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## Financial Planning Chatbot

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### Abstract

The financial market is volatile and complex, often requiring individuals to make informed decisions quickly. With advancements in artificial intelligence, large language models (LLMs) have emerged as powerful tools for understanding and generating human-like text, enabling the creation of financial planning assistants. This paper presents a financial planning chatbot powered by a LLM, designed to provide personalized financial advice based on user input aimed at assisting users in managing their finances more effectively

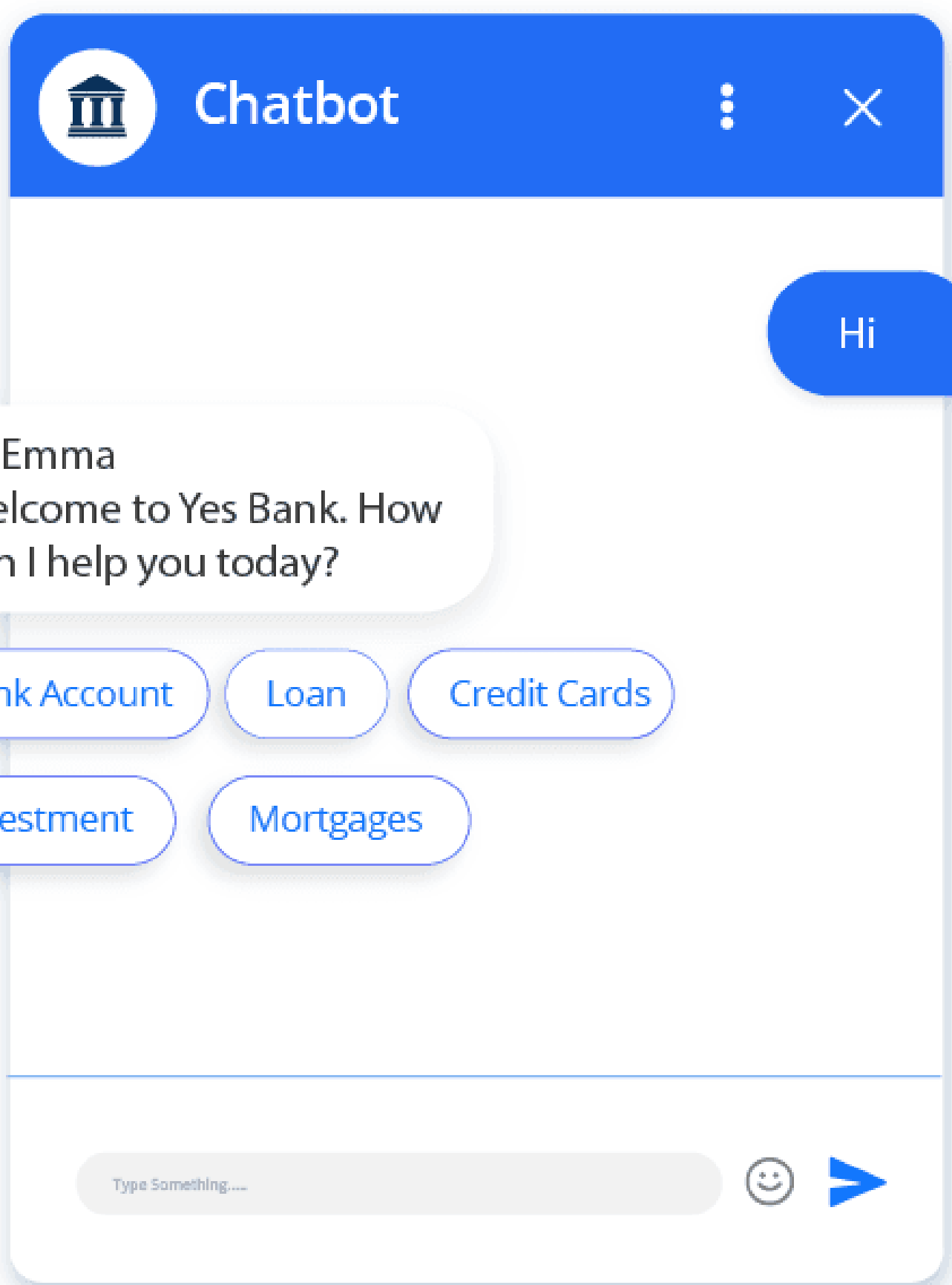
### Introduction

Financial markets are very hard to predictable, with stock prices, interest rates, and economic conditions constantly shifting. This volatility presents challenges for individuals seeking to make informed financial decisions. Traditional financial advisors are expensive and often inaccessible, making automated tools essential. Recent advances in artificial intelligence (AI) have made it possible to develop systems capable of understanding and generating human-like responses. Large language models (LLMs), specifically, are well-suited for tasks that require deep understanding of natural language. In this paper, we explore the design of a financial planning chatbot based on an LLM. This paper outlines the development of the financial planning chatbot and examines its effectiveness in handling real-time financial data. We focus on its ability to provide personalized financial advice, addressing the unique needs of each user while taking into account the market's inherent volatility.

### Development

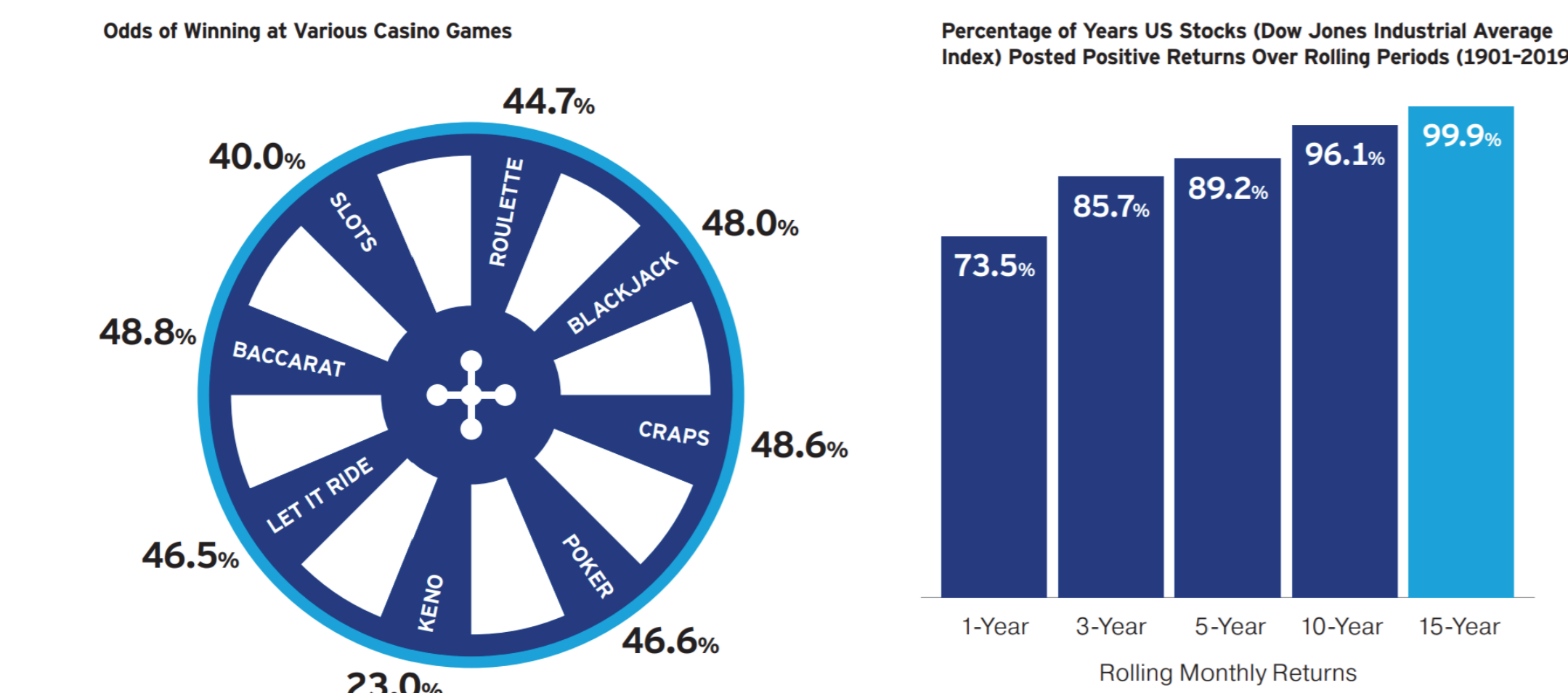
The financial planning chatbot is built around three main components: the user interface, an LLM for natural language processing, and a financial data integration module. Users can ask financial questions, and the LLM interprets their queries. The system retrieves relevant financial data, such as stock prices and savings rates, from real-time sources to offer tailored advice. The decision to use an LLM was driven by its ability to understand diverse natural queries and generate accurate, personalized responses. Unlike traditional systems, which rely on pre-programmed rules, the LLM can process a wide range of input without extensive reprogramming.

#### Finance Chatbot



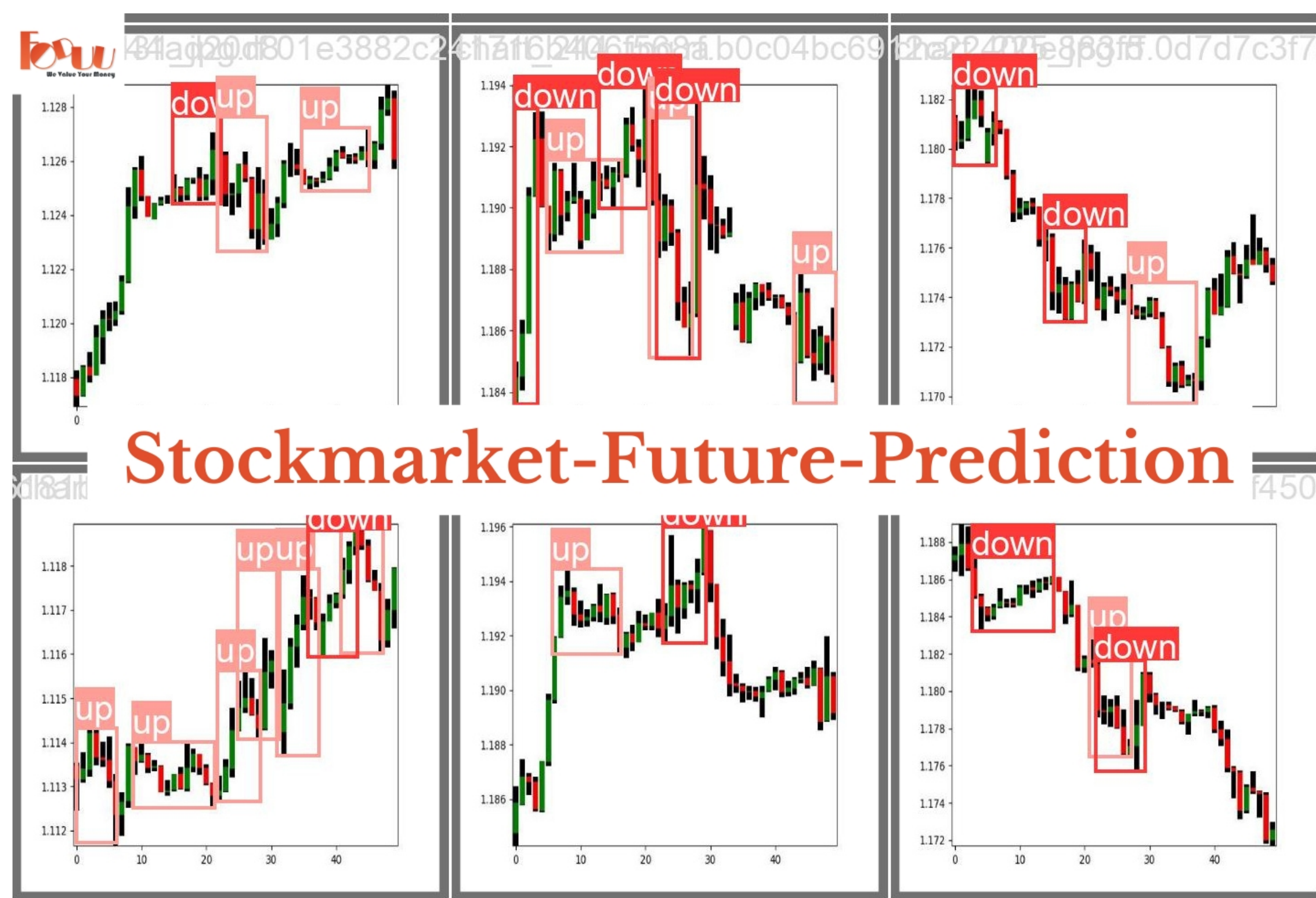
A general representation of a financial system using an LLM involves several core components: data input, natural language processing, and output generation. The system collects realtime financial data, such as stock prices and economic trends, and processes it through the LLM, which interprets user queries. The model analyzes these inputs, recognizes patterns, and generates personalized financial insights. This system is designed to adapt to changing market conditions, ensuring relevant and context-aware responses. Its architecture ensures scalability and flexibility, allowing it to handle complex financial queries efficiently and accurately. The financial market is highly sensitive to external factors, such as economic shifts, geopolitical events, and investor sentiment. Market inputs, like stock prices and interest rates, are volatile and unpredictable. LLMs process this dynamic information, adjusting outputs based on changing patterns in real-time data. However, the randomness and frequent fluctuations in market inputs introduce variability in the model's predictions, requiring constant updates to maintain accurate, contextually relevant responses.

#### Is the Market Really Like a Casino?



Source: Bloomberg, L.P. 10/31/19. Chart is for illustrative purposes only and is not intended as investment advice. US stocks are represented by the Dow Jones Industrial Average Index. Source of Casino odds: Wizard of Odds. The charts are hypothetical examples which are shown for illustrative purposes only and do not predict or depict the performance of any investment. An investment cannot be made directly into an index. Index definitions can be found on page 59. Past performance does not guarantee future results.

To ensure that the chatbot could handle dynamic market conditions, we must integrate a real-time financial data. This allows the system to offer up-to date advice even as markets fluctuate. The complexity of the financial market stems from its unpredictable, stock-driven nature and the influence of numerous interconnected variables, such as global economies and investor behavior. LLMs handle this complexity by processing vast amounts of data, recognizing patterns, and generating predictions. However, the market's stochastic elements and rapid shifts increase computational challenges. LLMs must efficiently manage these variations, adapting to complex, multifaceted inputs to provide reliable, real-time analysis while balancing accuracy and processing speed.



Emergent behaviors in financial systems arise from the unpredictable interaction of global events, market trends, and investor actions. LLMs, when processing vast financial data, can develop unexpected patterns or behaviors that weren't explicitly programmed. For instance, an LLM may shift its advice toward more conservative strategies during economic instability. These emergent behaviors highlight the system's ability to self-adapt, influenced by real-time data, world events, and complex market conditions, ultimately creating responses that evolve as new inputs or situations arise.

### EXPECTED RESULTS

Expected results in financial systems driven by LLMs include accurate, context-specific insights based on real-time market data. The model is expected to generate personalized financial advice by recognizing patterns in dynamic inputs like stock fluctuations and economic indicators. LLMs should adapt quickly to changes, providing relevant responses that align with current financial trends. Additionally, the system is expected to handle diverse queries with flexibility, ensuring scalability while maintaining performance and delivering precise, timely information despite the inherent volatility of financial markets. The chatbot is expected to deliver accurate, real-time financial insights tailored to individual user queries. By processing dynamic market data, it will provide relevant advice on budgeting and investment strategies. The system should effectively adapt to changing market conditions while maintaining high responsiveness. Ultimately, the chatbot aims to improve users financial literacy and empower them in navigating complex financial decisions.

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