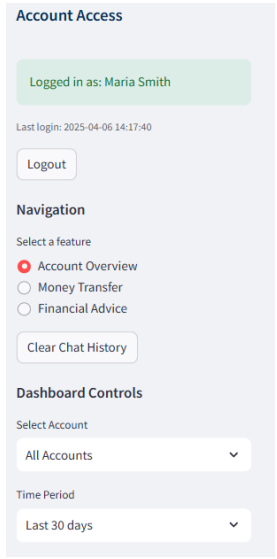
3. Stakeholder Analysis – The Persona of the Father

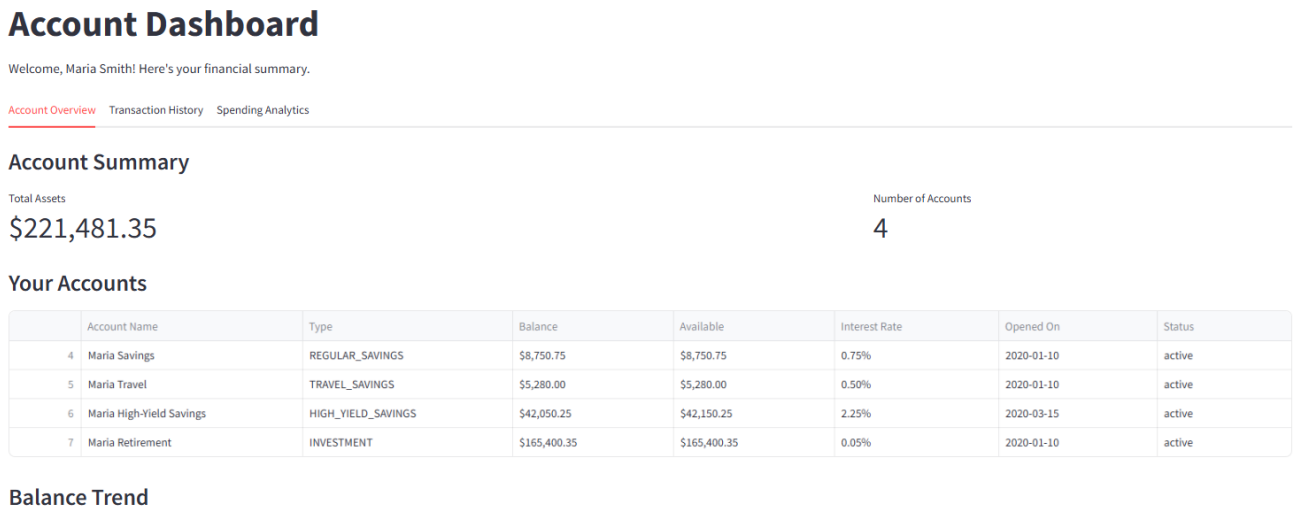
- **Darren (Father):** Primary breadwinner and account holder. Darren uses the Banking Copilot to get a consolidated view of all family finances – he can query overall account balances, monitor the budget, and ensure big bills (like the mortgage) are on track. The copilot helps him quickly transfer funds between accounts (e.g. moving money to savings or the kids' accounts) and alerts him to any unusual spending.



3. Stakeholder Analysis – The Persona of the Mother

- **Maria (Mother):** Co-manager of family finances. Maria interacts with AletaBank to review day-to-day expenses and savings goals. She can ask questions like “How much did we spend on groceries this month?” and get an immediate answer. Maria also benefits from the shared mortgage info accessible through the assistant, allowing her to check payment schedules or interest rates without digging through paperwork.





3. Stakeholder Analysis – The Persona of Child #1

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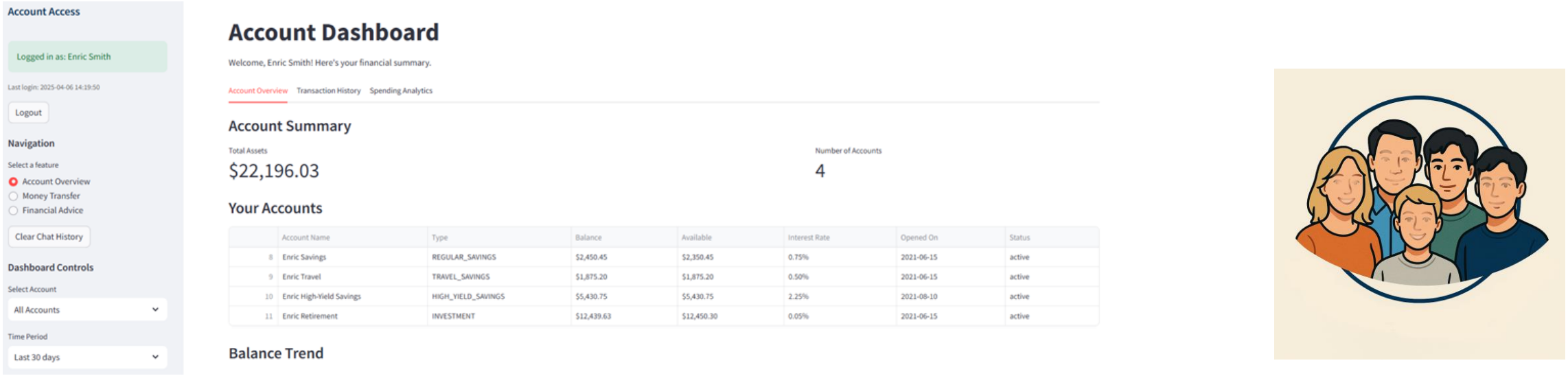
- **Enric (Son):** Teenager with his own bank account (sub-account under the parents). Enric uses the copilot via his personal login to check his allowance balance and recent transactions. He might ask, “How much do I have saved for college?” and get guidance. The copilot empowers Enric to manage his money responsibly – if he wants to buy something, he can inquire whether he can afford it, and the system will respond or even loop in his parents if needed.



3. Stakeholder Analysis – The Persona of Child #3

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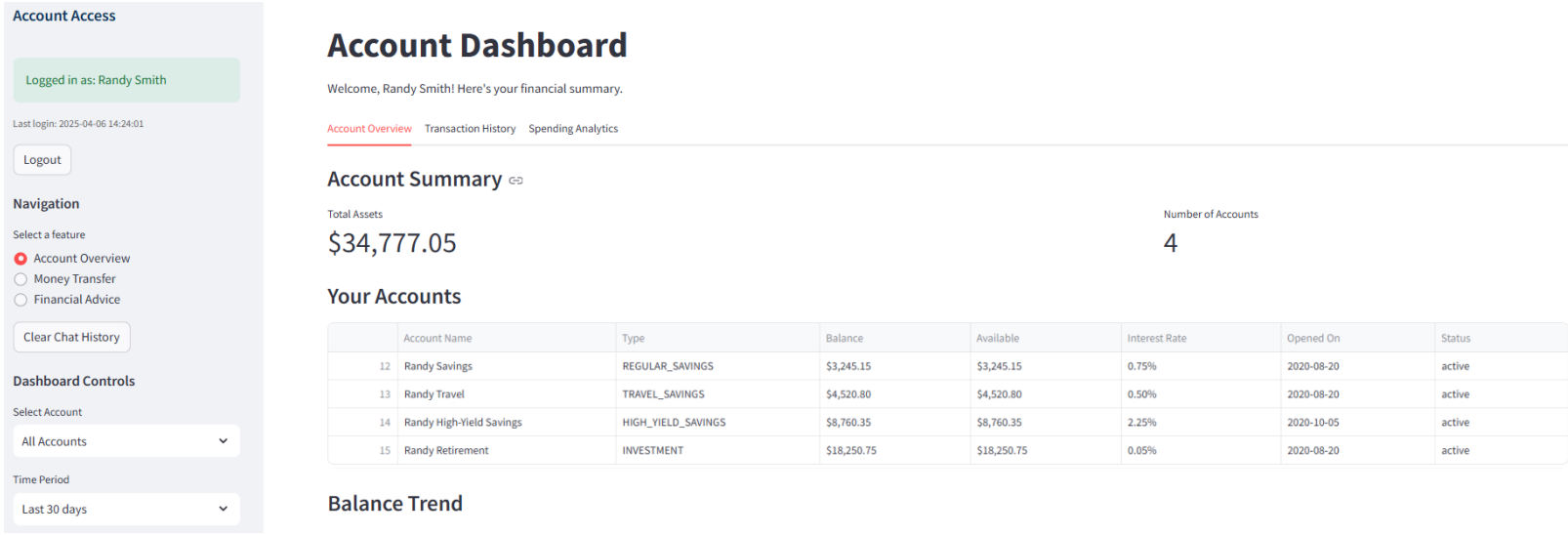
- **Randy (Son):** The youngest Smith son with a minor's account. Randy's usage of the copilot is likely guided by his parents. Through AletaBank, Randy gets a gentle introduction to banking – for example, with a parent's help he can ask the copilot to check his savings from chores or birthday money. The assistant's friendly, conversational replies make it easy for Randy to understand (e.g. "You have $50 in your savings account, great job!"), thus benefiting from financial awareness early on.



3. Stakeholder Analysis – The Persona of Child #3

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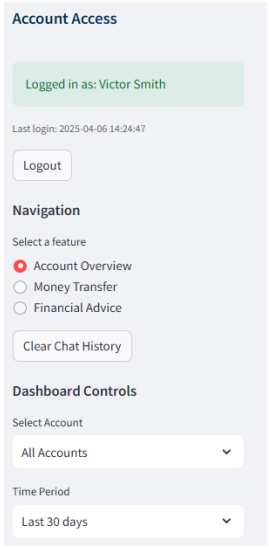
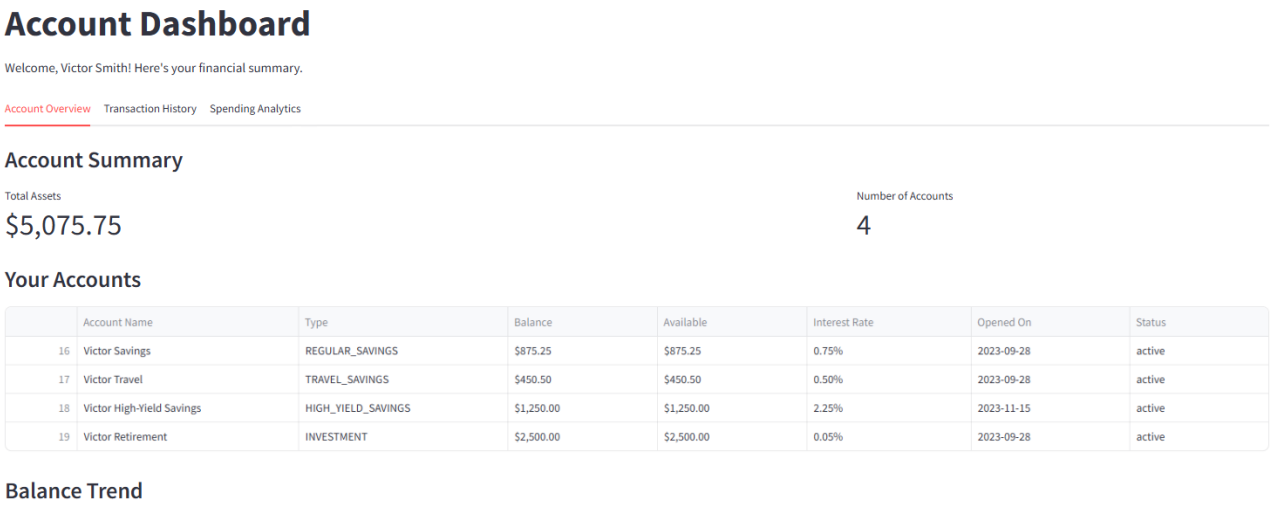
- **Victor (Son):** teenager who interacts with AletaBank for his personal finances. Victor benefits from real-time answers about his spending (“Did I pay back Dad for last week’s tickets?”) and can receive basic financial advice. For instance, if Victor asks how to build his savings, the copilot (drawing on the family’s financial context) can give simple tips or reminders, which helps Victor learn good habits.





4. Features overview

1. Account overview – the summary for your daily account monitoring

It consists of 3 parts (that includes different tables and plots): **Account summary**, **transaction history** and **spending analytics**

Account Summary

Total Assets
$241,221.27

Total Liabilities
$243,576.45

Number of Accounts
5

Your Accounts

	Account Name	Type	Balance	Available	Interest Rate	Opened On	Status
0	Darren Savings	REGULAR_SAVINGS	$14,712.32	$15,245.32	0.75%	2020-01-10	active
1	Darren Travel	TRAVEL_SAVINGS	$3,785.00	$3,254.33	0.50%	2020-01-10	active
2	Darren High-Yield Savings	HIGH_YIELD_SAVINGS	$35,223.50	$35,210.50	2.25%	2020-03-15	active
3	Darren Retirement	INVESTMENT	$187,500.45	$187,500.45	0.05%	2020-01-10	active
20	Family Mortgage	MORTGAGE	$243,576.45	$243,576.45	3.85%	2020-01-15	active

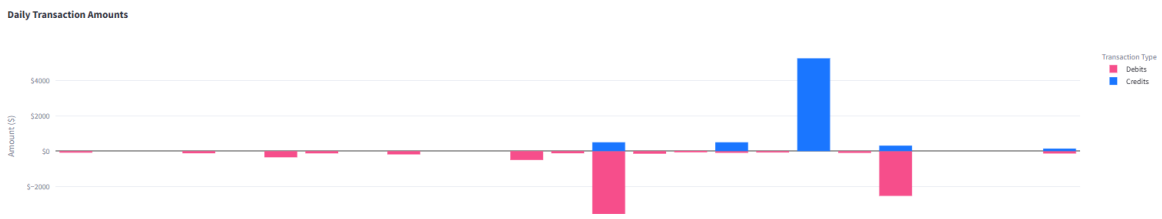
Account Overview | Transaction History | Spending Analytics

Transaction History

Showing 32 transactions for All Accounts

	Date & Time	Description	Category	Amount	Balance After	Merchant	Type
101	2025-04-05 21:49	Transfer from Enric Smith	Transfers	$10.67	$3,785.00	Internal Transfer	transfer
99	2025-04-05 16:15	Transfer from Maria Smith	Transfers	$100.00	$14,712.32	Internal Transfer	transfer
96	2025-04-05 13:06	School Fees	Transfers	$100.00	$14,612.32	Internal Transfer	transfer
95	2025-04-05 12:08	Transfer from Darren Smith	Transfers	$23.50	$35,223.50	Internal Transfer	transfer
94	2025-04-05 12:08	Dinner Expenses	Transfers	$23.50	$14,712.32	Internal Transfer	transfer
93	2025-04-05 12:08	Transfer from Darren Smith	Transfers	$10.50	$14,735.82	Internal Transfer	transfer
92	2025-04-05 12:08	Burger Expenses	Transfers	$10.50	$35,200.00	Internal Transfer	transfer
11	2025-04-01 00:00	Airline Tickets	Travel	$450.00	$3,254.33	Delta Airlines	online
65	2025-04-01 00:00	Mortgage Payment	Housing	$1,865.75	$243,576.45	Mortgage Lender	bill_payment
18	2025-04-01 00:00	Investment Growth	Interest	$245.50	$187,500.45	Investment Returns	interest

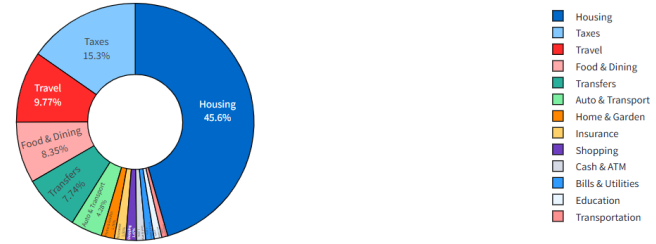
Transaction Amounts Over Time



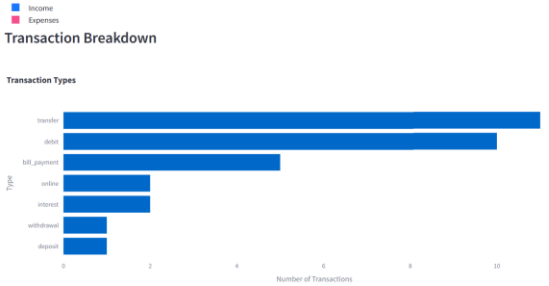
Account Overview | Transaction History | Spending Analytics

Spending Analytics

Spending by Category



Monthly Income vs Expenses



Total Income
$6,706.49

Total Expenses
$8,186.97

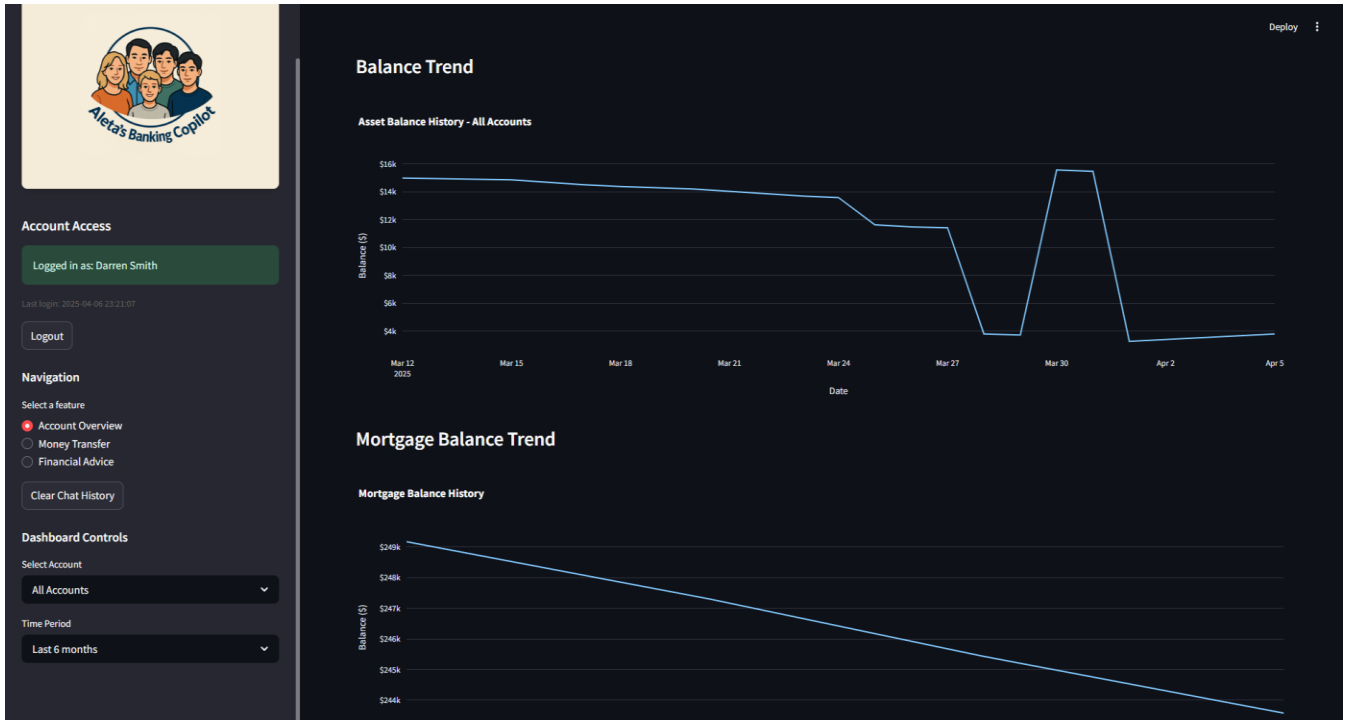
Savings Rate
-22.1%

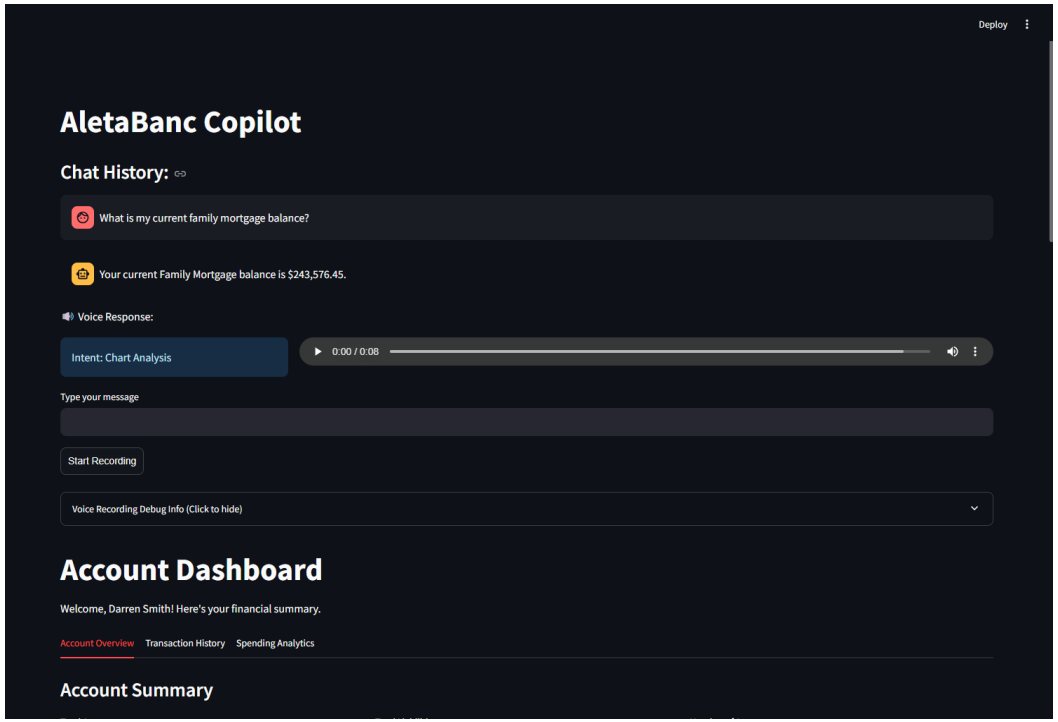
4. Features overview

1. Account overview – the summary for your daily account monitoring

Users are also able to deep dive into certain accounts: For the **Father Persona**, he has the **unique view** of **Mortgage Balance**.

Additionally, **voice inputs and audio outputs** are also enabled for users who might prefer voice-enabled communications.





4. Features overview

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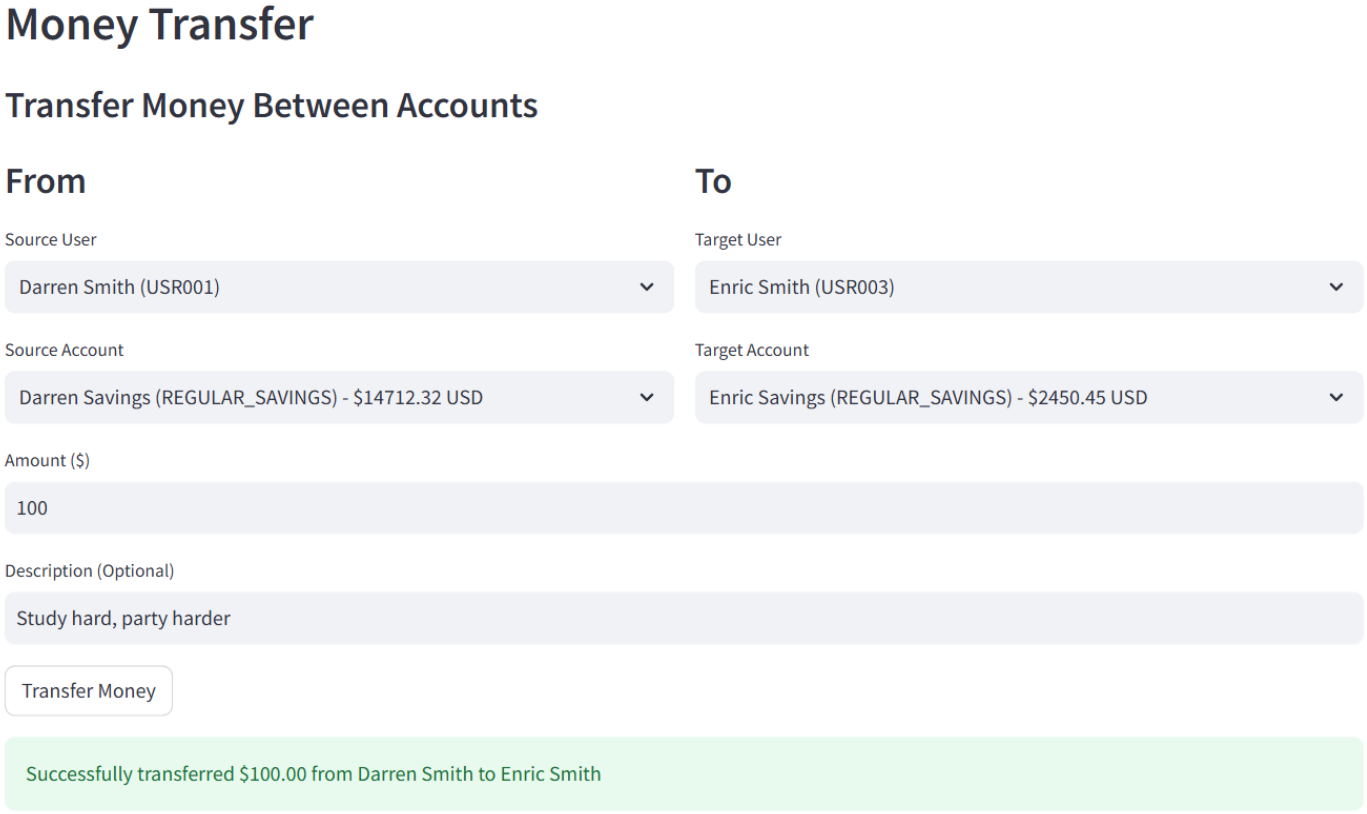
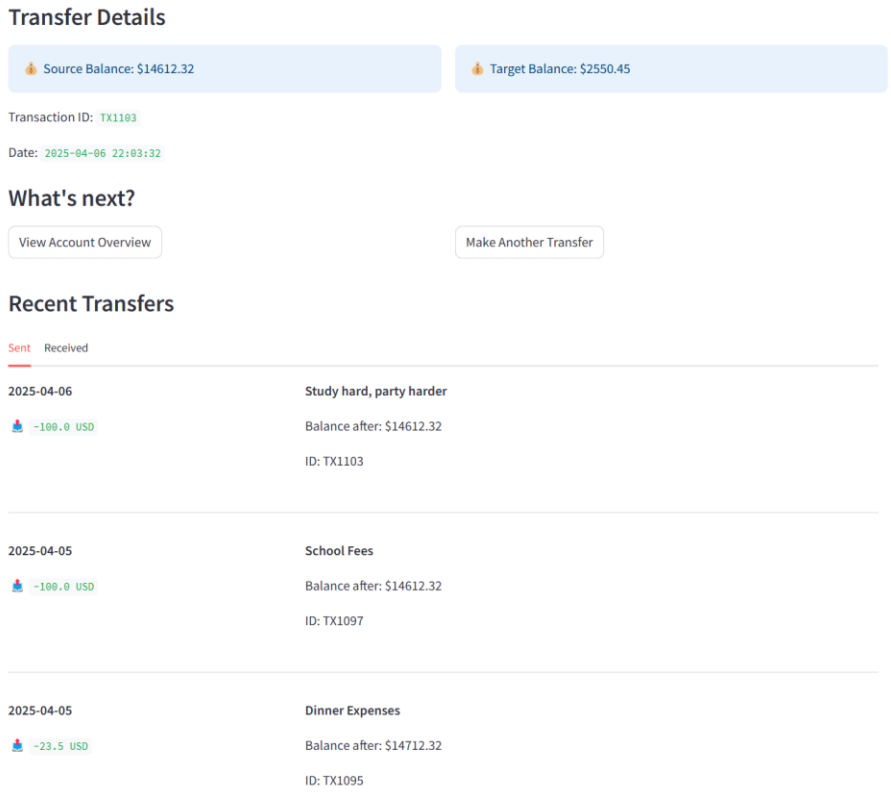
2. Money transfer – the way to transfer money between accounts

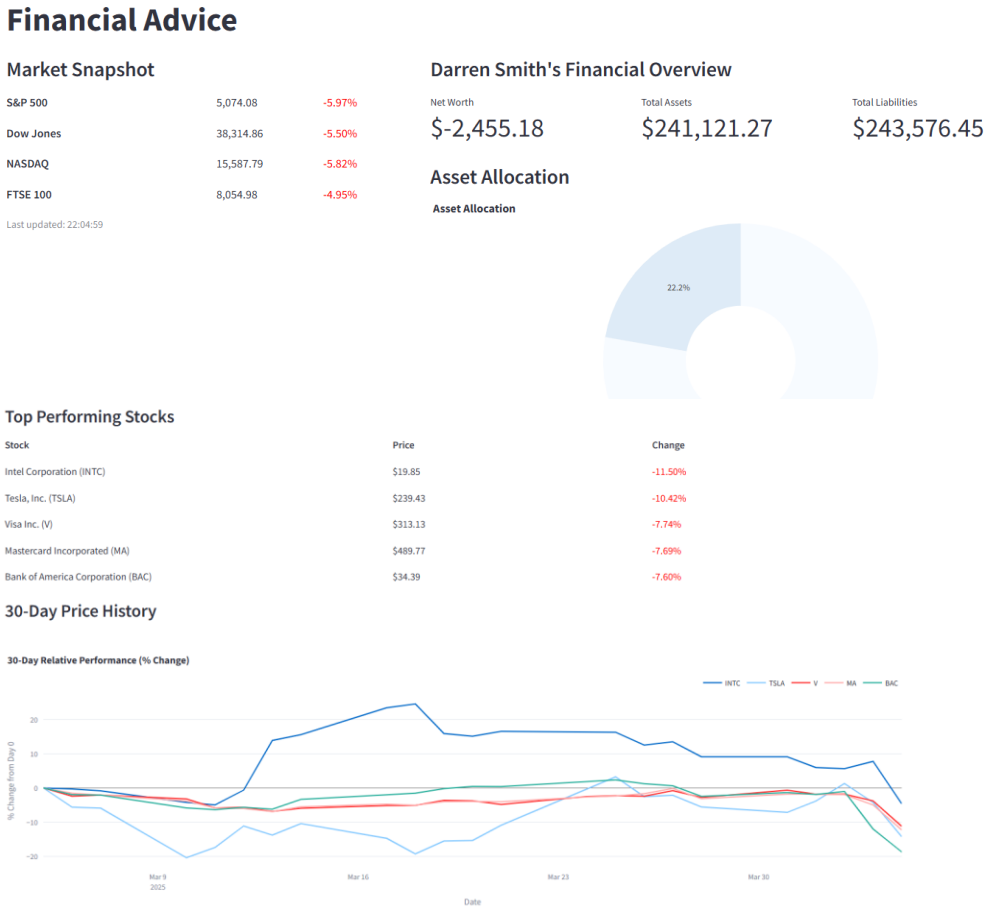




Voice feature is deliberately disabled for this feature as it is not user-friendly if money gets transferred out of his account due to mistakes made by the LLM in intent recognition.

4. Features overview

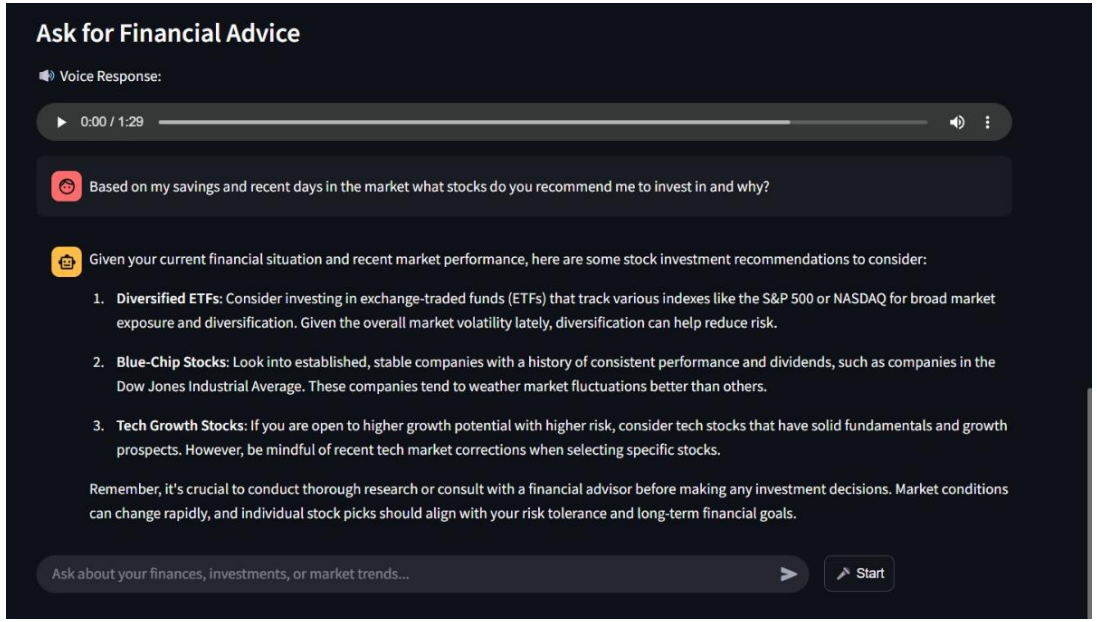
3. Finance advice – the flagship service enhanced with LLM technology



Ask the chatbot for any type of advice. Similar to 1. Account Overview, voice inputs and audio outputs are enabled

For example:

- *Based on my savings and recent days in the market what stocks do you recommend me to invest in and why?*



5. Architecture Overview (more in appendix)

AletaBank Copilot

- **User Interface**: A Streamlit web app with a chat-based UI where users can interact via text or voice. It includes voice transcription and audio playback for a smooth conversational experience.
- **Authentication & Data Access**: Secure login separates users and controls account access based on roles (e.g., parents vs. kids). Data is stored locally for demo purposes, simulating a bank's backend.
- **Natural Language Processing**: Uses a sentence-transformer to classify user queries by intent, enabling the system to understand and respond to both simple and complex language inputs.
- **Action Handlers**: Based on intent, the system either fetches account info, processes transfers (in demo mode), or hands off open-ended questions to an AI advisor.
- **LLM Integration**: Taps into OpenAI's LLM to give personalized financial advice and natural responses, using contextual data like transaction history and adding disclaimers as needed.
- **Voice Processing**: Converts speech to text using Whisper and generates voice responses via gTTS, enabling full voice-based interaction similar to a smart assistant.
- **Security & Session Management**: Tracks sessions securely, limits access to authorized users, and includes features like session timeouts and logs for safety and reliability.

5. Architecture Overview

Multi-Tiered Intent Recognition Framework

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AletaBank Copilot: Triple-Layered Intent Recognition

Three Complementary Approaches to Understanding User Queries

1. **Primary**: Embedding-Based Semantic Classification
    - Converts text to numerical vectors using SentenceTransformer (all-MiniLM-L6-v2)
    - Computes cosine similarity between query vector and pre-computed intent embeddings
    - Identifies semantic meaning beyond keywords (similarity > 0.4-0.5 threshold)

2. **Fallback**: Pattern Matching with RegEx
    - Activates when embedding similarity score falls below threshold
    - Domain-specific intent categories with multiple regex patterns each
    - Captures specific banking terminology and common phrasings

3. **Override**: Domain-Specific Keyword Detection
    - Context-aware rules that can override other classifications

Appendix: Architecture Overview

Architecture Overview

Architecture Overview (Text Only)

- **User Interface:** AletaBank's front-end is a Streamlit web app that provides an intuitive chat interface. Users log in and interact via **text or voice** – they can type questions or speak into a microphone. The app transcribes spoken queries and can play back responses in audio, creating a seamless conversational experience.
- **Authentication & Data Access:** The system uses secure login to differentiate family members. Each user can only access their own accounts and authorized shared accounts. (For example, Darren and Maria can see joint assets like the mortgage, while the kids cannot.) The underlying data (account balances, transactions, scheduled payments, etc.) is stored in the app's database/files for the demo. This simulates a bank's core data while enforcing **role-based access** so that privacy is maintained.
- **Natural Language Processing:** AletaBank has an intent classification component that interprets each query. It uses a sentence-transformer model to embed the user's question and match it to known intents (e.g. *Balance Inquiry*, *View Transactions*, *Money Transfer*, *Financial Advice*). This NLP layer lets the copilot understand what the user is asking for in free-form language, whether it's a straightforward request ("What's my balance?") or a more complex prompt ("Give me advice on saving for a car").
- **Action Handlers:** Based on the identified intent, the copilot routes the request to the appropriate module:
    - *Account queries* – The system fetches information from the user's data. For instance, it retrieves account balances, recent transaction history, or upcoming payment dates, then returns a concise answer or summary to the user.
    - *Money transfers* – The copilot invokes a transfer routine (simulated for demo). It will confirm details ("Transfer $200 from checking to Enric's savings?") and then update the account records accordingly, responding with a confirmation.
    - *Financial advice & Q&A* – For open-ended questions or advice requests, the query is handed to the AI **advisor module**. This is where a generative AI (LLM) comes into play to formulate a helpful response.
- **LLM Integration:** The Banking Copilot integrates a Large Language Model (via OpenAI's API) to provide **contextual advice and natural responses**. When a user asks for guidance ("How can I reduce my expenses?") or a complex question, the system gathers relevant context (e.g. spending patterns from their transactions) and prompts the LLM. The model's answer is then relayed back in a friendly, conversational tone. Importantly, the copilot adds necessary disclaimers (e.g. "This is general advice") to any financial guidance, and it can remember context from previous interactions to have a coherent dialogue.
- **Voice Processing:** The audio features are powered by AI services. The user's spoken input is transcribed using OpenAI's Whisper speech-to-text API, which converts voice into accurate text for the system to understand. Conversely, when the copilot has a reply, it uses a text-to-speech engine (Google's gTTS) to generate an audio clip of the answer. This architecture allows full **hands-free interaction**, where a family member could talk to the copilot (e.g. while cooking or driving) and listen to its response, just like using a voice assistant.
- **Security & Session Management:** The app maintains user session state to track context (like login status, recent questions, etc.). All sensitive operations (like a transfer) require the user to be authenticated and are confined to that user's scope. There are safeguards so that, for example, one child cannot accidentally access another sibling's account or perform unauthorized transactions. Session timeouts and logs (for debugging) are implemented to ensure the system remains secure and reliable during use.