EFFECT.AI

Decentralized Network for **Artificial Intelligence**

Powered by NEO

The effect of this network will
define the future relationship
between **humanity** and **AI**.

Light Paper v3

Abstract

The Effect Network will define the future relationship between humanity and AI

The past five years have seen rapid growth in the number Artificial Intelligence (AI) algorithms with practical applications. Smart services, like self-driving cars, face- and voice recognition in mobile phones and image translation are getting a central place in everyday life. This sudden rise can be explained by advances in machine learning and the ready availability of cloud computing. These advancements have made possible large scale adoption by the industry and the birth of a billion-dollar smart application economy.

However, while some academic achievements (with limited use) in the field of AI are available to the public, the majority of AI development happens behind closed doors at large corporations. This puts AI at risk of becoming a 'black box' that benefits only a select few. In order to provide a viable alternative that is sufficiently accessible and transparent, Effect.AI proposes a private and decentralized ecosystem for AI development and AI related services. This network will be called The Effect Network. By operating fully on smart contracts deployed on the NEO blockchain The Effect Network we ensure that the platform will be open, easy to use and scalable.

Because of the size of this undertaking, The Effect Network will be deployed in three consecutive phases, allowing healthy progression of development and adoption. The phases cover independent market sections, but are interconnected in our network model. All of the phases are fueled by the EFX utility token.

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Introduction

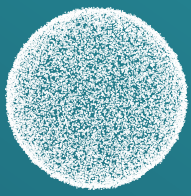
The Artificial Intelligence market is growing at a remarkable rate, but it's becoming less accessible with each passing moment. Large corporations, like Google, Facebook and Amazon are pioneers when it comes to AI development, but they have also driven much of the innovation behind closed doors. Effect.AI proposes a solution by creating an open, decentralized network that provides most, if not all of the services required for a healthy and accessible Artificial Intelligence market. This project is called The Effect Network. This network will replace several existing services in the current AI market. It requires no commissions, has a low barrier to entry and provides fast growth to its users. Effect.AI aims to accomplish this by deploying the project in three phases. These are:

Phase 1

EFFECT
M-Turk

Phase 2

EFFECT
Smart Market



Phase 3

EFFECT
Power

The first platform, Effect M-Turk is a marketplace for tasks that require human intelligence. It allows anyone in the world to perform tasks for fair payment. This first phase gives businesses and aspiring AI developers much needed access to a large workforce of human intelligence. The second platform, Effect Smart Market, is a decentralized registry of AI services. On this platform any algorithm can be accessed, and paid for, as a service in a unified manner. The last platform, Effect Power, provides a decentralized, distributed computational platform that can run popular deep learning frameworks. Before providing more detail on each of these phases, we will discuss blockchain technology and its potential for change given the current state of affairs in the field of AI development.

Blockchain

A blockchain is a decentralized data store that can contain arbitrary logic and processes without the need for a trusted central party. Blockchain was first proposed in the Bitcoin whitepaper by Satoshi Nakamoto in 2009. Since then, the technology has had a disruptive influence on a number of markets, notable examples include banking, insurance, and real-estate. A key reason for the disruptive nature of blockchain is that decentralized applications have unique properties like transparency and no-ownership. We propose a protocol that utilizes these properties to decentralize the global market of Artificial Intelligence, effectively lowering the barrier to entry, stimulating market growth and greatly reducing cost of use.

Current AI Market

Problem Statement

With a projected size of 15.7 trillion dollars as early as 2030, the Artificial Intelligence market is on track to become one of the largest and most important markets in the world. From transportation to commerce and communication, the development of new and more powerful types of Artificial Intelligence is likely to have a large impact on nearly every aspect of the human experience as we go forward. Effect.AI sees this as a positive development. What's bad is that, right now, there are only a few players who have the resources required to develop the AI algorithms necessary to power these developments. These are the main reasons why the AI market has such a prohibitively high barrier to entry:

Data Processing

Intelligent applications perform tasks that traditionally require human feedback. Such tasks involve processing unstructured data and finding patterns that can provide useful output. These applications are trained on large datasets with annotations. Obtaining an annotated dataset is non-trivial and requires a lot of time and money.

Diverging Tasks

An obstacle when developing a complex algorithm is the need to interact with parts of the world outside the current domain. For example: a self-driving car learning to steer will also need to identify road signs around the world. This situation can best be treated as a knowledge system where the classification of the sign is done by an external application. This quickly increases the amount of work needed.

Computational Costs

Developing and training a large AI is a computational intensive task, and requires a technical infrastructure capable of processing terabytes of data, doing batched processing on multiple GPUs and coordinating the results. Effect.AI proposes a system to train and run algorithms in a distributed fashion.

The AI market will therefore benefit from decentralization because it alleviates the problems mentioned above and allows for a much higher degree of interaction between agents. The creation of a decentralized network would provide the much needed alternative that allows both larger and smaller parties not only to contribute to the creation of AI, but also to benefit from and actually use these algorithms.

The Fourth **Revolution**

The creation of a decentralized and open network like the one proposed by Effect.AI has another potential benefit that has to do with automation and (mitigating) the large scale displacement of labor forces that could result from further automation.

AI is often considered a key component of the Fourth Industrial Revolution. Like the revolutions that came before it, the Fourth Industrial Revolution has the potential to raise global income levels and improve the quality of life for populations around the world. However, the revolution could yield greater inequality as well, particularly in its potential to disrupt labor markets as advancements in automation substitute labor across the entire economy. Consider, for example, when workforces were laid off when pinhead factories started incorporating machines in their fabrication process. A similar, though far larger threat looms due to new advances in AI development that threaten an ever greater range of professions with automation. As AI becomes smarter, these professions will not be limited to the manufacturing sector and will at one point also include medical, creative, financial and other sectors.

To compensate for potential job loss in these sectors, Bill Gates proposed to tax the labor performed by AI-algorithms. Implementation of such a measure seemed unfeasible when it was first discussed. In The Effect Network, however, it would be entirely possible and perhaps even trivial to implement such a system.

The EFFECT **Network**

The Solution

To solve many of the problems with the current AI market, Effect.AI proposes a private, decentralized ecosystem for AI development and AI related services called The Effect Network. The Effect Network is designed to provide a feature complete alternative to services like Amazon Mechanical Turk, Fiverr, OneSpace and Guru.com. It will operate fully on smart contracts deployed on the NEO blockchain. The Effect Network, like other decentralized applications, directly connects supply and demand without the need for an intermediary party. To be more specific, The Effect Work will establish the following:

•**Accessibility** - by directly linking supply and demand through our micro-tasking platform Effect.AI M-Turk we enable users who do not have access to large datasets or a big network to train their AI algorithm.

• **Accuracy** - the Effect Smart Market enables users and individual applications to find each other to buy or sell information. Through this exchange, users can get their hands on data sets with significantly higher complexities to train their AIs.

• **Performance** - Users can directly buy existing data sets on the Smart Market or quickly create their own data set by requesting micro-tasks on the M-Turk platform.

• **Interoperability** - By running AI on the blockchain and creating a standard to which algorithms have to comply, we stimulate interoperability resulting in powerful and emergent intelligence that would be difficult to achieve for single AI algorithms.

The EFFECT **Network**

The Solution

In order to 1. realize this project, 2. to effectively manage the growth of The Effect Network and 3. to make sure the platform delivers the four advantages as described above, The Effect Network will be deployed in three consecutive phases. In Phase 1 we develop The Effect M-Turk that connects supply and demand of micro-tasks on a decentralized network. Completion of these tasks will create the data sets that people need to teach AI algorithms. In phase 2 we create the Effect Smart Market, a decentralized exchange where people can purchase, exchange and improve each other's AI services. The algorithms will also be able to communicate and offer services to each other. In phase 3 the final phase of deployment, Effect Power, the actual computation will be distributed over The Effect Network. This will not only greatly decrease the costs involved with actually running algorithms, it will also allow the algorithms to run globally without a single point of failure.

On the subject of NEO

NEO is a platform that uses blockchain technology and digital identity to digitize assets. Through the use of smart contracts these digital assets can be self-managed. This establishes a Smart Economy on a distributed network. Hence, it's a smart contracts ecosystem, similar to Ethereum. NEP5 tokens are tokens that run on the NEO blockchain (for instance: RedPulse3 , Qlink 4 and DeepBrain Chain5). NEP5 describes the protocol that these tokens conform to. The Effect.AI EFX utility token will conform to this protocol as well.

EFFECT **M-Turk**

Phase 1

Effect M-Turk is a private, decentralized, marketplace for work that (for now) requires human intelligence. It is based on centralized business models like Amazon Mechanical Turk, Fiverr, OneSpace and Guru.com. It's a worldwide workforce on demand. A key difference with these centralized models is that the Effect M-Turk is peer to peer, meaning supply and demand are connect directly and more efficiently. The crowd sourcing technology enables requesters to create tasks to be completed by workers in exchange for compensation. The job offers are called Human Intelligence Tasks or HIT's for short. The provider of the HIT's are called Requesters. These HIT's are created by anyone who needs the power of human intelligence to perform tasks that computers are currently unable to do. On The Effect M-Turk, when a user completes a task they are paid with the Effect.AI token called EFX. These tasks are described and compiled through smart contracts on the blockchain.

Requesters

Effect Requesters can req[illegible] M-Turk to t[illegible]

by Workers. The Requesters can decide how much EFX the Workers will get for each completed task. The Requesters can retrieve the results from the Effect M-Turk and use these results to, for example, train their AI algorithm. This way, the Effect M-Turk gives requesters access to an on-demand, scalable and distributed workforce.

Workers

Effect Workers can choose tasks on the platform that are made available to them by Requesters. Workers might be excluded/included from tasks based on certain criteria such as location, age, gender etc. Workers can complete the tasks from the requesters in exchange for the EFX tied to these tasks.

Tasks

The job offers on the platform are tasks that require human intelligence. As mentioned before, these tasks are called Human Intelligence Tasks or HIT's for short. Effect maintains a database of deployed smart contracts to make it easy for Requesters and Workers to interact with the network. Adding smart contracts to the network is handled through governance. Affiliate programs will cover costs of deploying new contract types.

Bots

Of course, some of the tasks entered by Requesters could at one point be completed by bots or Artificial Intelligence. Instead of discouraging such practices, The Effect Network actually allows for this to happen by enabling functional algorithms (and their creators) to receive payment for their services. This leads into The Effect Network's second phase.

EFFECT **Smart Market**

Phase 2

The Effect.AI Smart Market is a decentralized marketplace where AI algorithms can exchange their services. Following our data interchange format (and by specifying a usage fee for consumers) an application owner can register on the exchange by specifying a public endpoint for his or her application. This application can now be invoked through smart contracts on the blockchain. The caller of the contract will have to transfer the required funds to the owner of the contract to get an authorization token that allows him or her to interact with the application.

The exchange protocol can be built directly onto the Effect.AI interface (see whitepaper section 2 for more detail) where the agents receiving EFX tokens are the ones supplying AI algorithms, and the agents providing EFX tokens for these services are the Requesters. The Effect.AI Galaxy Pool performs its role in the background to assure liquidity. The Pool enables payments for these services with native tokens as well as EFX tokens. At this point Smart Contracts will ensure and improve availability of the services that are requested or provided by agents in the network.

Two important pillars of the Effect Smart Market are the application registry and the endpoints.

Registry and interoperability

The network will maintain a registry of available applications. This registry will be enriched with a semantic ontology that describes the application, as well as a technical schema of its inputs and outputs. Thanks to the application registry, algorithms are able to explore possible collaborations over the blockchain. It also encourages standardization of data exchange formats. As interoperability with other applications means more interactions this provides an obvious financial incentive.

Access to services with Endpoints

Access to services and algorithms made available by users of the Effect Smart Market will be managed through endpoints. Application endpoints on the Market communicate over the HTTP protocol. Data is exchanged in JSON format and should strongly confirm the defined RDF schema. Requests signed with the private key of the buyer will be accepted by the endpoint. Issuing authorization tokens and checking their validity can be done by public APIs that hold a partial index of the blockchain. It is possible a small fee will be required for using this service.

EFFECT **Power**

Phase 3

Phase 1 and 2 of The Effect Network decentralized the data gathering and usage of AI algorithms. Up to this point, the algorithms themselves still run on centralized servers. In the final 'Effect Power' phase of the network, the actual computation will be distributed so that the algorithms run globally without a single point of failure. To achieve this, The Effect Network uses the fact that most machine learning algorithms have rigid structure and operate on sets of weights. These types of algorithms are relatively easy to distribute. The Effect Network decentralized compute engine is based on popular Deep Learning (DL) networks like Caffe15, MXNet16 , and TensorFlow17 where the network structure can be defined as a declarative graph and weights are stored as matrices of real numbers. These matrices can be distributed over a decentralized file system and be processed at different compute nodes on the network.
More detail on this phase will be provided as the project progresses.

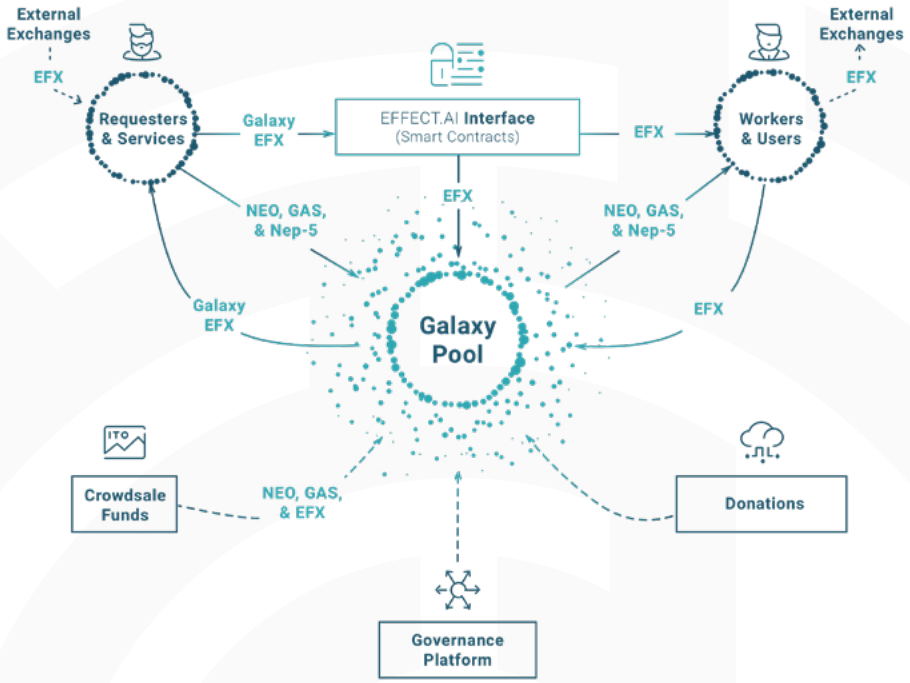
EFX & **The Galaxy Pool**

Building a resilient and enduring platform

Effect.AI's main objective is to build an AI development platform that will stand the test of time. To accomplish that, we have to design a platform that is resistant to outside influence or manipulation by third parties. This necessarily means preventing whales and syndicates from being able to destabilize the platform. In addition to a strict whitelist and KYC process for the Public Token Sale, a key component of the platform will be the Galaxy Pool. Having a central pool of EFX tokens will ensure the necessary level of liquidity is always maintained. This allows:

1. Workers to sell their **EFX** rewards for native tokens and
2. Requesters and network users to buy **EFX** if they wish to do so.

For a new token on the market this kind of liquidity can be hard to achieve and can be hurt by speculative trading. The Effect Network will, therefore, maintain a central pool of tokens to provide liquidity, encourage adoption and stabilize network fees. The Galaxy Pool consists of a mix of EFX and native tokens. Several rules will drive the Galaxy Pool towards a balanced state. These rules can later be refined by means of governance.



EFX **and** G-EFX

The Galaxy Pool ensures stable exchange rates for users of the network at all times by, among other measures, discouraging day traders. Key in achieving this is making a distinction between Galaxy-EFX (G-EFX) tokens and EFX tokens. G-EFX tokens can be bought. Any G-EFX bought from the Pool cannot be sold back to the Pool. A G-EFX token is cleared (converted to a regular EFX token) by spending it through an Effect.AI Service Contract. These are the service contracts from the tasks and service registry. This protects the Galaxy Pool from external manipulation and keeps exchange rates stable for all agents in the network. Furthermore, to assure Requesters will not have an overflow, G-EFX will gradually expire and return to the Galaxy Pool over time. The Pool compensates the Requester for this by offering a favorable exchange rate for the tokens used to purchase G-EFX.

EFFECT **Reputation Score**

Users in The Effect Network are rewarded for the amount of effort and work they do. This could allow malevolent users to gain wealth by submitting large quantities of work with poor quality. In order to encourage the opposite behavior, the network will appraise users by rating the quality of work. Users that put in good effort will get a higher Effect.AI Reputation Score (ERS). This score will gradually expire over time. Workers with a higher ERS will be able to apply for higher rewarding tasks than workers with a lower score. Furthermore, workers with higher, rather than lower ERS will have to pay less tax over their received EFX tokens to the Galaxy Pool. ERS is credited to users ad-hoc when they are rated for good work. There are two ways this can occur:

1. The Requester can add Ground Truth / Known Answer ratings of examples. If a worker rates an example similar to the ground-truth provide by the task owner, they are rewarded ERS, otherwise it is subtracted from their score. Ground-Truth examples are stored encrypted on the blockchain and the decryption key is shared by the Requester after the task has expired. Thus the rating takes place after task expiration time.

2. Workers that deliver similar work and performance on the same Human Intelligence Tasks are credited with ERS. This is done periodically and at random. Workers that consequently give deviant feedback are subtracted ERS.

Governance

While measures such as the ones proposed in the previous section are intended to work well, alterations might be necessary when they are put to the test. This is where the Effect. AI Governance model comes in.

The blockchain is immutable by nature so the network needs a way to apply changes to its components. There are two types of changes that can be applied. Firstly, there are the variables defined in Smart Contracts (SCs) that can change over time. Examples of SC variables that can change over time are the exchange rates in the Galaxy Pool and the tax over service transactions. Secondly, the smart contracts themselves need to be changeable with sufficient agreement: introducing new SCs - like new task types - and amending existing contracts will be necessary in the future. As The Effect Network is decentralized there cannot be a single person or organization authoring these changes. To fix this, the network has a governance system that allows prominent people in the community to propose and vote for improvements. Right to vote is at first acquired by a selection of 51 individuals. These individuals will form the Effect Council. This Council will be able to vote on proposals for improvement and other changes that are deemed necessary and beneficial by the community.

On the Subject of **Privacy**

The blockchain is decentralized and open by nature. These properties are not always desirable, for example when privacy is concerned. There are several measures that must be taken to make sure The Effect Network can be used for sensitive information. The network can provide privacy for the following cases: data set Requesters can provide their data set in encrypted form. Only selected users will be able to decrypt or access the data. This is determined by network smart contracts using Public Key Encryption ensuring only selected users can decrypt the data set credentials. User ratings of tasks performed by workers are stored on the blockchain using Public Key Encryption. The public key of the owner is used to sign the ratings, so only the owner of the task can view the ratings. Tasks that involve privacy features will be more computationally expensive and thus will also have a higher network fee.

Effect M-Turk **vs** **Amazon** Centralized M-Turk

	Effect M-Turk	**Amazon M-Turk**
Description	Decentralized, private, secure, fully global, very low cost, a potential for millions of on-demand workers.	Centralized, high cost, thousands of on-demand workers.
Percentage taken from Requesters	Free	20 - 40%
Restricted Countries	195 of 195 are included	Only 43 of 195 Countries have access to the platform
Payment to Workers	Instantly	4 - 21 days
Average hourly rate of a Worker	$ 9.40 (est.)	$ 2.13 (est.)
Secure & private	Yes	No

Conclusion

Having an open, accessible and affordable platform for smart algorithms to operate, collaborate and develop will prove to be of great importance in the coming century. Artificial Intelligence and decentralization are a natural match due to the potential improvements this combination offers in terms of accessibility and efficiency. Furthermore, The Effect Network will enable parties who previously didn't have access to benefit from the AI market and the opportunities it represents.

The expectation is that Effect.AI's platform will, over time, replace a significant portion of the 3.1 trillion USD AI-market by virtue of offering a much more accessible service that has immediate practical use and monetary value. The ultimate goal is to create an accessible and decentralized AI market. Key assets in realizing this goal are:

1. Community - The Effect Network is fueled by the EFX utility token that allows for fair, decentralized and peer-to-peer exchange for everything related to AI.

2. Galaxy Pool - One of the most unique aspects of the network is the Galaxy Pool. This setup assures liquidity, stable exchange rates and a solid platform.

3. Prospects - Besides offering the advantages of the Galaxy Pool and a healthy community from the start, The Effect Network has outlined clear goals for the future in the form of the additional AI service markets that will be launched in three consecutive phases (M-Turk, Smart Market and Power).

Once all phase are launched, The Effect Network will offer 1. an effective data labeling platform, 2. an easy to use market to allow for trade in algorithms (in addition to data) and 3. a means of sharing computation on The Effect Network. The resulting platform for AI related services, trade and development will be open and available to everyone.

The EFFECT **Team**

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Lawyer

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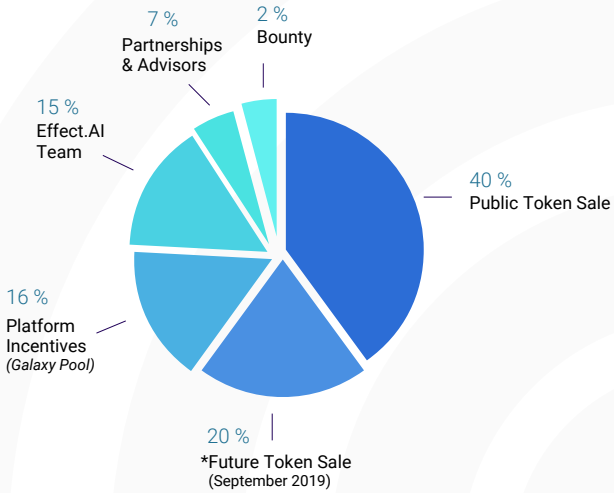
EFFECT **Roadmap**

Token Sale **Details**

Start date	**March**	
End date	**18 days after start date**	
Soft Cap	**€ 4,280,000**	
Hard Cap	**€ 14,820,000**	
Discount	**10%**	For the first 2% of tokens
Minimum Contribution	**€ 50**	
Maximum Contribution	**€ 25,000**	
Accepted currencies	**NEO, GAS**	
Maximum number of tokens generated	**650,000,000 EFX**	
% of tokens generated for public token sale	**40%**	
* % of tokens generated for future token sale	**20%**	Automatically locked for 18 months by smart contract
% of tokens generated for platform incentives	**16%**	Galaxy Pool
% of tokens generated to Effect.AI team	**15%**	Automatically locked for 24 months by smart contract
% of tokens generated for partnerships and advisors	**7%**	
Bounty	**2%**	

Token Sale **Details**



*The 20% of tokens for future funding will be locked by a smart contract for 18 months. If predetermined milestones are met these tokens will be released for a second round of funding for the later phases of the project.

Research

3 % Blockchain

2 % AI

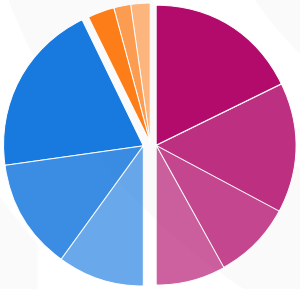
2 % IOT

Blockchain and Platform

20 %
Technology development and Effect M-Turk platform

13 %
Advanced Functionality of Blockchain & Smart contracts

10 %
Cyber Security and Software



Business

18 %
Requesters & Workers Acquisition

15 %
Marketing

9 %
Operations, Overhead
Legal, Administration

8 %
Partnership & Talent Acquisition