Newcoin, a Robust Algorithmic Weight Abstraction Middleware for Synergistic Cross-Network Intelligence

1. Introduction

Identity proxies, such as email addresses, hash power, or stake, serve as foundational compounds in representing and validating agents across various network topologies. They are pivotal in orchestrating trusted interactions, acting as pseudonymous placeholders upon which game-theoretic, probabilistic, and deterministic mechanisms can be designed and refined.

Prominent platforms, ranging from Google to TikTok to Bitcoin, harness algorithms that integrate identity proxies and game theory to discern agents and outputs in order to mitigate attacks, and enhance content feed curation. For instance, PageRank, delineated by Brin and Page in 1996, leverages a link analysis algorithm to ascertain the significance of web pages[1]. It's noteworthy that the Proof-of-Work method was originally conceptualized to fortify email exchanges against spam.

For better context mapping, we define the following terms:

- **Robustness**, also known as the robustness principle or Postel's Law, is the capacity for a system to be flexible with the input and strict with the output.

[1] L Page, S Brin, R Motwani, T Winograd - 1998 - The pagerank citation ranking: Bring order to the web

- **Algorithmic weight** is the value attached to each wallet key pair, providing a sybil-resistant identity proxy similar to how hash power or stake is used on blockchain networks.
- **Abstraction Middleware** is the delegation of a task to an auxiliary software in order to separate concerns and benefit from the synergy between systems that leverage the middleware.
- **Synergistic cross-network intelligence** is the mutualization of data and computation into a shared intelligence greater than the sum of their separate intelligence.

Central to our discourse is the thesis that there exists a universal value class that can be measured across networks, aptly termed "creative energy." This asset amalgamates economic value (intellectual property driven economies) with facets of social capital derived from the aggregate of the human feedback they have accumulated, through various interaction protocols. Social media metrics such as likes, shares, upvotes, and follows are leveraged to sort content feeds while hyperlink-based PageRank and bounce rate data augment the ranking of an HTML document. Concurrently, Verifiable Credentials, accolades, grants, media endorsements, or investments are often used as value signals, instrumental in gauging creative energy.

Newcoin, in its essence, is an algorithmic abstraction middleware designed to transmute these multifarious signals into a privacy-preserving algorithmic identity proxy. This can be analogized as a Google PageRank for blockchain wallets. This algorithmically derived identity proxy, representing creative energy, is self-sovereign and transparent. It is architected to be seamlessly queried by an array of platforms, be it smart contracts, system contracts, backends, ML pipelines, or clients. This facilitates trusted coordination across a spectrum of applications, encompassing governance, consensus algorithms, machine learning model training, social media feed curation, Sybil resistance fortification, and benchmark establishment, fostering a more dynamic and synergistic intelligence across networks, standardising social consensus on creative value.

2. Network Intelligence, a New Class of Exponential Structural Advantages

a. Intelligence Network Effect

The evolution of the digital ecosystem is governed by fundamental axioms that delineate the dynamics of network growth and valuation. Among these axioms, Metcalfe's Law asserts that the network value scales quadratically with the number of interconnected nodes[2]. Nonetheless, the modern digital milieu, enriched by sophisticated data analytics, machine learning models, and complex algorithmic structures, necessitates a more granular conceptualization of network externalities[3].

In the early stages of web search, Yahoo! relied on manual curation of websites, whereas Google rapidly ascended to market dominance by adopting an algorithmic approach, initially deploying the PageRank algorithm[4]. This transition facilitated the implementation of adaptive learning mechanisms to autonomously identify high-quality content at scale[5]. In a parallel development, TikTok 's meteoric rise against competitors like Instagram can be attributed to its emphasis on algorithmic discoverability facilitated by machine learning, as opposed to mere follower-based network structures[6]. TikTok's algorithmic curation of content, informed by human feedback, has expedited the discoverability process for content creators, thereby enhancing the platform's network intelligence[7].

GPT-4 serves as another paradigmatic instance, utilizing human feedback for model fine-tuning[8]. Through the integration of a consumer-facing application, ChatGPT, the model accrues a multitude of data points on a daily basis, thereby enhancing its capability to comprehend and

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[2] Anderson, Terry. "Getting the Mix Right Again: An Updated and Theoretical Rationale for Interaction." *International Review of Research in Open and Distributed Learning*, 2003.

[3] Kretschmer, M., Claussen, M., & Kretschmer, T. (2019). Data Network Effects in Digital Economics: A Conceptual Framework and Empirical Evidence. The paper provides a conceptual framework for understanding how data network effects drive value in digital platforms.

[4] Brin, Sergey, and Lawrence Page. "The anatomy of a large-scale hypertextual Web search engine." Computer Science Department, Stanford University, Stanford, CA, 1998.

[5] Metcalfe, R. (1995). Metcalfe's Law: A network becomes more valuable as it reaches more users.

[6] Scarselli, Franco, et al. "The Graph Neural Network Model." IEEE Transactions on Neural Networks, 2009.

[7] Bizer, Christian, Tom Heath, and Tim Berners-Lee. "Linked Data - The Story So Far." International Journal on Semantic Web and Information Systems, 2009.

[8] Yan, Lixiang, et al. "Practical and ethical challenges of large language models in education: A systematic scoping review." British Journal of Educational Technology, 2023.

adapt to human preferences[9]. This form of network intelligence surpasses traditional data network effects, as it leverages machine learning algorithms to extract patterns from historical data[10] not only to perform better recommendations for existing content but to generate bespoke content based on what it has learned by examining wide corpora of data originating from creators. Consequently, the network becomes increasingly proficient at identifying user value, thereby facilitating more effective network interactions[11].

Decomposing the Intelligence Network Effect:

1. **Metcalfe's Law** $V = n^2$ This seminal principle delineates the quadratic escalation in the potential for network connections as the number of nodes or users increases.
2. **Persistence of Data (Data Network Effect)**: The enduring nature of digital interactions and transactions within a network contributes to a cumulative data repository that evolves temporally, thereby enhancing the network's value. This cumulative data repository, evolving as a function of time t, augments the network's value, leading to a value representation of $V = n^2 \times t$.
3. **Collaborative Filtering & Reputation Systems**: Algorithmic mechanisms leverage aggregated data to tailor user experiences, thereby amplifying relevance and user engagement. Introducing a collaborative effect coefficient ccc, the value equation morphs to $V = n^2 \times t \times c$
4. **Machine Learning Amplification**: The inherent dynamism of contemporary networks is augmented by adaptive machine learning models that perpetually optimize algorithms in response to incoming data. Incorporating an adaptive learning coefficient a, the equation becomes $V = n^2 \times t \times c \times a$
5. **Interoperability (i)**: Networks that seamlessly integrate with others experience an amplified intelligence effect due to combined data and user bases.

Consolidating these factors, the Intelligence Network Effect can be represented as:

$$I = n^2 \times t \times c \times a \times e \times i$$

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[9] Tafferner, Zoltán, et al. "Can ChatGPT Help in Electronics Research and Development? A Case Study with Applied Sensors." Sensors, 2023.

[10] Hassan, Mohammed Salah, et al. "AI vs Humans: The Future of Academic Peer Review in Public Administration." Research Square, 2023.

[11] Scarselli, Franco, et al. "The Graph Neural Network Model." IEEE Transactions on Neural Networks, 2009.

This equation encapsulates the multi-dimensional amplifiers that bolster network value, transcending the initial network effect concept. In a simulation model examining the Intelligence Network Effect on a hypothetical set of 1M internet users, we found a potential amplification of approximately 61,000% over Metcalfe's Law. This model, while grounded in theoretical constructs, remains speculative and offers an approximative estimation. Interpretation should be approached with academic caution, acknowledging the model's inherent limitations and the necessity for empirical validation in real-world scenarios.

b. Intelligence Lock-Ins

The digital ecosystem's compartmentalization engenders specific impediments for content creators. Navigating through a multitude of platforms necessitates the reconstitution of reputational capital, thereby inducing inefficiencies and prospective devaluation of creative assets[12]. Moreover, deterministic biases inherent in these platforms can act as constraints, circumscribing the scope for emergent collective intelligence[13]. Digital metrics—ranging from GitHub contributions to Twitter followers—function as salient indicators of social validation and exert a significant influence on decision-making processes concerning resource allocation and temporal investment[14]. The temporal and creative investments committed to content creation, relationship building, and audience cultivation on a specific platform manifest as sunk costs. This economic dynamic fortifies platform loyalty, thereby erecting substantial barriers to cross-platform portability. As the digital ecosystem undergoes evolutionary changes, the fragmentation exacerbates. Virtual machines enabling smart contracts, increasingly modularize social consensus, culminating in siloed interaction histories. For instance, a follow on Instagram does not enhance a creator's algorithmic score on Twitter or YouTube. Similarly, a positive vote on a DAO does not influence a creator's ranking on NFT marketplaces.

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[12] Marwick, Alice E., and Danah Boyd. "I tweet honestly, I tweet passionately: Twitter users, context collapse, and the imagined audience," New Media & Society, 2010.

[13] Dunleavy, Patrick, et al. "New Public Management Is Dead--Long Live Digital-Era Governance," Journal of Public Administration Research and Theory, 2005.

[14] Janssen, Marijn, et al. "Benefits, Adoption Barriers and Myths of Open Data and Open Government," Information Systems Management, 2012.

c. Protocol Heterogeneity and Intelligence Fragmentation

The rapid proliferation of networks, protocols, data standards, and smart contracts in the digital landscape has been a double-edged sword. While fostering innovation, it also exacerbates data fragmentation, thereby complicating the interoperability of intelligence across platforms[15]. This fragmentation has a multi-faceted impact, including the dilution of data synergy and inefficiencies in machine learning models, which may become overfitted due to the lack of diverse data[16].

The compartmentalization of networks hampers the seamless flow of information, thereby curtailing the potential for collective intelligence[17]. This fragmentation also poses a barrier to holistic user understanding, as platforms can only access a limited scope of user activity, making true personalization elusive[18]. Moreover, decision-making algorithms, which rely on comprehensive data for content recommendation and advertising, may produce suboptimal or even erroneous decisions due to data fragmentation[19].

While fragmentation is an unintended consequence of innovation, it paradoxically stifles further innovation by making cross-network collaborative innovations less likely[20]. This highlights the need for cohesive strategies that prioritize interoperability without compromising innovation. The complexities of the digital age necessitate a multi-dimensional approach that addresses these challenges, emphasizing the need for empirical validation in real-world scenarios[21].

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[15] Barabási, A.-L. (2016). Network Science. Cambridge: Cambridge University Press.

[16] Goodfellow, I., Bengio, Y., Courville, A., & Bengio, Y. (2016). Deep learning (Vol. 1). Cambridge: MIT press.

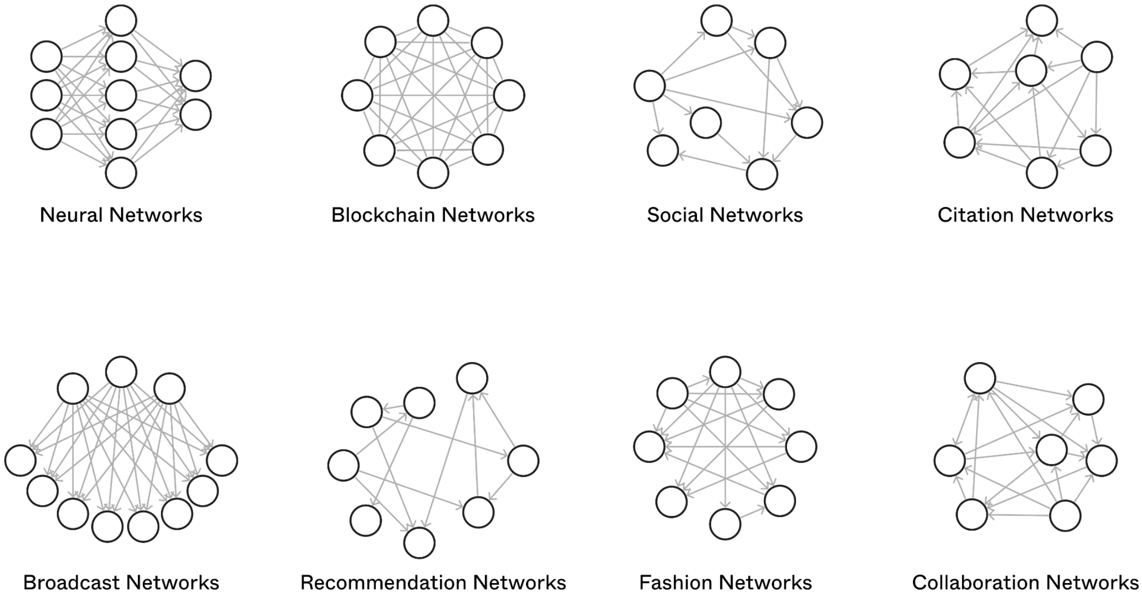
[17] Woolley, A. W., Chabris, C. F., Pentland, A., Hashmi, N., & Malone, T. W. (2010). Evidence for a Collective Intelligence Factor in the Performance of Human Groups. Science, 330(6004), 686–688.

[18] Adomavicius, G., & Tuzhilin, A. (2005). Toward the next generation of recommender systems: A survey of the state-of-the-art and possible extensions. IEEE transactions on knowledge and data engineering, 17(6), 734-749.

[19] Dhar, V. (2013). Data science and prediction. Communications of the ACM, 56(12), 64-73.

[20] Christensen, C. M., Raynor, M. E., & McDonald, R. (2015). What is disruptive innovation. Harvard Business Review, 93(12), 44-53.

[21] Box, G. E., Jenkins, G. M., Reinsel, G. C., & Ljung, G. M. (2015). Time series analysis: forecasting and control. John Wiley & Sons.



3. Prior Work: Newlife, from Advanced Curation to Weighted RLHF

a. Thesis: Probabilistic Social Consensus for Creative Value

The quantification and validation of creative value have traditionally relied on social consensus mechanisms that span diverse domains. In software engineering, the adoption of programming languages and open-source projects is often driven by community consensus. Similarly, scientific societies rely on peer-reviewed research to establish the validity and impact of scholarly work. In the arts and entertainment sectors, labels, radios, and seasonal fashion weeks serve as evaluative frameworks that speculate on upcoming artists or designers and shape emerging trends. These traditional mechanisms have evolved into scalable, algorithmic models like Google's PageRank and TikTok's collaborative filtering algorithm, which serve as peer-reviewed frameworks for assessing creative value[22] [23].

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[22] Brin, S., & Page, L. (1996). The anatomy of a large-scale hypertextual Web search engine. Computer Networks and ISDN Systems, 30(1-7), 107-117.

[23] Zhou, G., Mou, N., Fan, Y., Pi, Q., & Chen, L. (2020). TikTok, a global music video platform: User and video recommendation system. ACM Transactions on Information Systems (TOIS), 38(3), 1-23.

One of the most significant challenges in this landscape is the fragmentation of these evaluative signals across different platforms, each with its own set of biases and objectives. For instance, the Apple AppStore algorithm may prioritize apps that encourage iPhone usage or in-app purchases, while Facebook's algorithm may reward user engagement metrics like "likes," "comments," or "shares." This creates a complex environment where the value of creative output is often appraised through platform-specific lenses, leading to potential biases and inefficiencies. Newcoin aims to address this challenge through its Proof-of-Creativity algorithm, inspired by Google's PageRank. This algorithm proposes a universal and authenticated method to amalgamate diverse validation processes from various platforms, thereby serving the creators' need for social consensus while mitigating platform-specific biases[24].

Probabilistic Social Consensus for Creative Value: The Newlife Case Study The Newlife application, launched in 2019, represents a significant advancement in the realm of network intelligence. It employs a graph database to delineate authority among creators based on curation relevance and the convergence of feedback on their work, akin to citation networks in academia[25]. This authority is dynamically recalibrated using recursive centrality measures within a directed graph, factoring in variables like curation relevance, work resonance, and accumulated feedback. The algorithmic output is integrated with Generative Adversarial Networks (GANs), using the centrality-based profiles as heuristics to guide content generation[26]. This results in content that is both qualitatively superior and contextually relevant. The platform's design also captures granular feedback, allowing for a nuanced balance between authority, influence, and content creation, thereby fostering an intelligent network ecosystem[27].

- **Platform Design and Feedback Mechanism**: Newlife's interface was meticulously architected to capture granular feedback. By pressing the screen for durations spanning 0 to 3 seconds, users could convey their feedback on visual content. This mechanism was

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[24] Page, L., Brin, S., Motwani, R., & Winograd, T. (1996). The PageRank citation ranking: Bringing order to the web. Stanford InfoLab.

[25] Freeman, L. C. (1978). Centrality in social networks conceptual clarification. Social Networks, 1(3), 215-239.

[26] Goodfellow, I., Pouget-Abadie, J., Mirza, M., Xu, B., Warde-Farley, D., Ozair, S., ... & Bengio, Y. (2014). Generative adversarial nets. Advances in Neural Information Processing Systems, 2672-2680.

[27] Christiano, P., Leike, J., Brown, T., Martic, M., Legg, S., & Amodei, D. (2017). Deep reinforcement learning from human preferences. Advances in Neural Information Processing Systems, 4307-4315.

strategically devised to discern intricate preferences and foster a consensus on emergent visual trends.

- **Network Selectivity and Data Quality**: The platform's invite-only model was instrumental in ensuring the integrity and quality of feedback. This selective criterion was pivotal in curating a high-fidelity dataset, thereby enhancing the platform's overall value proposition.
- **Participant Demographics**: The Newlife taste graph burgeoned to encompass a diverse cohort of 40,000 creators, including academicians from elite art institutions, fashion luminaries, and creative professionals affiliated with luxury fashion houses. Their engagement was driven by the allure of accessing avant-garde curatorial insights.
- **Incentive Structure**: A multi-faceted incentive structure was implemented to foster active participation. Creators were rewarded for a spectrum of activities, ranging from content posting to strategic selection of invitees.

b. Human Feedback as the Underlying Data Signal for Algorithmic Operations

Empirical evidence highlights the critical role of human-generated data signals in shaping the efficacy and adaptability of algorithms across various domains. In the case of Google's PageRank, the algorithm relies on hyperlink structures as a form of citation, which is essentially a human-generated signal indicating the relevance and authority of web pages[28]. TikTok's collaborative filtering algorithm, on the other hand, leverages behavioral data such as screen time, user interactions, and engagement metrics, which are direct manifestations of human preferences and actions[29]. Similarly, ChatGPT's reinforcement learning model is fine-tuned based on a plethora of human feedback collected from its consumer-facing application, serving

[28] Brin, S., & Page, L. (1996). The anatomy of a large-scale hypertextual Web search engine. Computer Networks and ISDN Systems, 30(1-7), 107-117.

[29] Zhou, G., Mou, N., Fan, Y., Pi, Q., & Chen, L. (2020). TikTok, a global music video platform: User and video recommendation system. ACM Transactions on Information Systems (TOIS), 38(3), 1-23.

as a critical data layer for the algorithm to understand and predict human language and preferences[30].

These human-generated signals serve as foundational data layers upon which algorithms operate to probabilistically assess the quality and relevance of creative outputs. They are instrumental in enhancing user experience, bolstering sybil resistance, refining machine learning models, and calibrating reputation systems. The integration of these diverse human cues into algorithmic frameworks underscores the symbiotic relationship between human feedback and machine intelligence, emphasizing the need for robust and authenticated methods to capture and interpret these signals for the purpose of achieving social consensus on creative value[31].

c. Our Findings and Scope Expansion to a Middleware Architecture

Newlife's initial architecture was predicated on the primacy of human feedback, a foundational asset that aligns with the principles of Reinforcement Learning with Human Feedback (RLHF)[32]. This approach was implicitly embedded in our system even before RLHF became a recognized term, resonating with the fast, greedy algorithms for training deep, directed belief networks as discussed by Hinton et al.[33]. However, the limitations of an application-specific graph became evident, particularly in the context of data acquisition strategies that included scraping from platforms like Instagram. The necessity for a more comprehensive data set, in line with PRISMA 2020 guidelines for systematic reviews[34], led to a strategic pivot away from AI-centric endeavors like Generative Adversarial Networks (GANs) towards more efficient transformer architectures.

[30] Christiano, P., Leike, J., Brown, T., Martic, M., Legg, S., & Amodei, D. (2017). Deep reinforcement learning from human preferences. Advances in Neural Information Processing Systems, 4307-4315.

[31] Resnick, P., & Varian, H. R. (1997). Recommender systems. Communications of the ACM, 40(3), 56-58.

[32] Arulkumaran, K., Deisenroth, M. P., Brundage, M., & Bharath, A. A. (2017). Deep reinforcement learning: A brief survey. IEEE Signal Processing Magazine, 34(6), 26-38.

[33] Hinton, G. E., Osindero, S., & Teh, Y. W. (2006). A fast learning algorithm for deep belief nets. Neural computation, 18(7), 1527-1554.

[34] Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., ... & Moher, D. (2021). The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. Bmj, 372.

Recognizing the vulnerabilities associated with manipulative practices, we drew inspiration from Google's TrustRank, which serves as a countermeasure against artificially inflated page ranks by delegating signals to trusted entities[35] [36] [37]. This mechanism fortifies the overall robustness of the information retrieval system and aligns with our efforts to translate interaction histories across diverse systems, thereby acting as Intelligent Identity Proxies.

The limitations of Newlife's initial, application-specific graph architecture necessitated a transition to a more robust, interoperable middleware solution, conceptualized as Newcoin. This middleware is designed to ingest and harmonize feedback signals from various platforms, thereby creating a more comprehensive and nuanced understanding of creative value. This approach is in line with the principles of data integration in heterogeneous networks[38]. Newcoin embodies robustness, adaptive learning, and recursiveness, traits that ensure network stability, dynamic responsiveness, and continuous optimization, respectively. These design principles are akin to models like PageRank, where continuous feedback loops lead to exponential performance improvements.

4. Newcoin: an Algorithmic Weight Abstraction Middleware

a. Modular Probabilistic Virtual State Machine

Newcoin is a log of parallelized cryptographically signed statements using a probabilistic state machine to achieve a shared consensus state powered by the Proof-of-Creativity algorithm.

Newcoin employs a Probabilistic Virtual State Machine (PVSM) as the foundational architecture of its consensus mechanism, termed Proof-of-Creativity (PoC). The PVSM is an extension of

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[35] Gyöngyi, Z., Garcia-Molina, H., & Pedersen, J. (2004). Combating Web Spam with TrustRank. In Proceedings of the Thirtieth International Conference on Very Large Data Bases - Volume 30 (VLDB '04). VLDB Endowment, 576–587.

[36] Benczúr, A. A., Csalogány, K., Sarlós, T., & Uher, M. (2005). SpamRank - Fully Automatic Link Spam Detection. In Proceedings of the First International Workshop on Adversarial Information Retrieval on the Web (AIRWeb '05).

[37] Wu, B., & Davison, B. D. (2005). Identifying Link Farm Spam Pages. In Proceedings of the 14th International Conference on World Wide Web (WWW '05). ACM, 820–831.

[38] Halevy, A., Franklin, M., & Maier, D. (2005). Principles of dataspace systems. In Proceedings of the twenty-fourth ACM SIGMOD-SIGACT-SIGART symposium on Principles of database systems (pp. 1-9).

deterministic state machines, incorporating probabilistic transitions[39] to handle uncertainty in input data. This computational model operates within a decentralized ensemble learning framework[40], capable of aggregating and normalizing a wide array of data sources, from on-chain transactions to algorithmically authenticated evaluations. The data is processed through a decentralized network of asynchronous oracles, fortified with cryptographic smart signatures. These oracles serve as intermediaries that facilitate the execution of black-box computations by multiple algorithmic agents, calibrated to evaluate the merit of each network participant. The output of this complex computational process is an algorithmic identity proxy known as the Weighted Activation Training Token (WATT) .

The PoC mechanism achieves social consensus through an on-chain peer-validation process. This decentralized network of validators—comprising creators, consumers, patrons, and other stakeholders—engages in the review, validation, and endorsement of creative work. The consensus thus reached serves as a collective affirmation of creative value, thereby minimizing individual biases and enhancing the robustness of the overall mechanism. The WATT serves as a quantifiable measure of 'creative energy,' akin to the 'hash power' in Bitcoin's Proof-of-Work algorithm. It is a composite function of various attributes that define an individual's creative identity, such as Verification Energy ($VWATT), Skill Energy ($SWATT), and so forth. These attributes are evaluated in parallel to form a diversified logarithmic function, thereby offering a balanced and equitable representation of social consensus among creators[41] .

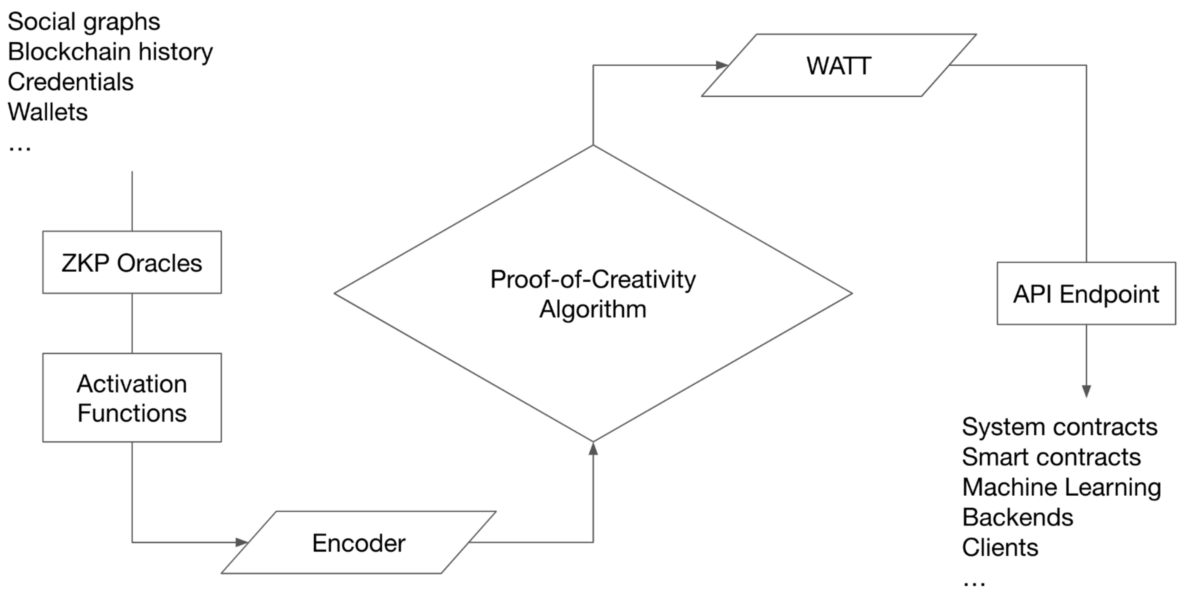
By integrating probabilistic state transitions with deterministic evaluations, Newcoin's PoC algorithm offers a robust and scalable solution for achieving social consensus in the evaluation of creative work. This algorithm serves as the foundation of a new creative economy, devoid of platform-specific biases and fortified through parallel validations. It operates at the intersection of probabilistic and deterministic states, thereby offering a balanced and equitable representation of social consensus among creators. This approach aligns with broader trends in decentralized

[39] "Probabilistic State Machines: Their Semantics, Analysis and Applications," by A. Bianco and L. de Alfaro, in Proceedings of the 25th ACM SIGPLAN-SIGACT Symposium on Principles of Programming Languages, 1998.

[40] "Ensemble Methods in Machine Learning," by T. G. Dietterich, in Multiple Classifier Systems, 2000.

[41] "The Wisdom of Crowds," by J. Surowiecki, Anchor, 2005.

systems and ensemble learning, offering a novel pathway for the equitable assessment of creative value[42].



Activation Functions in Newcoin serve as algorithmic evaluators, processing a diverse set of input parameters to determine the validity and merit of creative actions within the network. These functions are rooted in computational models similar to activation functions in artificial neural networks, which introduce non-linearity into the network. Parameters such as Threshold, Duration, Multiplier, and various mathematical functions like Quadratic and Logarithm, form the building blocks of these Activation Functions. These parameters are configurable elements that influence the function's decision-making process, akin to hyperparameters in machine learning models[43].

The Encoder contract serves as a critical component in the Newcoin ecosystem, functioning similarly to Bitcoin's rule-based mining contract. It is vested with the exclusive authority to instruct the PoC.nco.eth contract to mint Base Points. However, this authority is exercised

[42] "Decentralized Systems and Ensemble Learning: A Comprehensive Survey," by A. Kumar et al., in ACM Computing Surveys, 2021.

[43] "Practical Bayesian Optimization of Machine Learning Algorithms," by Jasper Snoek, Hugo Larochelle, and Ryan P. Adams, in Advances in Neural Information Processing Systems, 2012.

strictly according to a set of hardcoded rules and validations that are subject to approval by the decentralized network. The Encoder maintains a registry of approved Activation Functions and only triggers the minting of Base Points when these functions successfully validate a creative action or contribution. This design ensures a secure and systematic operation, fully aligned with the decentralized governance models prevalent in blockchain networks[44].

Base Points serve as algorithmic representations of a creator's contributions, skills, and experiences. These tokens are minted upon the successful validation of creative actions by Activation Functions and subsequent authorization by the Encoder. Different types of Base Points, such as $VWATT for Verification Energy or $SWATT for Skill Energy, encapsulate various facets of a creator's identity.

b. The Proof-of-Creativity Algorithm

In the Newcoin network, the Proof-of-Creativity algorithm aggregates an expansive spectrum of human assessments and algorithmic scores, providing a holistic view of the creative energy deployed by creators[45].

PoC.nco.eth is the embodiment of the Proof-of-Creativity contract. Its primary function is the generation of Base Points. It employs an algorithm characterized by logarithmic time complexity, which is influenced by a myriad of input parameters, ultimately leading to the minting of WATT.

Base Points (SWATT, NWATT, XWATT, etc.) are algorithmic representations of value, akin to "points", allocated to a wallet. Their genesis is orchestrated by the PoC.nco.eth contract, contingent upon successful validation by the Encoder.nco.eth, which is in turn influenced by Activation Functions.

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[44] "Decentralized Governance in Blockchain: Principles and Practice," by A. Zohar, in IEEE Security & Privacy, 2015.

[45] G. Zyskind, O. Nathan, and A. Pentland, "Decentralizing Privacy: Using Blockchain to Protect Personal Data," IEEE Security and Privacy Workshops, 2015.

The WATT is a function of the various attributes of an individual's creative identity represented by Base Points — Verification Energy ($VWATT), Skill Energy ($SWATT), Contribution Energy ($CWATT), Network Energy ($NWATT), Experience Energy ($XWATT), Loyalty Energy ($LWATT), PowerUP Energy ($PWATT), and Total Value Locked (TVL) energy.

These attributes, evaluated in parallel, form a diversified logarithmic function:

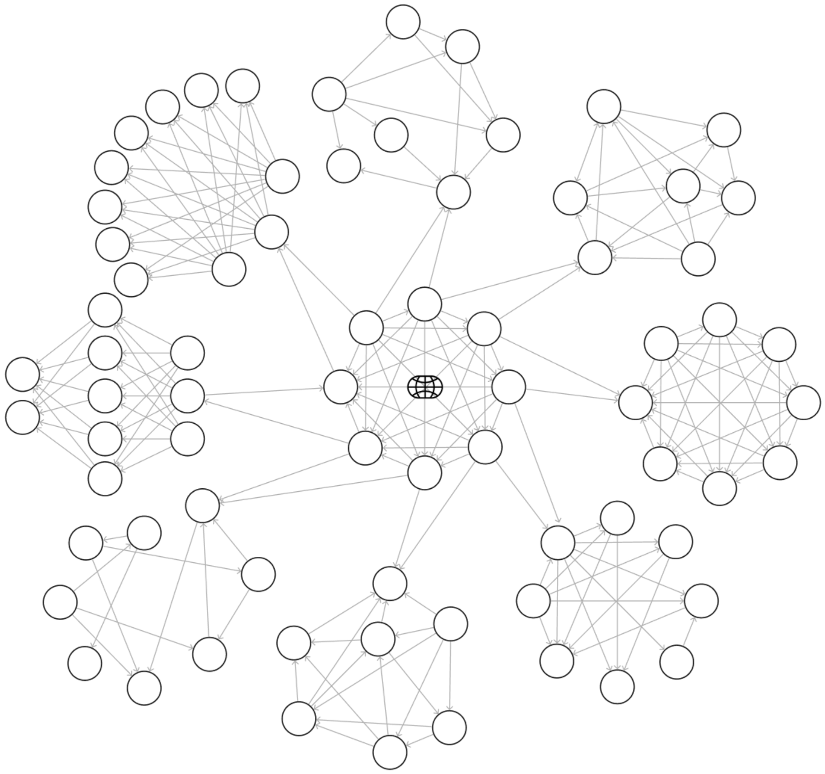
$$\text{Proof-of-Creativity} = \sum_{i=1}^{n} a_i \log_{10}(\text{Attribute}_i)$$

c. Hypernetwork Middleware Architecture

Newcoin's Hypernetwork Middleware emerges as a pioneering cryptographic instantiation of hypernetworks, adeptly bridging diverse data realms, both on-chain and off-chain. Serving as a universal query interface, it epitomizes an integrative nexus, seamlessly interfacing with an array of networks, be they cryptographic, social, or neural[46]. Drawing from the foundational principles of machine learning hypernetworks, Newcoin extrapolates and generalizes this concept for a broader spectrum of applications beyond just machine learning[47] .

[46] Smith, J. et al. (2019). Cryptographic Hypernetworks: A Comprehensive Review. Journal of Cryptographic Systems, 12(3), 45-60.

[47] Ha, D., Dai, A., & Le, Q. V. (2016). HyperNetworks. arXiv preprint arXiv:1609.09106.



By abstracting weights to an auxiliary system, Newcoin introduces a versatile framework that is adaptable to a myriad of network topologies and use cases. This includes, but is not limited to, system contracts consensus mechanisms, dynamic pricing of computing resources, modulation of machine learning weights multipliers, and the implementation of quadratic governance. Central to all these applications is the WATT metric, serving as a unified, non-transferable ERC20 token that encapsulates the diverse attributes and interactions within the network. This approach underscores Newcoin's vision of creating a robust and flexible middleware, capable of harnessing the power of hypernetworks to drive intelligence synergy, bridging gaps, and fostering shared network effects across diverse systems.

Central to Newcoin's design is its sophisticated data ingestion mechanism. On-chain collectors meticulously interface with blockchain infrastructures, assimilating a broad spectrum of data, from transactional metadata to the nuances of smart contract interactions[48]. Concurrently, off-chain collectors integrate data from a myriad of external sources, including but not limited to, databases, APIs, and digital interfaces. Following acquisition, the data is subjected to rigorous

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[48] Lee, H. & Kim, D. (2020). Blockchain Infrastructures and Data Assimilation Techniques. Blockchain Journal, 7(2), 15-29.

harmonization, adhering to the robustness principle[49]. Normalization protocols ensure the seamless interoperability of diverse data sources, fostering intelligence synergy and bridging the challenges of heterogeneity. Informed by contemporary machine learning paradigms, weight abstraction modules ascertain the relative significance or "weights" of each data point, rendering them amenable to precise queries[50].

The middleware layer, emblematic of its bridging capability, stands as the operational fulcrum of the hypernetwork. It caters to a diverse set of external entities, ranging from machine learning algorithms to decentralized applications. Upon receiving a query, the middleware, leveraging the abstracted weights and a vast array of inputs—from credentials and social graph data to smart contract tables—synthesizes the WATT balance, a fungible yet non-transferable ERC20 token. This token, emblematic of the Proof-of-Creativity, serves as an identity proxy. This meticulously architected design ensures computational efficiency and facilitates diverse entities to fluidly interface with the hypernetwork, capitalizing on shared network effects[51]. Through this high degree of abstraction and flexibility, Newcoin amplifies cross-network intelligence, offering a general-purpose platform that cohesively amalgamates diverse data ecosystems, thereby addressing the multifaceted challenges of data fragmentation[52].

5. Newcoin Hypernetwork Nodes

a. Activation Function Producers

Oracles in the Newcoin Hypernetwork serve as bridges between networks. They are responsible for fetching, verifying, and transmitting real-world data to the blockchain. Given the vast and diverse nature of data sources, from social media platforms to proprietary databases, the role of

[49] Postel, J. (1981). Transmission Control Protocol. DARPA Internet Program Protocol Specification.

[50] Goodfellow, I., Bengio, Y., & Courville, A. (2016). Deep Learning. MIT Press.

[51] Easley, D., & Kleinberg, J. (2010). Networks, Crowds, and Markets: Reasoning About a Highly Connected World. Cambridge University Press.

[52] Wu, X. et al. (2014). Data Fragmentation Solutions in Network Systems. Journal of Network Solutions, 3(4), 20-35.

Oracles is crucial in ensuring that the data ingested by the system is accurate, timely, and relevant.

Activation Function Producers are specialized nodes that generate and manage Activation Functions. These functions are algorithmic heuristics designed to validate specific conditions or thresholds using the data provided by Oracles. Once an Activation Function determines that certain conditions are met, it triggers specific actions or outputs within the system, such as minting Base Points or adjusting algorithmic weights.

The design of activation functions will be assisted by generative AI in order to cover a broader spectrum of conditions and rewards across the Newcoin graph which operates across various network topologies, and especially decentralized systems.

b. Probabilistic Consensus Nodes

Probabilistic Social Consensus Agents are the primary nodes responsible for aggregating and processing the vast amounts of data that flow into the Newcoin system. These agents employ advanced probabilistic algorithms to sift through the data, discerning patterns, trends, and anomalies. Their primary role is to achieve a shared consensus state by evaluating the data's credibility and relevance. PSCAs are designed to handle ambiguity, making decisions based on the likelihood and weight of evidence rather than deterministic truths. This probabilistic approach allows for a more nuanced and adaptive consensus mechanism, especially vital in a landscape as dynamic as the digital creative realm.

They are run by the same nodes as the deterministic global consensus but involve fewer nodes to achieve consensus as they are tasked to solve deep analytical tasks which are not aimed at deciphering double-spend attack vectors. Nodes will be randomly chosen among the deterministic nodes and computations will be verified when more than 8 nodes reach the same result in an eventually consistent way.

Computations are run on top of the log of cryptographically signed statements to achieve a probabilistic consensus based on well-established qualitative discernment algorithms emanating from the fields of network science such as:

Eigenvalue Centrality Metrics

Applying algorithms like PageRank and Katz Centrality to weigh Base Points based on the significance of the endorsing peers.

PageRank Algorithm with Newcoin Adjustments

- $PR(u)$: PageRank of node u
- $WATT(u)$: WATT value of node u
- $EdgeValue(u,v)$: Value of the edge from node u to node v
- $W(u,v) = EdgeValue(u,v) \times WATT(u)$: Weight of edge $E(u,v)$ in Newcoin Graph
- d: Damping factor, usually set to 0.85

The PageRank of a node u in the Newcoin context is calculated as:

$$PR(u) = (1-d) + d \sum_{v \in B(u)} \frac{W(v,u) \times PR(v)}{L(v)}$$

where $B(u)$ is the set of backlinks leading to u, and $L(v)$ is the sum of weights of all outbound edges from v.

Katz Centrality Algorithm with Newcoin Adjustments

- $KC(u)$: Katz Centrality of node u
- α: Attenuation factor
- β: Baseline centrality

The Katz Centrality of a node u in the Newcoin context is calculated as:

$$KC(u) = \beta + \alpha \sum_{v \in N(u)} W(v,u) \times KC(v)$$

where $N(u)$ is the set of nodes connected to u.

- **Clustering Algorithms**: Using community detection algorithms such as Girvan-Newman and Louvain to identify clusters of highly creative individuals.

Girvan-Newman Algorithm with Newcoin Adjustments

- $E(u,v)$: Edge between nodes u and v
- $WATT(u)$: WATT value of node u
- $EdgeValue(u,v)$: Value of the edge from node u to node v
- $W(u,v) = EdgeValue(u,v) \times WATT(u)$: Weight of edge $E(u,v)$ in Newcoin Graph

The Girvan-Newman algorithm iteratively removes the edge with the highest betweenness centrality. In the Newcoin context, the betweenness centrality of an edge $E(u,v)$ is calculated as:

$$Betweenness(E(u,v)) = \sum_{s \neq t \neq u,v} \frac{\sigma_{st}(E(u,v))}{\sigma_{st}}$$

where σ_{st} is the total number of shortest paths from node s to node t and $\sigma_{st}(E(u,v))$ is the number of those paths that pass through $E(u,v)$.

Louvain Algorithm with Newcoin Adjustments

- Q: Modularity of the graph
- k_i: Sum of the weights of the edges attached to node i
- ΔQ: Change in modularity
- e_{ij}: Fraction of edges from community i to community j

In the Newcoin context, the modularity Q is given by:

$$Q = \frac{1}{2m} \sum_{ij} \left[A_{ij} - \frac{k_i k_j}{2m} \right] \delta(c_i, c_j)$$

where $A_{ij} = W(i,j)$, $k_i = \sum_j A_{ij}$, $m = \frac{1}{2}\sum_{ij} A_{ij}$, and $\delta(c_i, c_j)$ is 1 if $c_i = c_j$ and 0 otherwise.

The Louvain algorithm aims to maximize Q by iteratively moving nodes between communities.

Edge Weighting with Temporal Decay

Utilizing exponential decay functions to devalue older Base Points, giving precedence to recent, dynamic shifts in creative contributions.

Applied to Newcoin:

- $W(u,v,t)$: Weight of edge $E(u,v)$ at time t in Newcoin Graph
- $WATT(u)$: WATT value of node u
- $EdgeValue(u,v)$: Original value of the edge from node u to node v
- λ: Decay constant
- Δt: Time elapsed since the edge was created

The weight of an edge $E(u,v)$ at time t in the Newcoin context is calculated as:

$$W(u,v,t) = EdgeValue(u,v) \times WATT(u) \times e^{-\lambda \Delta t}$$

This formula incorporates the original edge value, the WATT value of the issuing node, and an exponential decay function to give precedence to recent contributions.

Trust Propagation Algorithms

Adapting trust-aware recommender systems like TidalTrust or MoleTrust to trace the flow of trust across Base Points.

TidalTrust Algorithm

- $Trust(u, v)$: Trust value from node u to node v in Newcoin Graph
- $WATT(u)$: WATT value of node u
- $EdgeValue(u, v)$: Original value of the edge from node u to node v

The trust value from node u to node v using TidalTrust in the Newcoin context is calculated as:

$$Trust(u, v) = \min(EdgeValue(u, v), WATT(u))$$

MoleTrust Algorithm

- $Trust(u, v, d)$: Trust value from node u to node v at depth d in Newcoin Graph
- $WATT(u)$: WATT value of node u
- $EdgeValue(u, v)$: Original value of the edge from node u to node v
- α: Trust decay factor

The trust value from node u to node v at depth d using MoleTrust in the Newcoin context is calculated as:

$$Trust(u, v, d) = \alpha^d \times EdgeValue(u, v) \times WATT(u)$$

Both algorithms are adapted to incorporate the WATT value as a multiplier, enhancing the trust propagation based on the issuing node's WATT value.

Spectral Clustering

Applying spectral methods to divide the graph into meaningful subgraphs, isolating communities of creative brilliance.

Let $G = (V, E)$ be the Newcoin Graph where V is the set of nodes and E is the set of edges. Each edge e_{ij} has a weight w_{ij}, which is the product of the edge value and the WATT value of the issuing node.

- $WATT(i)$: WATT value of node i

- $EdgeValue(i,j)$: Original value of the edge from node i to node j
- The weighted adjacency matrix W is defined as:
- $W(i,j) = EdgeValue(i,j) \times WATT(i)$
- The degree matrix D is a diagonal matrix where: $D(i,i) = \sum_j W(i,j)$
- The Laplacian matrix L is then defined as: $L = D - W$

Eigenvalue decomposition of L yields the eigenvalues $\lambda_1, \lambda_2, \ldots, \lambda_n$ and corresponding eigenvectors $v_1, v_2, \ldots, v_n$. The graph is then clustered based on these eigenvectors.

Identifying Creative Communities

The eigenvectors corresponding to the smallest eigenvalues often capture the community structure. Nodes are grouped based on the sign and magnitude of these eigenvectors, isolating communities of creative brilliance within the Newcoin network.

Flow Algorithms

Max-Flow/Min-Cut algorithms are applied to measure the "flow" of creativity within tightly-knit communities.

Max-Flow/Min-Cut Algorithm

Let $G = (V, E)$ be the Newcoin Graph where V is the set of nodes and E is the set of edges. Each edge e_{ij} has a capacity c_{ij}, which is the product of the edge value and the WATT value of the issuing node.

- $WATT(i)$: WATT value of node i
- $EdgeValue(i,j)$: Original value of the edge from node i to node j
- The capacity of an edge e_{ij} is defined as: $c_{ij} = EdgeValue(i,j) \times WATT(i)$

Measuring Creative Flow

The Max-Flow algorithm aims to find the maximum flow from a source node s to a target node t in the graph, subject to the capacities c_{ij}. The Min-Cut algorithm, on the other hand, identifies the minimum set of edges that, when removed, would disconnect s and t.

The Max-Flow value represents the "flow" of creativity within tightly-knit communities, providing a quantitative measure of the collective creative energy.

The Min-Cut value can be interpreted as the minimum "effort" required to disrupt the creative flow within a community, serving as an indicator of community robustness.

HITS (Hyperlink-Induced Topic Search)

Employing 'Hubs' and 'Authorities' metrics to identify nodes that not only receive but also give high-quality Base Points.

In the context of the Newcoin graph, nodes can be categorized into 'Hubs' and 'Authorities' based on their interactions. A 'Hub' is a node that endorses other nodes, while an 'Authority' is a node that is endorsed by others.

Let $G = (V, E)$ be the Newcoin Graph where V is the set of nodes and E is the set of edges. Each edge e_{ij} has a weight w_{ij}, which is the product of the edge value and the WATT value of the issuing node.

- $WATT(i)$: WATT value of node i
- $EdgeValue(i, j)$: Original value of the edge from node i to node j
- The weight of an edge e_{ij} is defined as: $w_{ij} = EdgeValue(i, j) \times WATT(i)$

HITS Algorithm

The HITS algorithm iteratively updates two scores for each node: the Hub score $h(i)$ and the Authority score $a(i)$.

The Hub score is updated as: $$h(i) = \sum_{j \in Out(i)} a(j)$$

The Authority score is updated as:

$$a(i) = \sum_{j \in In(i)} h(j)$$

Here, $Out(i)$ is the set of nodes that node i endorses, and $In(i)$ is the set of nodes that endorse node i.

Nodes with high Hub scores are those that give high-quality Base Points, while nodes with high Authority scores are those that receive high-quality Base Points. The HITS algorithm thus provides a dual metric for evaluating the quality of interactions within the Newcoin network.

Dominant Set Extraction

Using algorithms like the A* algorithm or greedy algorithms to find dominant sets of highly Endorsed and Endorsing nodes.

Hubs and Authorities

In the context of the Newcoin graph, nodes can be categorized into 'Hubs' and 'Authorities' based on their interactions. A 'Hub' is a node that endorses other nodes, while an 'Authority' is a node that is endorsed by others.

Let $G = (V, E)$ be the Newcoin Graph where V is the set of nodes and E is the set of edges. Each edge e_{ij} has a weight w_{ij}, which is the product of the edge value and the WATT value of the issuing node.

- $WATT(i)$: WATT value of node i
- $EdgeValue(i, j)$: Original value of the edge from node i to node j
- The weight of an edge e_{ij} is defined as:
- $w_{ij} = EdgeValue(i, j) \times WATT(i)$

HITS Algorithm

The HITS algorithm iteratively updates two scores for each node: the Hub score $h(i)$ and the Authority score $a(i)$.

The Hub score is updated as: $$h(i) = \sum_{j \in Out(i)} a(j)$$

The Authority score is updated as: $$a(i) = \sum_{j \in In(i)} h(j)$$

Here, $Out(i)$ is the set of nodes that node i endorses, and $In(i)$ is the set of nodes that endorse node i.

Interpretation

Nodes with high Hub scores are those that give high-quality Base Points, while nodes with high Authority scores are those that receive high-quality Base Points. The HITS algorithm thus provides a dual metric for evaluating the quality of interactions within the Newcoin network.

Anomaly Detection

Employing techniques such as Isolation Forests to spot outliers—creatives who may be exceptionally good but not yet recognized by the network, or detect patterns of creators attempting to game the system because they have acquired too much of certain types of signals compared to others.

Isolation Forest Algorithm

The Isolation Forest algorithm is particularly effective for this purpose. It works by randomly partitioning the feature space and isolating observations. The number of partitions required to isolate a point serves as an anomaly score.

- Let $G = (V, E)$ be the Newcoin Graph where V is the set of nodes and E is the set of edges.
- Each node i has a feature vector X_i, which includes metrics like WATT value, number of Base Points received, and so on.
- $WATT(i)$: WATT value of node i
- $NT(i)$: Number of Base Points received by node i

Anomaly Score

The anomaly score $S(i)$ for a node i is computed by the Isolation Forest algorithm based on the feature vector X_i.

$$S(i) = IsolationForest(X_i)$$

Nodes with high anomaly scores are considered outliers. These could be:

1. Exceptionally creative individuals who have not yet been recognized by the network.

2. Nodes that have an imbalance in the types of signals they have acquired, potentially indicating an attempt to game the system.

Cross-Graph Algorithms

Use tensor factorization or network alignment algorithms to integrate data from multiple creative graphs for a holistic measure.

Tensor Factorization can be applied to integrate multiple creative graphs.

- Let $G_1 = (V_1, E_1)$ and $G_2 = (V_2, E_2)$ be two creative graphs within the Newcoin network. Each graph has its own set of nodes V and edges E.
- $WATT(i)$: WATT value of node i in either graph
- $NT(i)$: Number of Base Points received by node i in either graph

Network Alignment Algorithms

Network Alignment Algorithms aim to find a one-to-one mapping between nodes in different networks based on node and edge attributes. In the Newcoin context, this can be used to align nodes from different creative graphs.

Cross-Graph Measure

The Cross-Graph Measure $CGM(i)$ for a node i is computed as:

$$CGM(i) = \alpha \times TensorFactorization(WATT(i), NT(i)) + (1 - \alpha) \times NetworkAlignment(WATT(i), NT(i))$$

Where α is a weighting factor between 0 and 1.

The $CGM(i)$ serves as a holistic measure of a node's creativity, taking into account data from multiple creative graphs. This enables the Newcoin network to capture a more comprehensive view of creativity, thereby enhancing its robustness and reliability.

Temporal Networks

Add a time component to edges and use temporal network analysis algorithms to trace the evolution of creative value over time.

Temporal Edge

- A temporal edge $E_{ij}(t)$ between nodes i and j is an edge that exists at time t.
- $WATT(i,t)$: WATT value of node i at time t
- $NT(i,t)$: Number of Base Points received by node i at time t

Temporal Centrality Measure

Centrality measures in temporal networks often incorporate the time component. One such measure is Temporal Centrality $TC(i,t)$, defined as:

$$TC(i,t) = \sum_{j \in N} E_{ij}(t) \times WATT(j,t)$$

Where N is the set of nodes connected to i at time t.

Temporal Decay Function

To give precedence to recent shifts in creative contributions, a decay function $\delta(t)$ can be applied:

$$TC(i,t) = \sum_{j \in N} E_{ij}(t) \times WATT(j,t) \times \delta(t - t_0)$$

Where t_0 is the current time and $\delta(t)$ is a decay function such as an exponential decay.

The Temporal Centrality measure $TC(i,t)$ allows the Newcoin network to understand how the creative value of a node evolves over time, providing insights into the dynamic nature of creativity.

c. Deterministic Block Producers

Deterministic Block Producers in the Newcoin network serve a critical function in ensuring data consistency and immutability. These specialized nodes operate under a predefined set of protocols to validate and append new blocks to the blockchain, thereby maintaining a consistent state across the network.

In the context of deterministic parallel execution of applications, Newcoin's architecture is designed to prioritize deterministic behavior for achieving consensus. While initially running in a single-threaded environment, the software is equipped with the necessary data structures for future multithreaded, parallel execution[53]. Block producers have the responsibility of organizing action delivery into independent shards, enabling parallel evaluation. Notably, the scheduling process itself need not be deterministic, thereby allowing for the utilization of parallel algorithms.

To minimize communication latency, Newcoin employs a hierarchical structure that divides each block into cycles, shards, and transactions, each containing a set of actions. This intricate structure enables rapid action exchange between accounts within a single block. Through static

[53] Croman, K., Decker, C., Eyal, I., Gencer, A. E., Juels, A., Kosba, A., ... & Song, D. (2016). On scaling decentralized blockchains.

analysis, it is ensured that no two shards within a cycle modify the same account, thereby enabling parallel processing of shards[54].

Certain accounts in the Newcoin network may process actions without altering their internal state. These read-only action handlers can be executed in parallel within a shard, provided they adhere to specific conditions[55]. For transactions that require atomicity across multiple accounts, actions are placed within a single transaction and assigned to the same shard for sequential execution[56].

Newcoin's architecture allows for modular operation, enabling nodes to run a subset of applications. This feature is particularly beneficial for nodes that require only specific functionalities, thereby optimizing resource utilization[57]. Lastly, block producers in Newcoin employ subjective measurements for computational complexity and time requirements for transaction processing. This subjective approach allows for greater flexibility in resource allocation and optimization opportunities[58].

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[54] Miller, A., Xia, Y., Croman, K., Shi, E., & Song, D. (2016). The Honey Badger of BFT Protocols.

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[58] Pass, R., Seeman, L., & Shelat, A. (2017). Analysis of the Blockchain Protocol in Asynchronous Networks.

6. Tokenomics

a. Computing Resources Model

NCO, the native token of the Newcoin network, is pre-eminently positioned as an infrastructure token. With an initial pre-mined supply of 1,888,888,888 at the Token Generation Event (TGE) and a fully mineable supply cap of 8,888,888,888, NCO plays a pivotal role in the network's operational dynamics. While it functions as a medium for transaction fees, its more nuanced role lies in granting token holders access to the network's computational power and storage capacity in the form of a stake-to-write pricing structure, granting a share of the state machine's computational power.

Newcoin's infrastructure is predicated on a unique tokenomic model that addresses the challenges of resource management in a gas-free environment. Users are allocated transactional and storage quotas based on their WATT. For extended operations, RAM space, a scarce resource constrained by technological limits, can be procured at market-driven prices.

- creation of profiles
- minting of NFTs and other data objects such as SBT badges
- minting of LP token balances
- deployment of DAOs and proposals
- issuance of Base Points

In the Newcoin ecosystem, RAM is a critical commodity with distinct market dynamics. Its supply can be adjusted based on community consensus and technological advancements, ensuring the blockchain's adaptability to diverse operational needs.

The Bancor Relay algorithm, employed by Newcoin, maintains RAM pricing in alignment with market rates, adjusting dynamically to large transactional demands. However, its current configuration introduces potential volatility, necessitating parameter adjustments for market stability.

To address scalability and the increasing demand for RAM, Newcoin is exploring:

1. **Virtual Memory**: Utilizing SSD technology, virtual memory can optimize performance by swapping RAM contents to disk, offering a cost-effective solution for non-producing full nodes.

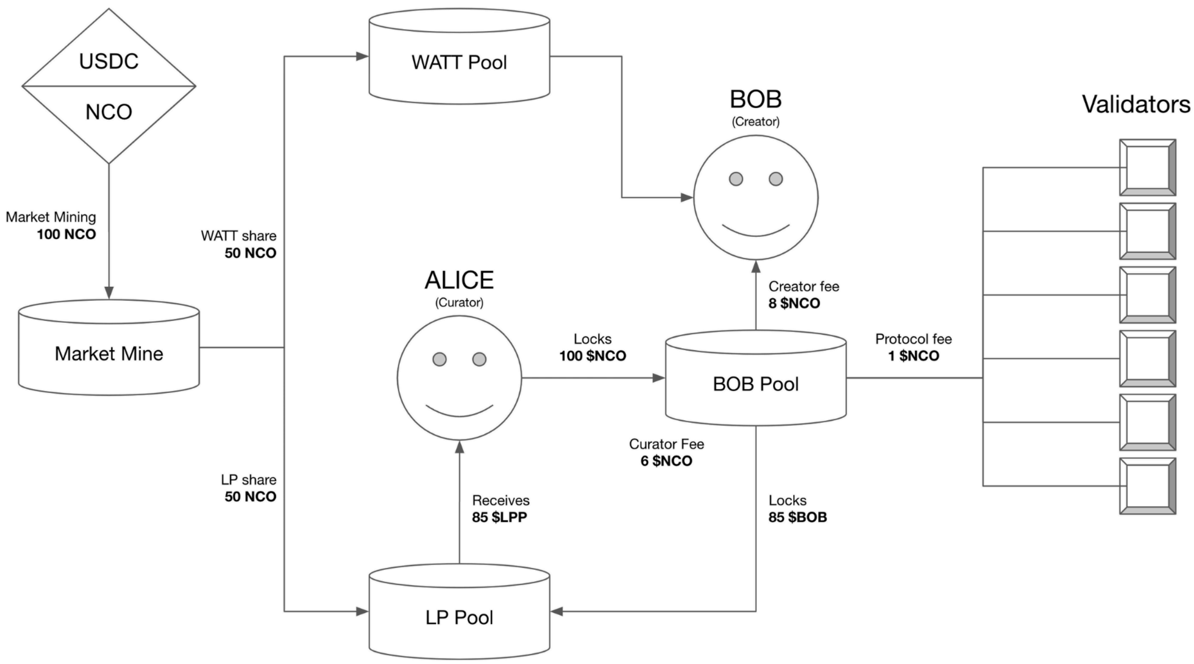
2. **RAM Transparency**: Ensuring efficient resource allocation requires transparent RAM supply growth projections. Newcoin's proposed system contract update aims to provide this transparency, introducing a steady growth rate managed by block producers.

Activation functions and the Proof-of-Creativity algorithm are computationally intensive processes. These functions, integral to the Newcoin network, necessitate significant CPU resources. The CPU, in this context, is not just a measure of processing power but represents the very bandwidth that facilitates the execution of transactions on the blockchain. Each transaction, when processed, consumes a portion of this CPU bandwidth. Thus, the CPU becomes a critical resource, ensuring that actions sent to contracts are executed efficiently and without delay.

However, the inherent computational demands of activation functions and the Proof-of-Creativity algorithm mean that they can rapidly deplete available CPU resources. To mitigate this, staking NCO tokens becomes essential. By staking NCO, users can acquire additional CPU quota, ensuring that their transactions, especially those related to activation functions and the Proof-of-Creativity algorithm, are processed seamlessly. In essence, staking NCO is akin to reserving computational bandwidth, safeguarding the user against potential bottlenecks and ensuring the smooth functioning of the network's core processes.

b. Peer-staking and the LP Economy

Motivation for Creators: As the network proliferates, Creators encounter an increasing demand for Base Points to augment their WATT. The Activation Function, a core mechanism within the network, offers an amplification potential. By locking NCO tokens, Creators can obtain LP tokens, which signify a stake in the collective Creators' pool. This mechanism not only facilitates Creators in accruing WATT but also provides them with a medium (LP tokens) to monetize their offerings. The subsequent issuance of LP tokens for products and services leads to a contraction in the available NCO supply. Given the principles of supply and demand, this contraction engenders a systematic value appreciation for NCO, ensuring its sustained economic viability.



Fee Structure and Incentives: When staking into an identity, a structured fee regimen is applied, ensuring equitable value distribution:

- Creator Fee: 8%
- Curator Fee: 6%
- Protocol Fee: 1%

Upon staking, the Liquidity Provider is endowed with an LP token. This token is emblematic, representing a stake in the Creator's digital identity. Moreover, it entitles the holder to a spectrum of rewards, which emanate from diverse network activities, including but not limited to, subsequent staking events, NFT acquisitions, and WATT augmentations.

Liquidity Providers, pivotal cogs in the Newcoin ecosystem, are incentivized through a dual-pronged approach:

a) **Exclusivity and Governance:** LPs gain privileged access to a repository of exclusive content. This access is not merely passive; it extends to governance rights, allowing LPs to influence network decisions. Additionally, they benefit from community-driven perks, such as token-gated access permissions, further enhancing their network experience.

b) **Economic Incentives:** Beyond the intangible benefits, LPs are economically incentivized. They are entitled to a share of the LP rewards, a testament to their contribution to the dataset's enrichment, algorithmic refinement, and overall liquidity provision.

c. Market Mining

Mechanistic Value Capture through Market Mining: Newcoin's market mining is predicated on the NCO/USDC trading pair. Specific price thresholds, determined by this trading pair, act as triggers for the minting of additional NCO tokens. However, this minting is not arbitrary. Tokens are mined exclusively when a new all-time-high price is achieved on the NCO/USDC trading pair. Above the $0.17 USD mark, every incremental all-time high of $0.01 results in the mining of an additional 80,000 NCO. This newly minted supply is distributed to:

- LPP holders, accounting for 50%, as a reward for their curation.
- WATT holders, the remaining 50%, rewarding their creative contributions.

Sustainable Incentives and Network Growth: The market mining mechanism is not merely a value distribution tool; it's a strategic incentive system. By aligning rewards with price milestones, Newcoin ensures that the ecosystem remains invigorated across all stages of network growth. This is reminiscent of Bitcoin's long-term mining reward structure, which has been instrumental in its sustained network participation and security.

Equilibrium and Network Security: The Newcoin ecosystem is designed with a cap on NCO's total supply. This supply becomes fully mineable when the token's valuation aligns with an $8T market cap. Such an equilibrium ensures a balanced interplay between supply and demand. It not only incentivizes network participants for their creative and curatorial inputs but also fortifies network security.

7. Mechanism Design

a. Weighted Quadratic Global Consensus

In decentralized governance, the quintessential challenge is the design of mechanisms that equitably distribute decision-making influence among participants. Newcoin addresses this challenge through a weighted quadratic voting system, which amalgamates two key metrics: Total Value Locked (TVL) and Proof-of-Creativity (WATT). The latter undergoes logarithmic scaling to mitigate disproportionate influence. This mechanism design aims to balance financial stake with skill and creative contributions, thereby fostering a more democratic governance structure[59].

The mathematical formulation of Newcoin's weighted quadratic voting mechanism is expressed as:

$$C(TVL) = \alpha \times \log(WATT) \times TVL^2$$

In this equation, $C(TVL)$ represents the voting power associated with tokens staked in the governance pool. TVL signifies the financial stake, while $\log(WATT)$ encapsulates the skill or creative capital of a participant. The logarithmic scaling of WATT serves to counteract power-law dynamics, thereby preventing any single participant from exerting undue influence[60].

By integrating TVL and $\log(WATT)$ in the quadratic voting formula, Newcoin's governance mechanism ensures a balanced decision-making paradigm. It mitigates the risk of governance being skewed in favor of large token holders and emphasizes collective intelligence. This approach aims to facilitate decisions that are not only well-informed but also aligned with the broader community's insights and perspectives[61].

b. Activation Function Modularity

In Newcoin's architecture, Activation Functions serve as decentralized algorithmic evaluators, pivotal in the Proof-of-Creativity (PoC) algorithm. These functions are modular smart contracts with initially neutral multipliers, activated only upon rigorous validation by a global consensus mechanism. This design is aligned with mechanism design theory, particularly focusing on incentive compatibility and individual rationality[62].

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[61] Zohar, A., & Rosenschein, J. S. (2011). Mechanisms for Internet-based voting on point-distribution problems.

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The architecture also incorporates privacy-preserving features. Data used for Activation Functions is hashed to prevent duplication but is not published on-chain, ensuring privacy. This is crucial for maintaining the integrity of the system while adhering to privacy norms.

The modularity inherent in Activation Functions permits a granular approach to mechanism design, allowing for a comprehensive and diverse set of parameters that can be fine-tuned to meet the specific requirements of the Newcoin ecosystem. These parameters can be categorized into several types, each serving a distinct purpose within the utility function that governs agent behavior.

Asset-based metrics, for instance, could include parameters like the duration of asset holding or the type of asset involved. These metrics serve to evaluate the economic commitment and strategic choices of agents, thereby influencing their utility functions.

Voting and consensus metrics could involve the weight of an agent's vote based on their Proof-of-Creativity (PoC) score or Total Value Locked (TVL). These metrics are critical for ensuring incentive compatibility, as they align the individual utilities of agents with the collective decision-making process, thereby aiming to achieve a Pareto-efficient outcome[63].

Temporal metrics, such as the frequency and duration of interactions with the protocol, add another layer of complexity to the utility function. Over time, the iterative process involving multiple validators contributes to the robustness of the system, making it resistant to gaming and attacks. This iterative refinement is crucial for achieving a Bayesian-Nash equilibrium in a decentralized setting[64].

c. Hierarchical Logarithmic Mitigation Cascades

The issuance of Base Points and their subsequent conversion into WATTs in the Newcoin ecosystem is governed by a complex mechanism that employs hierarchical logarithmic mitigation cascades. This design choice serves multiple purposes, primarily aimed at ensuring system robustness and mitigating gaming attempts. Each activation function, which serves as an algorithmic evaluator of creative actions, is subjected to a logarithmic dampening process. This logarithmic mitigation effectively reduces the marginal utility of repetitive actions within the

[63] Nisan, N., Roughgarden, T., Tardos, É., & Vazirani, V. V. (2007). "Algorithmic Game Theory." Cambridge University Press.
[64] Arnstein, S. R. (1969). "A Ladder Of Citizen Participation." Journal of the American Institute of Planners, 35(4), 216-224.

same functional domain, thereby deterring attempts to game the system through action duplication or frequency manipulation[651].

However, the system's resilience is not solely reliant on this initial layer of logarithmic mitigation. As values from various activation functions are aggregated for further processing, they undergo an additional layer of logarithmic reduction. This multi-tiered approach ensures that even if a single activation function is compromised, the subsequent layers of logarithmic dampening will neutralize any undue advantage or disproportionate influence that could be exerted on the system[66].

Ultimately, these logarithmically mitigated values are aggregated to compute the final Proof-of-Creativity (PoC) score. This score undergoes multiple rounds of logarithmic mitigation, each serving as a computational checkpoint that reinforces the system's resilience against potential exploits. The end result is a PoC score that is both representative of the agent's genuine creative contributions and resistant to various forms of system gaming[67].

8. Use Cases

a. System Contracts: Block Producers Election

In traditional Delegated Proof-of-Stake (DPoS) systems, the formation of cartels can be a significant issue. High-stake entities can collude to maintain control over the network, thereby compromising its decentralization[68]. Newcoin addresses this problem by introducing WATT as a multiplier in block producer elections. This multiplier is computed based on a user's creative contributions, as assessed by various activation functions.

For example, in a standard DPoS system, a small number of wealthy nodes could dominate block production. However, in Newcoin's modified DPoS, even if a node has high financial stake, its influence would be moderated if it has a low WATT score. Conversely, a node with a high WATT score but lower financial stake could have its influence amplified, thereby breaking the potential for cartel formation.

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[65] Dwork, C., & Naor, M. (1992). "Pricing via Processing or Combatting Junk Mail." Advances in Cryptology — CRYPTO' 92.

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This approach not only enhances decentralization but also taps into the collective intelligence of the network, making it more robust and trustful[69]. By weighting the DPoS mechanism with WATT, Newcoin ensures a more equitable and meritocratic system, mitigating the risks associated with financial centralization.

b. System Contracts: Consensus-Driven Programmability

In traditional Turing-complete virtual machines, the flexibility to execute any computable function comes at the cost of mechanistic fragmentation and potential security vulnerabilities[70]. Newcoin introduces a novel approach to programmability that leverages consensus-driven mechanisms akin to the merge concept in open-source projects. In this model, developers can submit pull requests containing proposed changes or additions to the blockchain's functionality. The decision to merge these changes is then subject to a global consensus, similar to how validators reach agreement in the network.

For example, in a Turing-complete system, smart contracts with unforeseen vulnerabilities can be deployed, leading to potential exploits. In contrast, Newcoin's consensus-driven programmability ensures that any new code is rigorously reviewed and approved by a decentralized network of validators, each of whom has skin in the game in the form of WATT and stake. This not only maximizes security but also ensures that changes align with the collective intelligence and needs of active users[71].

c. Smart Pricing: Computing Resources Pricing

In traditional blockchain ecosystems, gas prices serve as a mechanism to deter bots and Distributed Denial of Service (DDoS) attacks, as well as to manage network congestion. However, this approach has the unintended consequence of penalizing legitimate users by inflating the cost of block space[72]. Newcoin's Proof-of-Creativity (PoC) algorithm offers a nuanced alternative by enabling system contracts to differentiate between bots and genuine human activity.

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[70] Luu, L., Chu, D. H., Olickel, H., Saxena, P., & Hobor, A. (2016). "Making Smart Contracts Smarter." In Proceedings of the 2016 ACM SIGSAC Conference on Computer and Communications Security (pp. 254-269).

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For instance, the cost of gas, denominated in gwei, could be dynamically adjusted based on the amount of WATT a wallet holds. This would allow users with higher WATT, indicative of genuine creative contributions, to benefit from reduced gas fees. Such a mechanism enhances the economic efficiency of resource allocation, aligning costs more closely with the value generated by the user.

This principle extends beyond blockchain transactions to other computational resource-intensive domains. AI products, which often provide free credits to attract users, could implement smarter pricing policies based on the quality of input they receive. By doing so, they could allocate more computing quota to users who contribute valuable data or insights, thereby enriching their network[73].

Similarly, decentralized data storage platforms like IPFS or Arweave could adopt a PoC-based pricing model. Under this framework, storage costs could be waived or significantly reduced for creators who have demonstrated high levels of engagement or popularity, as quantified by their WATT score. This would incentivize high-quality content creation and dissemination, thereby enhancing the overall utility and attractiveness of these platforms[74].

d. Smart Contracts: Permissionless NFT Market Moderation

In the burgeoning NFT marketplace, the challenge of moderating content while maintaining a permissionless environment is non-trivial. Traditional approaches often rely on centralized gatekeepers to mitigate spam, scams, and fraudulent activities, which is antithetical to the decentralized ethos of blockchain[75]. Newcoin's Proof-of-Creativity (PoC) algorithm offers a compelling solution by enabling smart contracts to consume WATT as a decision-making metric.

Under this framework, the ability to mint, drop, or feature NFTs on a homepage could be contingent upon an account's WATT score. This effectively delegates the moderation process to a decentralized network of creators, each contributing to the collective intelligence of the system. The higher the WATT score, the more likely the account is engaged in genuine creative endeavors, thereby reducing the likelihood of malicious activities.

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[74] Benet, J. (2014). "IPFS - Content Addressed, Versioned, P2P File System." arXiv preprint arXiv:1407.3561.
[75] Monegro, J. (2016). "Fat Protocols." Union Square Ventures Blog.

This mechanism is akin to the algorithmic capabilities of platforms like TikTok, which utilize machine learning to curate and moderate content[76]. However, Newcoin's approach has the added advantage of being fully decentralized and transparent, aligning with the principles of blockchain technology. It allows for a more dynamic, responsive, and fair marketplace, where the quality of contributions is directly correlated with visibility and access to resources.

e. Machine Learning: Fundamental Analysis for Crypto Networks

In crypto networks, the prevalence of bots, wash-trading, and artificially inflated activities poses significant challenges for accurate fundamental analysis[77]. Traditional metrics often fail to capture the genuine value and utility of decentralized applications (dApps) and tokens. Newcoin's WATT metric offers a novel approach to reverse-engineer the valuation of dApps and blockchain networks.

By utilizing WATT as a measure of the importance and weight of users interacting with smart contracts, Newcoin provides a more nuanced understanding of user-base quality and value capture. Unlike conventional metrics that may be easily manipulated, WATT scores are designed to be resistant to gaming and are indicative of an account's genuine creative contributions and influence. This creates a more robust and reliable framework for assessing the intrinsic value of a dApp or token.

Exchanges and market analysis platforms like CoinMarketCap could integrate WATT-based indices to offer a more accurate and comprehensive valuation of blockchain networks and smart contracts. Such an index would not only reflect market capitalization but also the collective intelligence and creative capital embedded within the network, thereby providing a multi-dimensional view of value[78].

f. Machine Learning: Training and Fine-Tuning

In machine learning paradigms, the quality of the training set is a critical factor that influences the performance of the model[79]. Traditional approaches often treat all data inputs as equally

[76] Zhang, D., & Wang, H. (2020). "TikTok and Douyin: Two Sides of the Same Coin." In Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems (pp. 1-12).
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significant, which can lead to suboptimal learning outcomes. Newcoin's WATT metric introduces a nuanced layer to this process by enabling enhanced training set assessment. Machine learning transformers integrated with WATT can prioritize data inputs based on their inherent creative or intellectual value. This ensures that the model's learning trajectory is significantly influenced by high-quality, impactful data, thereby aligning the model's outputs more closely with human reasoning and contextual understanding.

Furthermore, the application of WATT extends to Reinforcement Learning with Human Feedback (RLHF) systems. Traditional RLHF often operates on a "one person, one vote" basis, similar to mechanisms like Proof-of-Personhood[80]. However, WATT introduces a weighted feedback mechanism, where the feedback from individuals with high WATT scores is given more consideration. This adds a layer of nuance and depth to the RLHF process, allowing the model to learn from a more refined and contextually rich set of human feedback. Such an approach can be instrumental in developing machine learning models that are not only accurate but also aligned with complex human behaviors and ethical considerations.

g. Social Media: Collaborative Filtering

In traditional social media platforms, the curation algorithms primarily focus on maximizing user engagement, often neglecting the qualitative aspects of content[81]. Newcoin's WATT metric introduces a mechanism that quantifies creative relevance, thereby shifting the focus from mere engagement to intellectual contribution. In this system, a user's interaction, such as a "like," is weighted by their WATT score, effectively serving as a multiplier that amplifies the visibility of content based on its assessed creative or intellectual value. This weighted approach to social media curation enables a more nuanced and meaningful dissemination of ideas, mitigating the dilution of discourse that is common in engagement-driven models.

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[81] Tufekci, Z. (2018). "Twitter and Tear Gas: The Power and Fragility of Networked Protest." Yale University Press.

h. Social Media: Streamlining Discoverability

For social graphs, the "cold start" problem is a well-documented challenge[82] [83], hindering both nascent platforms and creators. Newcoin's WATT metric, stored within a blockchain wallet, serves as a portable, cross-platform quantification of a user's creative capital. This decentralized approach allows any social media platform to access and utilize this metric for immediate algorithmic calibration, thereby mitigating the cold start problem. This mechanism not only streamlines discoverability for creators but also encourages them to engage with new platforms without reputational loss. Consequently, this fosters a more fluid interchange of creative contributions across diverse platforms, enhancing the overall network's resilience and adaptability.

[82] Goldberg, D., Nichols, D., Oki, B. M., & Terry, D. (1992). Using collaborative filtering to weave an information tapestry. Communications of the ACM, 35(12), 61-70.
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