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Chapter 9: Personalized financial services powered by generative artificial intelligence

9.1. Introduction

Generative Artificial Intelligence (Gen-AI) is making a significant impact in a wide variety of industries. Due to increasing business demands, improved cloud-based services, and advancements in model architecture and algorithms, interest in Gen-AI is surging. There are opportunities to offer personalized financial services using Gen-AI in several ways, including assisting regular investment and tax planning by quantizing a person's whole financial situation, dynamically providing news summaries and question-and-answer content related to investment and taxes, and offering personalized financial advice and templates for financial documents and contracts. The Gen-AI sector landscape includes a variety of tech firms providing significant AI services and solutions. This article aims to describe how Gen-AI can improve personalized financial services and to highlight potential problems and directions in application (Abbad & Hussain, n.d.; Akhtar et al., 2024; Aldasoro et al., 2024).

Generative AI (Gen-AI) has been rapidly adopted across various industries, including finance, since its debut as a prominent field in recent years. It has attracted a lot of attention from both individuals and institutions. There are many explanations for this hype of Gen-AI, including rapidly increasing business demands for this service and the convenience of cloud-native services enabling varied enterprises to incorporate large model services easily. Moreover, with the development of guiding model architectures and algorithms, Gen-AI has become more efficient, cheaper, easier to use, and more capable. As a result, current Gen-AI models wield great potential regarding providing personalized financial services. Gen-AI has been applied to a wide variety of financial services that are related to data or insight generations, especially portfolio-related services, which aim to analyze, model, and predict future stock trends or to better manage

a person's wealth or risk. However, few efforts have researched how to use Gen-AI in personal financial services that are related to document generations, recommendations, or automatic content analysis. Hence, this article aims to give a relatively comprehensive picture of how Gen-AI works in enhancing personalized financial services.Instead of providing mere lists of candidates with analysis bricks of corresponding advantages and disadvantages, and relevant review articles, etc., a grasp approach to discover hidden financial solutions through personalized and targeted conversations, stepwise interactions with financial institutions, and summary collections of potential products. AI can be used to transform a big firm into a brand like Apple offered it for luxurious products with identities, moods, and feelings. Credit cards considered on-demand consumption scenarios, parsing pre-made queries segment wise are worth the investment. Institutions need to share the concerns of being persuasive and revealing instead of manipulative.

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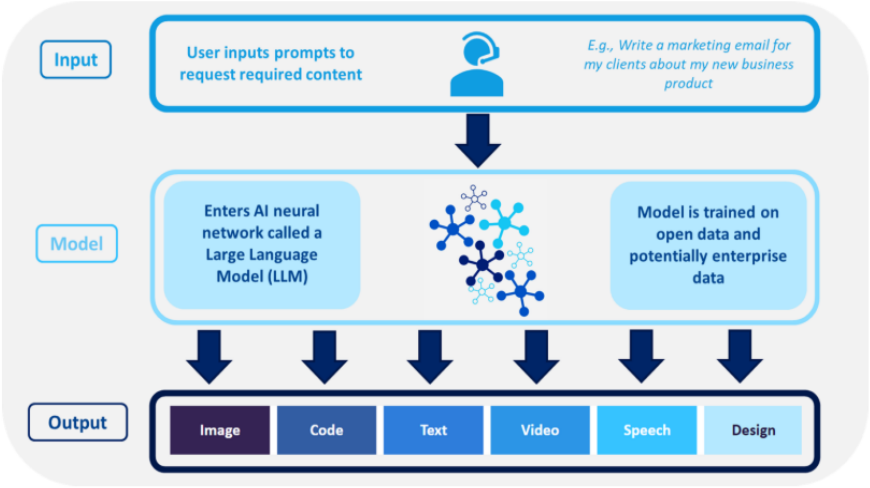

Fig 9.1: Generative Artificial Intelligence (AI) in Financial Services

9.2. Overview of Financial Services

Financial Services, also referred to as Financial Technology, fintech, or Info-Fin-Services Technology (FST), is a broad interdisciplinary subject. It encompasses a wide range of sectors and subsectors of companies and industries related by the shared use of technology to offer, help deliver, or facilitate financial services. The term typically refers to the company's use of sophisticated technology to carry out banking or trading services and offer financial advice or other information services. Fintech companies offer money transfer services, stock trading, lending, credit ratings, crowdfunding, analytic tools for

investors, and even services such as tax preparation. Well-known fintech companies include Intuit, Wealthfront, Funding Circle, and Toast. Companies operating within finance-related sectors that use technology to drive innovation in financial services are also considered fintech, such as chipmakers, Payment Gateways, Blockchains, Crypto Exchanges, and Crypto Wallets. When restricted to companies in the pure software category, fintech refers to software platforms that facilitate banking and trading. Despite the availability of software that helps execute algorithmic trading strategies, this has remained on the periphery of the fintech industry. Major Wall Street players tend to prefer internal, proprietary solutions for seat management and order tracking across trading venues and desks. There are companies developed to help brokerages migrate their trading to suggestions or enable brokers to create automated telco and client contact platforms for regulated markets.

Currently, financial services powered by Generative AI for personalization are officially offering tailored user experience customers in the form of powers of customer care, and product suggestions. The new stretchy way to render financial services is to leverage insights from OpenAi with Google Search Laws and Information invader platforms to help customers find tailored credit cards, brokers, brands, loyalty programs, overall services, etc. in the formats of questions and answers.

9.3. Generative Artificial Intelligence: A Primer

This section provides basic information about generative artificial intelligence (GAI): its definitions, historical developments, limitations, and potential future roadmap. GAI is an artificial intelligence (AI) technology that enables today's machines to create compelling narratives, image designs, songs, videos, and other outputs. Deep learning models are developed using much data from people to imitate their creations with incredibly high quality. As a result, GAI can replace people to program and design, write and brainstorm ideas, entertain and educate, and even love. GAI can disrupt the world as profoundly as the internet, spreadsheets, LLMs, and other past technological breakthroughs have done. This section begins with basic definitions of generative AI systems, LLMs, and web crawlers. It then discusses how GAI dramatically developed over the past years with Turing-like test-like studies. Additionally, this section highlights the limitations of generative AI technologies and details potential solutions for improvement in the future.

GAI is a class of software that learns to create new and novel data from existing training data. This capability encompasses the generation of text, images, audio, program code, and other content forms. There seem to be three essential pieces to GAI technologies. For GAI applications to succeed, they require a large amount of reasonable-quality training data, usually scraped from the web. General web crawlers search multiple

websites and documents to obtain it. The larger and more diverse the training data, the better the GAI systems can mimic it. However, there are limits for the world's most famous GAI systems, such as ChatGPT, to crawl data. To a large extent, GAI systems still deeply depend on data created by humans, especially data from less-known third-party firms, for which they need to pay the owners/creators of data.

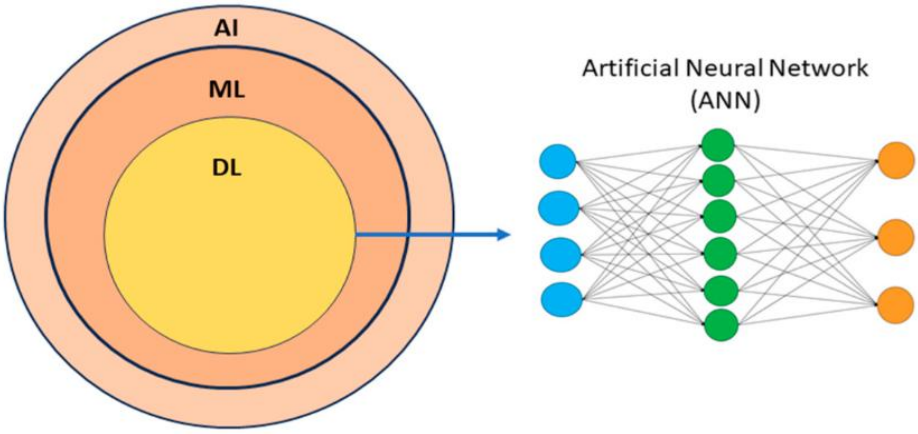

Fig 9.2: A Primer on Generative Artificial Intelligence

9.4. The Role of AI in Personalization

The emergence of personalized web applications that tailor contents and services to individual interests has been aided by the rapid growth of the Internet and the availability of technological infrastructure. Personalization is a broad concept encompassing pre-selection of items of interests, follows after learning, and is iterative and dynamic. The frontiers of personalized internet applications include news filtering, product recommendation, collaborative filtering, mail filtering and classification, specialized search engines, grant writing and funding opportunities screening, next-generation portals, personalized home pages, personalized article syndication, personalized aggregators, enterprise web portal, and web-based CRMs. Moreover, interactive, multi-modality applications with adaptive UIs and presentation-based personalization are emerging. The cross-cutting parsing of user needs, profiles, and preferences with query interpretation and session modeling and user modeling are great challenges and hotbeds for research. Personal services at web sites are specified as a class of problems for which personalization technology is a means to an end. A modeling methodology for reasoning about personalization, a two-part framework for reasoning about personalized interactions, and an example of using the methodology to reason about the personalization of an ePay web site is presented.

Research into personal web agents is still in its infancy. However, there has already been a wide base of technology for reasoning about personalization. This factor is enabled by advancements in information retrieval classification, reconciling variety in information representation, user modeling, information filtration, web monitoring, software agent technology, and other areas central to personalization. These various ingredients themselves, however, are largely disconnected and provide neither a conceptual common ground nor an integration point.

Disparate streams in the literature provide an abundance of information about assessing and evaluating components and system performance, algorithms for tailoring web content, defining personalization and other associated terms, and some novel applications. However, these treat personalization narrowly as a particular kind of application but do not specify its context, motivations, and implications or general principles for reasoning about personalization. One of the goals is to help put design considerations and challenges in a proper context. In particular, a framework for reasoning about personalization is motivated, which is composed of diverse contextual factors structuring personal services. The contextual factors concern, among other things, general characteristics of web contents and services; user characteristics; modeling and representation; web server considerations; and reasoning techniques and processes.

9.5. Data Collection and Management

The basic problem of collecting and analyzing data for PFM services speaks to how to procure transaction data in a form that is useful, since data is not reported and shared in the same way by various sources. Transaction reporting greatly varies among (or even

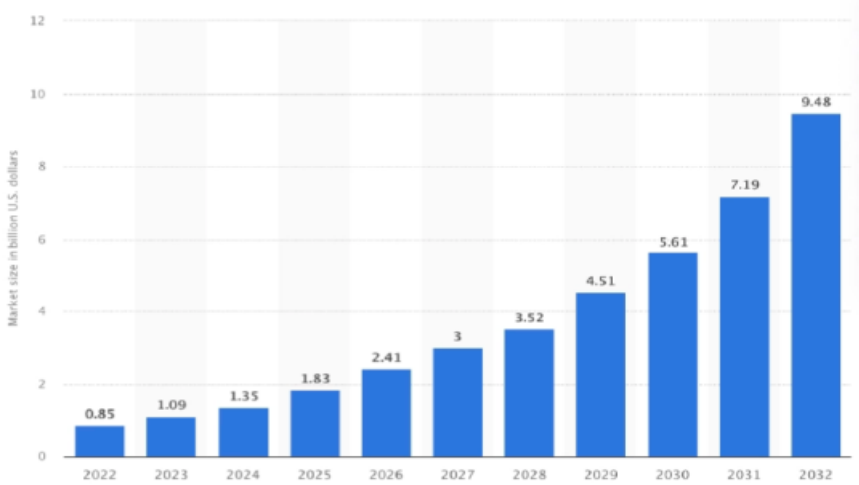

Fig : Generative AI in Finance

within) FIs regarding how to structure, represent, and encode transaction data. Transaction kinds can be grouped into bank transfers, deposits, withdrawals, and payments. Each transaction kind can be grouped into transaction data, which includes metadata. With that in mind, as a first step towards acquiring a full understanding of transaction data, practical application was written to focus on bank transfer transactions. The following list provides a complete dictionary of transaction data for bank transfers, similar to how this data is defined in the most elaborate systems - checking and savings accounts. Bank transfers are preceded by various names: wire transfers, ACH transfers, and interbank transfers. Broadly speaking, as far as identifying the nature of the transactions, bank transfers indicate a flow of money between different financial institutes. There are typically four pieces of information that emerge from bank transfers: the three actors involved, the money amount, and the time of the transaction.

9.6. Customer Segmentation Techniques

As customer bases continue to grow, customer segmentation in banking has become an increasingly important field [8]. Traditionally, customer segmentation has been achieved using demographic features such as age, gender, and location. However, demographic features produce coarse segments with only a limited number of segments. Hence, using only demographic features in customer segmentation also introduces the potential for discrimination. Although coarse segments are beneficial, micro-segmentation is needed in banking to obtain a more sophisticated classification. Thus, micro-segmentation improves personalization and reduces the potential for discrimination against customers. The need for more fine-grained segmentation techniques has been acknowledged within the banking sector. Surprisingly, the scientific community has been quiet on customer micro-segmentation, even within the finance sector, which is sensitive to data privacy and legal obligations.

Customer micro-segmentation is capturing customers into segmented groups with similar behaviors or needs. Personal financial services have advanced significantly over recent years, which require user-specific behavioral segmentation approaches. Customer segmentation can be achieved through a wide variety of techniques based on usage data analysis. Users' behaviors can change discretely over time, which cannot be analyzed with fixed-length representation of behavioral data. On the other hand, users with observed similar behaviors could have different social relationships affecting its consumption habits. Users also possess categorical attributes affecting their interests in the service. When building a recommendation system for service providers, a wide variety of user attributes need to be analyzed including categorical data, sequential data, and static data, which poses a significant challenge for data processing.

Most previous studies conducted on customer segmentation primarily focused on relevant feature selections. Researchers examined the effect of enhanced techniques on customer segmentation performance and a systematic review of craft-related features was performed towards improving cluster quality. Past approaches on customer segmentation generally focused on the detailed feature extraction for financial data. As a high performance with insufficient knowledge of the adopted approach is undesirable for service providers, a better understanding of customers' spending behavior under the explainable deep learning framework is required. In addition, since users' behaviors in finance are often affected by economic development, the seasonality of the clustered behavior patterns should not be ignored.

9.7. Conclusion

The financial industry has witnessed substantial advances in technology over the last decades. The digitalization, modelization, and automation of financial services have pushed on-demand and self-service financial applications powered by AI to the forefront. The emergence of innovative technologies has led to the rapid development of a wide range of means in data acquisition, measurement, processing, and analyzing of financial information. However, widespread adoption emphasizes the necessity to address significant challenges in ethical and regulatory implications, industry standards, data privacy, effectiveness, and human-AI interaction. Technologies have evolved considerably, particularly in blockchain technology and generative AI.

Through the utilization of innovative technologies, such as chatbot technologies and Robo-Advisors, there are numerous opportunities available to offer financial services that are both personalized and accessible. These services can enhance the conventional customer experience by creating more engaging, efficient, and satisfying points of contact. An unprecedented market demand has emerged for redefining the relationship with money, especially for profit-granting services such as wealth planning and investing. Traditional wealth management services have become a privilege, costly and tedious, and reserved for top wealth individuals. At the same time, people are overwhelmed by a growing pool of available investment options, tools, and information from countless channels. There has been alarming worldwide surging demand in retail investment and funding, yet the dilemma of investing without risking personal hardship remains unsolved.

With the advent of Gaming, media, and entertainment (GME) stocks in the finance arena, an unprecedented hype has gripped the stock market, igniting a legion of new retail investors as well as a litany of irrecoverable losses. This igniting riot also casts a dark shadow on the stock bust from the late 90s. On the other hand, the concept of Responsible AI was reasonable, raising rising concerns on the fairness and transparency

of AI solutions that remained opaque to both regulators and subject individuals. Traditional wealth management services and products still revolve around humans, which are not personalized, simple, or accessible.

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