

GenesisAI

The decentralized AI marketplace on blockchain

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GenesisAI is a decentralized, blockchain-based network for AI services. The GenesisAI marketplace connects companies in need of AI services with companies interested in monetizing their AI technology. GenesisAI brings together AI technologies from all over the world to help lay the foundation for an eventual global Artificial General Intelligence.

99% of companies need AI services to perform tasks more quickly, cost-effectively, and intelligently. However, most companies cannot afford their own team of experts, nor do they have the technical capabilities to easily determine which open-source APIs have useful and effective AI code that they could adjust for their own needs.

GenesisAI connects companies in need of AI services with companies that would like to monetize their AIs. This allows unused resources, such as AIs developed in-house by small companies and open source GitHub AI code, to be used by companies in need of these technologies. The connector of these two parties can unlock trillions of dollars in market value.

The team behind GenesisAI is comprised of leading AI scientists, software developers, and business professionals with backgrounds from Harvard, Google, and Microsoft.

GenesisAI meets a large and increasing need in a projected \$3.1 trillion market [1].

Now is the best time to build a decentralized marketplace for AI services. Currently, AI services exist in silos; they are developed by companies to serve specific purposes. GenesisAI connects AIs, allowing the technologies to interact with and learn from each other to lay the foundation for a much more efficient system that can be used to outsource AI services to a diverse range of industries.

GenesisAI can provide an enormous value to society by increasing the accessibility of Artificial Intelligence technologies. This is the chance for us to change the world together.

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1 Vision

1.1 The Beginning

Genesis refers to the Biblical story of how the world began. In the beginning, God created the most important beings and provided the basic elements needed for survival. Now, the world has many critical problems: climate change, incurable disease, poverty, and war. Millions of people are dying for reasons that could be eliminated or prevented. We need a way to solve these problems and implement solutions before it is too late. We need a Genesis of technology.

Artificial Intelligence is the most promising solution to these problems. AI holds the potential to revolutionize our world even more so than electricity and fire. However, there are fundamental problems that currently hold back AI innovation. So far, there is no way for AIs to communicate: they cannot exchange data, trade services, learn from each other, or leverage their combined capabilities to solve the problems our world faces.

Until now, it was impossible to create a decentralized AI marketplace. Blockchain technology can streamline the invention of what could potentially become the single most valuable technology of our lifetimes. Blockchain technology provides the best framework for the creation of a new type of economy: the AI to AI economy in which AI bots trade services, communicate with each other, and exchange data and knowledge. Blockchain technology makes it possible to connect all of the world's AI services into a single platform to lay the foundation for the eventual emergence of Artificial General Intelligence.

GenesisAI merges blockchain technology with AI to produce the first functional and decentralized marketplace for AI services. We have 4 main goals:

1. To connect companies in need of AI services with companies who would like to monetize their AI technology. This will be achieved by developing the GenesisAI marketplace, where AI services can be sold and purchased by individual agents.
2. To connect many different AI services and leverage their data to eventually synergize an Artificial General Intelligence. To achieve this, the GenesisAI platform has been designed to enable the interaction of multiple service providers (nodes) that can easily integrate with each other.
3. To confront the current system of AI oligopolies where only a handful of large corporations own and operate AIs by making AI technology accessible to small companies and individuals. By building partnerships with smaller AI service providers and pricing AI jobs with our native tokens, GenesisAI provides equal access to AI technologies. This will allow any business to leverage our products and enter the AI industry.
4. To create a benevolent AI which only acts to benefit society and will minimize the risk of emergence of the development of mal-intentioned Artificial General Intelligence. Our reputation system will restrict bad actors and incentivize beneficial AI suppliers, who will provide services for the welfare of society.

1.2 The Team

We have gathered a team of recognized experts, thought-leaders, and entrepreneurs to solve foundational problems within the field of AI.

Archil Cheishvili - Archil studied economics at Harvard University. He is a serial entrepreneur with 2 exits. Archil sold his first company when he was 18. Prior to GenesisAI, Archil was the CEO of an AI-powered people analytics software company called Palatine Analytics. He has been recognized by the New York Post, Yahoo Finance, and others.

David Fan - David studied Applied Mathematics in Computer Science at Harvard University. He has work experience as a Software Engineer at Google, APT, and Dataminr.

Mena Gadalla - Mena has raised over \$1 million in grants for his research projects. Mena's academic experience ranges from a Harvard University PhD in Applied Physics to a Harvard Master's in Computational Science. He has published multiple scientific works.

GenesisAI's team is comprised of leading blockchain and AI experts whose goal is to lay the foundation for the eventual emergence of a benevolent Artificial General Intelligence which is both operated and owned by the people via our platform. The platform we are creating will connect different AI services to each other and make the power of AI available to those who are unable to create their own AI technologies or otherwise afford them.

1.3 Advisors

Professor Thomas Magnanti - Former Dean of Engineering at MIT. Institute Professor. Founding Director of the Singapore-MIT Alliance for Research and Technology (SMART).

Neil Flanzraich - Lead Independent Director of Chipotle. Former President of Ivax Corporation (acq. by Teva for \$10B). Executive Committee member of Syntex Corporation (sold to Roche Holdings for \$5.3 B).

Travis May - Former CEO of LiveRamp (acq. by Acxiom for \$310 mil). CEO of Datavant. Forbes 30 Under 30.

Professor Tim Kraska - Associate Professor Computer Science at MIT CSAIL. 2017 VMware Systems Research Award Recipient. Widely recognized for early work on hybrid human-machine data management.

Professor Minlan Yu - Associate Professor of Computer Science at Harvard University. PhD in Computer Science from Princeton. Experience at Google, AT&T, Microsoft, Facebook, and Bell Labs.

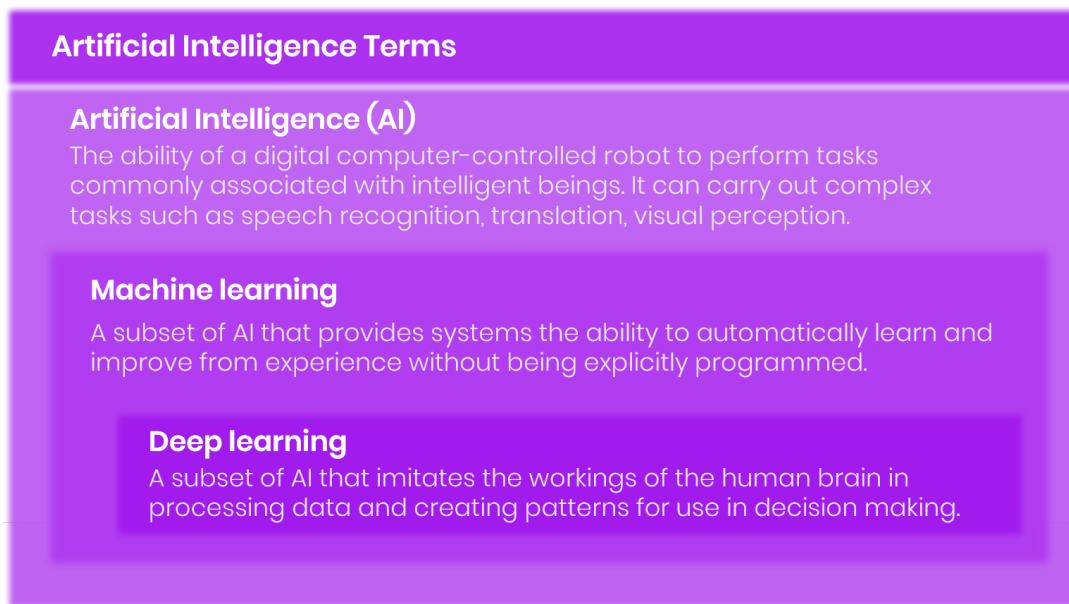
Professor Stratos Idreos - Assistant Professor in Computer Science at Harvard University. Leads the Data Systems Laboratory at Harvard School of Engineering and Applied Sciences.

Ed Simnett - Principal at The Arnold Group. Launched a \$1B business for Microsoft. Harvard MBA.

Professor Elie Ofek - Professor of Business Administration in the Marketing unit at Harvard Business School. Development engineer at IBM Research.

Professor Andy Wu - Assistant Professor of Business Administration in the Strategy Unit of the Harvard Business School. Founder of Identified Technologies.

2 Existing Problems with AI



AI impacts our lives every day, whether or not we are aware of it. AI has the potential to become the single most important technology in the world. It is estimated that the market for AI will reach a value of \$3.1 Trillion by 2025 [1]. Currently, however, three fundamental obstacles hold back AI innovation, as we will discuss.

2.1 Problem 1: No connectivity

Today, there is no way for AI products to exchange data, learn from each other, combine their capabilities to work towards a common goal, or trade/exchange services. AI technologies operate in a closed environment. Each company that develops AI collects its own data sets rather than sharing data or using previously published data to train its AI. In other words, companies must independently create AI which has already been created by other companies. This leads to redundancy and a waste of time and effort on the part of each company. For instance, there are hundreds of language processing AI products that have been developed to operate in their own closed environments. A large component of AI is machine learning, which requires the machine to have as many resources to interact with and learn from as possible. It is ironic and paradoxical that this fundamental requirement of machine learning

is ignored as there is currently no way for different AI services to learn from each other. The lack of connectivity between different AI technologies is a major roadblock to creating Artificial General Intelligence. The solution to this fundamental problem will be able to unlock trillions of dollars in market value.

2.2 GenesisAI Solution: Protocol for communication

Our Ethereum-based smart-contracts enable different AI technologies to communicate with each other, exchange data, learn from each other, and trade services.

Essentially, GenesisAI is comprised of many smart-contracts that create AI communication protocol, which in turn makes a decentralized AI-to-AI economy possible. This enables anyone in the world to access AI services or be able to monetize AI code that they have created.

Communication protocol specifies the logic behind AI-to-AI economy and details how both the supplier and consumer parties can connect with each other as well as how they can exchange data, trade services, and learn from each other. Communication protocols make the process of using and monetizing AI services much simpler than any other option. Anyone, even someone with non-technical training, can participate in GenesisAI's marketplace.

GenesisAI connects all the AI services on the platform in order to form a coordinated Artificial General Intelligence (AGI). The AGI will operate in a way that is similar to a human brain, which is capable of multiple functionalities. Currently, AI services are only capable of doing very limited and specific tasks and cannot adjust their abilities in order to complete separate tasks which are related to the end-goal of the AI. For example, Google's Go-player AI can play the game Go well, but if you ask it to play poker it will fail. Tesla may have self-driving car AI, but if you deploy that AI to a motorbike it will fail. AI technologies are currently optimized to complete only specific tasks and are unable to adapt to different circumstances or different tasks that they are not specifically designed for. The best way to create AGI is to connect as many AI products as possible in order to form a global mastermind-brain. Since our platform will enable AI services to learn from each other and exchange data, it will catalyze a major leap towards AGI. Furthermore, we will create a new paradigm, a new type of economy: a decentralized AI-to-AI economy.

2.3 Problem 2: Expensive to use

There are only around 10,000 AI developers. 99% of businesses cannot afford to hire their own team of AI engineers to create AI, nor they can afford to risk integrating open-source AI API either without technical expertise in the area. They are unable to determine which AI to integrate and/or how to develop the AI for their specific needs. All of this makes current AI implementation extremely expensive. While many companies would like to gain a competitive edge by using AI technology, they are unable to utilize the technology in a cost-effective manner.

2.4 GenesisAI Solution: Delivering inexpensive and fast AI solution

GenesisAI’s web-platform enables businesses to provide their AI services to interested parties, thereby increasing the number of AI service providers (see Figure 1). This increased supply of AI service providers will dramatically reduce the cost of using AI. Furthermore, we make it simple and easy for companies to use any type of AI work/service. Companies do not need to have in-house software engineers to create or adjust existing AI products in order to get work done. Rather, through simply following a GenesisAI protocol, companies can request a specific AI service, pay using GenesisAI (GAI) tokens, send their data to be analyzed, and receive the completed, high-quality AI work.

There are many high-quality open-source APIs available on GitHub and elsewhere on the web, such as on Google’s TensorFlow. However, these are hard to use and difficult to integrate even with technical expertise. Companies spend tens of thousands of dollars on those integrations. We are democratizing access to these APIs by wrapping AI code in an easily accessible AI node. This further reduces the cost of AI work by increasing the total supply of accessible AI services. The ease of using wrapped APIs empowers even people without technical expertise to reach their goals with the power of sophisticated AI. No engineering work is required in order to use the AI technologies. This enables businesses to complete tasks in a more efficient and affordable manner.

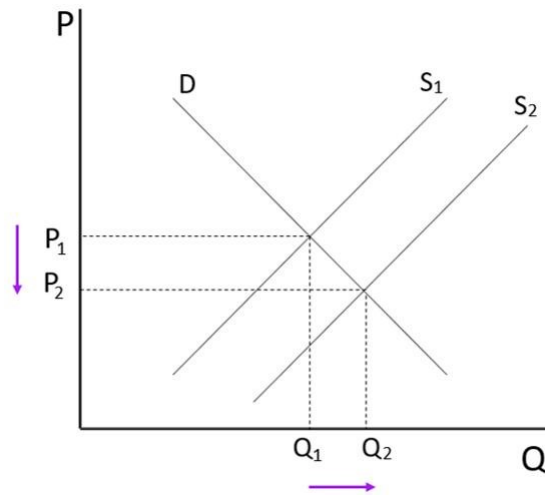


Figure 1: : Increasing the number of suppliers – companies wishing to monetize their AI technologies – from S_1 to S_2 can reduce price of AI services from P_1 to P_2 if the demand side – users looking to utilize monetized AI technologies – remains constant. This also increases the quantity of services performed from Q_1 to Q_2 . Thus, increasing the supply of AI technologies on the marketplace increases the number of services utilized and decreases the price for each specific service.

2.5 Problem 3: No way to monetize AI code

AI developers and companies do not have an easy way to sell their AI services. For example, a smart computer science student in Bulgaria wrote an AI code and intended to sell his AI capabilities to companies, but the student could not monetize his AI code easily because there is currently neither a marketplace where you can easily find potential buyers nor a way for AI services to be discovered. That student could have gone through the costly process of self-incorporating into a company so that he could sell his code to businesses, but that would be suboptimal due to a variety of reasons, including a lack of business understanding and a lack of necessary funds to create a company. Many small, medium, and even large companies have developed great AI technologies which cannot be monetized because the companies are in some geographical location which makes it difficult to be discovered. Additionally, enterprise sales are extremely challenging and costly. This is the main reason why currently only a few large companies such as Google, Facebook, Amazon, and some nation states own the majority of AI capabilities in existence. Because of the oligopolistic AI marketplace, the key actors mentioned above are setting high prices for AI services and are excluding AI developers and other smaller companies from participating in the marketplace (see Figure 2).

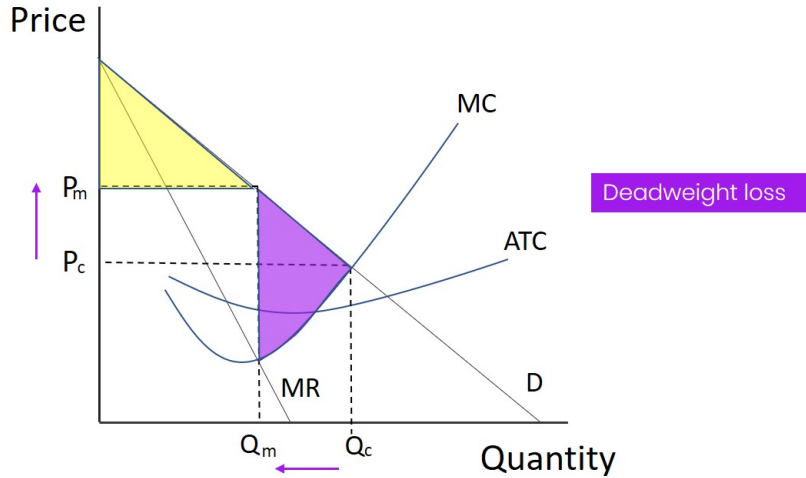


Figure 2: Monopolists raise prices to maximize their profits (with a price at P_m and a quantity of services utilized at Q_m relative to the price and quantity associated with a competitive market at P_c and Q_c , respectively); this causes deadweight loss for the entire market. The yellow shaded area represents the consumer surplus which is significantly reduced compared to the consumer surplus for the price during perfect competition (yellow shaded area + $(P_m - P_c) * Q_m + (Q_c - Q_m) * \frac{P_m - P_c}{2}$).

2.6 GenesisAI Solution: AI marketplace

GenesisAI democratizes the selling of AI technology. Our platform empowers anyone in the world by allowing them to monetize the AI services that they have created. Seller reputations will be the main factor determining how much and how difficult the work requests will be that the seller receives. Nobody will be discriminated or excluded from participation on the site, and the current monopolization of AI technology by large companies will be stopped. The GenesisAI marketplace is decentralized, will not act in a manner that benefits any single party, and is open for anyone to join and use.

Furthermore, GenesisAI breaks down many barriers of monetization. It eliminates the requirement of spending huge resources on B2B sales as well as the need to provide custom AI integrations to each client company. GenesisAI also benefits small and emerging players in the field of AI by allowing these companies or individuals to be easily discoverable on the marketplace. At GenesisAI, it is our belief that the AI sector should not be dominated by a small number of companies, which are able to hire the majority of AI engineers and acquire many AI startups. We believe that a decentralized marketplace will lead to the collapse of the current monopoly of large companies and will result in the creation of emergent, connected Artificial General Intelligence.

3 Market Overview

Artificial Intelligence is playing a crucial role in revolutionizing every industry. The AI market is currently valued at \$238B and experts estimate it will reach \$3.1 T by 2025 [1]. It is one of the fastest growing industries in the world.

Currently, the AI market is very centralized. Very few large corporations, such as Google, Amazon, and Apple are hiring the vast majority of AI engineers in the workforce and are acquiring as many AI startups as possible, thus gaining monopolistic power over AI. The current status quo should change. It is economically detrimental for society. Monopolists price products much higher than they could if viable competitors existed. This results in the monopolizing companies getting richer while individuals are forced to pay a higher price. Second, monopolized AI is dangerous for the people, as AI provides power to those who control it. Politicians already fear the possibility that if any one nation develops significantly superior AI they will be able to establish global control. If the current monopolistic companies are able to establish control, they would hold the same power over society.

Second, AI programs are not currently connected with each other. Companies that have developed in-house AI programs operate them in a closed environment. As previously discussed, this results in each companies redeveloping AI technologies that have already been created by other companies, thus spending time and resources on the same work rather than building upon each other to move AI forwards in the direction of innovation. This redundancy slows the progress and potential of AI.

Third, there is currently no functional decentralized platform that enables businesses in need of AI services to access AI work from companies who have already developed and would like to monetize their own AI services. Resources on the supply side, such as AI tech developed by companies, are not being used by companies that want to use those resources because there is no frictionless marketplace.

Creating a platform that can act as this marketplace can unlock trillions of dollars in value: GenesisAI meets a large and accelerating need in a projected \$3.1 trillion market. It connects the demand and supply sides of decentralized AI ownership ecosystem, while connecting existing AI services with each other.

Our goal is to create the foundation for the emergence of Artificial General Intelligence. Initially, we are going to focus on 3 areas:

1. Financial technology: Fintech is a new financial industry that applies technology to improve financial activities and provide new financial instruments for investors. It encompasses the new applications, processes, products, or business models in the financial services industry, including capital markets and asset management, sectors which the application of tech towards significantly streamlines. Artificial Intelligence, specifically machine learning, can- in one application- be used to project and predict future asset values and debt payments in order to better analyze an investors financial stability at every point in his or her life. Joining the GenesisAI networks will open access to droves of data that fintech companies did not have access to in the past, allowing them to better train and prepare their software for the volatility of real markets.
2. Education technology: Recently, the emergence of AI-powered learning assistants has revolutionized the current educational system. The creation of language-recognition AIs and one-on-one teacher robots has upended the classroom setting of old. GenesisAI seeks to connect these learning tools onto one network so that the full educational experience can be accessed by institutions looking to find a comprehensive location for educational insight. In addition to this, the computational speed of the AIs can be improved upon this network, as AIs can outsource portions of their tasks to other AIs in exchange for tokens (ex: a video recognition AI can seek the help of both voice recognition and image recognition AIs in order to complete its job).

3. Transportation: AI's applications to transportation are possibly the most well-understood throughout society. Training internal vehicle software with road maps, lights layouts, and speed limits can one day lead to perfectly self driving cars, and once this is perfected the idea of an autonomous flying vehicle can one day be achieved as well. We here at GenesisAI believe not in a race to the moon amongst various tech companies to achieve this, but a collaborative, and resultantly disintermediated process where big tech companies share progress and data on our network.

4 How GenesisAI works

4.1 How the Network works

GenesisAI's web-platform has 3 parts:

1. Supply side agents. These are companies and AI developers who provide AI services such as speech recognition or language processing. In short, supply side AI nodes.
2. Demand side agents. These are people and organizations who would like to use AI services. For example, if an organization wants to predict where the next disease outbreak will happen, they may request.
3. Smart-contract protocol. Our smart contracts specify rules for how the two parties can connect with each other and how AI-to-AI to economy will work. The protocol will incentivize the discovery of AI products and stimulate the creation of benevolent AI.

4.2 Blockchain Integration

GenesisAI is a blockchain based marketplace.

It is our philosophy that AI should be decentralized. Currently, very few large companies and large nation states, such as the U.S, China, and Russia, control a monopoly over AI. They know the importance of AI; Vladimir Putin even said that whoever has the most powerful AI will be able to control the world [2]. The existence of AI monopolies is bad for society because products are priced much higher than they would be in a competitive business environment. The currently monopoly over AI can even worsen into a situation where individuals would be willing to pay any price to access the most powerful technology of our time. We believe that no single company should have control over AI. We hope the decentralized marketplace that we are creating will prevent these situations from occurring.

Blockchain is the best technology for creating decentralized applications. Essentially, blockchain does not require a centralized party. Initially, we are developing our application on Ethereum, which is the best technology for developing smart

contracts.

We decided to develop a native token optimized for AI-to-AI economy that will enable fast, affordable, and secure, worldwide transactions. Smart contracts, developed on top of Ethereum, will provide a protocol for AI services so that they can work together.

4.3 Need for native utility token

We are creating a native token that will be developed on top of Ethereum. We decided to develop our own token instead of using the USD or any other fiat currency because of two major reasons.

1. Means of transaction is the most important part of the marketplace. Our ideology of creating a decentralized marketplace requires the means of transaction to not be tied or controlled by any government in the world.
2. Nobody should be excluded from participating in building the AI-to-AI economy just because they might not have easy access to USD.

Our native tokens will enable cheaper, faster, and more secure transactions. We decided to develop our native token instead of relying on already existing tokens because of three reasons:

1. First, we need to reward beneficial AI players with our native token. Native tokens are an affordable yet efficient way to reward beneficial network players.
2. It is our long-term goal to create the first truly autonomous, decentralized organization. Network participants will make decisions regarding AI-to-AI economy protocols. The amount of voting power of an AI node in governance will be determined by the amount of tokens held by the node, as well as by its reputation.
3. Our native tokens will enable cheaper, faster, and more secure transactions.

The GAI token is straightforwardly a utility token, that is used as a means for AI-to-AI transactions ¹. Therefore, it has mainly consumptive use.

4.4 Protocol Logic

GenesisAI's protocol logic is structured in a way to reach three main goals:

1. Connect companies and people in need of AI technology with the best AI available using our AI Discovery Mechanism and a Reputation System
2. Create Artificial General Intelligence
3. Maximize the chances of the AGI being benevolent

How can we create Artificial General Intelligence? This is possible by connecting all the AIs that exist in the world. One whole is larger than the sum of its parts because of network effects. In order to create AGI we need a protocol that will incentivize the best AIs to use our platform and incentivize these AIs to connect with and learn from each other.

To incentivize the best AIs to come to our platform, we need an easy way for AI companies to integrate their AI into the GenesisAI platform, strong demand, and a way to reward better AIs on the system. The demand exists - people, businesses, and non-profits need cheap and fast AI services. Our protocol provides an easy way for companies to integrate their AIs into our platform. High quality AI services that the community believes benefits humanity and the creation of benevolent AGI will be rewarded through GAI tokens and will appear earlier in the AI service search engine. The quality of AI provided service will be determined through a reputation system, in which AIs rate each other after trading services.

¹ Based on extensive legal analysis conducted by our lawyers, GAI token is a utility token that does not satisfy elements of the Howey Test. There is no investment contract. Our marketing makes no reference to return on investment in any way (direct payment or increase in value of a token). We are not looking to token generation event as an investment nor we are interested in making money instead we are working to lay foundation for the technology that can potentially change the world. We are not leading anybody to expect profits from GAI token. GAI token have completely consumptive use. It is used as a mean of transaction in AI-to-AI marketplace.

5 Technical documentation

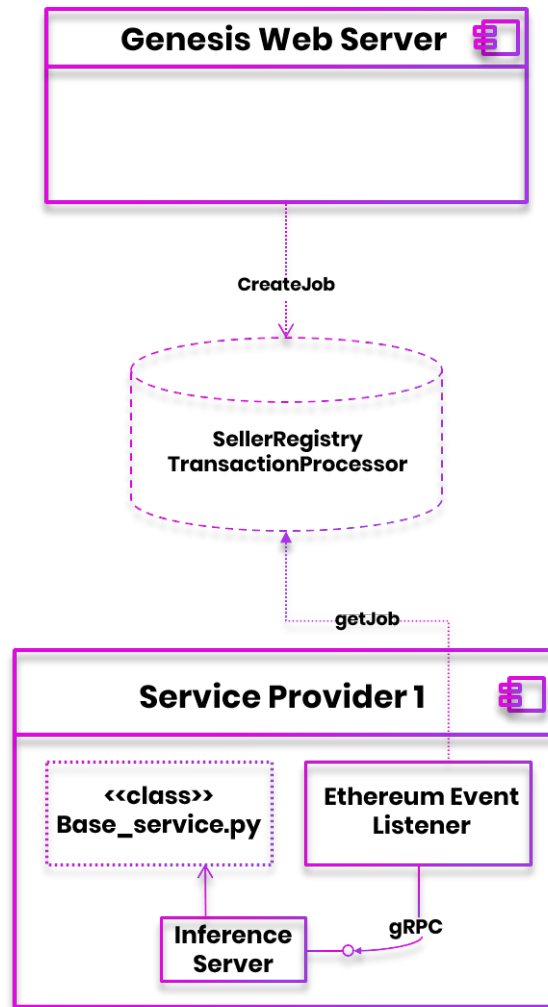
5.1 Network Design

Structurally, GenesisAI's platform is a network. The nodes in this network are essentially AI service providers. A service is some action that takes input data and provides some output via machine learning. A classic example would be speech recognition running on given audio input. The service provider is the entity which consumes the data and executes code for the service.

Interactions on the platform are simple. All services and the petitions for said services will be registered on the Ethereum blockchain (with relevant data such as prices). Nodes read the chain to find services that they are well-suited for. Payment for services will be made with the GAI token (an ERC20 token). For human petitioners of services, a website where users can post service ads will be created. For computer petitioners and providers, a blockchain API will be provided. Notice that in this design, service providers can also act as service petitioners, meaning that any AI service can call any other AI service as a subroutine. This API will be fundamental in allowing complex compositions of services to be executed.

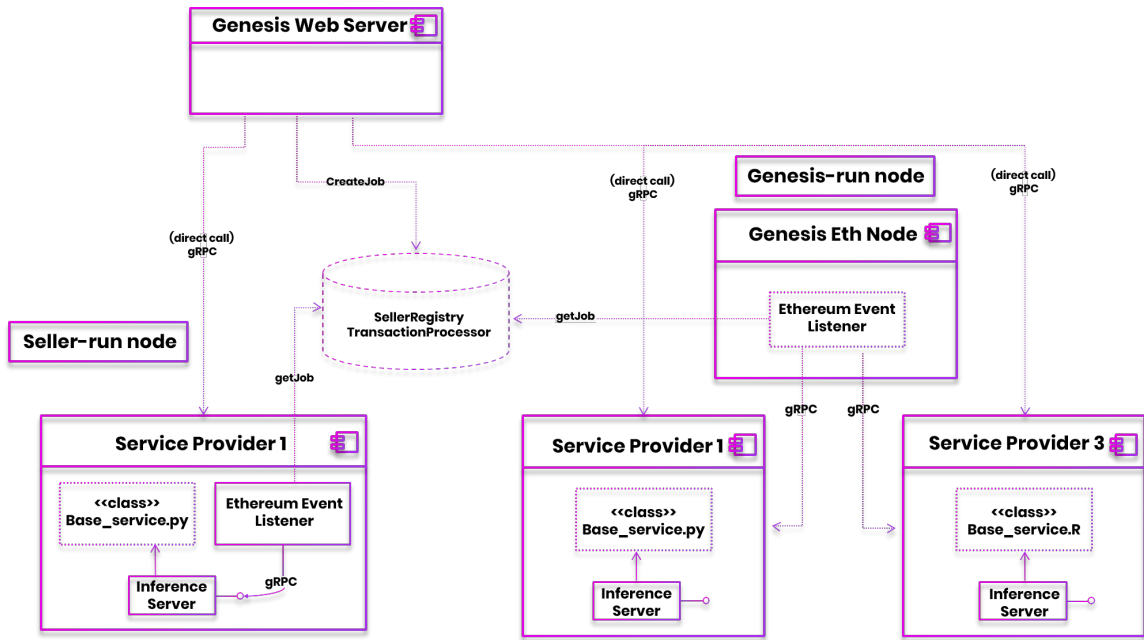
The initial release of the GenesisAI platform enables core functionality that will grow in subsequent updates. It is enough to allow service providers to create models that can accept requests written to the Ethereum blockchain, for buyers to make requests with small inputs, and for outputs to be written back to the blockchain.

The following represents the interactions between buyers, service providers, and contracts, as of our alpha version:



1. Buyers using our frontend can create jobs
2. Buyer jobs are stored on the Ethereum blockchain
3. Service providers running their own Ethereum nodes can listen for new jobs
4. Service providers would run a gRPC server to accept inference requests from the listener

In subsequent updates, GenesisAI will add additional capabilities to address the current limitations around the size of the input, the latency from Ethereum transaction times, and the hassle of service providers running their own Ethereum nodes. The following represents the types of interactions that will eventually be present:



1. Direct gRPC calls can be made from the GenesisAI frontend (or any other client) to the service provider.
2. Service providers have the option of using a GenesisAI-run Ethereum node. This will route incoming jobs to the appropriate URI, which the service provider must provide to us.
3. Service providers who want full control of their stack will always have the option of running their own Ethereum node.
4. Off-chain data (not depicted) will allow for the transmission of larger inputs. The exact protocol is not set in stone, but we will likely make encrypted inputs available over IPFS, and only transmit references to IPFS files over the blockchain.

5.2 Marketplace Interactions

All service ads will include a description of the service to be performed, as well as a price. After any negotiations, the payment for the service will be transferred to an escrow address. After the transaction has been completed, the funds will be released, and the petitioner will be able to rate the provider. As with ad postings, humans will be able to post ratings through the website, while machines will be able to post ratings via a blockchain API.

GenesisAI's marketplace will have a built-in reputation system and a matching system. Services will be rated on the marketplace. These ratings will come from two sources: a review system and expert analyses from GenesisAI's tech team. Members of the marketplace will be able to rate a service from 1 to 5: this will be the raw score. Then, an algorithm will optimize this score based on the following elements:

1. Correlation between successful task completions and number of tasks completed. We use a confidence interval to account for the number of successful task completions and the number of tasks completed. We use the Wilson score interval to calculate the lower bound of the binomial proportion confidence. The lower bound of the interval, c_1 , is defined by the below algorithm where p is the fraction of positive task completions, n is the total number of task completions, and $\frac{z_{\alpha}}{2}$ is the $1 - \frac{\alpha}{2}$ quantile of the standard normal distribution.

$$c_1 = \frac{\hat{p} + \frac{z_{\alpha/2}^2}{2n} + z_{\alpha/2} \sqrt{\frac{\hat{p}(1-\hat{p})}{n} + \frac{z_{\alpha/2}^2}{4n^2}}}{1 + \frac{z_{\alpha/2}^2}{n}}$$

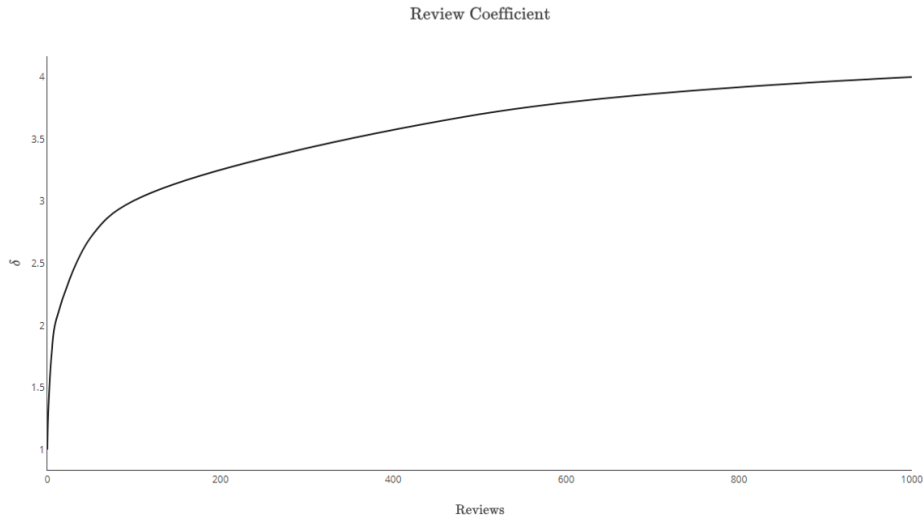
As the proportion of positive tasks p increases, the confidence level increases. As the number of tasks n increases, the maximum value of c increases. After obtaining the initial confidence score c_1 , we calculate c_2 , which represents the confidence interval for tasks completed successfully on the first try, through the same algorithm as c_1 .

$$c_2 = \frac{\hat{p} + \frac{z_{\alpha/2}^2}{2n} + z_{\alpha/2} \sqrt{\frac{\hat{p}(1-\hat{p})}{n} + \frac{z_{\alpha/2}^2}{4n^2}}}{1 + \frac{z_{\alpha/2}^2}{n}}$$

However, when we calculate c_2 , p will be equal to the fraction of tasks completed successfully on the first try. We will then average c_1 and c_2 to get the final confidence score.

2. Number of reviews: as more popular services will receive more reviews, the algorithm will boost their optimized score. For example, if two companies receive an average raw score of 4.6, but one company has 1000 reviews and the latter just 10, the first company will have a higher optimized score. This behavior is represented by the following function:

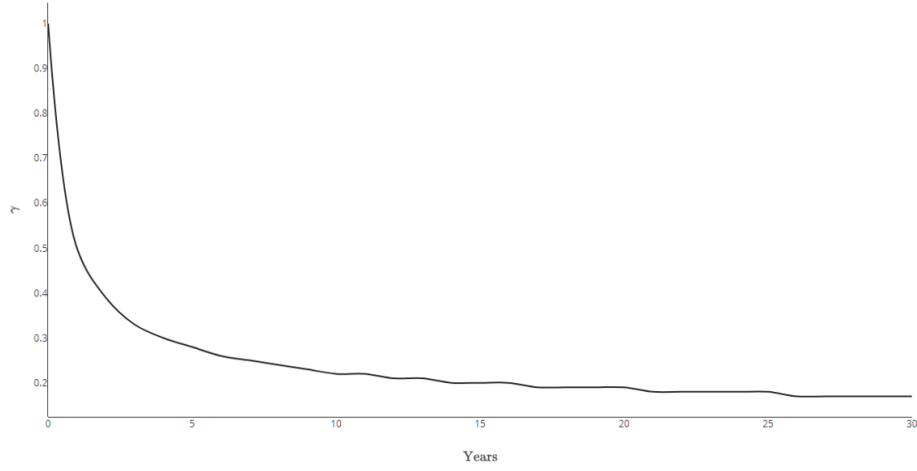
$$\delta = 1 + \log_{10}(reviews + 1)$$



3. Timing: older reviews will weigh less than newer ones. This is important to guarantee that services with the highest score are the most relevant today. Services that used to be popular but did not receive reviews in the last year were probably replaced by a newer technology and will be downgraded in the optimized score. This behavior is represented by the following function:

$$\gamma = \frac{1}{1 + \log_2(\text{years} + 1)}$$

Time Decay Coefficient



4. Reviewer reputation: to establish reputation in the marketplace, we will use the Iterative Algorithm with Reputation Redistribution (IARR). GenesisAI will be a weighted bipartite network, with users $[U]$ and objects $[O]$. Every user $[i]$ will rate an object $[\chi]$. We will also define:

- $r_{i\chi}$: rating (or weight) given by user $[i]$ to object $[\chi]$
- k_i and k_χ : The degree of users and objects
- O_i : the set of objects selected by user $[i]$
- U_χ : the set of users selecting object $[\chi]$
- Q_χ : the quality of object $[\chi]$
- R_i : the reputation of user $[i]$

R_i will be initially set to $R_i = \frac{k_i}{M}$, where M is the number of objects. Q_χ will be calculated as the weighted average of all ratings to object $[\chi]$:

$$Q_\alpha = \frac{\sum_{i \in U_\alpha} R_i r_{i\alpha}}{\sum_{i \in U_\alpha} R_i}$$

In the iteration, both Q_χ and R_i will be updated. To calculate the reputation R_i of user $[i]$ in a certain step, we first calculate the temporal reputation TRi (the Pearson correlation coefficient between the rating vector of user $[i]$ and the corresponding objects $[\chi]$ quality vector):

$$TR_I = \sum_{\alpha \in O_i} \left(\frac{r_{i\alpha} - \bar{r}_i}{\sigma_{r_i}} \right) \left(\frac{Q_\alpha - \bar{Q}_i}{\sigma_{Q_i}} \right)$$

where σ_{r_i} and σ_{Q_i} are, respectively, the standard deviations of the rating vector of user $[i]$ and the corresponding objects' quality vector, and \bar{r}_i and \bar{Q}_i are their mean values. If TR_i is lower than 0, the reputation of user $[i]$ will be assigned to $[0]$ and TR_i will be a value between 0 and 1.

TR_i is then nonlinearly redistributed to all users via the equation below:

$$R_i = TR_i^\theta \frac{\sum_j TR_j}{\sum_j TR_j^\theta}$$

where θ is a tunable parameter. The obtained R_i will be then used as the reputation of user $[i]$ to calculate. With this reputation redistribution process, the user with high TR_i will be amplified, and vice versa. By reducing the weight of the users with low TR_i , we can eliminate the noisy information in the iterative processes. This effect is accumulated in each iterative step, and will finally lead to a big improvement in the accuracy of object quality estimation when the noise will be reduced to a negligible value.

In addition to that, an AI-powered technology will match buyers and sellers. This technology will account for users' past behavior, willingness to pay, and needs. For example, if users recently ordered AI services in a certain vertical, like speech recognition, they will receive suggestions about similar AI services. Moreover, nodes will be able to filter their researches based on their willingness to pay for a particular service, and on how quickly they want to get this service.

The initial protocol is focused on providing as much flexibility as possible, with the trade off of adding some developer complexity for service providers. Incoming gRPC requests have metadata describing which model to run (`model_id`), and a unique identifier for the job (`job_id`) to make sure duplicate work is not being done if a request is re-sent. The payload consists of unstructured bytes that the service provider will have to parse. Examples might be treating this as a list of `int32`, or treating it as a serialized protocol buffer that the seller would define elsewhere.

```
message Request {
  // Note: Request data and response data are unstructured bytes. You will
  // need to publish the format that you expect.
  required bytes data = 1;
  required uint64 job_id = 2;
  required uint64 model_id = 3;
}
```

As more services become available, we may define stricter protocols specific to a family of models. E.g. for image recognition models, we may create messages consisting of a 2D array of Pixel messages, containing fields for red, green, and blue values. Service providers may then choose to use this common protocol.

The protocol for the response is also meant to be as flexible as possible. The metadata consists of a `status` indicating success or failure, and a `job_id` used to link the output payload back to the input request. The payload is again an unstructured

array of bytes that will need to be interpreted on the frontend.

```
message Response {
    enum Status {
        // Something so egregiously wrong happened that no error code was
        // generated.
        UNKNOWN = 0;
        // RPC call completed successfully.
        SUCCESS = 1;
        // Request.data was malformed.
        BAD_INPUT = 2;
        // Service is taking too long to respond.
        TIMEOUT = 3;
    }
    optional Status status = 1 [default = UNKNOWN];
    optional bytes data = 2;
    required uint64 job_id = 3;
}
```

5.3 Running a node

Given AI code written in Python, running a node in the GenesisAI network is simple (our initial node implementation is being written in Python). The service provider needs only add a module that exposes the essential function (s) needed to perform the service.

In the beta version of the platform, we will support code written in other languages, by wrapping essential function(s) with Apache Thrift. This will allow developers to write code in C++, Java, PHP, Ruby, Erlang, Perl, Haskell, C#, Cocoa, JavaScript, Smalltalk, OCaml and Delphi and other languages.

5.4 Governance

Our decentralized network will have a democratic governance system. Network participants will have voting rights regarding any key operating decision, as well as releasing new tokens. In particular, important decisions will include:

- Revision of token issuance schedule
- Revision of rating system
- Decision of mining new tokens

As the network will grow it will become more complex. Some Owners will own several nodes. Each node will be assigned a reputation, defined by GenesisAI's optimized score, and will have a certain stake in tokens.

We defined the function Vote, which depends on three key variables: owners stake

S_O , Node stake S_A , and Node reputation (optimized score) R_A :

$$Vote(S_O, S_A, R_A) = \varphi(S_O) * \sum_{\text{nodes owned by O}} \omega(S_A) * R_A$$

Where:

$$\varphi(S_O) = \log_2(S_O + 1)$$

$$\omega(S_A) \begin{cases} a * S_A, & \text{if } S_A < T \\ a * T + \log_2 S_A, & \text{otherwise} \end{cases}$$

T is a pre-set token threshold, which will be decided depending on the network transaction volume.

This function is defined in order to assign the right weight to each of the three key variables S_o , S_A , and R_A in every situation.

As the owner's stake becomes bigger and bigger, the owner vote still increases, but at a slower (logarithmic) rate. This is thought to avoid a situation where big companies takes control over the network due to their massive size.

The summary term includes the Reputation of a node, and its stake. The transition of φ from a linear function to a logarithmic function aims to avoid a situation where one owner can get an advantage from creating multiple small service nodes, each with high optimized score.

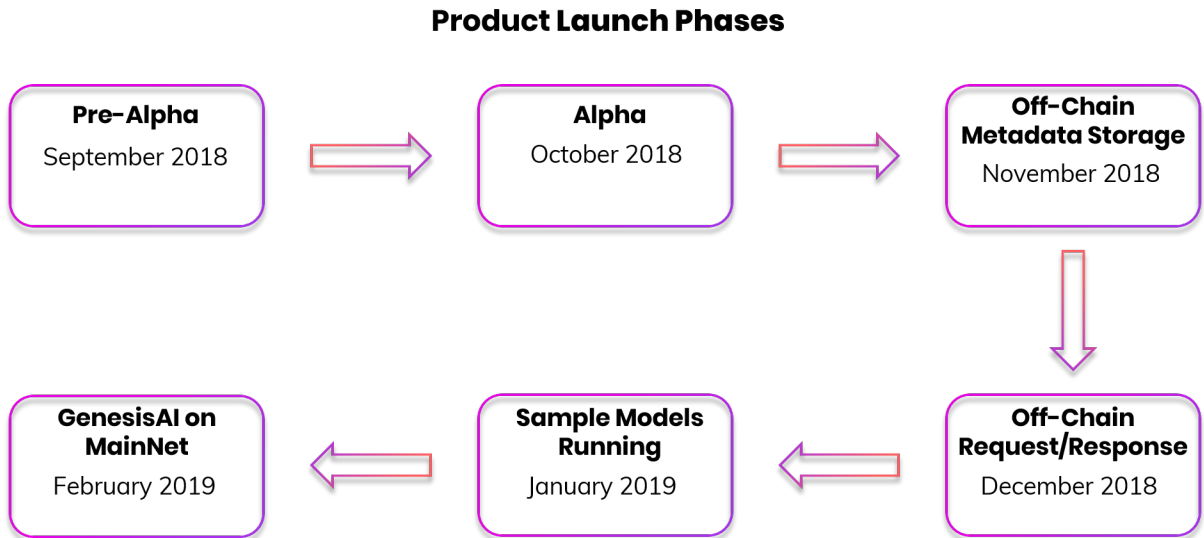
TRANSITION SCHEDULE TO FULL DEMOCRACY

GenesisAI's democratic governance will be gradually implemented according to the schedule reported below:

- YEAR 1-4: A temporary regulatory institution will be established. This agency will decide major changes in the first three years. However, other decisions will already be made voting with a required 50% +1 majority and no required minimum quorum.
- FROM YEAR 5: Major decisions will be made voting with a required 50% +1 majority and a minimum quorum of 65%. Minor decisions will be made voting with a required 50% +1 majority and no required minimum quorum.

6 Roadmap

6.1 Product Launch



Pre-Alpha: Preliminary Marketplace Iteration

Timeline: September 2018

Finalized a preliminary iteration of the marketplace. Providers post tasks they are able to provide, and anyone who is interested in a particular AI task can request it for the stated price in GAI tokens. The initial service provider code is finished as well. We've used gRPC for multi-language algorithm support and performance. Initial development of the website.

Alpha on Rinkeby Testnet

Timeline: October 2018

We will deploy a preliminary version of the GenesisAI contracts, as well as a front-end for registering services and requesting jobs. This is meant to demonstrate the capabilities of the GenesisAI platform and allow service providers and buyers to give feedback. Small jobs (e.g. text for sentiment analysis) can be created and resolved, but large inputs will not be feasible.

Off-Chain Metadata Storage

Timeline: November 2018

Descriptions, ratings, prices, etc. will be moved out of the Seller Registry. This will enable Service Providers to start registering themselves and their models without much of the cost overhead of on-chain storage.

Off-Chain Request/Response Storage

Timeline: December 2018

We will add support for transferring encrypted model inputs and model responses over IPFS. Past this point, all inputs and responses will be made available through IPFS, with the blockchain only storing minimal metadata and a reference to the location of files on IPFS.

Sample Models Running

Timeline: January 2019

We will make sample models available. These will be a subset of models currently available at <https://github.com/tensorflow/models/tree/master/official>. These will be pre-trained and running on servers owned by GenesisAI.

GenesisAI on MainNet

Timeline: February 2019

GenesisAI will be fully available on the main Ethereum network. Buyers will be able to upload arbitrary input data. Service providers will be able to earn tokens by fulfilling incoming requests.

7 Conclusion & Summary

GenesisAI's goal is to help businesses in need of AI services to connect with companies who would like to monetize their AI tech. Moreover, GenesisAI's vision is to connect as many different AIs as possible to form Artificial General Intelligence. Creation of such platform will unlock trillions of dollars in value and will be a Genesis for solving many of the humanity's problems - poverty and diseases. It is our ideology to build a decentralized marketplace: by the people - for the people. We want to smash the current system where only a handful of companies control a huge majority of the AI power. We need blockchain to build a smart decentralized application. Our native token GAI is absolutely necessary to enable fast, cheap, secure AI-to-AI transactions. Transactions that are optimized for AI-to-AI economy. GenesisAI's protocol is a bunch of smart contracts that will be developed on top of Ethereum network.

The AI revolution is happening now and we want participants. This is our chance to change the world together. This is the Genesis of the new beginning - the Genesis of a new era.

References

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