



# SKYCHAIN

Open medical neural network based on  
blockchain principles

## Annotation

Skychain is project of open and distributed neural network, designed for performing precise diagnostics.

Skychain will provide an opportunity to engineer, teach and host neural networks and provide paid access for independent specialists and organizations.

Skychain will bring together thousands of laboratories and corporations, manufacturers of artificial neural networks and provide an easy access to their neural networks for consumers from around the world.

Gennady Popov

A neural network in every home!

## Contents

Introduction .....	2
Problems in the field of medicine .....	2
Medical artificial neural networks today .....	2
About Skychain .....	4
Public encrypted distributed storage of authors' ANNs .....	4
Effective use of miners' computing powers .....	4
Public pay-per-use access to the neural network capabilities .....	4
Constant learning of the artificial neural network .....	5
Structure of Skychain modules .....	5
Road map .....	7
01.2017-11.2017 .....	7
Pre ICO – December 2017 .....	7
ICO - February 2017 .....	7
Skychain Alfa – June 2018 .....	7
Skychain Beta – December 2018 .....	7
Skychain Release – June 2019 .....	8
2025 .....	8
Skychain usage scenario .....	8
Building and training an artificial neural network .....	8
Usage of neural networks by consumers .....	9
Uploading, storage, execution of private ANNs and payment for them .....	11
Skychain Architecture .....	12
Blockchain network .....	12
Data storage .....	13
Neural network configuration and training datasets are published and stored in a separate p2p network to prevent excessive growth of the Skychain blockchain. Recorded data hash is written to blockchain network blocks .....	13
Creating an artificial neural network .....	13
Distributed training .....	13
Publishing an artificial neural network in the blockchain .....	13
SkyEngine register of neural networks .....	13
Launching calculations .....	14
Inference (generating a result) .....	14
Mining and monetization .....	15
Distribution of tokens at the ICO .....	16
Expected dynamics of the Skychain token price .....	17
Team .....	18
Advisors .....	19
<b>Terms &amp; Conditions</b> .....	21
FAQ .....	22
Participation in Skychain .....	25
Participation in the pre-ICO .....	25
Participation in the ICO .....	25
Participation in the Skychain development .....	25
Participation in the initial configuration and training of Skychain .....	25
Participation as a neural network developer .....	25
Participation as a miner .....	25
Participation in the testing and pilot operation of Skychain .....	25
Contact us .....	26

# Introduction

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We present you a Skychain project. Skychain is an infrastructure blockchain project aimed to host, train and use artificial neural networks (ANNs) by market participants.

First years of Skychain development will be devoted only to medicine to help doctors and patients have accurate diagnoses using this system.

Skychain is a "sharing economy" project, it means that each member of the Skychain ecosystem will provide his resources and thus create a product that is ahead of any competitors. In its turn, the system will reward each participant with high benefits.

Skychain is a project that will "uberize" artificial neural networks, but with developers of individual ANNs instead of taxi drivers, consumers of ANNs (doctors and patients) instead of passengers and computers and server of miners instead of cars. In the future, Skychain may be used for building, fast distributed training and further use of a wide range of neural networks not only in medicine.

IBM estimates the artificial intelligence market in the sphere of medicine at \$200 billion a year in a few years. The goal of Skychain is to take control over 70% of this market!

The way to achieve this goal is to create the best open infrastructure that will accumulate the resources of the majority of participants of this industry and surpass any closed corporate product.

## Problems in the field of medicine

Hundreds of thousands of misdiagnosed patients die every year in the US and the EU alone. Economic costs arising from complications caused by misappropriation of medicines are more than \$ 100 billion a year.

The main causes of incorrect diagnoses are:

- Narrow view of doctors on the problem, doctors specialize in individual organs or body systems and often do not see the picture as a whole;
- Lack of experience and gaps in the knowledge of doctors often result in their inability to diagnose rare diseases;
- Not enough time for the analysis of anamnesis due to high utilization of methods and a lot of time spent on documentation;
- Difficulty of determining a disease according to X-ray, CT, MRI, histological tests at a non-standard course of a disease, as well as high dependence on the subjective experience of a doctor.

Artificial intelligence based on artificial neural networks will totally change this situation in the field of medical diagnostics.

## Medical artificial neural networks today

Today artificial neural networks demonstrate their ability to diagnose more accurately than most doctors<sup>1</sup>. Besides diagnosing, ANNs can prescribe treatment, as well as adjust it upon receiving new data and a patient treatment dynamic.

ANNs are trained with large arrays of disease records from hospital patient records, as well as directly using reference data and medical researches. Many companies and laboratories are already successfully doing this. Key participants of this market are:

1. Creators of neural networks:
  - Small laboratories that trained one or two neural networks to solve a certain diagnostic problem. For example, detect a specific type of oncology on a radiograph.
  - Large corporations, such as IBM, creating neural networks for a wide range of diagnostic tasks.

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<https://www.newyorker.com/magazine/2017/04/03/ai-versus-md>

<https://www.extremetech.com/extreme/233746-ai-beats-doctors-at-visual-diagnosis-observes-many-times-more-lung-cancer-signals>

2. Medical data providers:
  - Hospitals and state structures create their own medical datasets, investing significant funds into them. These are disparate datasets, and their owners do not want to share them, as they wish to receive a return on investment and income from this data.
  - The current market state practically does not allow providers of medical data to earn money as the creators of artificial medical neural networks are not ready to buy this data at a high cost.
3. Infrastructure providers:
  - Manufacturers of equipment for training and using neural networks. The current leader is Nvidia providing specialized GPU processors with tensor cores increasing performance at computing neural networks up to 10 times. Other market participants include AMD, Intel and a few other corporations.
  - Cloud services such as Amazon, Google and Microsoft renting high processing powers to ANN developers.
  - Developers of libraries for building neural networks, allowing programmers and other specialists to quickly design and launch their own neural networks.
4. Consumers of neural networks:
  - Today doctors do not have ready-made tools for using external neural networks. Individual neural networks are tested by individual clinics, but widespread use is suppressed by the lack of a public infrastructure.
  - Patients are interested not only in more accurate and well-founded diagnoses, that could be obtained with the use of neural networks, but also self-diagnosis, for example, photographing moles for determining the risk of melanoma, etc. Today, such neural networks are inaccessible to ordinary citizens.

The current situation in the market of medical neural networks is the initial stage of its emergence. Current problems:

- Laboratories, creators of ANNs face difficulties to provide access to them for end users (doctors) due to the lack of a single infrastructure. Skychain will provide them an analogue of AppStore, that will let any doctor use a certain neural network.
- Experienced specialists in the field of artificial neural networks don't have access to medical data, due to a large number of possible data providers and a high cost of the data itself. Skychain contains a data marketplace which provides a possibility to train neural networks for a fee using a large number of datasets, created by independent providers. It offers the possibility to train the deepest and most accurate neural networks while paying the royalty to data providers.
- Large corporations, such as IBM, can not train thousands of ANNs required to fully cover all areas of medical diagnostics on their own. Skychain will host thousands or even tens of thousand highly specialized neural networks created by hundreds of laboratories and corporations.
- The market of neural network development is constrained by high costs of equipment for effective learning and the complexity of tools for building and training ANNs. Skychain will provide convenient tools for building ANNs, as well as their inexpensive and fast learning with the help of distributed computing resources of Skychain participants, that will exceed data centers of large corporations in their computing power.

Skychain will change the ecosystem of ANNs, make them publicly available to all market participants! At this, each participant will benefit from his participation in the Skychain community.

## About Skychain

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Skychain is a "distributed open network" project designed to accurately diagnose patients and prescribe effective treatment. Skychain has the following advantages:

- Uploading any ANNs trained by laboratories or specialists to Skychain and receiving payment from end users of ANNs;
- It's a data marketplace, where medical data suppliers will be able to offer their datasets as a service for AANs training;
- Effective use of miners' computing resources to ensure smooth operation of a neural network;
- Public pay-per-use access to the neural network capabilities;
- Open distributed storage of all ANNs within Skychain and their settings, stored in a distributed chain of blocks according to the blockchain principles;
- Constant learning of a neural network upon adding new information and experience.

### Public encrypted distributed storage of authors' ANNs

Skychain stores all information about all ANNs within Skychain in an encrypted form. Any specialist or company will be able to upload their neural network to Skychain, designed and trained to effectively solve a particular task. Then, an author of the uploaded neural network will be remunerated by Skychain participants at each access to the services of his ANN.

#### Data marketplace

Skychain for medical data providers is a data marketplace where they can provide their data as a service for training of third-party neural networks:

- AANs, which were trained using datasets, provided by Skychain's suppliers, can only be used within Skychain, so that the providers of the datasets sets will be sure to receive a guaranteed share of the revenue from all neural networks trained with the help of their datasets;
- The development of medical datasets will become a profitable business for market participants who own such data.

Skychain takes care of the intellectual property of developers of neural networks and data owners. The developed and trained neural network, as well as the datasets are well protected.

### Effective use of miners' computing powers

Today, the crypto-currency mining has brought unprecedented computing powers of miners together into a single network. At this, mining of modern crypto-currencies has no value, except for a proof of performed work serving as a basis for a crypto currency issuance and blockchain protection.

Skychain will change this situation. Miners will perform useful work, providing computing capabilities for a neural network. Upon the fact of performed work (analysis of anamnesis, referral to additional examination, diagnosis, creation of a treatment record, etc., as well as in the learning of ANNs), a miner will get a share of the cost of the provided service.

Thus, miners will not only generate crypto currency emissions, but will also perform a socially useful function of high economic value.

### Public pay-per-use access to the neural network capabilities

Skychain is a project of a public ANN, that any participant or organization can connect to. Miners will provide their computing powers and receive inner Skycoin crypto currency as a reward.

Patients, doctors, medical institutions or online services will be able to use the Skychain capabilities by paying for each use of a neural network with the inner currency called Skycoin. Creators of ANNs will be rewarded for each use of ANNs developed and trained by them.

## Constant learning of the artificial neural network

For each session of a request to the Artificial Neural Network, Skychain will get feedback in a form of patient test results, symptoms and recovery dynamics. This feedback will constantly train the neural network, making it more accurate and efficient. In the future, this should make Skychain the most accurate and trained therapist in the world!

## Structure of Skychain modules

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The Skychain project consists of several interconnected modules:

- SkyUI - Module for conducting an interactive dialogue with a doctor or patient
  - The dialogue is conducted in an interactive form, with speech recognition and cognitive analysis of the incoming information.
  - Besides text information, this module can download images and graphic files with medical test results (MRI, CT, X-ray, Histology, Endoscopy, etc.).
  - The module also recognizes test results in a form of graphic images or documents.
- SkyEngine – Core of the artificial neural network
  - It analyzes all information about the patient and gives a diagnosis or a list of possible diagnoses and a list of medical tests and studies required for an accurate diagnosis.
  - It is a set of trained ANNs. The input neural network classifies all the information received, determining areas for a detailed analysis.
  - Then, the input neural network sends all patient information to specialized ANNs checking for presence/absence of certain diagnoses or problems.
  - In case of severe diseases, specialized ANNs will perform differential diagnostics of diseases and confirm/reject diseases that threaten the life and health of a patient.
- SkyLearningZone - Closed area for neural networks training
  - This is the data marketplace where medical data providers can provide their datasets as a service for the training of third-party neural networks.
  - ANNs, which were trained using datasets, provided by Skychain's suppliers, can only be used within Skychain, so that the providers of the datasets sets will be sure to receive a guaranteed share of the revenue from all neural networks trained with the help of their datasets;
  - One neural network can be trained using several datasets of a single medical area thereby achieving high depth and accuracy.
  - Neural networks, which were trained in SkyLearningZone, cannot leave this zone and their authors won't be able to copy their neural networks, but can only provide paid access to their functions. This ensures that the owner of the data will receive royalty from all neural networks trained on the basis of his data. And also guarantees the preservation of the value of the data of the supplier.
  - When training neural networks in SkyLearningZone, the structure and code of the neural network also cannot be downloaded from SkyLearningZone, so the author of the neural network guarantees the safety of its own developments and know-how.

- All the neural networks trained in SkyLearningZone are automatically ranked because In addition to training, the neural networks are tested and their accuracy and quality are automatically determined by the system.
- SkyConstructor
  - An interactive environment for building and training ANNs. An ANN's author builds a structure of an ANN in a visual editor and selects its learning mechanism.
  - The module also provides ready-made patterns of ANNs for fast building a neural network.
  - An ANN's author creates a description of the neural network and uploads it to Skychain paying a reward to the system (miners) for adding his neural network to the blockchain.
- SkyTherapist – Module for creating treatment protocols
  - A specialized module consisting of a database of scientific researches and recommendations, trained on patient records by a neural network.
  - The module generates the most effective treatment protocol according to the patient diagnosis, test results and general information (growth, age, vest, drug tolerance, medical history, etc.).
- SkyTraining – Skychain self-training module.
  - Controlling module that launches processes of retraining of ANNs within Skychain according to new received information..
  - The module controls the effectiveness of treatments offered by SkyTherapist according to the patient recovery dynamics, additionally uploaded case histories or medical test results.
  - The module launches SkyEngine learning process upon receiving new information about diagnoses if there was an incorrect diagnosis at the patient's first treatment request.
  - SkyTraining is a key module that will constantly develop cognitive and analytical capabilities of Skychain, making this system the undisputed market leader.
- SkyMobile - A mobile application that allows patients to get independent service by using Skychain on their own. Tasks solved at the first stage include:
  - Diagnosis of melanoma, according to a photo from a mobile phone;
  - Analysis of symptoms of a patient who does not require emergency hospitalization, prescribing medicines that do not require a prescription;
  - Detection of risks and threats to the patient's health and a recommendation to contact the nearest doctor if detected.

# Road map

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## 01.2017-11.2017

Research and development works carried out in key areas of the project. The working capacity of all key technologies and algorithms of Skychain confirmed. Thus, Skychain is based on a fully developed architecture, algorithms, protocols and approaches.

## Pre ICO – December 2017

The fundraising plan is \$ 200,000 - \$ 1,000,000. The funds raised will be used for the project marketing and ICO.

## ICO - February 2017

The fundraising plan is \$ 20,000,000. The funds raised will be used for the product development, concluding partnership agreements and ecosystem development.

## Skychain Alfa – June 2018

ANNs of our partners trained to perform a limited set of diagnostics (a total of 20-30 tasks) will be added to SkyEngine.

Analysis of images and graphic studies:

- Detection of cancer at an early stage by analyzing radiographs, CT and MRI tests
- Detection of diseases according to the chest X-ray interpretation taking into account sensitivity and specifics of a patient's body
- Analysis of histological images for detection of common cancers
- Detecting melanoma on the basis of high resolution photos of the skin

Analysis of medical tests and symptoms:

- Predicting the possibility of a heart attack by analyzing a variety of criteria (height, age, ECG / ECHO, indications, chronic diseases)
- Diagnosis of common disorders and diseases based on biochemical blood tests and symptoms of patients

At this stage, Skychain will demonstrate its usefulness and vitality to the medical community and will continue developing.

## Skychain Beta – December 2018

Skychain keeps developing, additional opportunities for tests analysis (up to 100 high-quality trained ANNs) are added to it. SkyTherapist is trained on the basis of scientific research and analysis of case histories.

SkyTherapist is launched in a limited mode:

- Creation of an effective protocol for the treatment of 200 most common diseases (infectious, chronic, etc.) with out-patient treatment.
- Generating an effective protocol of treatment of 30 most common cancer diseases.

Doctors will independently enter a patient diagnosis and information about patient analyzes into SkyTherapist. SkyTherapist will offer a doctor several effective treatments according to the accumulated knowledge.



## Skychain Release – June 2019

Launching Skyshain in full scale, including the SkyUI module for interaction with a doctor/ patient, SkyEngine trained to diagnose thousands of diseases and SkyTherapist providing treatment protocols for most diseases. The further development of Skyshain will be evolutionary - the neural network will be trained, identifying diseases with ever-increasing accuracy and providing more and more effective treatment protocols.

## 2025

By 2025, we expect that Skyshain's capabilities in the field of hosting any ANNs, as well as the huge computing resources of Skychain miners, will be in demand by specialists in a wide range of areas, not only medicine.

## Skychain usage scenario

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### Building and training an artificial neural network

Staff of a laboratory at a medical clinic with a large array of patient data decided to design and train their own neural network not only to improve their clinic's performance, but also provide access to their neural network to outside doctors.

#### **Building an artificial neural network**

A laboratory analyst Bill created a new neural network using the SkyConstructor tools on the basis of a publicly available neural network pattern - an analyzer of graphic images. Using the visual builder SkyConstructor, Bill made changes to the neural network structure by adding additional layers and blocks to best configure the neural network to solve his application problem.

#### **Preparation for learning**

Bill's assistant Tom prepared an array of data for training in the form of a specially structured data set. The system will be trained according to this data set.

#### **Training an artificial neural network**

Bill added the prepared data set using the SkyConstructor tools, indicated the neural network training budget of 150 Skycoins provided by his company. These 150 coins will go to miners who will perform calculations necessary for training a neural network according to the specified data-set.

Thousands of computers of miners downloaded this neural network into their memory and trained Bill's network in several iterations. The final neural network was on Bill's computer, the miners were rewarded. Distributed training allowed reducing the training time to tens of minutes instead of days or weeks that would be required for training on one server.

#### **Testing an artificial neural network**

Bill tested the trained neural network through SkyConstructor on an additional (testing) data-set. The network operates correctly and with high accuracy.

## **Publishing an artificial neural network**

Bill entered registration information about his neural network (class, description of input data, result, cost of access to the neural network, author, etc.) using SkyConstructor, signed a manifesto with a laboratory certificate and executed the command "Upload a neural network in the blockchain". Bill set the transaction reward of 20 Skycoins for a miner who creates another block. In about 10 minutes, a new block was created in the Skychain blockchain and Bill's neural network became available to any doctor anywhere in the world. Bill set a reward of 1 Skycoin that each consumer must transfer to Bill's (or his laboratory's) digital wallet for each inference operation (using a neural network for diagnosis).

## **Alternative learning scenario using the Skychain data marketplace**

ANN lab specialists are experienced professionals in the field of neural networks, but they do not have necessary medical data for creating neural networks in the field of medicine.

In the SkyLearningZone interface in the Data Marketplace section, they selected the datasets which contain information on diagnosis of diseases by MRI studies, received sample data for each dataset. Using these examples, ANN lab specialists developed a neural network, tested its training on open examples and decided to conduct its training.

ANN lab uploaded their neural network to SkyLearningZone, and trained their neural network using all selected data sets, paying only the cost of computing resources needed for training - 450 Skycoin. After training, SkyLearningZone automatically checked the accuracy and quality of the neural network, the accuracy was 99.98% - which is higher than any neural network on the market at that moment.

ANN lab published its neural network in the Skychain registry, while the neural network (its trained state) remained in SkyLearningZone and is available for use only within Skychain.

## **Usage of neural networks by consumers**

For clarity, in this section we will give a short example of using Skychain in a fully completed form.

The clinic, where the therapist Tom works, purchased Skycoin at the price of \$1.5 for 1 Skycoin to use Skychain and transferred coins to Tom's wallet. All fees for operations are approximate.

### **Initial treatment**

Patient Mike contacts the therapist Tom. Mike has symptoms that have been haunting him for the last month and have escalated now.

Tom opens the SkyUI interface and enters Mike's symptoms and complaints to the program online in a dialog mode. SkyUI asks a few clarifying questions about the illness, tolerability, etc., that Tom answers using the interface. After that, all received information is sent to the distributed neural network SkyEngine and a system charges commission of 10 Skycoin from Tom's wallet.

In response, Skychain gives the following information:

- List of possible diagnoses with their probability coefficients;
- Request for additional medical tests for Mike to do to clarify a diagnosis;
- Protocol of symptomatic treatment to alleviate symptoms and protect Tom from the development of the most dangerous probable diagnoses.

10 Skycoin, sent to the system, will be credited to the accounts of Skychain miners who provided their computing resources for processing this request.

### **Entering additional information**

Mike did additional tests recommended by Skychain and started treatment according to the protocol recommended by Skychain. Mike came to the second appointment with the therapist Tom. Tom entered results of Mike's analyzes and treatment dynamics in the form of Mike's current symptoms, pressure,

temperature, etc. into the SkyUI interface. Then, all the information is sent to the SkyEngine distributed neural network and the system charges a fee of 10 Skycoins from Tom's wallet.

In response, Skychain gives the following information:

- Two possible diagnoses of Mike\*;
- Request for an additional test for differential diagnostics and the final diagnosis;
- Updated treatment protocol to protect Mike from negative development of any of the two diagnoses. The protocol of treatment also takes into account individual indicators of Mike's tests, tolerability of medicines and their interaction.

*\* Skychain determined that one of possible diagnoses was missed in the initial selection. This information was sent back to the neural network so that it learned to determine it.*

### **Final diagnosis**

Mike did an additional test to exclude one of the two diagnoses and came to Tom with test results. Tom entered results into SkyUI. After that, all received information was sent to the distributed neural network SkyEngine and a system charged a commission of 10 Skycoins from Tom's wallet.

In response, Skychain gives the following information:

- Mike's final diagnosis;
- Treatment protocol;
- Prognosis: "full recovery in 3 months".

### **Course of treatment**

During treatment, Mike visits Tom every week and Tom enters Mike's symptoms and new test results into SkyUI. After that, all received information is sent to the distributed neural network SkyEngine and Skychain transfers a reward of 0.1 Skycoins to Tom's wallet.

This reward motivates Tom to continue entering information about Mike, allowing Skychain to learn, monitor the treatment effectiveness and confirm correctness of the diagnosis.

### **Treatment adjustment**

During the treatment, Mike has two problems:

- Mike poorly tolerates one of the prescribed medicines;
- Mike has sore throat, resulting in a need to adjust the treatment.

Therapist Tom enters information about the poor tolerability of one of the medicines, as well as information about the sore throat into SkyUI. After that, all received information is sent to the distributed neural network Skychain and a system charges a commission of 10 Skycoins from Tom's purse.

In response, Skychain gives the following information:

- Changed treatment protocol and recommendations for the period of sore throat.

### **Expected treatment period**

As Skychain gave a prognosis of "full recovery in 3 months", in 3 months after the start of treatment, Skychain will ask Tom to provide information about Mike's health.

Tom can do one of the following:

- Enter information about the fact of Mike's recovery, after that Skychain will transfer Tom a reward of 1 Skycoin;

- Enter detailed information, according to the information requested by Skychain: results of new tests based on the results of recovery, a detailed description of the recovery progress. After that, Skychain will transfer Tom a reward of 5 Skycoins.

## Uploading, storage, execution of private ANNs and payment for them

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The basis of SkyEngine is a large stack of ANNs capable of performing specific tasks for diagnosing symptoms, analyzing medical images, differential diagnosis, etc. Before launching the project, we, the Skychain project team, will fill Skychain with a certain number

But the main strength of Skychain is its distribution and openness!

Any specialist in a particular disease, a medical institution with a lot of case histories, a scientific laboratory, etc., will be able to create their own neural network and upload it to Skychain.

SkyEngine will provide tools that will allow independent professionals design their own ANNs, train them on real data using Skychain computing resources. Then, these ANNs will be uploaded to Skychain in an encrypted form.

After this, creators of ANNs will get a reward established by themselves for each use of their neural network by a doctor. Medical specialists, as well as the SkyTraining module, will evaluate this neural network quality by raising or lowering its rating on a public list.

For example, the Institute of Intestinal Diseases can build, train and upload a neural network that will detect and carry out differential diagnosis of Crohn's Disease, Ulcerative Colitis, IBS and other specific intestinal diseases according to medical tests and histology and endoscopy images to Skychain and be remunerated for every use of their neural network by doctors around the world.

Skychain will protect the intellectual property of ANNs' authors. Nobody can use a neural network uploaded to the public blockchain Skychain by its author, without paying a fee set by its author. How will this be implemented?

When building a neural network, it will automatically include encryption of the output signal. In fact, anyone will be able to perform calculations on a network uploaded by its author, reading its structure and parameters from the public blockchain. But to get the correct result of calculations, the result of the neural network calculations and the incoming signal must be sent to the computer/server of the ANN's author.

Then, a specially created neural network will quickly decrypt this signal on the computer of its author and return the final correct calculation result. An ANN decrypting a signal will also be stored in a public block, but encrypted with an author's key, so that only its author can decrypt and run it.

99.9% of computing costs for performing a neural network will be distributed on the basis of an open part of the author's neural network. 0.1% of computing costs will be generated on the author's computer to Secure storage of configured and trained ANNs in Skychain will allow using Skychain for publishing any ANNs. Skychain will provide paid access to these ANNs, unprecedented computing resources for performing calculations and protection of intellectual property of authors of ANNs.

# Skychain Architecture

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## Blockchain network

The central element of the Skychain ecosystem is the Blockchain network providing interaction between network participants. A block, which size is limited to 10 MB, includes confirmation of the execution of the following operations (transactions):

- SkyCoin transactions
- Requests for an inference using a neural network
- Requests for neural network training
- Publishing inference results
- Publishing a new neural network in the register (1 per block)
- Changing a neural network's owner (10 per block)
- Updating a neural network (10 per block)

The service charges a fee for each transaction, the fee amount is set by the authors of transactions. A large fee increases a chance for a transaction to be included in a block. A block includes only a neural network manifest (description) value and its hash value, a neural network itself is included in a separate P2P storage.

The network operation is ensured by the proof-of-work concept. The network participants (miners) form blocks, including transactions in it. The proof-of-work algorithm implemented in Skychain has the following features:

- It requires at least 4 Gbt of RAM
- The main computing process is matrix multiplication, which makes calculations effective only on multi-core GPUs and especially effective on tensor cores

Operations of the proof-of-work algorithm:

1. Input: Obtain a key of the previous block  $K_0$ , hash code of the previous block  $H_0$ , hash code of the current block  $H_1$
2. repeat
  - a) Generate random number  $k_1$
  - b) Create three  $16 \times 16 \times 16$  matrices  $A, B, C$  on the basis of  $K_0, H_0, k_1, H_1$ , writing  $K_0, H_0, k_1, H_1$  values consequently in each matrix
  - c) Perform the operation  $D = Ax + B$
  - d) Compute a hash value of the matrix  $D$  -  $hD$
  - e) If  $p(hD, complexity) \leq 1$ , to  $K_1 = k_1$ , break;
    - i. The key is found, the miner creates a block using  $K_1$
3. until forever

$p(hD, complexity)$  - a function checking a hash code value that meet a criteria of including in a block, taking into account complexity. Complexity is calculated by the network automatically to regulate the speed of creating blocks in 1 block in 10 minutes.

For finding a block, participants receive 1,000 coins, the reward amount is reduced every 25,000 blocks. The issue is limited to 10,000,000,000 coins, plus 5,000,000,000 coins will be created in the first block and exchanged for tokens owned by their owners after the ICO of the project.

## Data storage

Neural network configuration and training datasets are published and stored in a separate p2p network to prevent excessive growth of the Skychain blockchain. Recorded data hash is written to blockchain network blocks.

## Creating an artificial neural network

Skychain users create and customise neural networks layers, indicate learning algorithms and test datasets. The neural network creator pays for its training with Skycoins after completing the configuration.

## Distributed training

Skychain will provide an opportunity for distributed training. A server, that controls the training process, will attract additional network servers to training. Then, the controlling server will “distribute” an artificial neural network module and its initial parameters to training servers. After that, training servers will perform the following iterative training:

1. repeat
  - a) Send a unique part of the data set to each server;
  - b) Get updated neural network parameters received through training from each trained server on the forwarded data-set -  $\nabla \omega_t$
  - c) Calculate updated neural network parameters  $\omega$  based on all  $\nabla \omega_t$
  - d) Send updated neural network parameters to all trained servers  $\omega$
  - e) If the data-set is completed, break;
2. until forever

Another option is training an artificial neural network with its own power.

## Publishing an artificial neural network in the blockchain

There are several options for publishing an artificial neural network:

- Open publishing in the data storage - any participants can perform calculations with this neural network. An author of this neural network is not rewarded for the use of his neural network by participants - only a miner who performed the calculation is rewarded.
- Enclosed publishing - a neural network is stored at its creator's computer, Skychain only publishes information about it. The author trains his neural network on his own, performs orders of the network participants himself and gets remuneration for them.
  - There is an option of connecting already trained neural networks of independent laboratories and corporations to Skychain. In this case all calculations are performed on the neural network's owner's server and Skychain is used as an infrastructure providing access to this neural network for consumers and rewarding its owner.
- Encrypted publishing - SkyConstructor provides tools for building an neural network, which results can be obtained only with a use of several layers in an enclosed part of the neural network located at its author's computer. The calculation is completed by a neural network's author. Both a neural network's author and a miner who completed the calculation are rewarded.

## SkyEngine register of neural networks

All artificial neural networks within the SkyEngine neural network register are public. The register contains a description of each neural network, its category (application field), information about the neural network structure and its trained state, neural network's owner's identifier/address, amount of the reward to the neural network's owner for each access to it (set by its owner), computational complexity (set by SkyEngine).

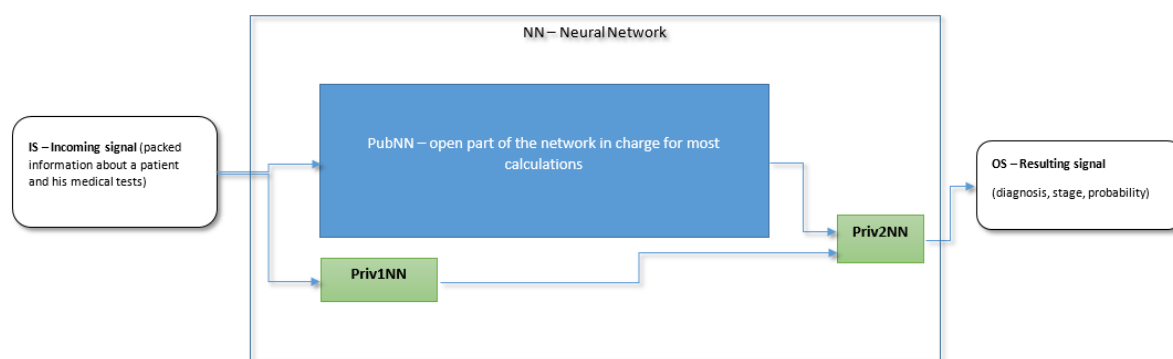
## Launching calculations

After a manual selection or as a result of an automatic classification, a table with options for launching SkyEngine is displayed to a doctor:

Category	Name, author	Reward to an author	Reward to a miner for complexity	Total price (Skycoin)	Perform
Diagnosis of skin diseases according to the dermatoscope images	Dermatoscope.Pro v.2	9	2	11	V
Diagnosis of skin diseases according to the dermatoscope images	Derm Alpha	1	3	4	V

A doctor selects neural networks from the list and clicks on Start calculations. The final cost (15 Skycoin for this example) is charged from the doctor's or his medical institution's wallet and the inference (calculation process) begins.

## Inference (generating a result)



NN is an artificial neural network computing incoming information about the IS patient and giving the result of OS calculations. NN consists of PubNN - an unencrypted public part of the neural network in the blockchain. Any Skychain member can run PubNN for calculations. Priv1NN and Priv2NN are encrypted decoding neural networks within NN. They are encrypted in the blockchain with the NN author's key. Priv1NN and Priv2NN are executed on the author's computer. These neural networks do not require significant computing resources for operation, but they are an integral part of the NN artificial neural network. The result of PubNN calculations is inaccurate without them.

Thus, the incoming signal is first processed with PubNN on a miner's computer or server and takes 99% of computing resources. Then, the PubNN calculation result and incoming IS signal are transmitted to the NN author's computer/server, where the final result OS is calculated with Priv1NN and Priv2NN neural networks. OS is sent to the user directly from the author's server.

How are Priv1NN and Priv2NN created? They are small neural networks, generated automatically by Skychain tools when building a neural network. Priv1NN and Priv2NN take part in the NN training and become its integral part. The result of PubNN calculations is inaccurate without them.

This has the following advantages:

- 99% of computing costs are performed on any free Skychain server. This maximizes distribution and utilization of network servers.
- An author of a neural network is protected from copying or use without his permission, as well as has guaranteed remuneration in the amount set by the author for each operation of using his neural network.
- The author can always restore his encrypted decoding neural networks from the block, if he knows his private key (password).

## Mining and monetization

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At the launch of the Skychain project, all SCH tokens will be exchanged for 5 000 000 000 Skycoins. All tokens produced during the ICO will be exchanged for Skycoins.

Miners creating new blocks in the chain will have the following rewards:

- Reward for each operation of including a new artificial neural network in the system (one operation per unit).
- Reward for each operation of changing a neural network's owner (lot sale transaction).
- Reward for each operation of changing a neural network's content by the developer (uploading a new neural network version to the blockchain).
- Reward for transfers of Skycoins within the network.
- Emission of additional coins at each creation of a new block in the chain.

The proof-of-work algorithm used in Skychain will be effectively executed only on computers with powerful video cards and, preferably, tensor cores. The main proof-of-work operation in Skychain is the matrix multiplication (BLAS GEMM). Matrix multiplication operations (BLAS GEMM) are the basis of training and inference (a process reverse to training - conclusions based on already trained neural networks) of neural networks, they are used to multiply large matrices of input data and weights in the interconnected network layers.

Therefore, computers of miners will be able to perform high-performance calculations of artificial intelligence and get the following rewards:

- Reward for an inference (execution of calculations) of individual neural networks (calculation of diagnosis) at the request of consumers.
- Reward for performing a neural network training requested by neural network developers.

Nevertheless, high-performance servers specialized in artificial intelligence calculations, such as Nvidia DGX-1, containing many GPUs and tensor cores, are often required for training and calculating deep neural networks. Therefore, the system will automatically choose computers or servers suitable for calculating a particular neural network, sending calculations for simple neural networks to simple farm networks and training and calculating complex neural networks to high-performance servers.

We also expect that as Skychain penetrates into the work of medical personnel, Skycoins will become a convenient and widespread means of payment in medicine. This will increase a demand for Skycoins and income of Skychain miners accordingly.



## Distribution of tokens at the ICO

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A total of 120 000 000 Skychain tokens will be issued.

- Up to 100,000,000 tokens will be sold during pre-ICO and ICO
  - + 10% of the total tokens sold will be transferred to the project team, without the possibility of selling tokens within 12 months
  - + 10% of the total tokens sold will be transferred to early investors, bounty program participants, project advisors and partners
- All unsold tokens will be destroyed.

1. Presale (pre-ICO) (December 2017)

- a) From 400 000 to 2 000 000 SCH tokens will be sold (1SCH = 0.5\$)
- b) The fundraising plan is \$200 000 - \$1 000 000

2. ICO (February 2018)

- a) Up to 100 000 000 SCH tokens will be sold. (1 SCH = 1\$).
- b) Unsold tokens will be destroyed.
- c) The fundraising plan is from \$10 to 100 millions. All unsold tokens will be destroyed.

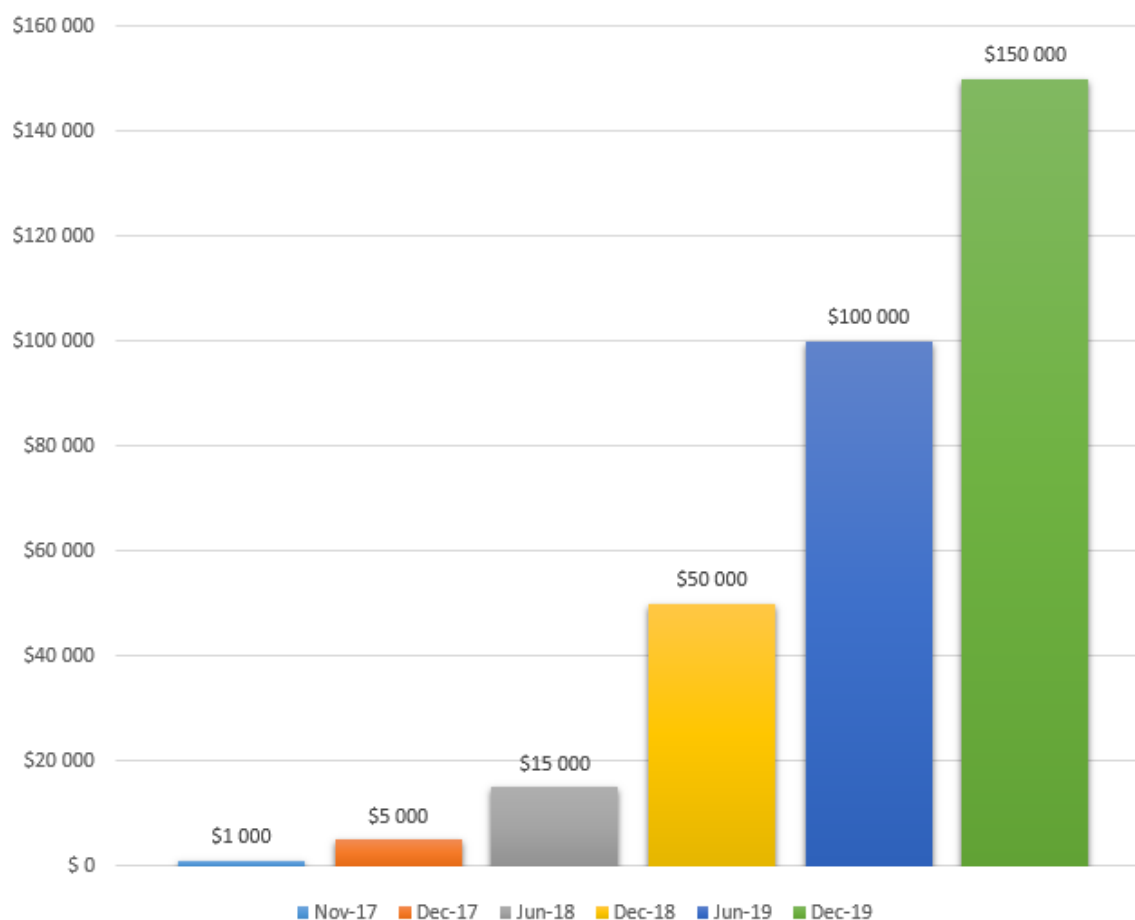
The funds raised will be used for the product development, development of the ecosystem of partners – neural network developers, promotion of Skychain in the medical community, connecting already trained neural networks to Skychain.

## Expected dynamics of the Skychain token price

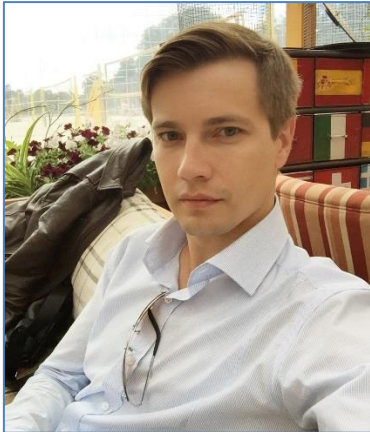
In this section, we present our expectations of the price of the SkyChain token and cryptocurrency. These expectations are not guaranteed in any way and given only for reference.

Event	Expected exchange rate	Expected date
Participation in the pre-ICO, \$ 1 000 invested. You get 1000 SCH.	1 SCH = 1\$	December 2017
ICO completed. The market value of 1000 SCH is \$5 000.	1 SCH = 5\$	April 2017
Launching Skychain Alfa. The market value of 1000 SCH is \$15 000.	1 SCH = 15\$	Summer 2018
Launching Skychain Betta. 1 SCH is converted to 100 Skycoins. 1000 SCH are converted to 100 000 Skycoins. The market value of 100 000 Skycoins is \$50 000.	1 SCH = 100 Skycoin 1 Skycoin = 0,5\$	Winter 2018
Successful launch of Skychain increases the demand for Skycoin and its price. The market value of 100 000 Skycoins is \$100 000.	1 Skycoin = 1\$	Summer 2019
Skychain development results in an increase of the Skycoin price. The market value of 100 000 Skycoins is \$150 000.	1 Skycoin = 1,5\$	Winter 2019

### Expected dynamics of the price of 1000 SCH tokens



## Team



### **Gennady Popov, Founder.**

Higher education: Physics faculty of Moscow State University, Computer methods in physics. Scientific projects in the field of fuzzy mathematics, recognition of images, neural networks and machine learning.

Continuing professional education: Faculty of Computational Mathematics and Cybernetics of Moscow State University. Scientific projects in the field of telecommunication systems, distributed P2P networks, BigData.

Second higher education: Financial University under the Government of the Russian Federation, Financial Management.

10 years of experience as a programmer. Projects.

Automation of medical laboratories, automatic recognition of images with MRI and CT for machine detection of pathologies of organs and joints.

Automation of hospital medicine and health insurance funds. Large data analysis - case histories of 6 million patients for machine-based calculation of correlations, efficiency of doctors and hospitals.

Implementation of large automation systems for electronic document management of public authorities.

In 2006, Gennady founded WSS-Consulting (<http://wss-solutions.net>), the market leader in the automation of electronic document management in Russia. The company has a development dynamics of 50-80% per year for 10 years since its foundation and more than 400 large enterprises as customers. The developer of WSS Docs Storage, WSS Docs, WSS Portal products automating the work of millions of employees of our clients.

In 2017, Gennady founded the Skychain project. His dream of a lifetime is to create a platform for artificial intelligence systems. The Skychain project should make this dream come true!



### **Ivan Svistunov, Chief technology officer**

Higher education: Faculty of Information Technologies of TSTU, Applied Informatics.

Language and technology proficiency: C ++, C #, Objective-C, JS, CUDA, T-SQL, Haskell, Blockchain, Deep Learning.

Programmer since 2010, an architect of industrial software products in the field of BigData, Highload and cryptography (WSS Docs) using the "private blockchain" technologies (WSS Docs Storage).

Since 2016 Ivan is working on machine learning projects and has implemented several projects in this field.

Cryptoanarchist, believes that a country of the future will be based on blockchain technologies and artificial neural networks.

In 2017 Ivan was invited to the Skychain project by the project founder Gennady Popov.



**Alexander Kuzmin, Chief operating officer**

Higher education: Physical faculty of Moscow State University, Physical and mathematical methods of management. Scientific projects in the field of artificial intelligence in multi-agent systems and artificial neural networks. Analytical projects in the field of innovative technologies.

2 year experience as an analyst of high-tech projects in the field of nanotechnology and IT.

3 year experience as a project manager in the field of development and implementation of corporate IT systems.

In 2017, Alexander was invited to the Skychain project by the project founder Gennady Popov.

"I dream of implementing projects of practical and social value on a global scale. Skychain is a project that will let me make my dream come true and use my specialized skills and competences obtained at the University and on project at various companies."

## Advisors

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**Anton Klechenov, Scientific advisor**

Higher education: Physical Faculty of Moscow State University, Laboratory of Medical Programs. Thesis topic: "Segmentation of sequences of ultrasound images of the heart".

Continuing professional education: Faculty of Computational Mathematics and Cybernetics of Moscow State University. Scientific projects in the field of neural networks.

National University of Singapore, Faculty of Information Systems. Joint scientific research and publications with the University of MIT (USA) in the field of Computer Vision and parallel computing.

Work experience as a programmer - 7 years. Automation of medical institutions. Processing of medical images.

Work experience as an IT consultant in Accenture. Projects of the introduction of automation systems by enterprises at transnational corporations.

Promotion and sale of software for processing medical video signals on the global market.

Founder of several companies specializing in electronic commerce and international trade.

Anton joined the Skychain project in 2017.

"I believe that in 5 years an artificial neural network will function in every electronic device and Skychain will become an "Internet for neural networks".



**Andrey Reznik, Business adviser**

Education: Finances and loans, Plekhanov Russian University of Economics

Additional Education:

- Master of Business Administration, INSEAD (France)
- Management of Business Pricing, Amsterdam Finance Institute

Experience:

- Deloitte, 5 years, Department of Transactions Support

Current partner of the Department of Assets and Business Estimation of international consulting company "Mazars". Principle of Strategy and Enterprise Finance management. The member of the board of Directors of the largest Russian telemetry, software, and automated trading equipment development company. The founder of few companies, specialized in Finance services, IT-services and development, automated trading.

In 2017 joined the project "Skychain".

Confident that it is better to invest in team that have succeeded in project development, and in infrastructural projects.



**Konstantin Sablin, Medicine adviser**

Graduated from: The Sechenov Moscow Medical Academy

Diploma in "General Medicine (health care)"

Andrologist, urologist, endocrinologist with more than 8 year's experience.

The member of The European Association of Urologists (EAU). The member of The Russian Community of Urologists (RCU). The member of The International Society for the Study of the Aging Male.

In 2017 joined the project "Skychain".

Confident that neural networks will perform diagnostics better than humans, in the nearest future. That is the reason of joining the project "Skychain".



**Maria Florenteva, Digital Healthcare Advisor**

Higher education: Faculty of Economics of Lomonosov Moscow State University

Business Education: MBA (London Business School).

2013-2017 Senior Vice President of PJSC "Rostelecom".

Since 2017 - Director of the "Digital Economy" laboratory of the Faculty of Economics of Lomonosov Moscow State University. Member of the Coordinating Committee of the National Consortium "Smart City".

Initiator of the creation of the "Digital Health" Consortium.

# Terms & Conditions

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This document can be used only for information purposes and should not be considered a public offer to sell shares or securities using the Skychain platform or any other related company.

## **Skychain tokens do not give the right to control.**

Owning Skychain tokens does not give the ownership or property rights in the company to their owner. While the community's opinion and feedback can be taken into account, Skychain tokens do not give their owners a right to participate in decision-making regarding the Skychain ecosystem development.

## **Income or benefit is not guaranteed.**

All examples of income calculations or benefits used in this document are provided for demonstration purposes or for showing industry averages and do not mean a guarantee that these results will be obtained in accordance with the marketing plan.

## **Regulatory uncertainty**

Blockchain technologies can be subject to supervision or control by various regulators around the world. Skychain tokens may be subject to one or more audits or influence, including but not limited to use or possession of digital tokens such as Skychain tokens that may slow down or limit functionality of the system or the process of purchasing Skychain tokens in the future.

## **Skychain Tokens are not an investment**

Skychain Tokens are not an official or legally registered investment of any kind. Unforeseen circumstances can make significant adjustments to the objectives outlined in this document. Even though we intend to achieve all goals described in this document, all people and parties involved in the purchase of Skychain tokens do it at their own risk.

## **Inappropriate use**

Even though Skychain tokens should not be treated as an investment, they can grow in price over time. They can also fall in price if they are not actively used in the Skychain ecosystem.

## **Risk of loss of funds**

Funds obtained during the ICO procedure are not insured. In case of their loss or loss in price, there is no private or public insurance representative you can recourse to.

## **Risk of malfunction**

There is a chance that for various reasons, including but not limited to failures in business organization or marketing strategies, the Skychain ecosystem and all subsequent marketing activities connected with the funds raised at the ICO may not be successful.

## **Integration**

This Agreement establishes full agreement of the parties with recognition of the importance of the topic set forth herein. All previous agreements, discussions, presentations, guarantees and conditions are collected in this document. There are no warranties, conditions or agreements, express or implied, between the parties, other than those expressly set forth in this Agreement. This Agreement can be amended only in writing by the parties in a due manner.

## **Disclaimer of warranties**

You agree that using or not using Skychain tokens is entirely your risk and Skychain organizers bear no liability for that. Since the release date, Skychain tokens will be sent without warranty of any kind, either explicit or implicit, including all implied warranties of a commercial price for a particular purpose without violating the intellectual rights of anyone. Since some jurisdictions do not allow the exclusion of implicit guarantees, the higher exclusion of implied warranties may not apply to you personally.

## **Prohibition of ICO in some countries**

Legislation in your country may explicitly prohibit you from participating in an Initial Coin Offering (ICO). In this case, you can not participate the initial coin offering of Skychain.



## FAQ

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### **You are talking about diagnosing using medical test results, test images. Can this be even implemented?**

Yes. Several dozen neural networks have been implemented and trained by specialists around the world today, already solving these tasks as the best specialists in their fields. This area is developing dynamically – in 10 years most diagnoses will be made by neural networks, probably under the supervision of a living doctor.

### **Then what is the use of Skychain, if all this is developing fine without it?**

The today's problem is that these neural networks function within laboratories and institutions and there is no mechanism for the unified use of neural networks by doctors. Skychain will unify all these distributed neural networks and provide doctors with a single window for their use.

Skychain's data marketplace will allow the best specialists in the field of artificial intelligence to quickly develop and teach neural networks using the amount of medical data, which no organization or state can ever collect in one place. Due to this, the number and quality of Skychain's neural networks will be unreachable for any private or public project.

Besides this, by uploading information about a patient in Skychain, a doctor can analyze it in dozens (or even hundreds) different neural networks and get the most complete state of a patient.

### **What market share does Skychain claim?**

IBM estimates the artificial intelligence market in the sphere of medicine at \$200 billion a year in a few years. The goal of Skychain is to take control over 70% of this market!

The way to achieve this goal is to create the best open infrastructure that will accumulate the resources of the majority of participants of this industry and surpass any closed corporate product.

### **What has a blockchain to do with it?**

It will store all neural networks developed by hundreds of laboratories and organizations in a single registry so that any neural network can be calculated any server connected to Skychain. Besides this, storing neural networks in a single registry is safe for their author as no one except the author can get a reward for the use of his neural network and it can't be unloaded and launched outside Skychain, because the calculation result is decoded the neural network's author's computer with his private key.

### **What are the advantages of Skychain for developers of neural networks?**

Today developers of neural networks must purchase expensive equipment to train their artificial neural network, experiment with various neural network structures and select the best structure for solving their problem. With Skychain, any researcher can build his own artificial neural network using SkyConstrucor builder tools, pay for renting the required computing resources with Skycoins and train his neural network.

The developer will also be able to train his neural networks using a large number of datasets provided by independent suppliers, this will make it possible to train the deepest and most accurate neural networks.

Then, Skychain will allow an author to get remuneration from end users of his neural network. This will motivate developers of neural networks to upload their neural networks to Skychain and thus develop the Skychain ecosystem.

### **Will calculations and training of neural networks be distributed?**

Yes, when a doctor sends information about a patient and test results, this information is distributed to a plenty of neural networks and executed on different servers at the same time.

neural networks can be also trained in parallel, when one server (for example, of a neural network's developer) controls the training process and plenty of servers of miners consistently train it on individual examples and send the neural network parameters to the controlling server for combining them together. The calculation of neural networks (inference) will be performed on a miner's server and decrypted on a server of the neural network's owner. But an inference is not a costly operation and is effectively performed even on one server.

### **What are the advantages of Skychain for miners?**

Skychain miners can provide their computing resources and get paid not only for mining of cryptocurrency coins, but also providing a requested service, which is in a solvent demand. This fundamentally sets Skychain mining apart from mining of classic cryptocurrencies (BTC, ETC, etc.) where miners perform useless calculations only to proof-of-work.

### **What are the advantages of Skychain for doctors and patients?**

Skychain will be able to analyze information about a patient according to his medical tests, history, symptoms and research results. Moreover, this analysis can be performed with hundreds of different neural networks at once that will not miss any important detail and can effectively diagnose rare diseases and improve the quality of diagnostics. A doctor and a patient will be able to get a reliable "second opinion" from Skychain.

### **Can Skychain be used not for medical neural networks, but for other tasks as well?**

Yes, Skychain architecture allows storing and processing any neural networks. We decided to focus on medicine at this stage, as this is a very urgent task and the project organizers have a rich experience in this field.

### **Some large companies (IBM, Google) design and provide their neural networks for rent, including for medical purposes. Don't you think that they will monopolize this market and leave room for Skychain?**

Yes, developments of these companies are interesting. But training even one artificial neural network for diagnosis of a single disease is a complex task that requires painstaking work on designing a neural network and preparing a large data set for its training. A neural network often must be redesigned and retrained after the training.

In Skychain, the developer will be able to train his neural networks using large number of datasets provided by independent suppliers for reward, this will make it possible to train the deepest and most accurate neural networks.

Thousands of independent laboratories will be able to place their neural networks on Skychain and no corporation in the world can spend so much intellectual and human resources to create their product. Just like no taxi company can compete with the Uber drivers network in the number of cars, no software developer can compete with App Store in the number and coverage of applications.

### **Some companies, such as Amazon, provide computing resources of their data centers for rent to neural network developers for training and calculations. These centers are very efficient. Will the use of Skychain computing resources for training neural networks be in demand?**

Yes, data centers of large corporations are really big. But if you look at the current blockchain networks, such as Ethereum, you can see that these networks combine huge computing resources of miners, much superior in their processing power than any centralized data center. That's why Skychain will provide more computing powers and at a better price than any corporation.



### **How do you assess a chance of the project failure?**

We admit that at the pre-ICO or ICO stage there may be a situation that the project's tokens will not be redeemed and we will not be able to develop the project without this support. The project failure is possible in this regard. But we are 100% sure that a platform with principles outlined in our whitepaper will be created and universally recognized. Modern technologies allow creating such a system, which means that it will definitely appear, since its high value for people is obvious. If the ICO is successful, we are confident that we will implement Skychain and it will be universally recognized.

### **Ok, this project is really interesting, but why do you think that it is your team that should implement it?**

The Skychain project is at the intersection of five fields:

1. Blockchain
2. Artificial neural networks
3. IT in medicine
4. Sharing economy
5. Cryptography

We, founders of Skychain, have deep knowledge and experience in all these four fields. And, which is also important, Skychain is a project that we want to devote our lives to.

### **Why did you choose ICO and not attracting venture investment?**

The attraction of classical investors reduces the level of independence of the team and the project. We want to remain independent, develop Skychain not relying on investors' opinions and their short-term goals. Therefore, we chose an ICO model and hope for community confidence in our project, team and goals.

### **What equipment do I need for Skycoin mining?**

Skycoins can be mined with computers with several powerful video cards. The proof-of-work algorithm used in Skycoin uses matrix multiplication operations (BLAS GEMM), which is most efficiently computed on tensor cores (such as Nvidia Tesla V100). The use of tensor cores allows speeding up the training and calculation of Skychain neural networks a dozen times. We chose this solution to ensure that all computers of miners are useful to the Skychain network, not only for creating new blocks, but also training and calculating neural networks.

### **The field of artificial neural networks is rapidly developing and new architectures, libraries and new approaches to training are emerging. What if Skychain lags behind?**

Skychain is an infrastructure. We will be adding support for all widespread libraries and tools in Skychain. So, if a new library for artificial neural networks that solves problems well appears tomorrow, for example, we will test it and include its support in our core. Thus, Skychain will speed up spreading the progress in this area and the use of the latest developments and libraries by a wide range of specialists and consumers.

# Participation in Skychain

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## Participation in the pre-ICO

We look forward to your participation in our pre-ICO. Funds raised at the pre-ICO will be used to organize the ICO and platform marketing.

The participation method is indicated on the website <http://skychain.global>

## Participation in the ICO

By becoming an ICO participant, you will become a full-fledged participant of the Skychain community. After launching the platform, we will exchange the tokens you purchased at ICO into the inner currency Skycoin.

The participation method is indicated on the website <http://skychain.global>

## Participation in the Skychain development

We welcome everyone who wants to join our team. We are interested in attracting mathematicians and programmers with scientific projects and experience in the field of artificial intelligence, artificial neural networks and deep learning. We are also interested in your fresh ideas or developments in these fields. Just email us and we will definitely reply you!

## Participation in the initial configuration and training of Skychain

We are looking for partnerships with medical institutions and health insurance funds that can provide us with millions of case histories, for training and configuration of the Skychain artificial neural network.

## Participation as a neural network developer

If your laboratory or organization already has experience in the field of artificial neural networks and you want to publish them for public access and get remuneration for their use, we welcome you to our project. We can test the operation of your neural networks in Skychain and support you in the integration of your neural networks into Skychain.

## Participation as a miner

The functioning of artificial neural networks and artificial intelligence requires huge computing resources. Therefore, only high-performance multiprocessor systems can be used as mining computers for effective operation. Specialized hash processors ASIC can't be used in Skychain due to being useless for working with neural networks.

We recommend using computers/servers with video cards with powerful GPUs and tensor cores, such as the NVIDIA Tesla V100 GPU or similar, which can replace hundreds of CPUs in high-performance computing.

## Participation in the testing and pilot operation of Skychain

We are looking for partnerships with medical institutions, specialists and practicing doctors that will help us test the system on real patients. During the testing period, no diagnosis and treatment will be prescribed based on Skychain recommendations, only a diagnosis and protocol of treatment prescribed by a doctor and proposed by the artificial neural network will be checked with displaying comparison results in Skychain.

## Contact us

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<http://skychain.global/>