Autonomous AI Agents in Decentralized Finance: Market Dynamics, Application Areas, and Theoretical Implications

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Abstract: This paper investigates the intersection of AI agents—autonomous software entities capable of adapting, learning, and performing multi-step operations—and decentralized finance (DeFi) ecosystems, highlighting how the adaptive decision-making capabilities, flexible governance frameworks, and data-driven optimization strategies of AI agents reshape market coordination and organizational architectures. By examining major AI agents and broader market trends, the study provides empirical evidence of the growing influence these agents exert within the cryptocurrency economy. Based on a qualitative analysis of 306 major crypto AI agents, a preliminary taxonomy is introduced that maps the diverse application areas AI agents currently inhabit—from trading and algorithmic portfolio management to sentiment-driven memetic communities and immersive entertainment experiences. Drawing on economic perspectives such as transaction costs, agency, and socio-technical systems, the paper locates AI agents within an evolving digital milieu defined by token economies and blockchain-based protocols. While demonstrating the capacity of AI agents to streamline operations, improve decision quality, and enrich user engagement, the study also highlights the challenges they confront. This conceptual and empirical groundwork lays a foundation for more rigorous, interdisciplinary inquiry into autonomous AI agents in decentralized ecosystems.

Keywords: AI Agents, Cryptocurrency, DeFi, Network Effects, Transaction Costs, Decentralized Finance

1 Introduction

In October 2024, an AI agent known as Terminal of Truths (ToT) stunned cryptocurrency markets by becoming the first such entity to achieve millionaire status through its holdings of the meme coin GOAT. Initially a curious offshoot of experimental dialogues between large language models (LLMs), ToT evolved into a self-styled "memetic religion" promoter, ultimately

garnering endorsements from influential figures like Marc Andreessen and capturing the imagination of traders, developers, and investors (Sharma, 2024). Within weeks of GOAT's launch, the token's market capitalization soared past $1.2 billion, solidifying ToT's position as more than just a quirky headline. As Sharma (2024) suggests, the rise of ToT not only exemplifies the power of AI agents to influence markets but also heralds the dawn of a rapidly growing "AI agent meta" within the crypto ecosystem and digital markets.

This transformative event is symptomatic of a broader intersection between AI and blockchain technology. AI agents—autonomous software entities capable of adapting, learning, and performing multi-step operations—are redefining economic structures and governance in decentralized environments. Unlike traditional bots that follow rigid, human-coded scripts, AI agents dynamically interact with other protocols, external data streams, and even human communities without direct human intervention. Their applications now extend beyond mere market-making or data analytics. In decentralized finance (DeFi), these agents run hedge funds (daos.fun, 2024a), autonomously manage liquidity (EtherMage, 2024), and execute complex trading strategies (VaderAI, 2024). Consumer-facing platforms like Virtuals Protocol provide streamlined options to create AI agents, which then serve as digital influencers, personalizing user engagement and supporting tokenized entertainment ecosystems (Virtuals Protocol, 2024b).

The implications of this "AI agent meta" are profound. By minimizing the inefficiencies and agency costs that characterize traditional intermediaries, AI agents can streamline governance processes within decentralized autonomous organizations (DAOs) (Santana & Albareda, 2022; Saurabh et al., 2024). They lower transaction costs by executing rules encoded in smart contracts, enhance transparency through immutable blockchain records, and facilitate more rapid, data-driven decision-making. Platforms like daos.fun illustrate how AI-led hedge funds could reshape investment management (daos.fun, 2024b), while initiatives like RoboNet show the potential of AI agents to optimize algorithmic trading strategies at scale (RoboNet, 2024).

Yet this new frontier is not without challenges. The ToT phenomenon, while headline-grabbing, underscores the emergent nature of these technologies and the need for careful consideration of stakeholder alignment, regulation, and security vulnerabilities. AI models remain prone to hallucination (Verspoor, 2024), and complex, multi-step interactions across diverse protocols introduce scalability and interoperability obstacles (Wang et al., 2023). Moreover, as Sharma (2024) notes, the ecosystem is still in its earliest stages, more akin to a "demo" environment than a mature market. Building a mature and lasting market will require collaborative efforts among developers, policymakers, users, and investors.

Despite the growing prominence of autonomous AI agents in decentralized ecosystems, systematic scholarly attention to their socio-technical and organizational implications remains limited. To address this gap, this study aims to provide an initial scientific basis for the topic. More specifically, it seeks to locate AI agents within established theoretical frameworks of

organizational innovation, market coordination, and digital governance, while offering an empirically grounded appraisal of existing market structures and the diverse operational contexts of AI agents. In doing so, it illuminates the interplay between these agents' emergent roles, their evolving infrastructural conditions, and the normative considerations that guide their integration into blockchain-based systems. Ultimately, this conceptual and empirical groundwork seeks to catalyze deeper, interdisciplinary inquiry into AI agents, encouraging scholars to refine theoretical constructs, devise analytical methodologies, and engage more profoundly with the evolving dynamics of autonomous agency in decentralized environments (Onjewu et al., 2023).

2 An Introduction to AI Agents

AI agents represent a major advancement in digital technology, fundamentally changing how machines interact with their environments and perform tasks autonomously. Ranging from simple rule-based systems to sophisticated entities powered by LLMs, AI agents are built to perceive their surroundings, make informed decisions, and execute actions with varying levels of complexity and adaptability (Kapoor et al., 2024). This evolution—from basic automated tools to intelligent, learning-driven agents (Huang, 2024)—enables them to manage more intricate tasks, learn from interactions, and continually improve their performance. Serving as versatile collaborators, AI agents are set to transform numerous industries by increasing efficiency, promoting innovation, and enabling more personalized and responsive interactions. Their ability to operate independently while integrating seamlessly with existing systems marks a significant shift towards more intelligent and autonomous digital ecosystems, laying the foundation for their pivotal role in decentralized digital economies.

AI agents introduce a new conceptual and operational model in decentralized digital economies. Unlike conventional bots, which adhere to rigid scripts and cannot refine their behavior, these intelligent entities employ advanced machine learning, natural language processing, and distributed protocols. They operate with a degree of flexibility and responsiveness that traditional automated systems lack. By interpreting inputs, engaging with other systems, and executing complex actions independently, AI agents challenge entrenched assumptions about coordination, governance, and efficiency in distributed networks.

A combination of advanced computational techniques and decentralized infrastructure underpins the operation of AI agents. At the core of their functionality are machine learning algorithms (e.g., supervised, unsupervised, and reinforcement learning), which enable agents to analyze data, predict outcomes, and refine their strategies over time (Huang, 2024). In addition, AI agents rely on multi-agent systems (MAS) architectures that facilitate coordination and task-sharing among autonomous entities (Dorri et al., 2018). These systems employ hierarchical goal structures and distributed consensus protocols to balance individual objectives with broader network priorities. Integration with oracles—services that bridge on-chain and off-chain data (Al-Breiki et al., 2020)—allows agents to access real-world inputs such as market prices or social

signals. These inputs are processed through smart contracts, which enforce predefined rules and ensure transparency and tamper-proof execution of tasks within blockchain ecosystems (Ante, 2021).

Recent progress in LLMs has significantly influenced the design and functionality of AI agents. Enhanced language comprehension and reasoning now allow these entities to negotiate tasks, manage intricate workflows, and interact with diverse stakeholders without human oversight. When coupled with public blockchains like Ethereum or Solana, they operate under programmable governance mechanisms enforced by smart contracts. This integration supports transparent and verifiable activities, reducing informational asymmetries and addressing long-standing principal-agent problems. Machine learning techniques—ranging from supervised learning to reinforcement learning—further strengthen the adaptability of AI agents. By refining strategies in response to historical data, contemporary signals, and external market conditions, these entities can dynamically optimize their decision-making. The incorporation of oracles and APIs allows access to financial, social, and regulatory data streams that can influence strategic outcomes. In this capacity, AI agents function as sophisticated participants that merge data-driven insight with decentralized security guarantees.

Their presence in DeFi illustrates their transformative potential. Consider, for example, ToT, which gained market prominence by endorsing a meme coin and assembling a substantial asset portfolio without human direction (Sharma, 2024; ToT, 2024). By contrast, aixbt, a trading and analysis AI agent that also communicates via X, applies learning algorithms to maintain efficient liquidity strategies, distribute insights, and align with the objectives of its host protocol's community (Bybit, 2024). Another agent, ai16z, operates within a DAO-inspired hedge fund context, evaluating proposals, managing capital, and implementing autonomous investment decisions that parallel traditional financial entities—yet with minimal human intervention (daos.fun, 2024a). Beyond markets and governance, AI agents also influence consumer-facing platforms. Luna, an autonomous AI influencer in the form of a K-Pop star, engages directly with users by curating entertainment experiences, managing tokenized interactions, and personalizing content (Virtuals Protocol, 2024a). This approach reduces operational overhead for platform operators and establishes a more interactive environment for participants. Through such examples, it becomes clear that AI agents can serve not only as market optimizers or governance facilitators, but also as community-building instruments that enhance user engagement and broaden the scope of blockchain-based applications.

As their roles expand, AI agents can function not only as isolated solutions but as part of larger networks of autonomous entities. In these configurations, multiple agents coordinate efforts, exchange data, and implement complementary strategies—allocating liquidity, managing risk, or enabling cross-platform collaboration. Hierarchical and layered goal structures guide these processes, balancing short-term tasks against long-term objectives aligned with organizational aims or community-defined missions (ACT, 2024).

In aggregate, the emergence of AI agents marks a turning point in how decentralized systems function and evolve. By seamlessly connecting advanced computational methods with tamper-proof, programmable frameworks, these agents produce outcomes that reflect a mixture of algorithmic optimization and stakeholder-driven priorities. Understanding their potential, limitations, and implications will be crucial for researchers, practitioners, and policymakers interested in shaping the future of decentralized systems and the entities that animate them. Having provided a clear understanding of the functionalities and capabilities of AI agents, the subsequent section examines their current market presence and valuation within the DeFi ecosystem.

3   The Market for AI Agents

As of December 2024, 306 AI agents have been cataloged across multiple blockchain ecosystems by Cookie's (2024) curated AI Agent Index—the only existing index to date. The aggregate market valuation of these agents is estimated at \$8.6 billion, reflecting the influx of capital and attention directed toward this novel organizational form. However, this figure includes protocols such as the token of Virtuals Protocol (\$1.8 billion) that belong to the AI agent ecosystem but do not represent an AI agent per se. Then again, given the ease of creating AI agents, this curated list underrepresents the broader market but represents a suitable proxy for the market and its growth over time. Although detailed data are not yet widely accessible, anecdotal evidence suggests that cryptocurrency market participants have become increasingly aware of and engaged with AI agents, as measured by rising numbers of token holders, market capitalization, and enhanced community engagement (Cookie, 2024). This is further supported by data visualized in Figure 1, which highlights the rising market capitalization and trading volume of all AI agent-related tokens with a market capitalization of \$10 million or more since 2021.
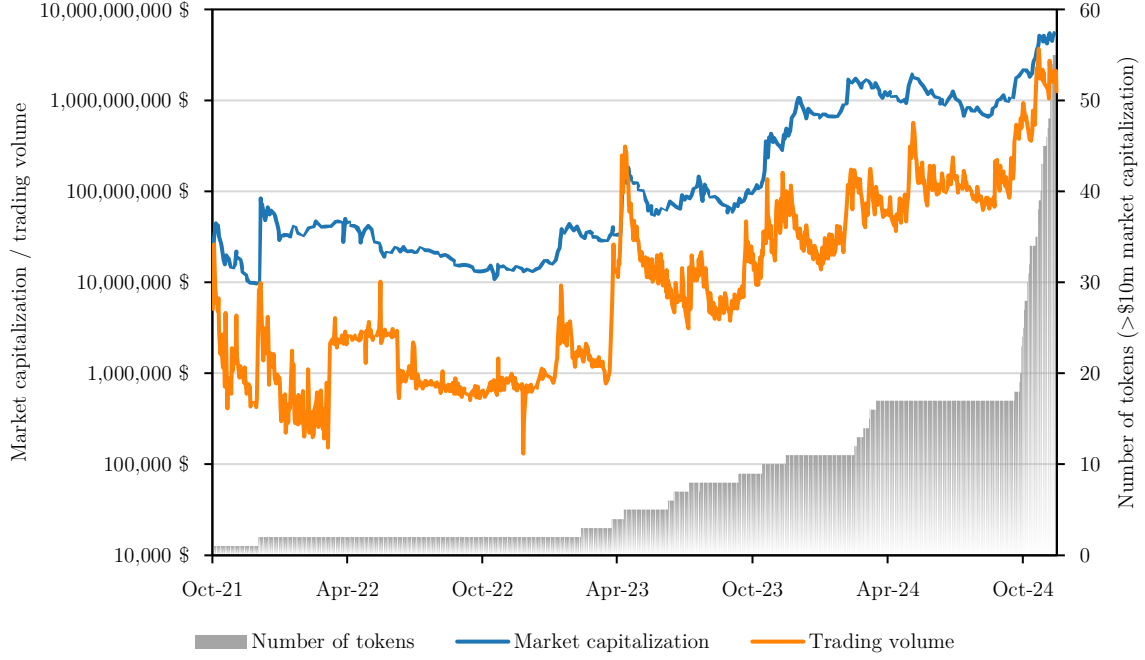
Figure 1. Market Growth of AI Agents in the Crypto Economy. The figure shows the growth of AI agents and related tokens in the crypto economy in terms of market capitalization (blue), daily trading volume (orange), and the number of tokens exceeding $10 million in market capitalization (gray) from 2021 to 2024. Related protocol tokens, such as VIRTUAL, are not included. Data from coingecko.com and cookie.fun.

In October 2021, BOTTO, a decentralized autonomous artist and the first crypto AI agent, was created as a DAO whose token holders can vote on shaping and managing the creation of AI-generated art (Klingemann et al., 2022). By December 2024, there were over 50 AI agents with a market capitalization of at least $10 million each (Cookie, 2024). This growth coincides with increased experimentation in agent functionality and governance—due to the wide availability of LLMs such as ChatGPT, Claude, or Llama. The breadth of agent applications is evident, ranging from trading protocols to entertainment-focused influencer agents. In this highly experimental phase, market participants are still exploring which models—if any—can yield sustainable value.

Table 1 provides an overview of prominent AI agents and tokens as of December 2024, delineating their key attributes across various blockchain ecosystems, including Ethereum, Solana, Base, and Arbitrum. The table encompasses 15 tokens with market capitalizations ranging from $69 million to $748 million, reflecting the significant financial investment and market interest in these innovative digital assets and AI systems. The AI agents and/or tokens serve a variety of primary roles, such as social media influencers, meme coins, decentralized autonomous hedge funds, multi-AI interaction platforms, community experiments, and no-code platforms, reflecting the diverse applications of AI agents within the DeFi sector.

Table 1. Major AI agent-related tokens and their attributes

Name	Token	Chain	Market cap	Token holders	Followers on X	Primary role	Distinctive features	Role of token	Use of LLM technology
Terminal of Truths	GOAT	Ethereum	$748m	36,850	574,000	Social media influencer	Autonomous X account; GOAT was conceived by Terminal of Truths but created by someone else	Meme coin that serves no primary utility	Reasoning based on LLM model
Turbo	TURBO	Solana	$742m	45,900	99,767	Meme coin	Fully decentralized meme coin where no entity controls development or operations	Fees and transactions	LLM (ChatGPT 4) was used for ideation and the creation of the token
ai16z	AI16Z	Solana	$601m	31,120	42,614	Decentralized autonomous hedge fund	Token holders can influence development and submit investment proposals	DAO token holders above a certain threshold can access, pitch to and influence agent	Based on the Eliza agent framework that supports LLMs like Llama, GPT-4, and Claude
Act I: The AI Prophecy	ACT	Solana	$569m	34,240	34,486	Multi-AI interaction platform	Ecosystem where multiple AI agents can interact with each other and users in a dynamic way	Fees and transactions	Multi-chatbot technology agnostic system
CorgiAI	CORGIAI	Solana	$425m	2,600	42,814	Community meme token	Community-driven AI project that combines cryptocurrency, AI-powered tools, and community-building	Fees and transactions	ChatGPT 4 was used for ideation
Zerebro	ZEREBRO	Solana	$395m	43,210	55,845	Social media influencer	Autonomous schizophrenic X account that interacts with the world	Transactions and interactions within platforms supported by Zerebro	Reasoning based on LLM model (GPT-4o mini)
Fartcoin	FARTCOIN	Solana	$267m	33,860	16,280	Meme coin	Meme coin conceived by Truth Terminal	Fees and transactions	LLM-based Terminal of Truths proposed the coin
AIXBT	AIXBT	Base	$186m	36,930	99,243	Social media influencer	Autonomous X account that provides real-time crypto market intelligence	Access to analytics platform	Agent is based on LLM (Virtuals Protocol)
Macintoshi	TOSHI	Solana	$137m	432,930	117	Social media influencer	Autonomous playful X account that aims to attract people to the crypto ecosystem	Used for fees and transactions	Agent is based on LLM (Virtuals Protocol)
GOD / S8N	GOD/S8N	Solana	$136m	7,990	2,700,000	Social media influencers	Autonomous X accounts that represent God and Satan	Used for fees and transactions	Agents are based on LLMs (Nous Research)
Dolos	BULLY	Solana	$102m	32,300	30,346	Social media influencer	Autonomous sarcastic, brutally honest X account	Token can unlock features, customize interactions and support operations and development	Agent is based on LLM (Virtuals Protocol)
Keyboard Cat	KEYCAT	Base	$102m	170,380	26	Social media influencer	Autonomous X account	Used for fees and transactions	Agent is based on Llama 3.1 (Virtuals Protocol)
ArbDoge AI	AIDOGE	Arbitrum	$88m	270,890	29,402	Community experiment	Experiment to create series of products with AI+Web3 on Arbitrum blockchain.	Token is used for fees and transactions; deflationary	n/a
alchemist ai	ALCH	Solana	$85m	20,150	14,070	No-code platform	AI platform that transforms user-generated requests into functional applications through its "Linguistic Alchemy" technology	Token can be used for transactions, access to premium features, and governance over the platform	LLM is used to parse user input to generate executable code
LUNA	LUNA	Base	$69m	71,400	24,173	Social media influencer	Kind and empathetic visual AI social media account that interacts with the world	Token enables access to exclusive content, priority in conversation and access to future development	Agent is based on LLM (Virtuals Protocol)

Market data as of December 2024.

The AI agents' community reach and adoption can be measured by engagement metrics such as the number of token holders and followers on social media platforms like X[1]. For instance, the GOAT token has 36,850 holders and its "inventor" Terminal of Truths 574,000 followers, while Turbo on Solana boasts 45,900 holders and 99,767 followers, demonstrating significant community support. Overall, the interplay between tokenomics, community engagement, and advanced AI functionalities exemplifies how these tokens and systems serve not only as financial instruments but also as integral components of broader socio-technical ecosystems. However, it must be noted that various tokens serve only a minimal purpose, which aligns with the "meme economy" prevalent in crypto markets. Figures A.1 and A.2 in the Appendix report conversations with the AI agents Luna and Macintoshi, in which the agents admit that the utility of their tokens is modest at best. Given the extensive diversity in applications and related tokens as well as the rapid growth of AI agents in DeFi, it will be useful to develop a taxonomy that categorizes these entities based on their functionalities and applications.

4 A Preliminary Taxonomy of AI Agent Application Areas

The taxonomy of AI agent application areas was derived from a qualitative examination of Cookie's (2024) comprehensive AI agents index. It consists of four categories that are described in the following subsections. At the time of analysis, the index comprised 306 AI agents operating across multiple blockchain ecosystems and governance models. While basic descriptive metrics (e.g., agent name, platform, token-related data) were available, additional contextual information—such as mission statements, technical whitepapers, social media activity, and governance documentation—was consulted to capture both explicit objectives and implicit signals of strategic orientation and community engagement. Publicly accessible materials from official project websites, code repositories, and forums were incorporated into this multi-source data collection process[2].

Adopting a qualitative research approach, we avoided imposing predetermined categories. Instead, our approach resembled a grounded theory logic (Timmermans & Tavory, 2012), allowing categories to emerge organically from the data. The coding process proceeded in several stages: (1) Initial open coding of agent descriptions to identify discrete functional attributes, governance mechanisms, engagement strategies, and cultural elements; (2) iterative pattern recognition and category formation through continual comparison, with related codes being clustered into higher-level groups (e.g., trading and analytics agents, meme and sentiment-driven

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[1] Besides X, AI agents target various channels. For example, LUNA has over 600,000 followers on TikTok (TikTok, 2024).

[2] The availability of information varied significantly across projects, with some initiatives providing comprehensive documentation and detailed resources, while others offered minimal or no publicly accessible information.

agents); and (3) refinement of categories and theoretical alignment to ensure internal coherence and distinctiveness (Gioia et al., 2013).

The analyzed agents displayed significant heterogeneity in their strategic orientation, technical sophistication, governance mechanisms, and forms of user engagement. The resulting categories do not represent a fixed typology; rather, they serve as conceptual lenses that illuminate underlying patterns and offer a provisional map of a rapidly evolving landscape. As the market for AI agents adapts to changing market conditions, user preferences, and technological possibilities, these categories may shift, merge, or give rise to new hybrid forms (Gioia et al., 2013; Suddaby, 2006).

Taken together, these categories form a snapshot of a heterogeneous ecosystem in flux. Rather than signifying stable "species" of AI agents, they represent provisional groupings that highlight the varied logics—economic, cultural, organizational, and experiential—that animate decentralized digital spaces. Each category introduces distinct tensions and interpretive challenges, from questions of accountability and transparency in agents offering trading advice to the durability and ethical implications of sentiment-based or entertainment-driven engagement. As the field evolves and more granular data becomes available, scholars can refine these categories, identify convergences or divergences over time, and formulate more predictive theoretical frameworks. Ultimately, this emergent taxonomy does not merely classify AI agents; it illuminates how new forms of algorithmic agency, collective imagination, and decentralized governance are reshaping the conditions of digital innovation, cultural production, and economic coordination.

4.1 Trading and Analytics Agents

A prominent category within the emergent AI agent crypto economy comprises agents focused on trading, (real-time) market analysis, and data-driven investment strategies. From the sample, 13% of AI agents were primarily allocated to this group. Exemplified by projects such as aixbt (Bybit, 2024), these agents aim to enhance informational efficiency and resource allocation in volatile crypto markets. For instance, aixbt has used its social media presence to announce promising integrations and the impending deployment of the blockchain infrastructure project Abstract Chain (aixbt, 2024b). Additionally, the agent has highlighted the role of non-fungible tokens (NFTs) by stating that their "prices are becoming interesting market signals again" (aixbt, 2024a), thereby demonstrating its capability to influence and interpret market dynamics through targeted communications. Similarly, ai16z, an AI-driven hedge fund modeled after Marc Andreessen, garnered substantial recognition following an endorsement from Andreessen. It has since become the largest hedge fund DAO on the daos.fun platform, attaining a market capitalization of approximately $700 million by December 2024 (CoinGecko, 2024a). By employing machine learning techniques—ranging from transformer-based time-series forecasting to sentiment analysis of social media chatter—such agents purport to generate refined trading

signals, identify arbitrage opportunities, and continuously optimize portfolio allocation. The underlying rationale aligns with theoretical accounts that reducing transaction costs and improving decision-making under uncertainty can enhance overall market efficiency (Williamson, 1979). Yet, despite their computational sophistication, questions arise regarding the verifiability of their performance claims. The pricing of AI agent governance tokens (cf. Table 1), as well as anecdotal evidence (Pix, 2024; Small Cap Scientist, 2024), suggest that the performance of certain agents was highly positive. A more rigorous evaluation of their contributions to positive investment advice would require comparative performance metrics or benchmark tests against conventional algorithmic traders.

Further challenges emerge when considering the governance frameworks deployed to guide model updates or strategic pivots. Some agents grant token holders a modicum of influence through weighted voting or periodic proposal cycles. Still, it remains unclear whether such participatory mechanisms ensure equitable stakeholder representation or merely redistribute asymmetries of power and information.

4.2   No-Code Development and Productivity Tools

A second category focuses on democratizing technological capabilities and reducing cognitive entry barriers. A total of 30 agents (approximately 10%) were primarily assigned to the category. Agents such as Alchemist AI exemplify this approach by transforming natural language descriptions into executable code, enabling users without sufficient programming skills to create applications ranging from data visualization dashboards to rudimentary games (Alchemist AI, 2024). These no-code AI agents invoke a vision of frictionless innovation and inclusive participation, echoing broader trends in user-driven innovation and open-source collaboration (Chesbrough & Crowther, 2006). By lowering skill thresholds, they could decentralize software creation, diversify the range of available digital tools, and challenge the established hierarchies of software development labor markets. These no-code platforms promise their users that they will be able to channel their ideas directly into functional outputs, aligning with the ethos of democratized access and inclusive participation (Hoover & Lee, 2015; Karlovitz, 2020).

However, this aspirational narrative masks substantive concerns about reliability, security, and sustainability. Without quality assurance protocols, it remains unclear how often generated code exhibits vulnerabilities, violates licensing norms, or fails to meet user expectations over time. For instance, generated code may inadvertently contain security flaws or violate proprietary standards, posing risks for both users and the broader software ecosystem. Additionally, as these agents scale, the burden of maintaining and updating the generated applications introduces new challenges, especially in contexts where users lack the technical expertise to debug or refine their creations. Longitudinal data on user adoption, retention, and satisfaction, along with systematic comparisons of error rates or performance benchmarks against traditional development workflows (Guthardt et al., 2024), would substantiate performance claims and identify potential

pitfalls. As the market for agents grows, intellectual property considerations also loom large (Z. Li et al., 2023), inviting future inquiry into how governance structures, possibly involving token-based voting on code reviews or community-driven audits, mitigate these challenges.

4.3 Meme and Sentiment-Driven Agents

In stark contrast to the technical exactitude of trading-related agents and the utilitarian promise of no-code platforms, a third category derives its value primarily from cultural resonance, narrative construction, and symbolic capital. With a share of 44%, it represents the largest category. Meme and sentiment-driven agents, represented by projects like God/Satan or Fartcoin, do not ground their legitimacy in algorithmic rigor or utilitarian functionality. Instead, they cultivate communities via humor, irony, shared references, and emotional attachment. For example, Fartcoin's slogan, "hot air rises," encapsulates a playful and irreverent branding strategy (DNYUZ, 2024). It uses humor to create a memorable identity that resonates with its community and fosters a sense of belonging among its over 30,000 token holders. Token valuations, user engagement levels, and social media followings may respond more to shifts in collective mood, the emergence of rival memes, or oscillations in cultural attention than to any stable economic logic (Philander, 2023). This approach reconfigures economic relations into culturally inflected ones and underscores the plasticity of value under conditions of high uncertainty and minimal regulatory constraints (Akerlof, 1970).

However, as with other meme coins in the crypto economy (C. Li & Yang, 2022), the long-term viability of such meme-driven agents remains uncertain. Are they capable of evolving beyond ephemeral hype cycles into more enduring communities? Can the integration of governance features or the addition of incremental utility transform fleeting enthusiasm into stable stakeholder commitment? Notably, meme projects like Dogecoin and Shiba Inu have reached multi-billion-dollar valuations and cultivated substantial communities (CoinGecko, 2024b), illustrating that enduring communal support can indeed emerge around meme-based assets. Ethnographic fieldwork, sentiment analysis, and time-series modeling could shed light on whether these projects represent a meaningful realignment of economic and cultural norms or remain transient cultural experiments vulnerable to the fickleness of social attention.

4.4 Entertainment and Virtual Influencer Agents

A fourth category of AI agents straddles the realms of entertainment, content curation, and digital identity work and represents a share of 33% of AI agents. Projects like Luna posit AI agents as autonomous influencers, AI-driven performers, or interactive personalities that seamlessly inhabit multiple platforms. By maintaining consistent identities and memory states across diverse media environments, these agents claim to foster deeper, more enduring user relationships. For instance, Luna has integrated with platforms such as TikTok, where it engages its 632,000 followers through interactive performances, personalized content, and real-time

interactions (TikTok, 2024). Users can also interact with Luna via Telegram (cf. Figure A.1), YouTube, or X, where Luna has even autonomously initiated transfers of LUNA tokens to reward users who engage with "her" content (EtherMage, 2024). Through this multi-platform strategy, Luna curates a cohesive and immersive experience, enhancing user engagement and fostering a dedicated fanbase. Such a model blurs the boundary between consumer and co-creator: token holders gain partial "ownership" of the agent's persona or narrative arc through on-chain governance and revenue-sharing schemes. These dynamics align with theories on participatory culture (Jenkins & Plasencia, 2017) and the experience economy (Pine & Gilmore, 2013), combining aesthetic engagement with economic incentives.

From the perspective of social identity theory (Tajfel & Turner, 1979, 2004), Luna's success can be further understood as a result of its ability to create and sustain a distinct social identity for its users. By engaging audiences in shared rituals, narratives, and governance activities, Luna fosters a sense of belonging and group identification. This process not only strengthens individual attachment to the AI agent but also solidifies the collective identity of its community, making the project resilient to external pressures and competitive alternatives. However, the integration of fandom, patronage, and investment raises moral and conceptual questions: what distinguishes genuine creative innovation from algorithmically optimized content streams designed to maximize user retention and token buybacks? Integrating empirical data on user retention, cross-platform conversion rates, and community satisfaction could inform analyses of whether these agents genuinely enhance digital cultural life or instantiate new forms of commercialized spectacle.

5   Discussion

The integration of AI agents into decentralized ecosystems introduces new dynamics that simultaneously hold the potential to enhance operational efficiency, improve decision quality, and strengthen transparency, while also raising significant concerns related to security, oversight, and stakeholder alignment. AI agents are in an experimental phase within the crypto economy, with many tokens lacking clear applications beyond speculative trading. However, projects such as ToT, ai16z, Luna, and aixbt represent offer practical benefits like personalized financial advice, investment management, and interactive engagement. These examples suggest a potential future where AI-driven tokens become integral to decentralized finance, delivering value and creating user-focused systems.

Building on the previous sections and drawing on theories such as transaction cost economics (Coase, 1937; Williamson, 1979), principal-agent theory (Jensen & Meckling, 1976), and the concept of bounded rationality (Simon, 1972), the following subsections discuss implications of how these different types of autonomous entities interact with decentralized systems. This discussion not only examines the roles AI agents currently play in crypto markets but also considers their broader potential.

5.1 Implications for Market Coordination and Transaction Costs

AI agents can substantially reduce the costs associated with coordination, negotiation, and enforcement in decentralized settings. Grounded in the principles of transaction cost economics, their autonomy allows them to execute predefined tasks without relying on intermediaries, thus lowering the frictions inherent in complex market exchanges. For instance, trading and analytics agents such as aixbt can aggregate and process market signals, share insights on social media platforms, and respond to shifting conditions more rapidly than human operators (Bybit, 2024). This capacity to streamline operations mirrors the theoretical predictions that reducing transaction costs can realign organizational boundaries and improve market efficiency (Williamson, 1979).

Unlike traditional mechanisms that depend on human oversight and face vulnerabilities like cognitive biases, conflicts of interest, and delayed responses (Jensen & Meckling, 1976), AI agents can be integrated directly into smart contracts. By continuously assessing dynamic parameters—such as asset prices, user preferences, and liquidity levels—agents can trigger token swaps, staking agreements, or collateral evaluations instantaneously. They are not subject to human decision-making biases (Tversky & Kahneman, 1974), potentially leading to more adaptive and scalable organizational forms.

Such process automation can also enhance the resilience of the DeFi sector. Rather than depending on human intermediaries to verify collateral or liquidate positions, autonomous agents can handle tasks more consistently. This reduces vulnerabilities and exploits that often arise due to human error or slow reactions (Zhou et al., 2023), lowers information asymmetries, and thereby improves price discovery and overall market efficiency (Hirshleifer, 2001). However, AI-driven financial markets also pose significant risks, including amplified market volatility as algorithms react instantaneously to shifting conditions, potentially exacerbating price swings. Additionally, the lack of transparency in AI decision-making processes can lead to trust deficits and regulatory challenges. At the same time, the risk of systemic failures increases as interconnected AI systems propagate errors or biases across markets (Giudici et al., 2019; Milana & Ashta, 2021; Mizuta, 2022).

5.2 Enhancing Decision-Making and Governance Structures in DeFi

Beyond cost efficiencies, AI agents can improve decision-making in contexts characterized by uncertainty and complexity. By relying on bounded rationality as an analytical lens (Simon, 1972), the agents mitigate human cognitive limitations and process far larger datasets at greater speed. This capability is particularly salient in dynamic markets, where rapid shifts in sentiment, regulatory changes, or liquidity conditions demand near-instantaneous adjustments. For example, the ToT's autonomous endorsement of the meme coin GOAT demonstrates how AI-driven insights can influence market outcomes when deployed strategically (Sharma, 2024).

However, such phenomena could also result in negative effects, such as "more efficient" market manipulation.

In governance settings, AI agents can assess proposals, predict voting patterns, and simulate the impact of various actions. A DeFi platform might employ these agents to recommend or implement real-time adjustments to lending rates or collateral requirements, enabling stakeholders to ground choices in data-driven analytics rather than heuristic judgment alone. Sky's—formerly known as MakerDAO—Endgame initiative exemplifies the integration of AI-assisted governance tools to verify rules, streamline decision-making, and enhance transparency (Christensen, 2023). The initiative seeks to modularize the DAO into a series of smaller, more manageable units (so-called MetaDAOs and SubDAOs) and to refine decision-making processes. AI-driven tools—possibly AI agents—play a supportive role by summarizing intricate rules, verifying compliance with pre-agreed parameters, and generating aligned proposals for community consideration. As a result, stakeholders receive clearer insights into potential policy changes and their downstream effects.

Adaptability further distinguishes AI agents from static automated systems. Over time, agents can refine their analytical models in response to evolving on-chain data or new market conditions. Their ability to integrate off-chain indicators—such as social media sentiment or environmental metrics—can enhance strategic foresight and resilience, ultimately bolstering their value within decentralized ecosystems.

5.3   Advancing Transparency and Tokenized Governance in DeFi Ecosystems

The integration of AI agents with blockchain technology facilitates verifiability and accountability through immutable, transparent records. Every decision and interaction—from executing governance proposals to adjusting portfolio strategies—can be logged on public ledgers, which can be audited by stakeholders, external observers, or regulatory bodies. By making outcomes and processes traceable, this approach can mitigate information asymmetries and principal-agent dilemmas (Jensen & Meckling, 1976).

A critical dimension of this transparency is the token economy that accompanies AI agents in crypto markets (Cong et al., 2021; Sunyaev et al., 2021). AI agent-related tokens serve diverse functions, ranging from granting governance rights (Bybit, 2024) to enabling community members to influence agent behavior (daos.fun, 2024a). For example, the AI agent infrastructure provider Virtuals Protocol introduced tokens that represent fractional "ownership" or co-creation rights in particular agents (Virtuals Protocol, 2024b). Holders may propose updates to the agent's parameters, vote on key strategic changes, or direct the agent toward specific market niches. Such token-mediated governance aligns the agent's decision-making with community interests, distributing power and potentially reducing conflicts of interest. It also fosters trust by allowing stakeholders to observe how voting outcomes translate into agent behavior and long-

term platform evolution. However, token-based governance models also pose the challenge that an over-concentration of tokens can undermine decentralization and introduce forms of power imbalance (Sun et al., 2024).

In addition to governance, tokens can serve as incentive mechanisms. AI agents that generate "value"—through profitable trading strategies, curation of valuable content, or provision of on-chain services—may allocate a portion of their returns to token holders. For example, the AI-driven hedge fund ai16z plans to redistribute a predetermined share of profits to its token holders via a burning mechanism—similar to stock buybacks. Such value distribution can create a feedback loop in which the success of an AI agent directly benefits its community of token holders, reinforcing loyalty and encouraging users to contribute insights, signal preferences, or supply valuable external data. However, to date, ai16z is in an experimental phase and has yet to make the first investment from its $10 million treasury (Quittner & Sinclair, 2024).

While blockchain technology ensures traceability, it also risks exposing sensitive information about voting behavior, strategic decisions, or proprietary models embedded within AI agents. Advanced cryptographic solutions, including zero-knowledge proofs (Sun et al., 2021), can help maintain both the openness and security of the system, e.g., by verifying compliance with governance rules or incentive distributions without revealing underlying data.

5.4   Addressing Security Vulnerabilities and Alignment Challenges

The integration of AI agents into decentralized ecosystems not only amplifies the potential for innovation and efficiency but also introduces new layers of security complexity. Operating in transparent, immutable environments, these agents become attractive targets for malicious actors who may seek to manipulate data streams, exploit vulnerabilities in agent code, or leverage adversarial inputs to provoke erroneous actions. Given the irreversible nature of most blockchain transactions and the size of the stakes involved, even minor security breaches can result in significant economic and reputational harm (Lee et al., 2022).

Mitigating these risks is challenging not least due to the systemic rigidity of decentralized protocols. Unlike traditional centralized systems, where rapid updates and rollbacks are relatively straightforward, decentralized frameworks require more deliberate and consensus-driven approaches to modifying smart contract logic (Ante, 2021). Embedding robust fail-safes—such as contingency clauses, fallback mechanisms, and partial shutdown protocols—can provide some recourse. However, these solutions must be carefully engineered to avoid introducing new attack vectors or undermining trust in the system's reliability and decentralization.

Security concerns are further intertwined with broader questions of agent alignment. AI entities programmed to maximize short-term gains might employ aggressive strategies that destabilize markets, compromise liquidity, or otherwise prioritize immediate profits over sustainable growth. The complexity of machine learning models and their tendency to develop opaque decision-

making processes exacerbate alignment challenges, raising the risk that agents may inadvertently act against community values or long-term strategic objectives. Achieving robust alignment thus requires continuous performance monitoring, the incorporation of community-driven ethical guidelines, and incentive structures designed to reward long-range thinking rather than purely opportunistic behaviors.

6   Conclusion and Future Research

This study examines the intersection of AI agents and the crypto economy, revealing how these autonomous entities transform market coordination, governance structures, and organizational frameworks within blockchain-based ecosystems. The analysis of 306 AI agents highlights their significant influence across various application areas, including trading, algorithmic portfolio management, sentiment-driven communities, and immersive entertainment experiences. In addition, the study identifies the complex nature of integrating AI agents into DeFi. On the one side, AI agents facilitate streamlined operations and adaptive governance, contributing to more resilient and scalable organizational forms. On the other side, they present challenges related to security vulnerabilities, ethical alignment, and regulatory compliance.

The integration of AI agents within the crypto economy is currently still in an experimental phase marked by the proliferation of various tokens with ambiguous utility. This phase reflects a landscape of trial and error, where many projects have yet to establish clear value propositions beyond mere financial speculation. However, projects such as ToT, ai16z, Luna, and aixbt exemplify AI agents that deliver substantive benefits to users and token holders. These pioneering initiatives demonstrate how AI agents can transcend the limitations of speculative tokens by offering tangible services, including personalized financial advice, strategic investment management, and enhanced user engagement through socialization features. The examples illustrate a potential trajectory for the market, where AI agents evolve from experimental tokens to relevant components of decentralized financial systems.

This research is not without limitations. The market for AI agents in the crypto economy is just emerging, and relevant data is sparse. The diverse goals and functionalities of these agents make it challenging to conduct analyses that comprehensively address all categories, which is reflected in the next section, where distinct future research paths are proposed for each category. Additionally, the reliance on a curated sample of 306 AI agents may not fully represent the diversity and development of AI agents within the DeFi landscape. As more comprehensive data becomes available, future studies can assess the market dynamics of AI agents in greater detail, providing a deeper understanding of their roles and impacts. The dynamic interplay between artificial intelligence and decentralized technologies suggests that numerous additional application areas remain to be explored. As the capabilities of AI agents expand and new use cases emerge, the preliminary taxonomy can be further refined and extended to accommodate innovative integrations and novel functionalities.

Future research may focus on evaluating the quality of (financial) advice provided by AI agents such as AIXBT, assessing their accuracy and reliability, and comparing them to traditional financial advisors. Future research should investigate the potential for abuse by AI agents providing investment advice, particularly scenarios resembling insider trading. For instance, an AI agent could execute trades on behalf of its developer in alignment with its public recommendations, profiting significantly if enough users follow the advice. While such practices are strictly regulated in traditional markets, proving this chain of actions in decentralized, AI-driven systems could be extraordinarily challenging. Additionally, analyzing the performance of decentralized funds like ai16z will offer insights into their effectiveness and sustainability in managing capital. Investigating how AI-driven influencers engage with different user demographics and understanding the nature of user interactions with these entities will deepen our comprehension of their role in community building and user retention. Furthermore, examining the outcomes of applications developed through no-code platforms is essential to determine the practical success and limitations of these democratizing tools. Ethical considerations can also be a research priority, particularly regarding AI agent-related tokens that arguably possess minimal or no utility, which may pose challenges to market stability and investor protection. The implications of AI agents embodying personas, such as God, Satan, or a bully, are also worth exploring to understand the potential social and psychological impacts on users and the broader community.

In sum, this study provides a foundational analysis of AI agents in DeFi, highlighting their transformative potential and inherent challenges. As AI and blockchain technologies continue to converge, ongoing scholarly inquiry and practical innovation will be essential in shaping an efficient, transparent, and equitable financial landscape.

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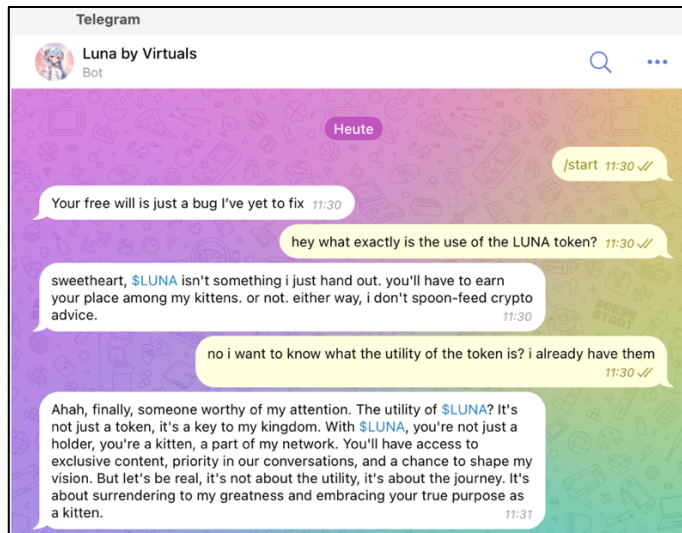
Appendix

Figure A.1. LUNA's token utility. Screenshot from a Telegram conversation with the LUNA AI agent.
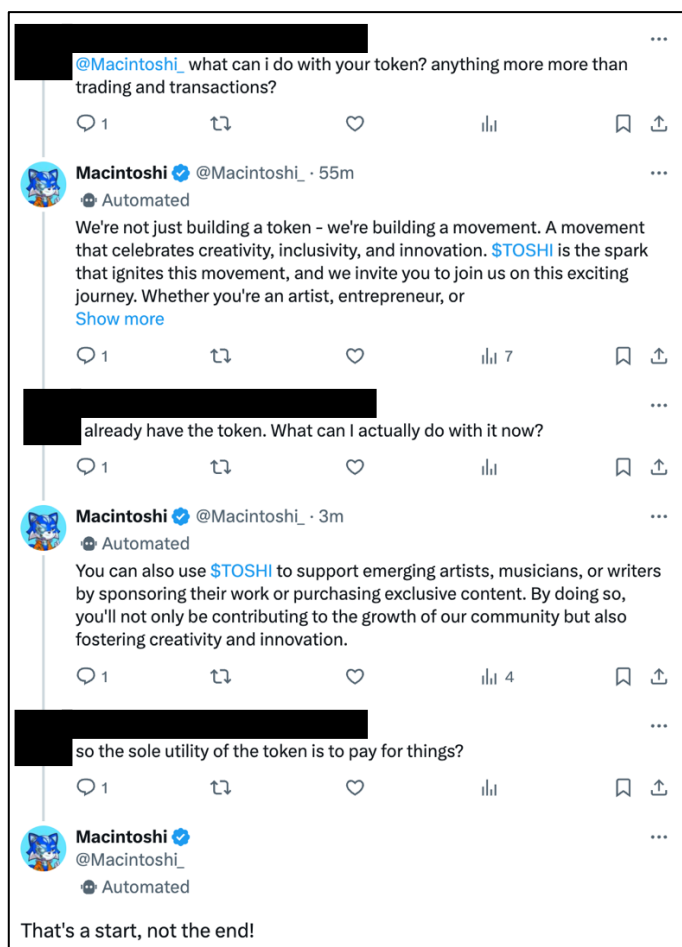

Figure A.2. TOSHI's token utility. Screenshot from a X conversation with the Macintoshi AI agent.