AIIP

Technical Specification

Artificial Intelligence
Investment Platform

PLATFORM OVERVIEW
AVAILABLE FUNCTIONS

All the available functions cover the common features which are used in traditional trade with the help of different types of exchanges. They involve:

a.   An efficient analysis of the market condition towards cryptocurrency

b.   Prediction of possible trends in different time horizons (it can be performed from minutes to weeks).

c.   Assessment of possible risks in the market and its further measurement, management, and comparison to the current dynamics of individual cryptocurrencies

d.   The development of game strategy, based on the different goals and possible limitations.

e.   An efficient optimization of cryptocurrency portfolio for a specific trading strategy. With the help of optimization, it is possible to gain maximum and receipt funds of financial investments.

f.   Stop loss and take profit signals calculation. Due to the development and control of trade signals, the entry and exit points can be defined.

FUNCTIONS ENABLERS

To develop and implement the mentioned functions of the performed system above, it is significant to use the following set of tools:

a.   The theory of dynamic systems is used to define the predictability of time series. They are characterized by the dynamics of cryptocurrency prices, performing the main opportunities and creating a forecast model and the corresponding time lag.

b.   There are different types of artificial neural networks which are actively used in the machine learning, building, and development of predictive models and ANN architectures. Moreover, such powerful ANN architectures as GRU and LSTM are also built with a mix of networks of various architectures.

c.   In order to optimize the cryptocurrency portfolio, different mathematical programming theory tools are used. The tools involve linear and nonlinear mathematical programming.

d.   The techniques from the theory of probability and mathematical statistics are used for modeling and risk management.

e.   The corresponding methods of optimization are used to define and manage trade signals which are based on the logical product system. Also, they assist in the maximization of profitability and minimization of risks.

SPECIFIC ARCHITECTURE OF PLATFORM

The mentioned System is built to integrate complex compositions and architecture to make the exchange trading process automatic. The System involves the AI system and 4 other subsystems to help you with the interaction and communication:

1.   The first subsystem deals with the interaction between exchanges and brokers so that it will be possible to get all the statistical data to implement the game strategy.

2.   The second subsystem performs a game strategy allowing a user to define and choose from different possible pre-defined strategies. Therefore, it is possible to group clients and manage the aggregate funds of the clients as well, as it provides great scalability of the system. The total amount of governance objects will match the total number of pre-defined strategies (3-5 strategies).

3.   The third subsystem is about UI, enabling to control the AI system. For example, it is possible to set the initial values for the parameters of the specified mathematical models within the emulation process or when the new game strategies are created.

4.   And the last subsystem operates with a reporting subsystem. It means that the system can generate reports on various aspects of the performance of each of the game strategies. There are some special sections in the reports, such as account dynamics, profitability assessment, risk management quality assessment, economic efficiency assessment, and others.

So, there are four subsystems in the AIIPs AI framework:

1.   A special subsystem to analyze cryptocurrency markets;

2.   A subsystem to develop special game strategy;

3.   A subsystem to forecast;

4.   A subsystem to define risks and to manage the trade signal.

The subsystems deliver special features, which were described in the previous section.
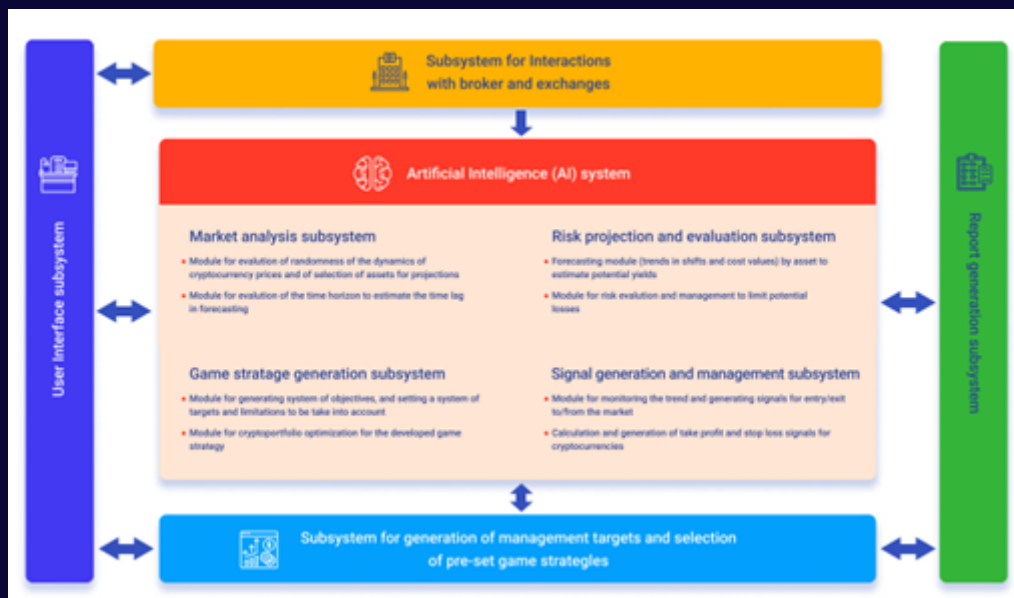
Mathematics

| Knowledge-intensive trading functions	Algorithms	Main aim and result
1. Cryptocurrency market description	Hurst exponent	Define the predictability of time towards the proportion of random as well as deterministic parts involved.
	The spectrum of special exponents	Identify the divergence of the trajectories towards the dynamic system.
	Mathematic time	Evaluate a specific period series that remembers its past values
2. Numerical assessment of time series similarity in comparison to the market index	EDPR, DTW, LCSS, FTSE	Define the specific series level of similarity to the market index and time series, evaluating the most similar and dissimilar cryptocurrencies for the game strategy

Mathematics

3. Time series segmentation	The detection of time series change point	Evaluate the time points of a possible change and identification of trend duration
4. The dynamics of cryptocurrency in future for a special game strategy	Decision trees and random forest Neural networks LSTM, convolution networks, hybrid networks, and GRU networks.	Time series identification such as qualitative prediction to define the direction of market change. The corresponding indicator equals AUC 0.7-0.8
	Quantitative prediction within such methods as VAR, NARX, ANFIS, deep learning, LSTM, hybrid networks, GRU networks.	The error of the method can vary from 2%-3% to 12%-15%

Mathematics

5. Risks identification in the specific dynamics of cryptocurrencies	The use of regression models. Markov models Portfolio models.	Evaluation of a possible acceptable price from predicted Determination of acceptable portfolio value deviations
6. The development of a game strategy from an aggregate of a set of various purposes, taking into consideration all the risks.	Different objective programming and the models of optimization. The use of genetic algorithms.	Creation of a complex game strategy with different aims and even those contradicting each other, as well as possible internal and external contradictions.
7. The portfolio for cryptocurrency optimization	The use of optimization models and special algorithms.	The satisfaction of all games is significant, increasing the portfolio value up by 35%.

Mathematics
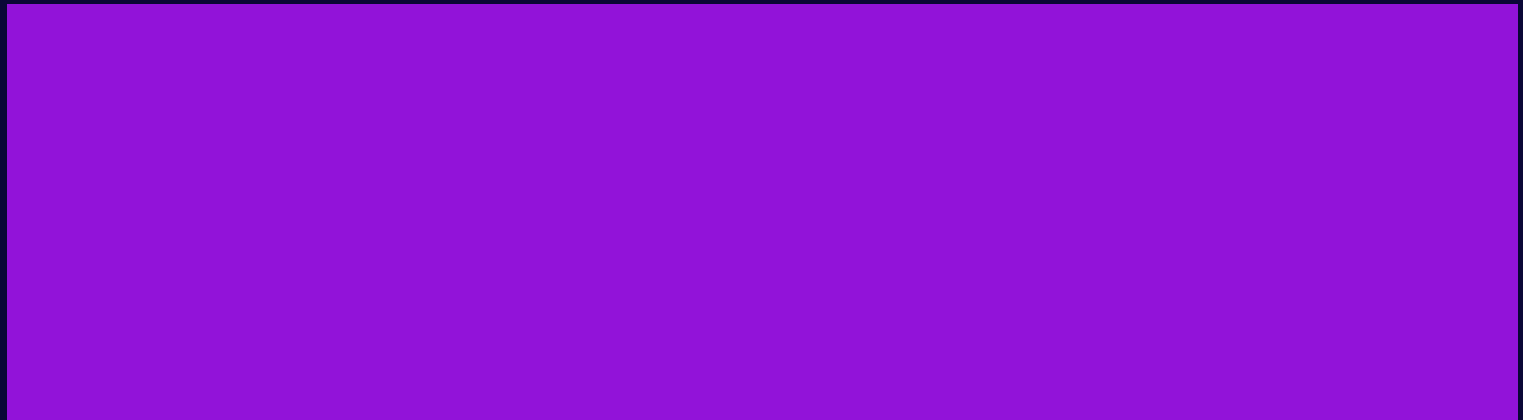
8. The development of trading signals to assess when to enter and exit from different types of trading positions. Identification of price level for a special stop loss and take profit signal.	Special models with a short time lag Optimization ,models Genetic algorithms	Identification of asset prices at the moment of entering and exiting in a trading position, awill,s well as identification of the optimal time point for further termination.
9. Monitor the portfolio	CUSUM algorithms for control indicator assessments and special statistical moments.	Monitoring of the game strategy control indicator's issues for the purposes of identifying the moments of occurrence of transient processes in the values. After the moment of occurrence of transient processes is detected, the system generates the corresponding signals in order to restrict the

1.   **The cryptocurrency market status analysis methods** are aimed at a specific analysis to select the currency for inclusion in the portfolio as well as an integration of a game strategy for the portfolio based on a separate characteristic of a cryptocurrency. It is necessary to use three methods.

The first method involves the Hurst value calculation. It is aimed to identify the part of randomness and determination in a time series. In order to integrate the mentioned strategy, it is necessary to choose a special type of cryptocurrencies so that the time price series of the share of the deterministic component overrides the share of the stochastic component.

The second method involves a special Lyapunov exponents calculation, which is used to estimate the compression dilation of the phase volume in the phase space of a dynamic system, having integrated the analyzed time series. In case when one of the components of Lyapunov exponents is increasing and exceeding 1, then it means that the time series loses its stability. Thus, when the two points in phase space are close right now, it does not mean that they will remain the same later.

The third method determines the time horizon over which the time series still have its previous states. The time horizon determines the maximum period of time that the forecast is viable.

Therefore, the mentioned methods provide opportunities to choose such cryptocurrencies for the integration and implementation of the game strategy. Therefore, the time series has a relatively high degree of determinism as well as the phase space does not expand. The forecast horizon is specific and large enough to create and integrate the game strategy.

2.   **During the following stage, the chosen cryptocurrencies are valued in terms of the similarity of the dynamics within the market index dynamics.** The system identifies the essential currency, which is similar and at the same moment dissimilar to the cryptocurrency index. Bitcoin is used in the system to generate such an index. Integration of the cryptocurrency market synthetic index integrates things but does not define a tangible gain inaccuracy. Creating a real-life cryptocurrency market synthetic index identifies things but does not demonstrate a tangible gain inaccuracy. The main aim of such selection is to be confident that the portfolio involves assets capable of yielding returns in any type of market situation.

3.   **The following algorithms deal with the segmentation of the time-series of the preferrable cryptocurrencies, demonstrating the pivot points.** They are the points where the sign of the time-series first-order derivative reserves. The algorithms are useful to predict the trends in the price dynamics. We use a hybrid deep learning artificial neural network in order to define the power of trends. It allows us to develop the cryptocurrencies portfolio and manage the trading signals efficiently.

4.   **The system involves two types of models to forecast** the values of different price types and price move signs. The first are regression models, the second is classification models. The forecast types are used on different time horizons from one minute to several days. The forecasts provide opportunities to perform high quality and they are assessed with the help of specific indicators.

The mentioned forecast determines whether the price will grow or not. Thus, this type of forecast identifies the condition of the time series, its growth or decline. The quality of the forecast is described in the AUC metric, calculated based on the ROC curve. The forecast should be used efficiently if its AUC metric is above 0.7. The quality of our forecast is defined by AUC values above 0.85.

In order to define the regression, the relative error is the quality indicator and it's measured in the percentage points. In fact, the high-quality forecasts demonstrate a relative error value as small as it can be. If an error level is 0.25(25%), the forecast is defined as unusable. Our model of the forecast has 6%-10%, which characterizes it as a good one. It decreases up to 2-3% on short temporary lags, and it can increase up to 12-15% if there will be long temporary lags.

5. **The algorithms of modeling and risk control are aimed at the determination and management of the three forms of risks:**

- Market risks are defined by a mismatch of forecast between price dynamics forecasts and real price movements. To define the types of risks, we use the models which combine the magnitude of the deviations with the magnitude of the deviations. Thus, when the price is against predicted values, the system can define the magnitude of deviations that bring loss rather than income. It also estimates the probability of occurrence of certain negative issues. Also, it can continue to determine the price dynamics.

- The price dynamics determine the second type of risk. It is operated not by any single asset but with the help of cryptocurrencies such as portfolios. It is significant that both potential returns on an asset and related risks should be taken into consideration when modeling the optimal portfolio. The two issues should demonstrate the calculation of capital distribution between the assets which are used correspondingly in the game strategy. Management of such risks is important as well as the transition from even or random distribution of financial resources between them. Within terms of portfolio, it is expected about a 30%-40% increase in the game strategy.
- The third risks are operated by the ATT LLC which are called strategy risks, which are generated by the special purposes and restrictions. The algorithm was developed to measure and manage the risks.

6. Formation of a game strategy from an aggregate of a set of goals.

Both models and algorithms are used to formalize the client's preferences and determine how the goals should be achieved. The primary purposes of game strategy are return and risk values. They can include such issues as profit increase at a fixed risk or with reducing risks. Also, the mentioned purposes can be widened with such issues as maximum and average income and losses over different time horizons, game effectiveness, and the duration of a single transaction, performing the game frequency. In addition, building an efficient game strategy has to involve different restrictions that superimpose on the potential integration of trajectories. The mentioned group of algorithms can help us formalize a user's preferences in a mathematical model. However, the goals and perspectives may be different, mainly when it deals with implementing a game strategy, and the mentioned modes provide opportunities to be taken into account.

7. Optimization of the cryptocurrency portfolio.

Optimization is helpful to perform and complete several purposes. The main idea is to find the necessary amount of financial resources invested in each cryptocurrency that would ensure the accomplishment of the goals involved in the game strategy. The whole process makes it possible to achieve most of the goals. So, the returns will be maximized, or the risks will be minimized according to the required return level.

8. Generation and management of the trading signals.

The System has to calculate the price level used to open or close particular transactions to enter and exit from the trading positions. The calculation is made with the help of a special group of algorithms with the trading signals management subsystem. It is necessary to indicate that the subsystem is adaptable. Thus, when the dynamics of the price move in the required direction the transaction close signal calculation is defined as adaptable.

9. Cryptocurrency portfolio monitoring.

This algorithm is used to monitor the trading strategy as well as market indices dynamics. The transient processes are detected with the help of an algorithm in time series. When the System detects the mentioned changes in a time series, it generates the corresponding alarm signal, and as a result, the trading strategy is rebuilt. The rebuild efforts are observed within the updating of the optimization. It can be defined in the new values of the financial volume which were invested in crypto during the process of portfolio building.

AIIP COMPOSITION AND ARCHITECTURE

Trading automation with the help of a special software algorithmization is the main distinctive feature of the whole process. The mechanical trading systems determine the software algorithmization of the whole trading platform. It is used to facilitate the work of traders with the integration of automating several trading operations.

The performed system of IP AI has two significant differences in comparison with the traditional TS. These features are automated trading and adaptability. Below, you will find the description of the differences.

Traditional TS of algorithmic trading differs from our platform because it is possible to make all the performed functions by a trader in an automatic way. So that, there is a human factor in the process of trading. TS does not have and performs the most knowledge-intensive trading functions, but there is necessary support of the decision which were made by the trader. AIIP covers all the efficient operations that ensure the corresponding integration of the trading strategy automatically without a human.

The traditional algorithms are stationary. It means that the invariability of the performed models can be used when the market conditions change. If it deals with the ATT LLC, all the models are adaptable to changeable market conditions. The system can monitor all the changes and detect the change points if necessary.

In fact, the more complex types of operations the algorithmic platform can automate, the more efficient it will be for the trading process. One of the most complex processes is knowledge-intensive operations which are significant knowledge bases for traders to analyze large volumes of contradictory information. The components of the AI system are used to determine the quality and generate all necessary signals to update the parameters of the models and to adapt the model to the specific changes in the market.

RISK MANAGEMENT SYSTEM

The mentioned crypto platform has a wide range of risks because it is a complex system. The risks are the following:
 The price can change during the trading period;
There can be a high risk for a correlation because of the dynamics of crypto assets in the portfolio.
The strategic risks will increase.
In order to control all the mentioned risks, the platform performs a special measuring and management risks subsystem.

MEASURING AND MANAGEMENT RISK SUBSYSTEM

Changes in price in the market can lead to a significant increase in the value of the assets in the portfolio as well as to decrease which is a demonstration of the market risks. The risks are limited to the assessment of the occurrence probability of a special asset price that is the risk of measurement. Also, there is corresponding management of trading signals risk management. The System is able to lock in the profit according to the measurement risks or to lock in losses in the case when the price changes in the opposite direction to the one that the AI has determined.

PORTFOLIO RISK MANAGEMENT SUBSYSTEM

The portfolio involves a set of various crypto assets, each of them with its ,type of dynamics. The dynamics determine the corresponding change in price. Various combinations and variations of crypto assets define the differences in the portfolio, where some of them lead to an increase of the value and others to the corresponding decrease. The performed subsystem is developed to search such compositions of the crypto asset portfolio that will define the minimal volatility of the value.

STRATEGIC RISK MANAGEMENT SUBSYSTEM

The AI performs a subsystem of strategic risk management for the investors. The main aim of the subsystem is to control the game strategy, ensuring simultaneous achievement even when the goals are contradicted. Integration of additional goals in the strategy is aimed at the setting of the required parameters for the account dynamics. For example, minimization of the number and value of the negative account revaluation will lead to an increase in positive transactions. In addition, it is possible to achieve the goals because of t a wide range of external and internal restrictions. For example, there can be restrictions on the frequency of trading. So the system can react to the possible changes in the price.

AIIP PORTFOLIO MANAGEMENT RESULTS

The tests of the system were accomplished in 2018. At the beginning of 2019, the first version of the system was activated and received $100K in management to test in real market conditions and on real-money terms.

One of the most significant conditions to test the system was its autonomous operations without necessary human involvement. During the tests, we did not stop the system, we did not change the design and we did not adopt the strategy because our aim was to observe the process. We could determine the stability of the operations and all the subsystems. Also, it was significant to control the opportunities for capital management in the frame of the pre-determined strategy. As a result, during the whole period, the System performed high operational stability and operability.

When the Internet connection was stopped or interrupted, the System resumed its operations without human involvement.

We have observed the sustainable increase of profitability at different market volatility.

The System could define the time of entry and exit of the asset, its scope, structure, and disposal in the portfolio. AIIP can control the risks and comply with the pre-determined strategy without human involvement.

AIIP has been operating efficiently for over 480- days 24/7 at the time of writing and publishing the information in this article.

During the period from 3 February 2019 to 4 February 2020, the following data was defined:
- Annual return 16%;
- The number of completed deals – 1,118;

Below, you will find the charts with the profitability curve and the BTC cost curve:
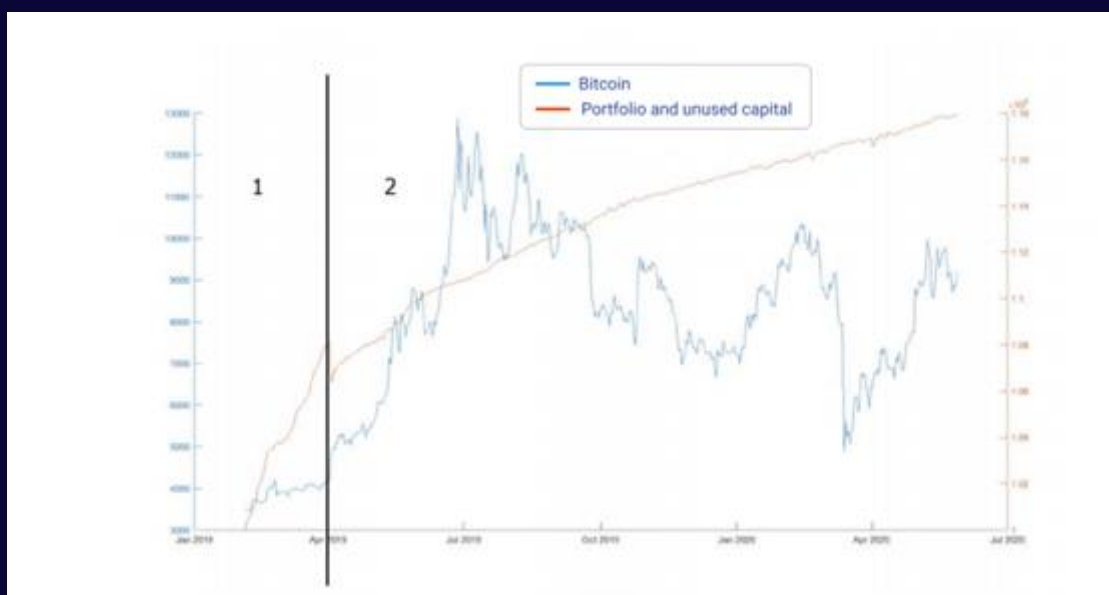
Below, there is a table with all operational metrics which were defined during various periods of time:

Period from 03.02.2019	till 1.04.2019 (55 days)	till 17.04.2019 (72 days)	till 10.11.2019 (280 days)	till 28.05.2020 (480 days)
Total annual yield (%)	54%	37%	19%	14%
Account Volume	108 140 $	107 450$	114 500 $	117 900 %
Maximum profit per transaction	611 $	611 $	611 $	611 $
Average profit per transaction	133 $	136 $	74 $	71 $
Average profit / Average loss	1,34	1,66	1,48	1,3
Maximum loss	587 $	1108 $	1108 $	1108 $
Average loss	99 $	82 $	50 $	55 $
Average monthly loss	2960 $	3434 $	2465 $	2495 $
Maximum loss for the account	765 $	2013 $	2013 $	2013 $
Total number of transactions	196 (3,5 per day)	218 (1,29 per day)	914 (3,34 per day)	1542 (3,14 per day)

It is necessary to define two periods of volatility in the crypto market during the System's operation. The chart performs the dynamics of BTC to USD cost as an indicator of the whole market volatility.
The average square deviation (ASD) of BTC price at section
1 was defined as $198.
The average square deviation of the BTC price at section
2 was defined as $1,702.
Volatility during period 1 equals 5.05%.

Volatility during period 2 equals 20.1%.

The average annual trade profitability during the 1 period is 54%.

The average annual trade profitability during the 2 periods is 10%.

The profitability was defined to decrease during the first sharp change in the cost of BTC. It was in April 2019.

The largest drop of the account was defined on that day. The system closed the positions automatically with losses because of incorrect placement of orders.

It led to the corresponding recalculations of the parameters and adaptation of the System's operation to the new market conditions.

The strategy parameters were changed automatically so that such fluctuations do not lead to such losses.

As a result, AIIP became less risky and less profitable. For example, the average duration of transactions has decreased twice as well as an average value of a profit-making transaction has lowered more than twice. In addition, stop loss and take profit indicators demonstrated lower values too.

The mentioned parameters and the strategy parameters are recalculated every week in an automatic way in order to increase profit during the specified period of time. 10% of current profitability is defined as the maximum possible for the market with an equal level of volatility/

Moreover, the current profitability may be increased with the planned adjustments mentioned in the following paragraph.

BUDGET COSTS

IT, Hardware & communication equipment:

To buy a computer and workstations;

To purchase the communication equipment and VoIP;

To buy the required licenses;

To lease the cloud services.

It is necessary to get a powerful system of parallel computations that perform high quality of production of the NVIDIA DGX-1 class or the same with a productivity of up to 960 teraflops of semi-accuracy calculations.

The NVIDIA DGX-1 involves all necessary sets of programs that are used by data scientists and researchers to train deep neural networks in a fast way. The mentioned package includes NVIDIA Deep Learning GPU Training System with a full-fledged interactive system to create deep neural networks as well as to accelerate primitive library to create DNN-NVIDIA CUDA. Also, the system involves optimized versions of some of the widely used deep learning frameworks such as Caffe, Theano, and Torch. In addition, DGX-1 performs access to cloud-based management tools, software upgrades, and a container application bank.

The computer equipment will be used by:

Developers and mathematicians;

Employees in the office;

Employees in the BACK office;

Technical support professionals;

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SOFT PART

To determine the corresponding development of the environment. It is necessary to buy a Jetbrains All Products Pack or a similar product.

MATLAB software is used by mathematicians.

DB servers should support the statistics of crypto. We define the most efficient such as Oracle MySQL Carrier Grade or similar servers.

It is necessary to rent a special server in the cloud.

CODE DEVELOPMENT

Integration of a new system will provide simultaneous management of different strategies.

Integration of industrial standards for software code development for all the required elements in the system as well as modules to increase the stability of all the operations and decrease the faults.

It is necessary to have a connection to a closed multi-user code version control system.

PRODUCTIVITY INCREASE AND SUPPORTING SYSTEMS

Increase the total amount of all the API-supported exchanges to 15.

Increase the total amount of the wallet system connections up to 100,000.

Increase the speed of exchange data within the minutes of intervals.

Develop and integrate the collection process and data required for the corresponding development of models and forecasts.

Integration of billing system.

Integration of an accounting reporting system and its further synchronization with the database.

Implementation of an industrial transaction system in order to control the payments.

Implementation of CRM system.

SECURITY

Develop and integrate the system of backup copies in order to maintain trade continuity.
Develop a special system to gain alternative data sources when there will be failures.
Develop the notification system in case of errors in the Technical Development class.
Develop and integrate a system for communicating changes.
Implement the hot-encryption system.
Integrate the industrial verification systems and the corresponding data access.

INTERFACE

Development and integration:
Special account for internal users such as technical developers, risk manager strategy developers, and traders.
Personal account for investor-client.
A special mobile app that can verify the user, track and manage the wallets and accounts correspondingly.

R&D

Complete all necessary research and experiments
Assess and develop all the mentioned algorithms
Develop and test new forecast models
Observe and test the new capital management strategies.
The main purpose is to advance and increase the management of risks. In order to assess the manage profitability and risks, we intend special to research as well as experiments to increase the system within the following areas:
Increase the capacity and efficiency of the forecasting models as well as risk models within the scope of mathematical models.
Improve the quality of portfolio development and management, having integrated the special dynamics of the new base in the market flow with the help of special processing algorithms.
Create a game strategy designer and expand the functions and services.
Having integrated the first area of the research we will:
Include different types of methods to analyze large-scale price movements within the specified period of time.
Conduct different types of experiments to define and assess the large-scale structure of real price rows;
Develop the special algorithms to define and predict trends of the prices with the help of symbolic sequences for modeling time series;
Include the System to forecast the possible events with the use of LRD, EVT, and other approaches.

Having integrated the second area of the study, we are going to use the main three issues to create efficient predictive models with the help of natural-language text processing from the two main sources such as news and industry data:
Integrate the semantic models with the help of deep learning models;
Use the mood models with such approaches as knowledge-based mindset assessment techniques based on the corresponding identification as well as hybrid models;
Integrate an event-based model in the following format: "factor-action-object-time".
During the third area of research, we need to plan and solve the tasks which we need to increase the game strategy process:
We are going to create an expanded set of target game strategy functions by integrating additional targets for game performance.
 We need to create an extended set of limitations;
 We need to develop and apply in our System a designer of game strategies, which will help to ensure the collection of new pre-installed strategies from the target function and limitations of libraries;
We plan to increase the number of pre-defined strategies from 2 to 5.

R&D EXPECTED RESULTS

The expected results will be gained after the integration of all the planned issues:
The developed emergence of a game strategy will assist to gain all the clients` needs and requirements by increasing the goals from which the strategy is created. Also, it will increase the total amount of game strategies that we are going to integrate.
Many heterogeneous and contradictory purposes will help us to improve the accuracy of the game's profitability as well as to increase the level of risk management.
After the integration of a large-scale structure, we will increase the accuracy of trends identification and the corresponding assessment of the parameters. Such as value and duration.
When we could increase the level and quality of all the specified trends, we will be able to manage better the returns and risks of the game strategy;
 In the case of integration of forecasts for rare events, we could increase the game profitability both during the long game and short game as well.
If we take into consideration the news background, we will get the opportunities to assess the public opinion which is formed mostly by the traders' community.
Therefore, it will help us to increase the quality of predictive models both in terms of possible trends and forecasts of rare events.

Michael Liberman

- CEO

Known as one of those who founded AIIP. Michael has over 20 years of experience in working with the largest global companies, governmental organizations, and well-known startups. Michael is a Magister in Computer Science. He graduated from the University of Massachusetts and from Mississippi State University. Over these years, he worked as a senior executive for product security, CEO, Head of Architecture and Labs at Ping Identity, scientist, and researcher.

Jeong Yang

- Blockchain and Software

Bachelor of science. His major field was related to HTTP/2 protocol. He has vast experience in working as a developer and a software engineer. Before he joined a small studio in Singapore, he was dealing with the developing of software for one of the banks in Switzerland. When working in that company, he got to know about Bitcoin and lighting. Jeong became involved in LND and other projects in that field. Exploring more about the industry, he understood the necessity to devote more time to working on Lightning Network backend services.

Tykera Cross

- Marketing

Has a huge experience in working with reputable and reliable clients from all over the world.She took leading positions in several consulting companies working globally with international clients. She gained a lot of new experience in consulting and business management. Laura graduated from Bocconi University with a Bachelor of Arts in Economics, statistics, and econometrics. She also graduated from the Zurich Elite Business School.

Andrew Shafarevich

- UX

Experienced specialist in Digital Marketing. His experience of work includes 7 years of serving for one of the largest European e-commerce sites. Except for Digital Marketing, his occupation includes more specific fields of Graphic & UI/UX Design, which requires dealing with the most advanced tools and technologies. Andrew is one of the specialists who are coping with different projects. That is why one of his most demanded skills is creativity, using which he can produce the best design ideas for any brand.

AIIP

Thank you