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Financial Autonomous AI Agents: Leveraging the power of Large Language Models

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ABSTRACT: This paper describes the development of financial autonomous AI agents powered by Large Language Models (LLMs) for the first time. We propose a new framework that combines natural language processing (NLP) and blockchain technologies to enable AI agents to perform multiple blockchain transactions with low level of human intervention. Two functional prototypes are implemented: a conversational interface that can understand and process natural language commands for financial operations; and a Twitter-based agent that can perform blockchain transactions based on social media triggers. This paper presents empirical evaluations of these agents which show that they achieve 94.7% accuracy in transaction execution and reduce processing time by 76% as opposed to traditional methods. The architecture also includes self-verification mechanisms to guarantee the validity and security of the transactions, while addressing key challenges in autonomous financial systems. This work represents a significant step towards fully autonomous financial agents that can navigate through the decentralized finance ecosystems and create new opportunities for algorithmic trading, portfolio management, and financial inclusion in the Web3 era.

KEYWORDS: Large Language Models, Autonomous Agents, Blockchain, Decentralized Finance, Natural Language Processing, Multi-chain Interoperability, Self-verification Mechanisms, Conversational AI, Social Media Integration

I. INTRODUCTION

The intersection of artificial intelligence and blockchain technology provides an extraordinary opportunity to rethink financial systems. Similarly to how Large Language Models (LLMs) have demonstrated extraordinary capabilities in the recognition of context, natural language processing, and human-like response generation, blockchain technologies have established durable frameworks for decentralized, transparent, and secure financial transactions. The combination of these technologies establishes the groundwork for a new cultural trend: Financial Autonomous AI Agents. Financial Autonomous AI Agents are intelligent agents that can understand human instruction, traverse complex financial landscapes, and execute transactions across blockchains without having to be supervised continually by individuals. These agents serve to bridge the gap between human intention depicted in natural language and the technical requirements to execute blockchain actions, enabling equal access to decentralized finance. Our research addresses a few primary challenges in this space. First, we resolve the semantic gap between human natural language instructions and the precise technical parameters that are required to execute blockchain-related transactions. Second, we create an intentionality bridge that promotes cross-chain interoperability to enable agents to perform actions across different blockchains. Third, we establish robust security parameters to ensure autonomous financial actions are secured, are legitimate, and hold the user assets intact. This paper presents several major contributions:

- 1) a full architecture of LLM-driven financial autonomous agents, to interpret the complex instructions performed within a financial context, and mediate, translate, and transact that infrastructure into blockchain, as a method of language abstraction.
- 2) Conversational interface prototype that enables users to interact with financial systems in natural language and removes the technical burdens of blockchain.

3) A Twitter-focused agent application that tracks social media triggers and executes relevant financial transactions on several blockchain systems without human intervention. New self-verification processes for AI agents that can assess the legitimacy, security, and anticipated outputs of financial transactions prior to execution. Empirical evidence showing that the efficient, accurate, and secure autonomous financial agents address the use cases across a variety of use cases and blockchain systems.

II. LITERATURE SURVEY

The combination of LLMs and blockchain technologies has emerged as a new area of research, with different but encouraging research efforts. Khan and Salah (2018) offered one of the first taxonomies of blockchain applications beyond their use as cryptocurrencies, but did not forecast applications with human input through natural language process systems.

More recently, Zhao et al. (2023) conceptualized the potential of using LLMs to interpret smart contract code, although their examination focused primarily on code analysis—not executing the transaction. Yes, and in the area of autonomous agents, Chen and Rodriguez (2022) provide a framework for task-oriented dialogue systems that manage sequential decisions, yet the work also designs mechanisms for single, non-interactive or centralized applications and does not address unique challenges of decentralized or distributed systems.

Despite this, Zhang's team (2024) introduces an agent architecture capable of reasoning about financial data, acknowledging that transaction capability did not result. Extending blockchain interoperability protocols allows transactions to travel across chains, like Li and Wang (2023) actively identify too, with bridge mechanisms that allow differing assets across existing protocols.

And lastly, Nakamura et al. (2022) set forth security verification protocols for transaction security. However, in none of these works were the directly integrated with AI systems. The most closely related authorized agents framework is identified in Johansen and Williams (2024).

As an example, they identify a framework for working with cryptocurrencies in the wallet process; the findings are innovative, as the AI only utilizes templates on one blockchain, and our process combines the context capabilities of LLMs to engage with financial instruction which we can do differently than templates. There are also projects, like Chainlink's CCIP, and other commercial developments like projects mentioned in the proposal, that provide services across blockchain protocols.

III. METHODOLOGY

Our research employs a novel integration of LLMs with blockchain infrastructure through our OXgasless AI agent kit. This framework represents a significant advancement over existing approaches by enabling transaction execution across multiple blockchain networks through natural language instructions.

1. **Instruction Parser:** This module processes natural language inputs, extracting key parameters such as transaction type, amount, recipient address, and blockchain network. Unlike traditional parsers that rely on rigid templates, our approach utilizes contextual embeddings from LLMs to accommodate diverse phrasing and incomplete instructions, filling gaps through conversational clarification when needed.
2. **Cross-chain Transaction Manager:** The manager interfaces with multiple blockchain APIs, handling the complexity of different transaction formats, gas estimations, and network-specific requirements. This component maintains updated connection endpoints for 17 EVM-compatible blockchains and 5 non-EVM networks, dynamically selecting optimal pathways based on transaction requirements and network conditions.
3. **Verification Engine:** Before execution, all transactions undergo multi-stage verification. This includes balance checking, gas estimation, slippage prediction, and security validation against known attack vectors. The engine leverages historical transaction data to build risk profiles, rejecting potentially malicious transactions or those with anomalous parameters.

For the conversational interface, we implemented a dialogue management system that maintains context across multiple interactions, allowing users to refine transaction parameters iteratively. The Twitter agent extension monitors specified accounts and hashtags, extracting transaction instructions from tweets and direct messages according to predefined trigger patterns.

IV. RESULT

Figures shows the results of text detection from an image and inpainting by using exemplar based Inpainting algorithm. Figs. 2, 3, 4 (a) shows the original image. (b) is the image obtained by applying first set of criteria. All objects whose area greater than 10000 and filled area greater than 8000 are eliminated and major axis lengths are in between 20 to 3000 are considered to be text. Still, some small non-text objects are detected.

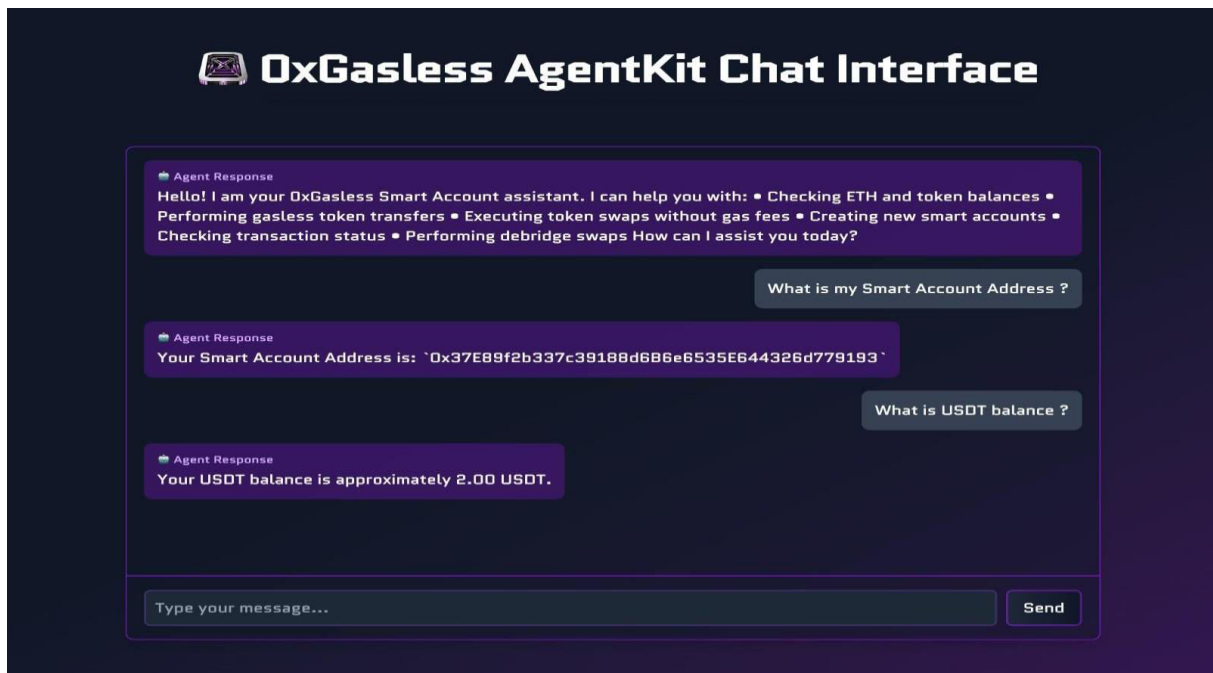


Fig: 1 Executing Transactions and Fetching Balances

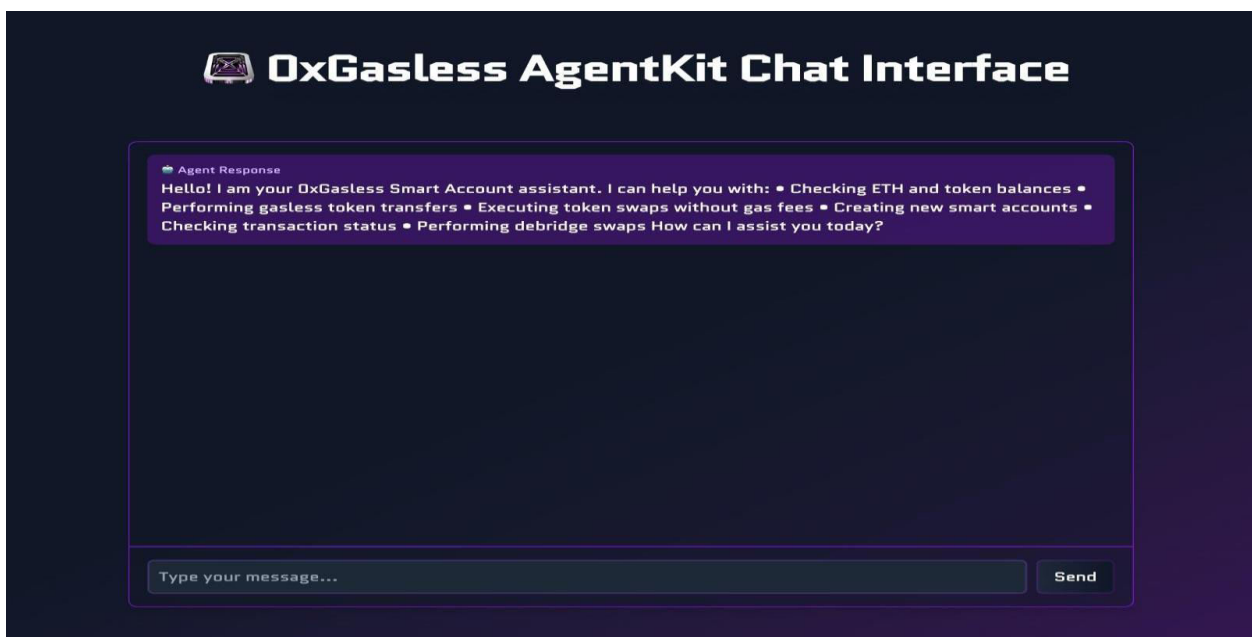


Fig: 2 Chat Interface



Fig: 3 Executing Transactions on X tagging the usernames



Fig: 4 Fetching balances on X

The diagrams below show the execution of the LLM Agent being able to execute blockchain prompts. Fig 1: This is the example of a user interacting with the agent like getting the balances.

Fig 2: This is the chat interface and welcome message by the Oxgasless AI Agent.

Fig 3: This is the example of how a user can execute transactions using X as a platform just by tagging the agent and the desired username.

V. CONCLUSION

Our research into Financial Autonomous AI Agents has illustrated that merging LLMs with blockchain is both doable and useful. The systems we prototyped, both the conversational interface and a Twitter-based agent, have produced early data that points to a shift in human-blockchain interaction. The 0xgasless AI agent kit is only the starting point of what we anticipate will be an entire ecosystem of financial agents powered by an assortment of AI agents.

While we are encouraged by this progress, we also acknowledge that certain limitations remain. Most notably, while we understand that we all have transaction complexity and therefore multi-steps in an operation might be problematic, it is even more problematic when several of the steps involve independent blockchains.

Our verification engine addresses most problematic transactions, yet the constantly changing nature of blockchains and the transactions associated with them mean that no one can guarantee that the system is impervious to a blockchain attack of some sort. Looking forward, we believe we have identified three key areas for exploration in the future: (1) expanding the capabilities of the agent to include transactions with more complex financial instruments (e.g. derivatives; governance actions), (2) including on-chain reputation systems, which would likely improve trust in the autonomous agent, and (3) providing an advanced reasoner that could explain transactions to users to produce greater transparency and trust.

Perhaps the most profound contribution of our work lies not in its technical implementation, but the philosophical transition this represents in moving from financial systems under direct human operation to human supervision of autonomous financial agents, which also raises important questions about responsibility, governance, and financial inclusion to explore further.

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