QAII

QUANTUM ARTIFICIAL INTELLIGENCE

A project proposal by

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Quantum Artificial Intelligence: binding AI and Quantum computing.

Historical background

With the advent of the artificial intelligence revolution, information science has made huge progress in data-related fields.

I. Cryptography

The systemic overflow of data storage has started a trend in processing and securing bits of information.

For this purpose we have developed algorithms such as the ECDSA (Elliptic Curve Digital Signature algorithm), in order to prevent potential security threats.

But all this security relies on our random number generators: our computers.

Unfortunately, computers are discrete systems, and, as such, they do not allow for truly random numbers, and, therefore, for security.

II. AI

Moreover A.I. is being used daily in every common service: NLP chatbots, Weather predictions, Emotion prediction, Game theory, Criminal rate, Wealth, Risk Management.

From Deep Neural Networks to Genetic Programming, thanks to the progress determined by Moore's law our computation power have fulfilled the expectations, leaving us eager to find new computation power progress, in order to make even further discoveries in such fields.

AI is a wonderful field of research: it has been the foundation for many projects.

At the same time researchers are conscious more computation power would allow us to dig deeper in AI, as we would run a stronger and smarter intelligence

Historical background

III. Quantum Computing

Quantum computers have been under research for over 40 years, but only recently are we starting to understand them better.

Quantum computers would solve the security issues by generating truly random numbers.

Such computers have great computational power and may run A.I. algorithms in much shorter time, allowing for greater improvements in theoretical and practical applications.

A QC may solve NP-complete problems in polynomial time by refactoring the complexity with a quantum algorithm.

A 400-qubit QC is said to be so powerful that, if entangled, it could recreate all the holographic variables and simulate our entire universe state.

Quantum Artificial Intelligence is a brand new field which is starting to develop as you read this.

It has space for huge improvements and would allow for many sector specialisations

Goal

Our project is to investigate this blue ocean and develop new technology for quantum computers which will be accessible to clients as a service.
By merging AI and Quantum computation we would be the very first of a kind to enter this market.
We do not aim to solely develop services.
The applications are endless: ranging from true randomness, and, therefore, quantum safeness, to quantum algorithms, to quantum simulators, frameworks, consulting, and, mostly, improving current algorithms by reducing complexity running them on quantic/quasi-quantic technology.
Our aim would be to research what is most profitable out there for companies: most likely, the market which is mainly on huge demand is trading.
Our quantum algorithms would improve accuracy by bringing new power to AI.
Companies would not only benefit out of our prediction models, they would then train employees to maintain the technology and adapt it for its needs.
We would also then enter the education market by partnering with online education platforms and campuses

Our motivations lie in the knowledge and understanding that this is an ambitious project without precedents, a blue ocean where anything is possible.

Moreover the copious amount of applications and the slow pace of academics vs development make it a high fertility ground for applications.

Last year IBM provided QISKit, a framework to develop and test your own algorithms on a 20-qbit QC

December 17 Microsoft launched Q# a programming language with an integrated simulator for quantum programming.

Both of these technologies are free and ready to use with easy documentation.

There are also a few startups lining up to develop and backtest programming environments: Rigetti has just released their public API 'Forest'.

Moreover, the amount of money and attention this market is receiving has no predecessor.

The quantum computing market is anticipated to grow at a compound annual growth rate (CAGR) of ~29.0 percent between 2017 and 2023 and is anticipated to be valued at $495.30M by 2023.


Which, combined with steady growth of ledger technology, would set us apart from competitors such as QRL, and at the same time take profit of the next big thing.

Not only would new investors bring new researchers, we may actually have contracts/partnerships with the aforementioned giants

Blockchain is expected to have CAGR of 79% reaching over 7500M USD in 2023, while QC is expected to have a 29% CAGR, reaching around 400M USD in 2022.

Similarly, AI is is expected to have CAGR of 29%, reaching over 12000M USD in 2023.

We have chose the combination of these three technologies that so happen to yield a growing and fertile market

| | QC | Blockchain | AI | Blockchain, QC and AI |
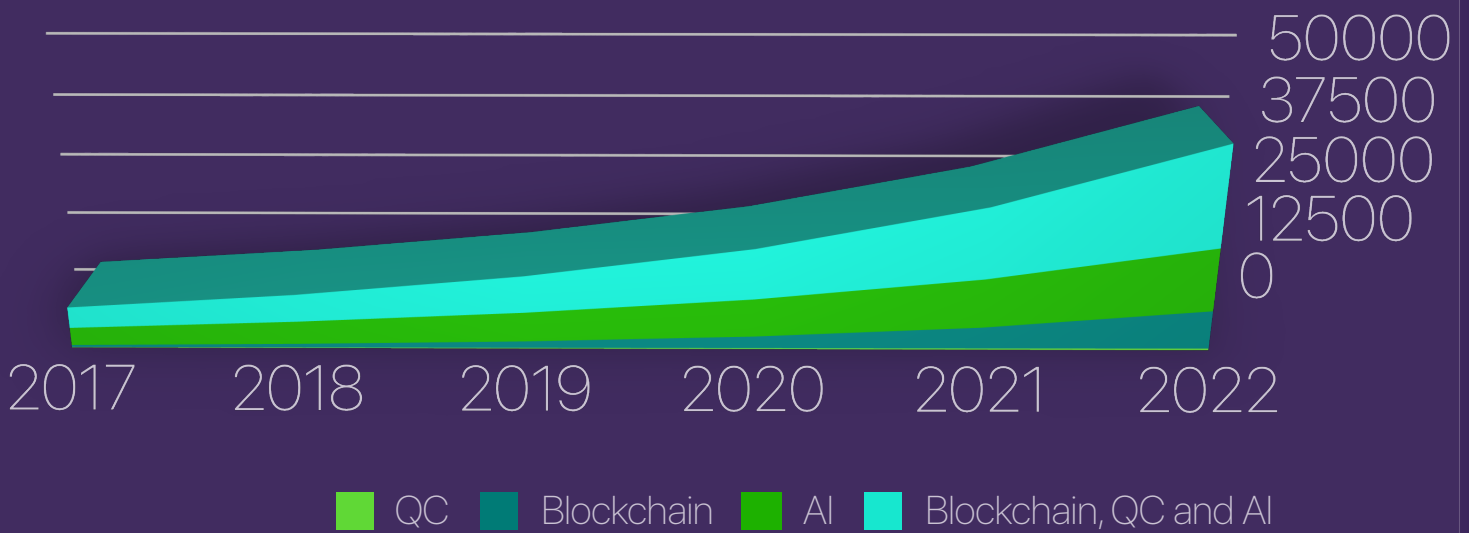
Results are displayed in USD M

As all markets, we would have competitors, but in our luck the only competitors running a ledger would be the QRL token, which is quite different from our project.

QRL only provides quantum safeness, while we would try to develop actual quantum technology.

This would then put us in competition with current startups involved in similar goals, like Rigetti, but needless to say, they are not currently involved with specific goals rather than building a general purpose quantum framework.

The other competitors are purely quantum computer providers, which is totally different from our market

- Rigetti
- Ionq
- QRL
- Qubitekk
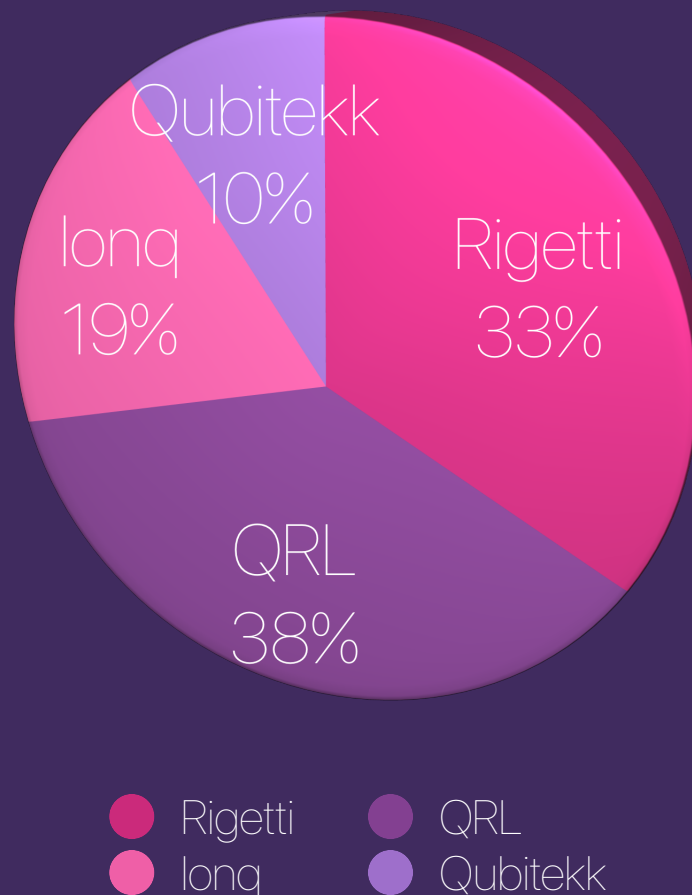
Results are displayed in % of similarity

Another key factor is the team.

Our team would be composed of top developers, researchers and scientists.

We hope that more investments will bring more researchers

Developers

D'Ambrosio Mario Robert
Programming is what I do daily, it is not just a job or a hobby, it is what I've wanted since a very early age.
And as coding without a purpose can become boring, I find engineering problems a perfect match.
That is why I chose to attend the 'École Polytechnique Fédérale de Lausanne', to keep me stimulated on the world's craziest projects.
I have worked on DSP (Seam-Carving, GeoMap on https://github.com/MarioRD), prime sieving and optimisation problems.

Dmitry Mazur
A results-driven professional with a strong academic background, dynamic record of achievements and unique set of skills gained across 10 years of Risk Management whilst working for high profile companies. He has strengths in analytical, interpersonal and communication skills.
Highly skilled in computer science and passionate about quantum computing

Baldev Ghelani
Certified IBM PureData System for Analytics(Netezza) specialist and experienced Database/ETL Developer with a demonstrated history of working in the apparel and fashion and media industry. Strong information technology professional and skilled in Microsoft SQL Server, SSIS, Microsoft Excel, Power BI, Data Analysis, C# and C++.

Advisors

Dr. David Greynat
State Engineer École Centrale de Marseille – France
Ph.D. summa cum laude in
Particles Physics, Mathematical Physics and Modelling
Université Aix-Marseille – France

1. http://bacon.umcs.lublin.pl/~lukasik/wp-content/uploads/2010/12/Principles.of_.Quantum.Artificial.Intelligence.pdf

2. https://arxiv.org/pdf/0705.3360.pdf

3. http://www.cs.virginia.edu/~robins/The_Limits_of_Quantum_Computers.pdf

4. http://www-reynal.ensea.fr/docs/iq/QC10th.pdf

5. http://power.itp.ac.cn/~mli/pdavies.pdf

6. https://www.reportlinker.com/p05064748/Quantum-Computing-Market-by-Revenue-Source-Application-Simulation-Optimization-and-Sampling-Industry-Defense-Banking-Finance-Energy-Power-Chemicals-and-Healthcare-Pharmaceuticals-and-Geography-Global-Forecast-to.html

7. https://www.reportbuyer.com/product/4226790/blockchain-market-by-provider-application-organization-size-industry-vertical-and-region-global-forecast-to-2022.html

8. http://www.reportsnreports.com/reports/1341737-artificial-intelligence-ai-robots-market-by-robot-type-service-industrial-offering-gpu-mpu-technology-machine-learning-computer-vision-application-public-relations-stock-management-and-geography-st-to-2023.html