Project Title: LLM-Based Investment Advisor

Team Name: Investment Advisor

Team Members

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2. Problem statement

a) Hill:

WHO: Individual investors interested in the Johannesburg Stock Exchange.

WHAT: Access a customized portfolio with asset allocation, gain forecasts, and clear explanations of complex investment terms.

WOW: Investors get customized portfolio recommendations and forecasts in easy-to-understand charts, perfectly suited to their goals and experience.

Individual investors interested in the Johannesburg Stock Exchange can access a customized portfolio with asset allocation, gain forecasts, and clear explanations of complex investment terms and get tailored portfolio recommendations and forecasts in easy-to-understand charts, perfectly suited to their goals and experience.

Epics:

EPIC 1: As an investor, I want to understand specific investment opportunities in the South African market so that I can make informed decisions.

EPIC 2: As an investor, I want personalized investment recommendations that consider my financial goals and risk tolerance, so I can receive an optimized asset allocation to maximize potential returns and manage risk effectively.

EPIC 3: As a user, I want to explore the investment platform so that I can understand what it offers.

EPIC 4: As an investor, I want to easily understand potential investment returns so that I can make informed decisions about my financial future.

EPIC 5: As a client using the chatbot service, I want to provide feedback on the answers I receive, so that the quality of responses can be improved and I can indicate whether my questions were answered satisfactorily.

Interactions between Users and the system

Sequence Diagrams:

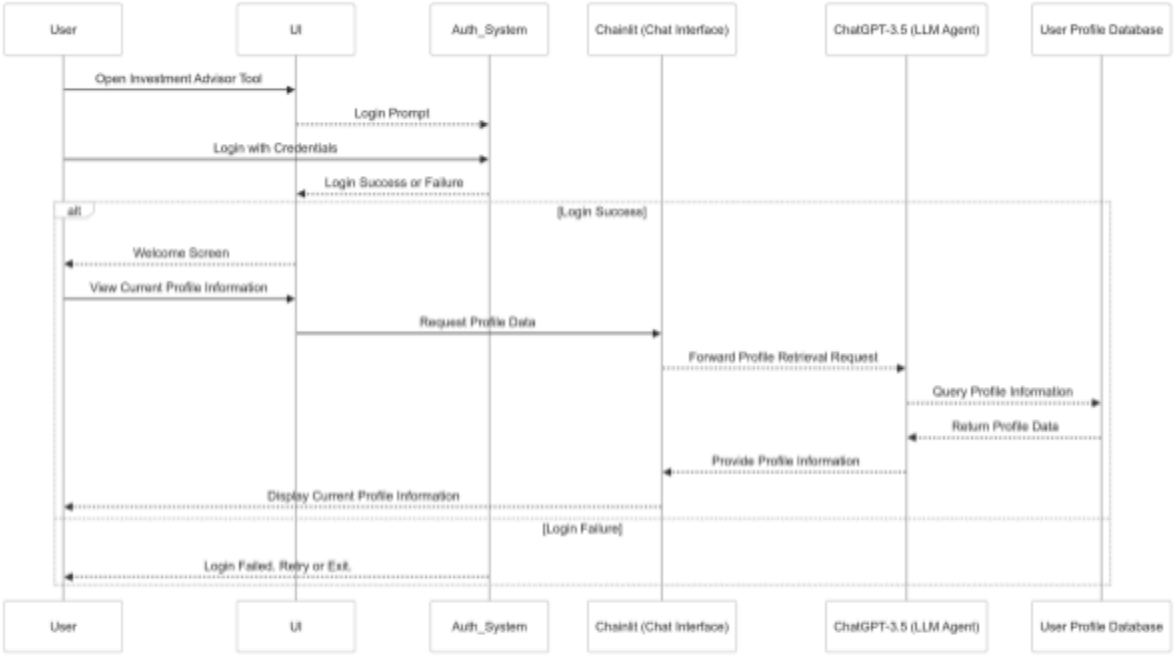

Fig 1: Authentication and Profile management

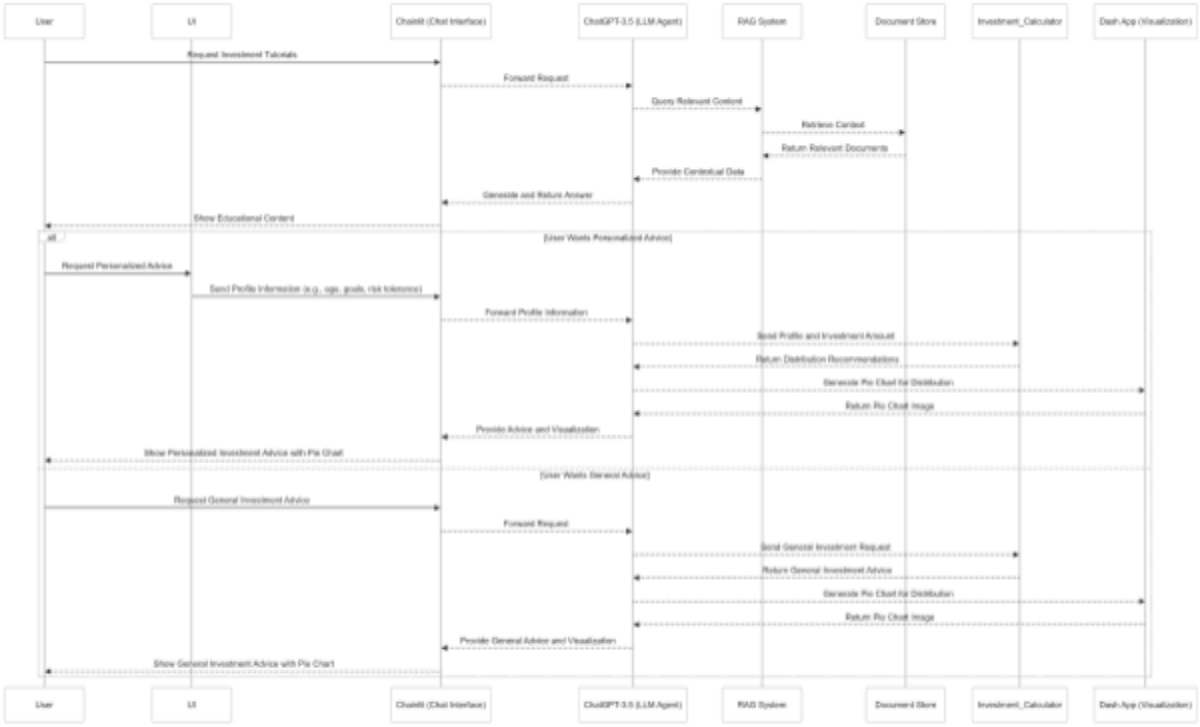

Fig 2: Education and Investment Advice

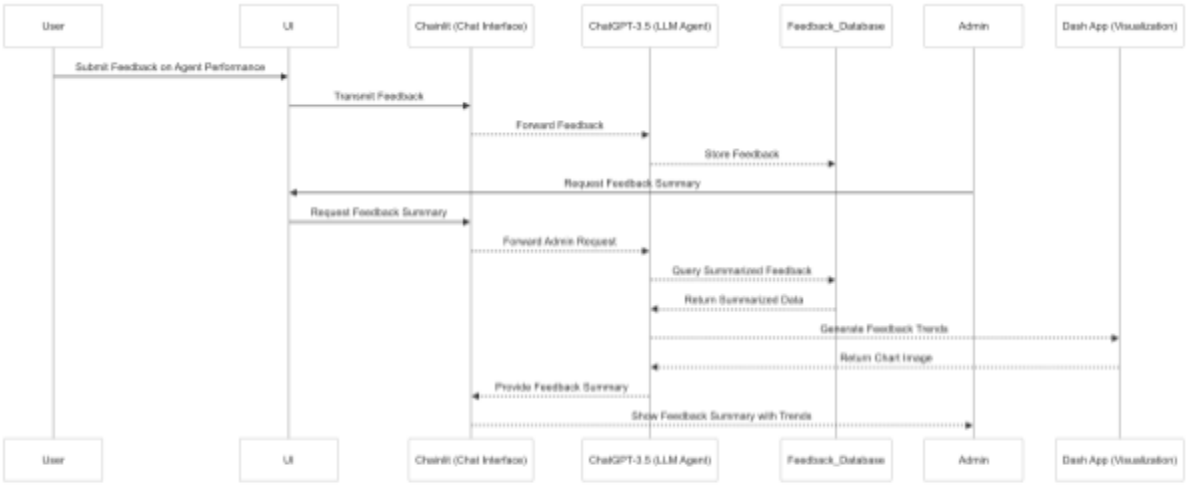

Fig 3:User Feedback and Admin Summary

b) Services to Be Provided:

The system will provide the following services to meet the needs of the users:

1. **Educational Service**: The system will integrate GPT-3.5 alongside a Retrieval-Augmented Generation (RAG) model to provide users with clear and accurate explanations of financial concepts. This combination ensures that users can ask educational questions and receive comprehensive answers tailored to their specific needs, helping them better understand the complexities of investing.
2. **Investment Profiling**: The chatbot will gather user-specific data by asking targeted questions about their investment objectives, preferred investment term, and financial goals. Using this information, the system will create a detailed risk profile for each user, serving as the foundation for personalized investment recommendations.
3. **Resource Allocation**: Leveraging the user's risk profile from the investment profiling stage, the system will allocate assets across stocks, bonds, and mutual funds in a manner optimized for their risk tolerance and financial objectives. This ensures that the portfolio aligns with the user's preferences while balancing potential returns and risk exposure.
4. **Prediction and Forecasting**: The forecasting tool will utilize key financial formulas, including compound interest and growth rate calculations, adjusted for inflation. These computations will provide predictions on how each asset within the portfolio is expected to perform over the specified investment horizon, offering users a realistic outlook on their financial future.
5. **Visualization**: The system will present users with interactive and intuitive visualizations of their resource allocations and portfolio forecasts. Dashboards will display data in formats such as pie charts and growth graphs, ensuring users can easily interpret their investment performance and adjustments over time.
6. **Feedback Collection**: A built-in feedback mechanism will allow users to rate the accuracy and usefulness of the system's recommendations and educational responses. This feedback will be used to refine the system continuously, ensuring its services remain effective and user-focused.

3. Project Plan:

a) Major activities and time allocation

Schedule	**Activities**	**Tasks/Efforts**	**Milestones**	**Deliverables**	**Status**
Sprint 1 (Week 1 -2)	Educational content	- Integrate GPT-3.5 for financial question answering. **(48 hours)**	**Milestone 1: Demo on 1st of October 2024**	Sprint 1 review demo first functional part	Done
Sprint 2 (Week 3 - 5)	The RAG was integrated in the system	- Set up connection to the RAG System. **(24 hours)** - Develop and test chatbot interface (Chainlit + Dash). **(24 hours)**	**Milestone 2**: mid-term presentation on **29th October 2024**	We will demo a functional chatbot that can answer financial questions concerning the South African market using GPT-3.5.	Done
	Build an asset allocation tool based on a questionnaire.	- Integrate with an allocation tool based on a questionnaire that computes the risk profile and generates recommendations. **(24 hours)**		We will demo how users can enter their investment preferences through the chatbot. The demo will include integration with the asset allocation tool, showing personalized recommendations based on user risk profile.	
	Resource	- Develop a		We will demo a	

	allocation dashboard	Dash-based dashboard to display resource allocation. **(12 hours)** - Create visualizations (pie charts) for allocations (stocks, bonds, mutual funds). **(4 hours)**		dynamic Dash-based dashboard that visualizes resource allocations (e.g., pie charts for stocks, bonds, and mutual funds). The demo will showcase the real-time update of allocation results and user data persistence across sessions.	
Sprint 3 (Week 6 - 7)	Integration of the front-end and backend with working visualizations.	- Integrate with the external forecasting tool for predicting future gains. **(24 hours)** - Retrieve and display predictions on the dashboard. **(16 hours)** - Ensure predictions update dynamically based on user allocation changes. **(24 hours)** - User interface **(24 hours)**	**Milestone 3**: Sprint demo on **November 5th**	We will demo the integration of the external forecasting tool that predicts potential future gains based on the user's investment allocations. The demo will include how predictions are updated dynamically in the dashboard based on allocation changes.	Done
Sprint 4 (Week 8 -9)	Forecasting tool integration into the	- Display past conversations and historical data for	**Milestone 4**: Sprint demo on **November**	We will demo the complete system, including user authentication,	Done

	LLM agent. user authenticati on	returning users. **(48 hours)** - Integrating the LLM agent with a forecasting tool for predicting future gains. **(40 hours)**	**19th**	the ability to view past interactions, and a fully functional investment advisor system. The demo will show the integration of all components: education, recommendations and predictions	
Sprint 5 (Week 10 -11)	Feedback system, review and final integration. Testing and feedback Data persistence	- Functional and integration testing. **(24 hours)** -Implement a feedback collection system. **(24 hours)** -Address Critical Issues. **(16 hours**) - Ensure persistent data display on subsequent logins. **(24 hours)**	**Milestone 5**: Final presentation on **December 3rd 2024**	Comprehensive testing result Functional and integration test reports. User feedback insights and recommendations Resolved critical issues and system refinements. Final presentation	In progress

Note: Each sprint consists of 96 hours, with 8 hours reserved for meetings and 88 hours for development and research work.

b) Resources needs

1. **Computing resources**:
   The project requires access to the OpenAI GPT-3.5 API, which powers the language model for generating responses, and the LangChain API, which helps manage conversations and retrieve relevant information efficiently. Chainlit will also be used as the chat interface to enable smooth and interactive communication between the system and users. These tools are essential for delivering accurate recommendations, educational responses, and personalized investment insights.
2. **Development environment**:
   The dashboard and visualization features will be developed using Dash, a Python-based framework for creating interactive web applications. For storing user profiles and preferences, an SQLite database will be used. This ensures user data is securely saved and can be retrieved for future sessions, providing a seamless experience for returning users.

4. Plan for success:

a) Criteria for measuring outcomes:

1. **Milestone verification:** We will conduct demos during the remaining weekly meetings with our faculty advisor showcasing completed features (e.g., chatbot, resource allocation, prediction system) to verify they meet user and system requirements.
2. **Deliverable reports:** Final deliverables will be sent to our faculty advisor including team engineering notebooks, billable hours etc.
3. **Key performance indicators:** Users should be able to view a pie chart displaying their resource allocation (stocks, bonds, mutual funds) on the dashboard, and the system shall answer at least three financial questions correctly to ensure the accuracy of educational content provided by GPT-3.5 and Tavily integrations. Additionally, we will collect input-output data to verify that the system's responses match expected results and use benchmark datasets to further evaluate system accuracy and performance.
4. **User feedback:** we will collect feedback from the advisor during the remaining weekly meetings to evaluate the system's usability, educational content, and recommendation accuracy.
5. **Testing and validation:** Each sprint has included unit and integration testing, with automated test cases ensuring functionality across education queries, user inputs, and dashboard updates.

b) Risk identification and handling:

1. **Organizational risks**:
   Communication delays could disrupt project flow. To mitigate this, we will hold regular team meetings and use project management tools to track tasks and deadlines efficiently. Additionally, time constraints may pose a challenge, so we will follow a scrum methodology to ensure incremental progress while allowing flexibility to adjust workloads based on project needs and unforeseen delays.
2. **Technological risks**:
   There is a risk that general LLM models may not be niche-specific enough for financial topics. To address this, we built a custom education RAG that uses relevant financial data from the JSE to improve accuracy and relevance. Another concern is the lack of advanced web development expertise within the team. To overcome this, we will use user-friendly frameworks like Dash, prioritizing simplicity and functionality over visual complexity.
3. **Dependency risks**:
   Lack of access to premium financial data APIs could hinder the system's ability to provide accurate market data. To prevent this, we will secure the necessary API subscriptions early in the project.