Introduction

Motivation

The financial services industry has witnessed a paradigm shift towards personalization, driven by evolving customer expectations and advancements in technology. Personalized financial advisory services have become essential in catering to the unique financial goals, risk appetites, and life circumstances of individual clients. Traditional advisory models, however, struggle to deliver tailored advice at scale due to their reliance on manual processes and limited data integration capabilities.

Concurrently, the proliferation of data from diverse sources—including transactional records, market data, social media, and regulatory updates—presents both an opportunity and a challenge. Financial institutions possess vast amounts of structured and unstructured data that, if effectively harnessed, can significantly enhance the personalization of advisory services. The integration and interpretation of this heterogeneous data exceed the capabilities of conventional data processing and analytical methods.

Retrieval Augmented Generation (RAG) has emerged as a promising approach that combines the strengths of large language models (LLMs) with information retrieval systems. By leveraging knowledge graphs or graph databases, RAG can access and integrate vast, interconnected datasets to generate contextually relevant and personalized outputs. Knowledge graphs provide a structured representation of information, capturing entities and their relationships, which is particularly advantageous in modeling complex financial domains.

This thesis explores the application of RAG on knowledge graphs to address the challenges of delivering personalized financial advisory services at scale. The central premise is that integrating RAG with knowledge graphs can enable the generation of tailored financial advice by retrieving relevant, client-specific data and applying sophisticated natural language processing techniques.

Problem Statement

Despite the potential benefits, several obstacles hinder the effective implementation of personalized advisory services using traditional methods:

1. **Data Silos and Fragmentation**: Financial data is often dispersed across multiple systems and formats, impeding comprehensive analysis.
2. **Scalability Issues**: Manual personalization is labor-intensive and not feasible for large client bases.
3. **Regulatory Compliance**: Ensuring advice adheres to ever-changing regulations adds complexity to the advisory process.
4. **Transparency and Explainability**: Clients and regulators demand clear explanations for advice, which is challenging with opaque AI models.

Objectives

The primary objective of this research is to develop a framework that utilizes Retrieval Augmented Generation on knowledge graphs to enhance personalized financial advisory services. The specific goals include:

- **Designing a Knowledge Graph Model**: Constructing a financial knowledge graph that integrates client data, financial products, market trends, and regulatory information.
- **Implementing RAG Techniques**: Applying RAG to retrieve relevant information from the knowledge graph and generate personalized advice.

- **Ensuring Compliance and Explainability**: Incorporating mechanisms to produce advice that is both compliant with regulations and explainable to clients.
- **Evaluating Effectiveness**: Assessing the proposed framework's performance in terms of personalization accuracy, scalability, and user satisfaction compared to traditional methods.

Significance of the Study

This research contributes to the fields of artificial intelligence and financial technology by:

- **Advancing AI Applications in Finance**: Demonstrating how advanced AI techniques can address real-world financial advisory challenges.
- **Enhancing Personalization**: Providing a scalable solution for delivering customized financial advice to a broad client base.
- **Improving Data Utilization**: Showcasing the effective integration of heterogeneous financial data sources through knowledge graphs.
- **Facilitating Regulatory Compliance**: Offering a method to generate advice that is aligned with regulatory requirements and transparent in its rationale.