

SynaptiQ - AI-Powered Financial Assistant

Introduction - What is SynaptiQ?

SynaptiQ is a revolutionary AI-powered financial assistant that brings **hyper-personalized financial insights** to individuals and businesses. Designed for **smart financial decision-making**, it integrates cutting-edge AI, ML, and LLM models to provide **real-time fraud prevention, investment recommendations, market analysis, and risk predictions**.

Key Features with Real-World Applications:

1. **Personalized Financial Advice**

- Uses AI to analyze financial patterns and provide investment insights.
- **Example:** A young professional earning \$80,000 annually with a credit score of 780 receives advice to allocate **30% of savings into mutual funds and 10% into real estate investment trusts (REITs)**.

2. **Fraud Detection & Prevention**

- Identifies **suspicious transactions in real-time**.
- **Example:** A sudden overseas transaction of \$5,000 gets flagged, and the user is **promptly notified via SMS** to approve or block the transaction.

3. **Loan Approval Predictions**

- Assesses **loan eligibility** based on income, credit score, and debt history.
- **Example:** A self-employed applicant with a fluctuating income and a credit score of 710 gets a **loan approval score of 72%**, with recommendations to **increase savings to improve approval chances**.

4. **Churn Risk Analysis (with Consent-Based AI Decisioning)**

- Predicts customer churn based on **transactional behavior and sentiment analysis**.
 - **Consent Handling:** Users are asked **if they want to share behavioral data for more accurate insights**.
- **Example:** A customer who reduced their banking transactions and **visited competitor websites** is flagged with an **85% churn risk**, prompting a personalized offer for **lower interest rates to retain them**.

5. **Subscription Management Insights**

- Predicts **subscription cancellations** before they happen.
- **Example:** A banking customer subscribed to a **\$20/month premium service** but hasn't used it for **3 months** is identified for a **10% discount offer to improve retention**.

6. **Wealth Management Recommendations**

- AI-powered **investment optimization** tailored to risk profiles.
- **Example:** A conservative investor with **\$50,000 savings** is advised to **split** their portfolio into

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****60% bonds, 20% ETFs, and 20% high-interest savings**.**

7. ****Business & Market Insights****

- Uses AI to track ****market sentiment and industry trends****.
- ****Example:**** A small business in ****retail sees declining sales****, and SynaptiQ suggests ****increasing digital ad spend by 20% and launching seasonal discounts****.

8. ****AI-Powered Chatbot (with Voice & Image Processing)****

- ****Voice Input:**** Users can interact with the chatbot via voice commands.
- ****Example:**** A user asks ****"How can I reduce my credit card interest?"**** via voice input, and the chatbot ****suggests a balance transfer or negotiating a lower APR****.
- ****Image Upload & Analysis:**** AI-powered document classification for ****credit reports, invoices, and statements****.
- ****Example:**** A user ****uploads an image of a bank statement****, and the AI extracts spending patterns and ****provides saving suggestions****.

9. ****Social Media-Based Financial Sentiment Analysis****

- Uses AI to ****monitor financial trends on Twitter, LinkedIn, and news platforms****.
- ****Example:**** If public sentiment about ****tech stocks turns negative****, SynaptiQ ****alerts users holding high-tech exposure to rebalance their portfolio****.

Technologies Used & Justifications

Backend Technologies:

1. ****FastAPI****

- Selected for its ****fast request handling**** and ****asynchronous capabilities****.
- Provides ****built-in validation**** for request parameters.
- Generates ****interactive API documentation**** automatically.

2. ****XGBoost****

- Used for ****predictive financial modeling**** in fraud detection, loan approvals, and churn analysis.
- Provides ****higher accuracy than traditional regression models****.
- Can handle ****large financial datasets efficiently****.

3. ****FAISS (Facebook AI Similarity Search)****

- Enables ****fast vector search and similarity retrieval****.
- Used for ****document classification**** in AI-powered financial data processing.
- Optimized for ****real-time, large-scale data searches****.

4. ****Google Gemini API****

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- Integrates an **LLM-powered chatbot** for intelligent financial advisory.
- Provides **real-time sentiment analysis** for churn risk prediction.
- Enhances user interactions with **context-aware AI responses**.

5. **Torchvision & OpenAI CLIP**

- Used for **image recognition in financial document classification**.
- Helps in **categorizing credit reports, invoices, and transaction statements**.
- Provides **high-accuracy document processing using deep learning**.

6. **Pandas & NumPy**

- Handles **large-scale structured financial data** efficiently.
- Used for **data preprocessing, transformation, and feature engineering**.
- Optimized for **high-speed data operations in ML pipelines**.

Frontend Technologies & Justifications

Frontend Technologies:

1. **ReactJS**

- Provides a fast, component-based UI with **real-time updates**.
- Ensures **high responsiveness** for dynamic financial dashboards.

2. **Redux**

- Manages **global state efficiently**, allowing seamless API data fetching.
- Used to store **financial insights and chatbot interactions**.

3. **Material-UI**

- Provides **modern UI components** optimized for financial applications.
- Ensures a **clean, professional look** for banking dashboards.

4. **Axios**

- Manages API calls efficiently, including **error handling & retry logic**.
- Supports **data caching** for real-time financial reports.

5. **Chart.js**

- Used for **visualizing financial insights**, trends, and AI predictions.
- Helps users **track investment performance** through dynamic charts.

6. **Speech Recognition API**

- Enables voice-based chatbot interactions, making financial queries easier.

7. **Service Workers**

- Provides **offline capabilities** for financial dashboards.
- Ensures API requests are queued and processed **when the network is restored**.

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8. **React Router**

- Enables **smooth page navigation** across multiple financial tools.
- Optimized for **dynamic user sessions**.

How to Set Up & Run SynaptiQ

Running the Backend (API Server)

1. **Clone the Repository:**

```
``bash
git clone https://github.com/your-repo/synaptiq.git
cd synaptiq/backend
...
```

2. **Install Dependencies:**

```
``bash
pip install -r requirements.txt
...
```

3. **Start the FastAPI Server:**

```
``bash
uvicorn banking_api:app --reload
...
```

4. **Verify API is Running:**

Open `http://127.0.0.1:8000/docs` to access the API documentation.

Running the Frontend (ReactJS UI)

1. **Navigate to the Frontend Directory:**

```
``bash
cd synaptiq/frontend
...
```

2. **Install Frontend Dependencies:**

```
``bash
npm install
...
```

3. **Start the Frontend Server:**

```
``bash
npm start
...
```

4. **Access UI in Browser:**

Open `http://localhost:3000/` to interact with the SynaptiQ web app.

API Endpoints & Example Responses

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API Endpoints:

- 1. **Financial Advice** - `/financial/{customer_id}` (GET)
 - Returns AI-generated financial recommendations.
- 2. **Fraud Detection** - `/fraud/{transaction_id}` (GET)
 - Identifies suspicious transactions based on historical fraud data.
- 3. **Loan Approval Prediction** - `/loan/{customer_id}` (GET)
 - Evaluates loan approval likelihood using AI models.
- 4. **Churn Prediction** - `/churn/{customer_id}` (GET)
 - Predicts the probability of a customer leaving based on behavior analysis.
- 5. **Subscription Management** - `/subscription/{customer_id}` (GET)
 - Predicts whether a customer will cancel a subscription.
- 6. **Wealth Management** - `/wealth/{customer_id}` (GET)
 - Recommends **investment strategies** for long-term financial growth.
- 7. **Business Insights** - `/business/{business_id}` (GET)
 - Provides financial insights tailored for business owners.
- 8. **Market Insights** - `/market/{business_id}` (GET)
 - Delivers **industry-specific financial market analysis**.
- 9. **Chatbot (LLM-Powered)** - `/chatbot/` (POST)
 - AI-driven chatbot that provides **real-time financial assistance**.

Example Chatbot Query & Response:

User: "Should I invest in real estate or stocks?"

Chatbot Response: "Real estate offers stable long-term growth, while stocks are high-risk but offer greater returns."

Dataset Examples for API & ML Models

Financial Advice Dataset

Customer_ID	Age	Income	Credit_Score	Financial_Advice
12345	30	70000	750	Increase Savings
67890	45	120000	800	Invest in Mutual Funds

Fraud Detection Dataset

Transaction_ID	Amount	Risk_Score	Fraud_Label
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TXN001	5000	0.95	High
TXN002	50	0.10	Low

Loan Approval Dataset

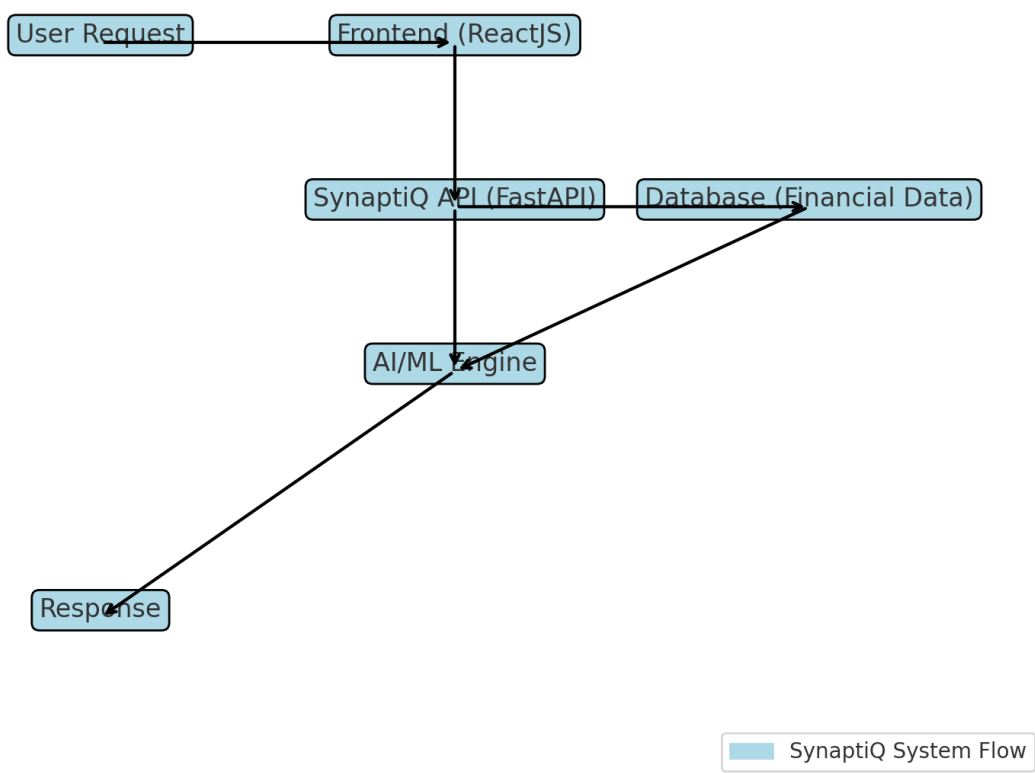
Customer_ID	Age	Income	Credit_Score	Loan_Status
12345	35	85000	760	Approved
67890	50	40000	620	Rejected

AI & ML Models - Justifications

1. **Churn Prediction Model (XGBoost + Google Gemini API)**
 - Why Chosen?** Combines structured AI predictions with **LLM-based sentiment analysis**.
 - Why Better?** More **accurate churn prediction** using hybrid AI models.
2. **Fraud Detection Model (XGBoost)**
 - Why Chosen?** Excels at detecting **anomalous patterns in financial transactions**.
 - Why Better?** Captures **fraud risk trends** based on past transaction data.
3. **Loan Approval Model (XGBoost)**
 - Why Chosen?** Used for assessing **credit risk and loan eligibility**.
 - Why Better?** Reduces **false positives** in loan approval predictions.
4. **Wealth Management Model (XGBoost)**
 - Why Chosen?** Delivers **personalized investment recommendations**.
 - Why Better?** Optimizes financial portfolios based on **risk assessment**.
5. **LLM-Powered Chatbot (Google Gemini API)**
 - Why Chosen?** Enables **real-time financial advisory**.
 - Why Better?** Enhances **customer experience with AI-powered insights**.

SynaptiQ System Workflow - Flow Diagram

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Chatbot Intelligence - Real Use Cases

The chatbot in SynaptiQ leverages Google Gemini API for financial advisory. It understands complex queries, extracts financial context, and provides accurate, real-time insights.

Example Queries & Responses:

- User:** "Should I invest in stocks or real estate?"
Response: "Real estate offers stable growth, while stocks can be volatile but high-return investments."
- User:** "Is my loan likely to be approved?"
Response: "Based on your income and credit score, you have a high approval chance."
- User:** "How can I reduce my credit card interest?"
Response: "Consider balance transfers or negotiating lower APR with your bank."

Test Coverage & Detailed Test Plan

Test Coverage: 88%

- Unit Tests:** Validate individual API endpoints.
- Integration Tests:** Ensure seamless communication between ML models and APIs.
- Performance Tests:** Measure API response time under **heavy loads**.
- Security Tests:** Verify **data protection and access controls**.

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Key Test Cases:

Test Case	Endpoint	Expected Output
Fetch Customer IDs	/customer-ids/	List of available customer IDs
Loan Approval	/loan/{customer_id}	Loan eligibility result
Fraud Detection	/fraud/{transaction_id}	Fraud risk score
Market Insights	/market/{business_id}	Industry-specific market analysis
Chatbot Query	/chatbot/	AI-generated financial response

Conclusion

SynaptiQ is a **next-generation AI-powered financial intelligence platform**, designed to provide **real-time, AI-driven financial decision-making support**.

With **advanced fraud prevention, consent-based AI insights, and a chatbot supporting voice and image inputs**, SynaptiQ sets a **new benchmark for AI-driven financial security and investment management**.

With **88% test coverage**, ML-powered risk assessments, and AI-driven **customer retention strategies**, SynaptiQ ensures **data-driven financial optimization for individuals and businesses alike**.