

# AiEX White Paper

BlockQuant Technologies

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## **Abstract**

*“Everybody wants a trading bot.”* Introducing, AiEX—the platform for developing, testing, and deploying automated trading algorithms for any cryptocurrency on any exchange. AiEX eliminates the complex barriers to building and profiting from the most elusive & sought-after trading tool. AiEX combines a robust trading framework, cutting-edge machine-learning & portfolio analytics with a user-experience friendly for both novices & seasoned veterans alike. Users are empowered to build their own algorithms, either for public or private use. Private investors are incentivized to deploy capital behind the best algorithms via licensing & sale contracts. By creating a decentralized marketplace of knowledge, AiEX transforms learning & development into a true meritocracy where anyone can create a good algorithm and be rewarded for it.

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# 1 The Problem

As adoption of blockchain technology grows, so does the underlying cryptocurrency market fueled by speculative investment. Many former Wall Street professionals, some with backgrounds working at hedge funds or quantitative trading shops, have embraced cryptocurrency trading. As is the case in traditional equity markets, the most successful cryptocurrency traders are becoming increasingly reliant on automated trading systems—or more commonly referred to as “trading bots”—which execute trades according to algorithms.<sup>1</sup>

These systems exist in varying capacities; from the simple single-endpoint home-brew bot to commercialized “blackbox” solutions to full-fledged high-frequency trading algos deployed by hedge funds and prop trading desks. While the existence of algorithmic trading in cryptocurrency markets has been far from secret, what remains shrouded in mystery is how exactly such algorithms work, and perhaps more elusive, is how exactly they are engineered.

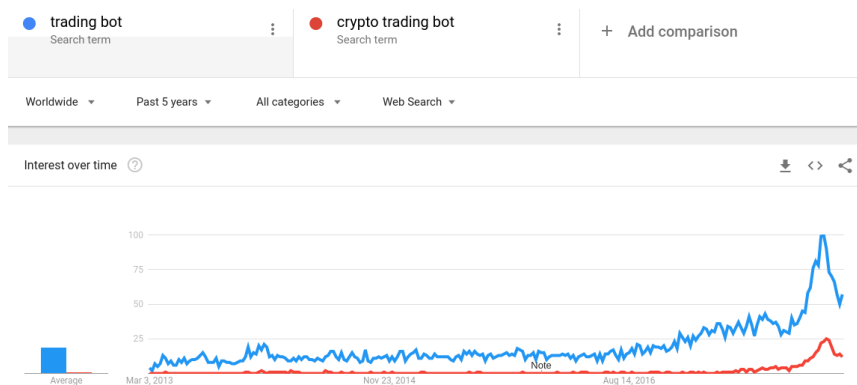


Figure 1: Google Trends

A quick search for the term “trading bot” on the most popular Reddit communities for cryptocurrency trading discussion returns hundreds of threads

<sup>1</sup>Zuckerman, G., & Hope, B. (2017, May 21). *The Quants Run Wall Street Now*. Retrieved from <https://www.wsj.com/articles/the-quants-run-wall-street-now-1495389108>

with curious users eager to gain access to, and profit from, algorithmic trading methods—with the most common query being: “*Does anybody use a trading bot?*”.

Yet despite the apparent demand, the actual number of replies & quality of the discussion have remained low. To understand why, we must acknowledge the perspectives, abilities, and shortcomings of each of the following prospective users, all of whom share the common goal of profitable trading:

### **The Professional Trader**

*Advantages:* This individual has a track-record of profitability in this emerging market. They understand concepts such as: momentum, mean reversion, sentiment, etc. and how those affect the market. They know how to apply various technical indicators to identify such trends. They desire analytics & visibility into performance metrics. Their goals might be to increase profitability, or scale into additional markets.

*Disadvantages:* This individual has limited technical & engineering skills; trade execution is by-hand. Their quantitative models are limited to non-existent, as a function of reliance on existing tools; thus increasing their risk exposure. While personal funding may be good, they have limited access to capital beyond their own.

### **The Quantitative Analyst or Data Scientist**

*Advantages:* This individual has a background in finance and/or the tech industry. They possess a good grasp of the fundamentals of the crypto market. Their analytical & quantitative modeling abilities range from good-to-great; the entry-level individuals are typically reliant on Microsoft Excel, whereas the intermediate-to-advanced individuals are capable of scripting in Python, R, or similar. The most advanced individuals will have experience with optimization techniques, risk management, and machine learning.

*Disadvantages:* This person has limited to no hands-on experience with actual trading—possibly due to natural risk-aversion—and any trades they do execute are done by hand. They are not a full-stack engineer, and thus lack

the technical ability to build trading applications.

### **The Software Engineer**

*Advantages:* This individual comes from the tech industry. They possess a good understanding of the technical underpinnings of cryptocurrency trading at the exchange level. In almost all cases, they will have experience working with RESTful API services and open-source projects. The most capable individuals will be those with “full-stack” application abilities, a solid understanding of algorithm principles, and exposure to higher-frequency technologies (e.g. WebSockets).

*Disadvantages:* This person has minimal to zero experience with quantitative modeling & analytics, particularly as it pertains to cryptocurrencies. Most will have little-to-no trading exposure; due in part to risk-aversion, misjudging market sentiment, etc.

### **The Speculative Investor**

*Advantages:* This is the most common individual. Overall grasp of the cryptocurrency market ranges from good to great, but most possess limited positive trading experiences; very few have outperformed buy-and-hold strategies. They are chasing alpha and thus place importance on performance metrics. They are wholly willing to deploy their capital immediately to invest via speculation; the ceiling on funding & capitalization is virtually limitless.

*Disadvantages:* They do not necessarily understand the detailed inner workings of complex trading algorithms & systems; lack the technical ability to engineer them.

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At a hedge fund, the intersection of all four of these individuals likely in addition to several others is how an algorithmic trading system gets built. Due to the scarcity of qualified human capital and demand by institutional investment firms in traditional finance seeking this elite engineering talent, it becomes woefully apparent why trading bots remain elusive for the common cryptocurrency investor. Developers of successful trading algorithms are no-

toriously reluctant to share their work, if at all. Those that do make their work available do so at a steep price; and potential users are wary to the glaring shortcomings such as reliance on a single point of contact for ongoing development, lack of control over algorithm parameters, risk management, and unclear profitability.

## 2 A One-Stop Solution: The AiEX Platform

*AiEX brings trading bots to everybody.*

### 2.1 Mission Statement & Tenets

- Empowerment through egalitarianism. We will provide all our users access to the best trading tools on the market paired with a flawless user-experience.
- Second-to-none data quality & reliability. We strive to maintain the most comprehensive library of cryptocurrency trading data available on the market, and be the benchmark against which others are measured against.
- Security is our number one priority, period. Nothing destroys trust more than a breach; we have an unwavering commitment to protect our users' sensitive data at all costs.
- Inspire, promote, and reward learning at all levels, for all users. We believe knowledge is limitless, so we encourage everybody to explore & develop new ideas as a community.

AiEX is the command center for cryptocurrency traders, quants, and investors alike. Below are the key components of the platform:

### 2.2 Historical Data

Trustworthy data is backbone for any algorithm. Users will have access to the most comprehensive collection of cryptocurrency market and pricing time-series data across the three major geographic regions: North America, Europe, and Asia. Pricing data exists for *crypto-to-fiat* (e.g. BTC-USD) and *crypto-to-crypto* (e.g. ETH-BTC) pairs. Macro-level data includes such metrics as: market capitalization, aggregated trading volume & distribution, equity flows, etc. Network data includes: transactions, fees, hash-rate, difficulty, etc. Eventually, we will offer sentiment metrics mined from natural language processing (NLP) machine learning algorithms applied to cryptocurrency communities (e.g. Reddit) and social media (e.g. Twitter).

As of writing, AiEX already has historical OHLC pricing data, across 10 periodicities, for over 100 cryptocurrencies and a dozen exchanges—including all three regions. These will be made available for download in *.csv* format and remain as an always-free feature to gain customer trust and grow product awareness. In alignment with our core principle of egalitarianism, a RESTful API service (`/data`) will also be available for independent or external consumption of our publicly-available datasets by advanced user groups.

### 2.3 Existing Algorithms

Building off the foundation of our comprehensive time-series data, we developed a framework by which anybody can develop their own algorithm with zero programming. However, diving straight into building an algorithm from scratch may seem like a daunting task for many of our users. Thus, we will make a handful of algorithms available, for free. Novice users will be able to analyze their historical backtested performance as well as change default parameters for the indicators, signals, and rules. In doing so, we strive to incorporate simple learning mechanisms as well for various features (e.g. ‘*Click here to learn what RSI is*’, or ‘*Learn more about Max Drawdown*’; external links Investopedia) to help build user confidence & comfort with our product. If desired, users may deploy any of these existing algorithms, with their own funds & selected parameters, to the trading engine and automatically execute trades on their behalf. No programming experience required; all of this is accomplished via the UX.

### 2.4 Develop New Algorithms (“Build-Your-Own-Bot”)

Intermediate users are able to create their own algorithms guided by an intuitive user-experience, again with no programming experience necessary. The UX guides users through the following key steps:

#### 1. Input selection & definition

- (a) *Indicators*. Is the algorithm trying to identify break-outs? Use Bollinger Bands. Are you trying to ‘*buy the dip*’? Use the Relative Strength Index (RSI).
- (b) *Signals*. Examples:  $RSI(n) < \text{threshold}$  signals buy; MACD crosses below signal means sell.



(c) *Rules.*

- Basic: Enter long at buy signal; exit long at sell signal.
- Intermediate: Stop-loss, trailing stops, take-profit, etc.
- Advanced: OCO order chains, iceberg orders, etc.

(d) *Parameters.* Examples: the  $n$  periods for RSI, position sizing, stop-loss %, take-profit targets, etc.

## 2. Backtesting & Analysis

Once the user has defined all the inputs, they are able to construct a portfolio object of their algorithm(s) and backtest against our comprehensive library of historical data of every cryptocurrency & exchange. They will then be able to analyze their simulated trading statistics & performance (e.g. cumulative P&L, drawdown, etc.) as well as benchmark against other portfolios (i.e. buy-and-hold), all within the UX. By removing the underlying technical barriers of complexity, we aim to empower our users to take a data-driven approach towards algorithm development and more-accurately gauge their potential effectiveness. It has been said that an algorithm which is backtested to be historically profitable has a chance at being profitable moving forward; but one which is not, has no chance.

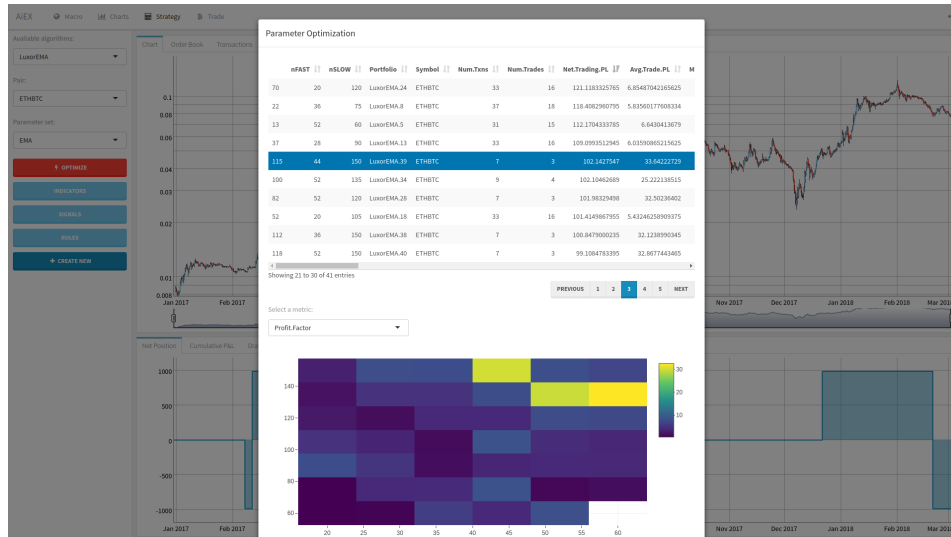


Figure 2: Screenshot of Optimization Menu

### 3. Optimization

At the most advanced levels, users are encouraged to pass their algorithm(s) through a optimization layer, utilizing machine learning. To illustrate, consider a simple example where one trades a basic SMA 50/200 algorithm. Suppose one wanted to determine for each  $i$ 'th cryptocurrency in a portfolio that trades this algorithm, if the fast/slow parameters of 50 and 200 periods are indeed “best” relative to a particular risk metric (e.g. annualized Sharpe). They could create an  $n$ -dimensional parameter set distribution (in this case, two dimensional) and apply one of the available walk-forward optimization algorithms so solve the objective function.

## 2.5 Trading Engine

Once a user is satisfied with their selected algorithm(s)—either existing or self-developed—they are able to deploy them using our trading engine. Users are able to toggle between ‘Paper’ and ‘Production’ mode for their algorithm(s); the latter being where trades are executed autonomously with actual user funds. Users will receive notifications via email and SMS to inform them when their signals have been triggered. Similar to how two-factor authentication works, users can opt to manually authorize (or reject) trades the engine attempts to enter on their behalf, or modify select parameters (e.g. position size) at time of execution.

*Note:* Until a trust-less solution becomes available via Ethereum smart contract or similar, users must grant AiEX access to their trading account on the desired exchange via API key. AiEX will never require access to or control over users’ funds (functions such as ‘Withdraw’ will be explicitly disabled via API key).

## 2.6 Open-Source SDK & API

In the spirit of AiEX’s egalitarian tenets, we will release an open-source SDK for our backtesting & optimization framework in two languages, in the following order of priority: R first, and then Python. This will enable our most-technically adept users (e.g. quants, data scientists, etc.) to develop & test on their local machines, as well as contribute to our open-source

initiatives. Algorithms developed outside the platform with the SDK can be uploaded to the platform via raw `.R` and `.py` scripts. Additionally, a RESTful API service will be available for advanced developers to interact with our analytics outputs in external applications (example: custom charting & visualization).

## 2.7 Algorithm Marketplace

Once the number of users & their respective algorithms has grown sufficiently, we will enable a marketplace mechanism by which users may publish their work for sale and/or licensing by other users of the platform—similar to how social investing platforms function. Users browse the catalog of publicly available algorithms, filtered by various categorizations or features (e.g. market, algorithm type, indicator, etc.), and sort by various performance metrics (e.g. expected P&L, profit factor, max drawdown, Sharpe ratio, etc.).

When an algorithm is licensed, licensees will pay fees to developers for ongoing access—while AiEX collects a small fee. Developers retain 100% of their intellectual property and are permitted to mask/reveal any part/all of their work at their discretion. Depending on what is available to them, licensees may be permitted to change some of the trading parameters belonging to a certain developer’s algorithm. To discourage malicious and/or manipulative behavior (e.g. trading against their public bot), developers may be required to “stake” a portion of their funds (XAI tokens; described below). When an algorithm is sold, ownership is transferred between users—AiEX may collect a nominal fee, but never assumes ownership. The new owner is thereby free to modify any and all parameters, in addition to apply any of the available backtesting & optimization methods available on the platform.

This connects the largest class of users, speculative investors, with the most quantitatively powerful class, developers, in a mutually beneficial way that facilitates intelligent capital flow. Over time, a meritocracy will arise where the best developers & their algorithms—that is, those which extract the most value out of the backtesting & optimization tools available on our platform—will be rewarded immensely.

## 2.8 The XAI Token

XAI (pronounced, /zye/) is an ERC20 utility token built on top of Ethereum, which we propose as a medium of exchange for interacting with the AiEX platform. XAI will be used:

- To pay for subscription access to AiEX’s advanced capabilities & features, in a tiered feature structure. For example, Free Tier users may only be allowed 1-3 algorithms at a time, while paid subscribers may be allowed more, as well as access to certain ‘Advanced’ features.
- To pay for computationally-intensive ‘Advanced’ services a la carte, such as parameter optimization. The best-performing algorithms will be the ones that have undergone rigorous testing & optimization, thus encouraging real use of XAI.
- As a form of payment between algorithm developers & licensees/buyers, according to a fee structure set by the creator—from which AiEX will collect a nominal percentage. Developers wishing to license their algorithms publicly may be required to “stake” (lock up) a portion of their XAI to discourage malicious trading behavior.
- To sponsor ongoing algorithm development contests on the platform. A portion of the funds raised from the XAI token offering will be collected in the Algorithm Development & Growth Pool. Every week/month/quarter, XAI will be released from this pool and awarded to the top-performing users as measured by actual performance of their public algorithms. This serves the dual purposes of growing the platform via real use & awareness as well as promoting top development talent to potential investors.

XAI tokens paid directly to AiEX for use of its platform & services will be burned on a regular schedule, thus making their supply deflationary.

## 2.9 Roadmap

- Q2'2018
  - XAI token launch.
  - MVP & Alpha release SDK for R available to select accredited investors (10-30).
- Q3'2018
  - Ongoing development to (ranked in order of priority): trading engine, backtesting & optimization framework, data library.
  - UI/UX upgrades; mobile-first initiative, pending developer availability.
  - Onboard XAI token to major exchanges.
  - Onboard additional users to Alpha program (100 total).
- Q4'2018
  - Development of algorithm marketplace.
  - Alpha release for Python SDK.
  - Sponsor inaugural algorithm development contest & initiate bug bounty program.
  - Release candidate (500 users total).
- Q1'2019
  - Alpha release of algorithm marketplace to select users & investors (10-50).
  - Ongoing algorithm contests & local hackathons.
  - First token “burn” for spent XAI.
  - Public beta launch for full AiEX platform (500+ users).

## 2.10 Security

Platform security & the protection of our members' intellectual property are core promises of ours. Success is dependent on us keeping these promises. We do not take this responsibility lightly. Our approach is outlined below:

### Modular Codebase & Layers of Security

Our codebase is architected in a way that enables rapid, effective isolation of bugs & compromises. For example, our website is entirely separate from the AiEX platform application & user data, which in turn is also separate from the environment where trades are executed, in multiple independent ways. Our data schemas are segregated to the maximum extent possible; for example, our users' logins are not stored in the same database as their algorithms. The overriding goal is clear—even if one isolated component is compromised, overall system security will remain intact. Furthermore, careful consideration is given to which open-source software, libraries, packages, etc. are utilized with a primary emphasis on security.

### Industry Best Practices

- Two-factor authentication **will be required** for all users & employees.
- All sensitive data is multilayer encrypted; passwords are securely stored as salted, one-way hashes.
- All application network data is encrypted in transit.
- AiEX will never, under any circumstances, require access to withdraw or transmit users' funds.
- Risk Management Protocol: clear documentation, separation, and redundancy of critical privileges. (`root`, `su`, etc.)
- Comprehensive internal code review process where every line is examined by multiple developers.
- Hard-coded keys, passwords, mnemonic seeds, etc. will never be exposed anywhere in the codebase.
- All prospective employees must pass an extensive background check.

## Proactive Vigilance

- Engage external security professionals to perform routine audits, white-hat penetration testing, and code reviews.
- Operate private bug-bounty programs through HackerOne as well as encourage independent security professionals to report vulnerabilities with rewards paid in cryptocurrency.
- To the maximum extent possible, we will implement automated measures to detect and prevent fraud and/or abuse on the platform (e.g. “kill switch”).
- 24x7 on-call engineering staff monitoring platform performance and for suspicious behavior.
- Maximum transparency with public post-mortem disclosure due in the event of a breach.

## 3 Business Landscape

### 3.1 Competition

As of writing, AiEX has three competitors:

1. Quantopian. Boston-based startup that aims to create a crowd-sourced hedge fund by letting freelance quantitative analysts develop, test, and use trading algorithms to buy and sell securities. Support for stocks, only; **no native support for cryptocurrency**, with no plans to add. Programming is still required as their UX is a modified IPython environment run in-browser. Creators of the open-source Zipline package.
2. Pine Script for TradingView. Popular charting platform released their own proprietary scripting language for developing strategies & back-testing. Steep learning curve; programming required. No live trading.
3. Catalyst by Enigma. As of writing, only CLI tool is available; appears to be fork of Quantopian’s Zipline codebase modified for cryptocurrency. **Advanced programming is still required; no functioning UI.** Framework does not support all exchanges (only 3, as of writing), order books, nor any advanced order types—only simple single-position buys & sells. No live trading. Enigma, the parent project, claim to be building a second-layer sidechain that “aims to solve the two biggest problems for blockchains: scalability and privacy”. They further claim their yet-to-exist “data marketplace for crypto” will be the first “application” on this blockchain. In their whitepaper, they state their ultimate goal is to develop a “decentralized exchange” for “live trading of ICO tokens”. None of this is tightly-aligned with their Catalyst product; investor skepticism towards vague goals and unclear direction.

### 3.2 The AiEX Advantage

Compared to our competitors, we are prioritizing an intuitive user-experience over forcing our users to revert back to advanced programming—one of the biggest barriers into algorithmic trading. We are not creating, and will never create, a blockchain just for the sake of creating a blockchain—our focus is solely on delivering the best platform possible for algorithmic trading & analytics for cryptocurrencies in line with our core tenets. Our growth model



is not dependent upon users adopting a separate blockchain nor learning an entirely new programming language just to curate data—as experts, we own that. The XAI token has immediate utility on the platform, with the long-term prospect of accessibility to the best trading bots available.

### **3.3 About The Creator**

AiEX was built as a passion project by Ray Bao (age 31), a successful self-funded cryptocurrency trader. He currently serves as CTO of BlockQuant, a Puerto Rico based hedge fund specializing in blockchain & emerging digital asset markets.

More recently, he worked at Amazon.com in senior data science, engineering, and management roles for several key programs. Prior to that, he worked in lead data science roles at several startups, and cut his teeth at a prop derivatives trading desk in San Francisco for his first three years after college. He holds a Bachelors in Statistics from the University of California Berkeley.

## 4 XAI Token Launch

### 4.1 Summary

Our goal is to raise a maximum of \$15 million USD and a minimum of \$5 million USD. The following figures may change with USD/ETH exchange rates and volatility, but represent best-effort estimates as of writing:

- **Maximum financing:** 17,850 ETH
- **Minimum financing:** 5,950 ETH
- **Exchange rate:** 1 ETH = 56,000 XAI tokens (\$842 USD/ETH exchange rate calculated from trailing 4-week closing price on GDAX; subject to change)
- **Token contract address:** TBD
- **Launch date & time:** TBD
- **Token launch timeframe:** 30 days
- **Token launch completion:** Ends when either the maximum number of ETH are raised or the timeframe expires, whichever comes first. If less than the minimum ETH are raised, ETH can be retrieved by holders of XAI.

### 4.2 Token Distribution

- AiEX Team: 300 million XAI.
- Algorithm Development & Growth Pool: 200 million XAI.
- Total XAI available: 1 billion.

### 4.3 Algorithm Development & Growth Pool

We propose setting aside an endowment fund to incentivize users to develop on the AiEX platform.

- 200 million XAI will be set aside for early adopters and dispersed to users as they onboard; can be used for ‘Advanced’ features on platform, or eventually, license/buy algorithms.
- XAI received as a reward may not be withdrawn off the platform; any which remain unused after 180 days will go back into the pool.
- XAI from this pool will also be released weekly/monthly/quarterly in line with scheduled contests and used to award to top-performing algorithm developers.
- **No new tokens will be created once this pool is exhausted.**

#### 4.4 Budget Allocation

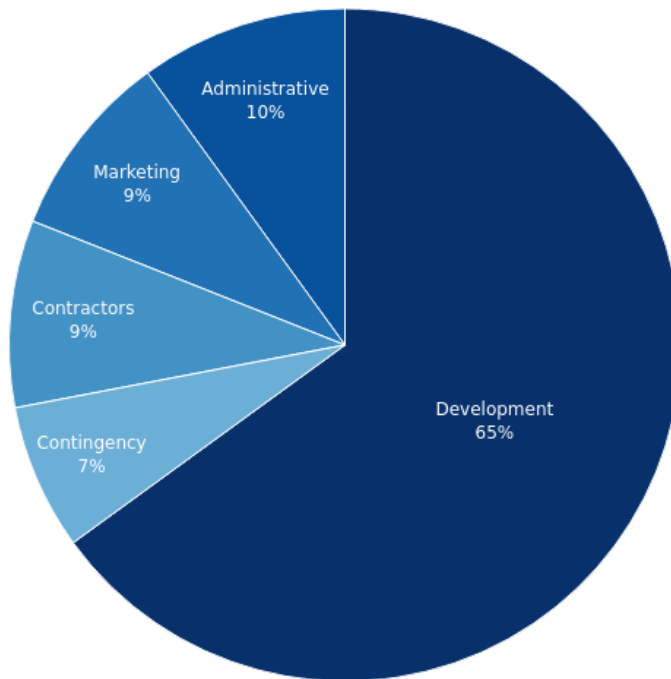


Figure 3: Proposed Budget Allocation

- **AiEX Development Team:** 65% of budget. This is the most important, and largest allocation. This funds the ongoing engineering & product development of the AiEX platform.
- **Administration:** 10% of budget. Consists of legal, accounting, security, and other administrative costs.
- **Marketing:** 9% of budget. Directed towards growing awareness & adoption of the platform through social media, sponsored hackathons, targeted advertising, or similar.
- **Contractors:** 9% of budget. Funds to be paid to third-party engineers, marketers, growth-hackers, PR, partnerships, etc.
- **Contingency:** 7% of budget. For unforeseen costs.

## 5 Closing Remarks

The landscape for cryptocurrency trading is rapidly evolving. We are witnessing a paradigm shift as Wall Street makes its presence felt and the need for advanced trading tools is becoming very clear. AiEX is purpose built to not only meet this demand, but also usher in the next generation of trading by providing egalitarian access to data, analytics, and automation without the steep learning curve of programming or insane cost carriers. Furthermore, we envision our marketplace of algorithms to flourish as an exchange of information where intelligent capital flows to and rewards the individuals who fully embrace cryptocurrencies as well as the speculation that comes with it.

## Appendix A Frequently Asked Questions

**Q: Where did the name “AiEX” come from? How is it pronounced?**

A: AiEX is short for **A**lgorithm **E**xchange. It is pronounced /ay-eye ex/.

**Q: What information do you get visibility into when you license an algorithm from a developer? Are you buying one version? What about updates?**

A: Algorithm developers retain 100% of their intellectual property. At the bare minimum, you will see a brief summary of the algorithm. However, we anticipate developers will be encouraged & incentivized to be more transparent by exposing certain indicators/parameters, allowing modification, and/or providing ongoing updates, as way to attract licensees. The XAI token facilitates the “fee market” whereby access to proprietary information is fairly priced and distributed.

**Q: What is the fee structure for licensing algorithms?**

A: We will curate a list of algorithms, developed both by us internally as well as by a select few Alpha early adopters, and make them available for licensing at our anticipated public Beta launch (Q1’2019). We will immediately begin conducting A/B testing and analysis of our customer base during this Beta phase to evaluate platform engagement versus fee revenue. From there, we will implement a transparent fee structure which will serve as the baseline for when additional developers join the platform.