DATA
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QuantaVania

A QUANTUM COMPUTING SANDBOX PLATFORMER GAME

Aniket Das, Ashmit Gupta

Hackathon Participant, Quantum Games Hackathon 2023

www.dssconf.pl

23-24.11.2023

PGE Narodowy + Online

ORGANIZERS: ACADEMIC PARTNERS Data Science Warsaw Wydział Matematyki i Nauk Informacyjnych POLITECHNIKA WARSZAWSKA

About Us

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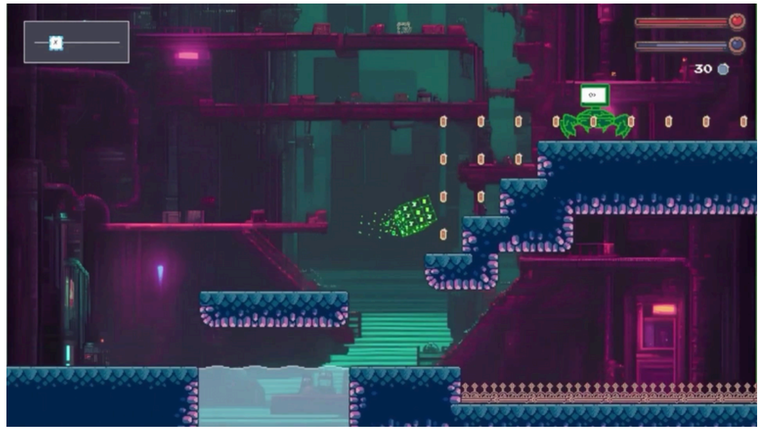
Quantum Games

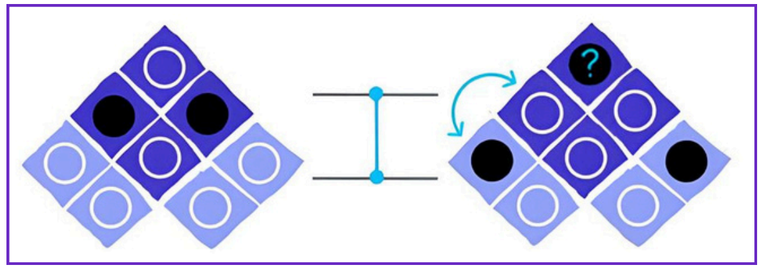
Image Source: Qiskit Textbook

Why we need Quantum Games?

Quantum games serve as a gateway, welcoming beginners with no physics background. They break down complex concepts into interactive and engaging experiences, making quantum computing accessible to all.

- Accessible Quantum Learning
- Playful Mastery of Quantum Concepts
- Visualizing Quantum Ideas in Action
- Fun Foundations for Quantum Intuition





Quantum Games Hackathon

Quantum Games Hackathon is an annual, hackathon organized by Quantum AI Foundation with a goal to create games related to quantum mechanics and computing, and encouraging cross-disciplinary collaboration.

Key features

- Worldwide, fully remote.
- Prize pool of more than 30,000 PLN.
- The participants can consult their projects with mentors (during the Hackathon and after the Hackathon).
- Multiple online talks about quantum computing, quantum games, designing user interfaces, game design, and founding startups.
- All projects formed during the hackathon are Open-Source (MIT License).

QUANTUM GAMES HACKATHON

QuantaVania

“Bridging the gap between quantum computation industry need and students in the field of quantum computing through an interactive quantum sandbox game.”

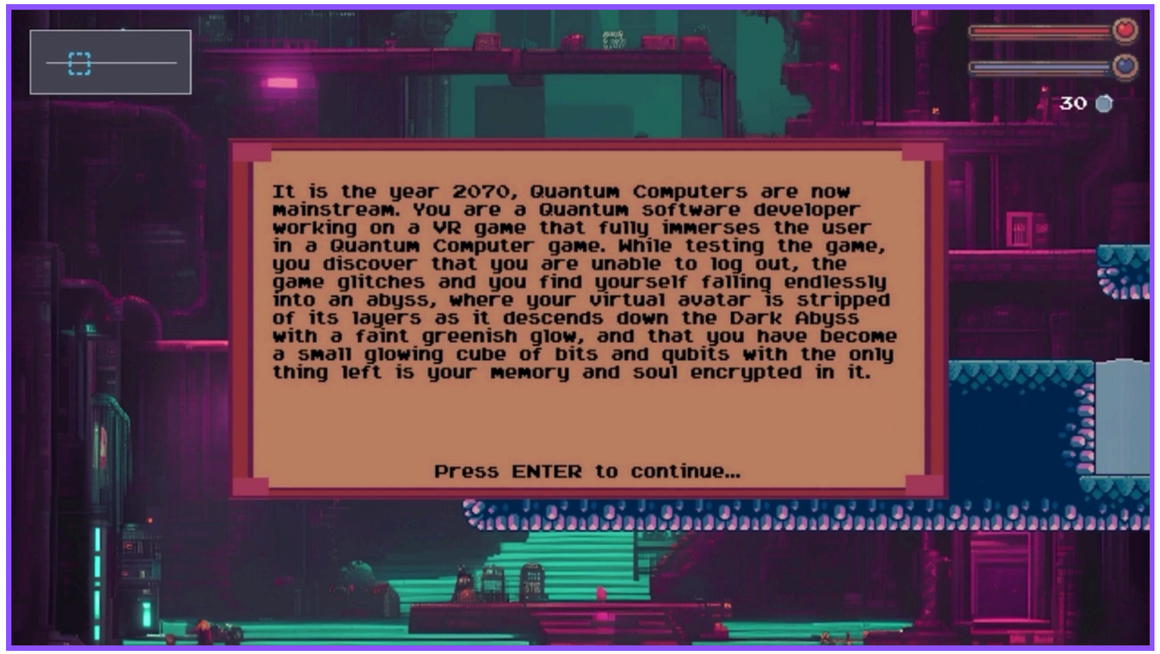
Image Source: Qiskit Textbook

QuantaVania Game

An action-adventure 2D platformer with the potential to evolve into an open-world sandbox game

QuantaVania is a platformer game in which players can learn quantum computing from the ground up while playing, design their game level, and share it with others in the quantum community.

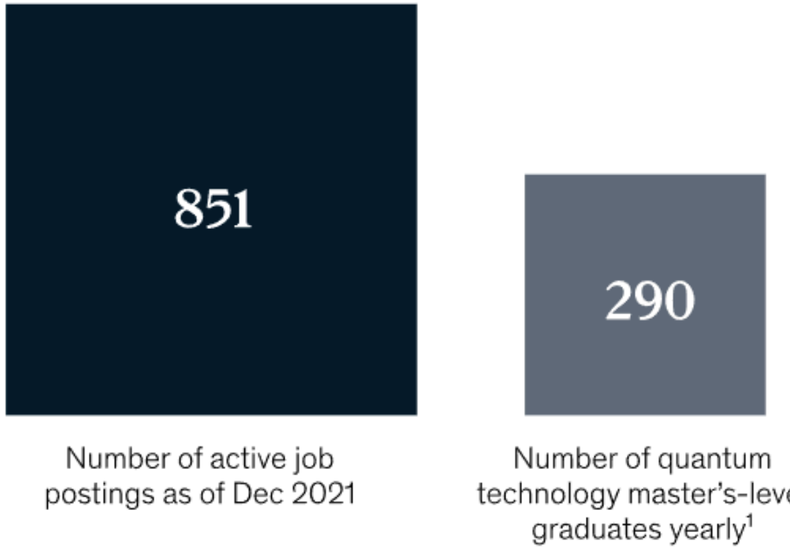
Our game will not only allow them to run the game on their local device but also real quantum computers and simulators from various quantum computing providers like IBM Quantum, IONQ, Rigetti Computing, etc.



GitHub Repository: https://github.com/devilkiller-ag/QuantaVania

The talent gap in quantum technology is wide, but interventions such as upskilling experts in adjacent fields can begin to fill it.

The number of job postings outstrips qualified talent by as much as three to one…



…but upskilling graduates in related disciplines can help close the gap.

350,000
graduates in quantum technology–relevant fields[2]

[1] Estimate based on the number of universities with such programs and how many students graduate per year.
[2] Graduates of master's level or equivalent in biochemistry, chemistry, electronics and chemical engineering, information and communications technology, mathematics and statistics, and physics.
Source: OECD; Quantum Computing Report, quantumcomputingreport.com

McKinsey & Company

Problem we are trying to solve

But beginners with no prior research or coding experience find it difficult in getting started through documentations and online courses alone.

We are trying to decrease

“The gap between quantum computation industry needs and students in the field of quantum computing.”

through a quantum sandbox game that allows the player to learn the concepts of quantum computing from basics to advanced algorithms through puzzles.

Image Source: Qiskit Textbook

Game Level Structure

We intend to teach the players quantum computing as they go through the levels.

We introduce qubits to the player in the first level, and then they'll have to find the X-Gate hiding behind any box or monster.

As the levels progress, the player will discover new gates that he may use in the gun circuit.

And, at the end of each level, we will introduce to the user each quantum algorithm, from basic to advanced, in the form of a game problem.

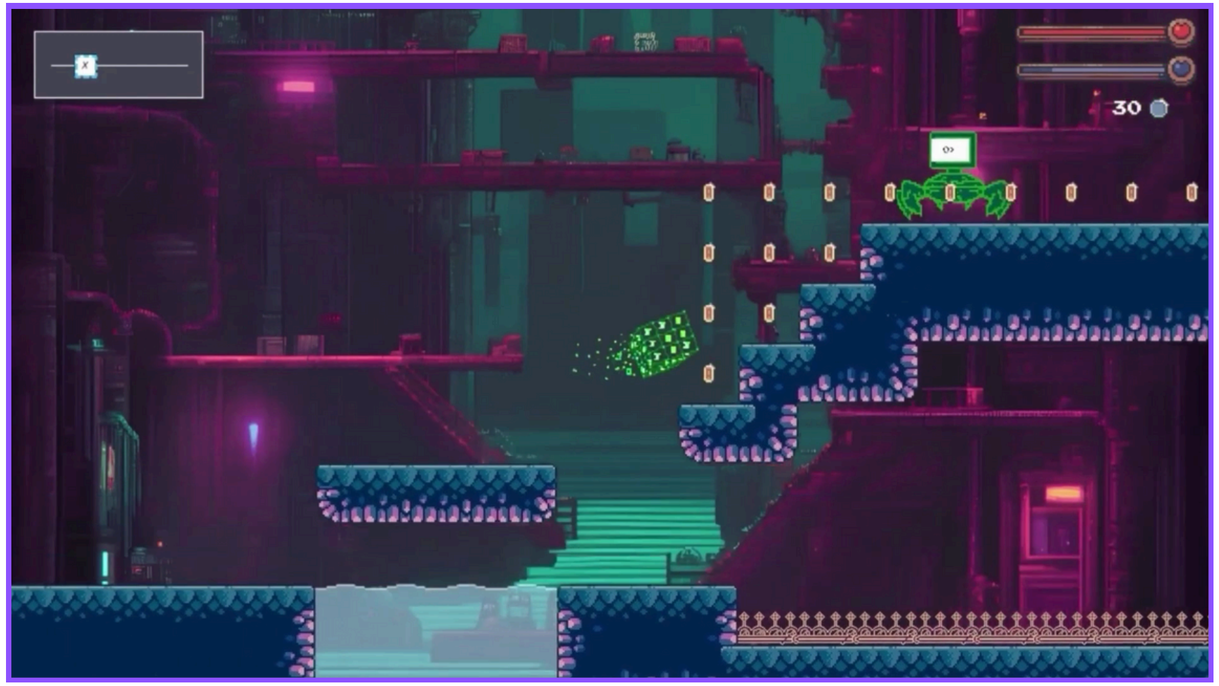
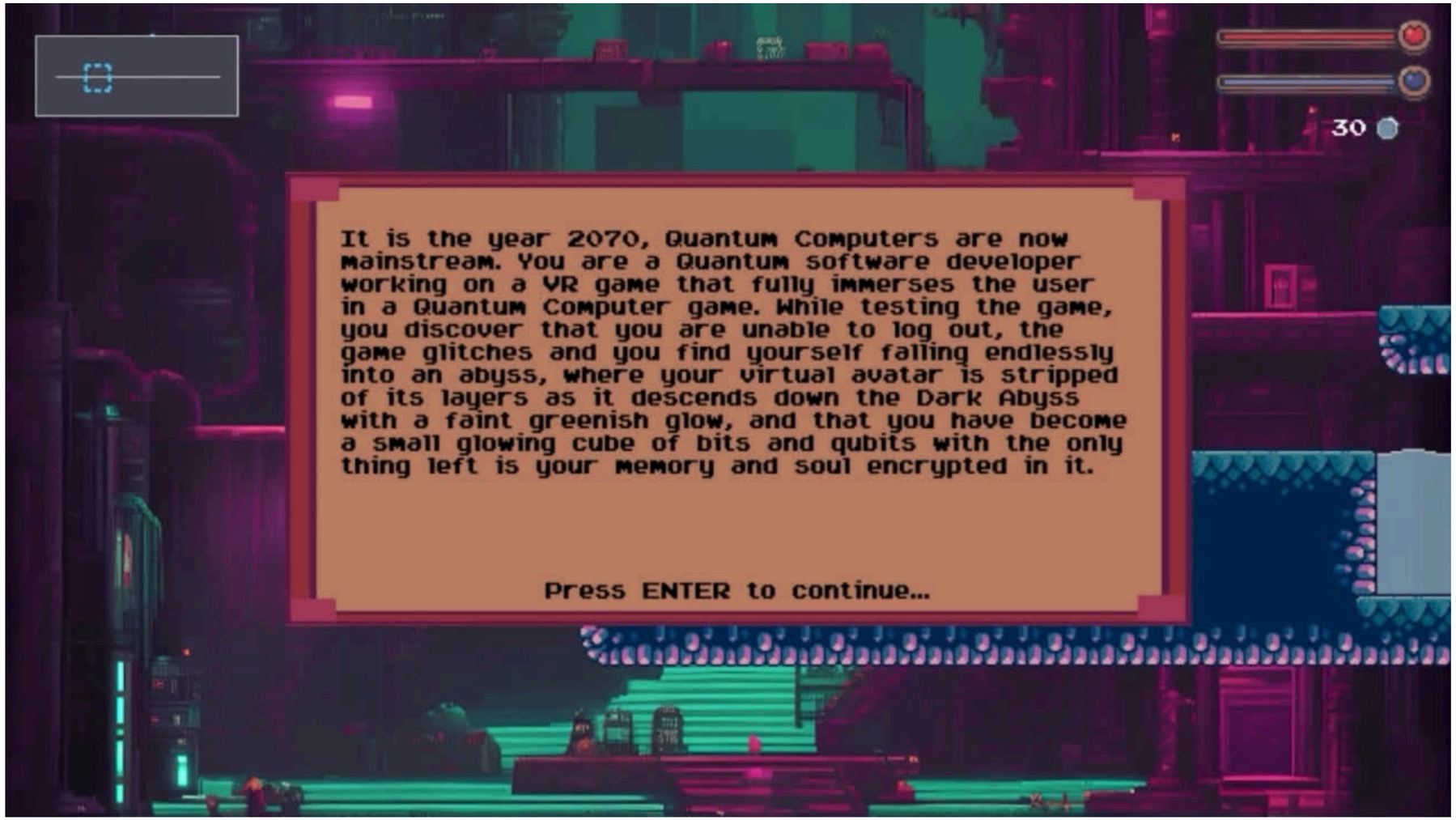


Image Source: Qiskit Textbook

Demo: QuanaVania Game



Watch on YouTube: https://youtu.be/hiG8MVEmIc8?si=oAHBkgUTStys1uO7

Future Plans

As of now, the game has been designed as a submission to the Quantum Games Hackathon. We have used Python, PyGame, and Qiskit as the backend for the game. And the levels are limited to 3 pre-designed levels, and a custom level creator for the player to create as many levels as they want and how they want.

We want our game to have endless creative possibilities, similar to games like Terraria and Minecraft. What makes these games great is the freedom of a sandbox and a choose-your-own-adventure type of loose storyline.

We plan to create an open-world sandbox-like game where players can mine to collect qubits, quantum gates, and power-ups. We will also change our tech stack from Pygame to C# or C++. Initially, we will be targeting the PC platform.

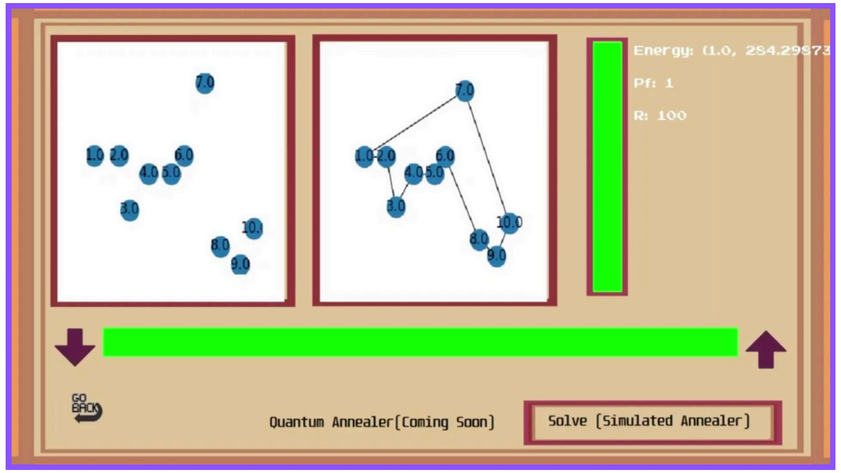


Image Source: Qiskit Textbook

Intended Business Model

The ideas that we currently have for monetizing our games are:

- **Subscription-based** Special Level Themes and skins of players and enemies. (We plan to do this after going through the user research phase.)
- **Special tier** of weapons, powers, and theme levels for subscribed players.
- Players can buy different player avatars and gun skins independently from the subscription.
- For the free tier, he can run the Quantum Circuit by only using the Qiskit Aer Simulator. He can buy compute times of various quantum computing cloud providers individually to **run game circuit on various real as well simulated quantum backends**.

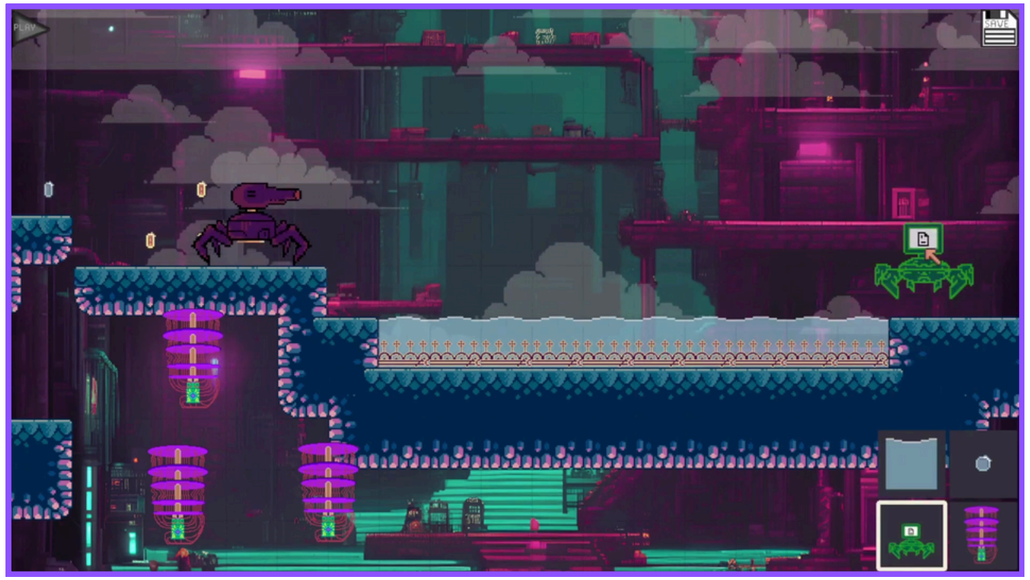
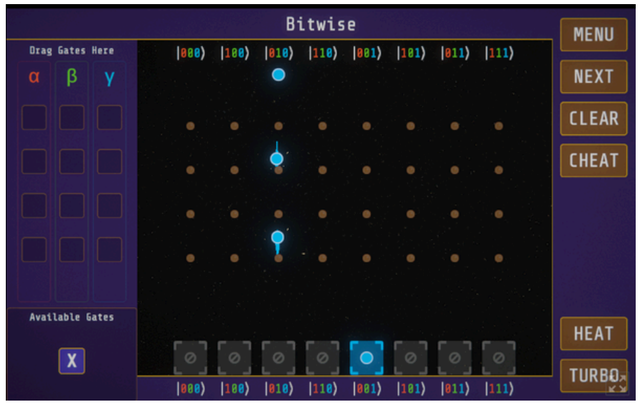


Image Source: Qiskit Textbook

Other Quantum Games from Quantum Hackathon Games 2023

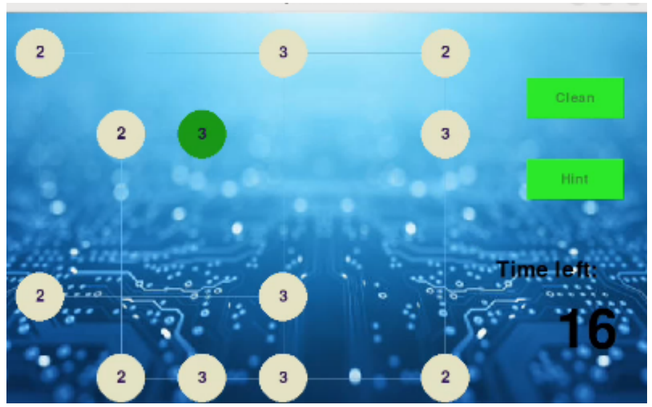
Make Quantum Learning fun



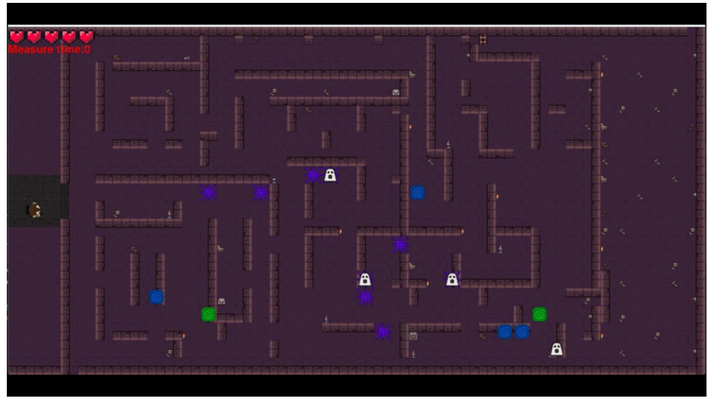
Superposition Arcade

Schrödinger's Mice

Quantum RPG



Quantum Hashi



QGhost Busters

Out of the Box

Some Awesome Resources

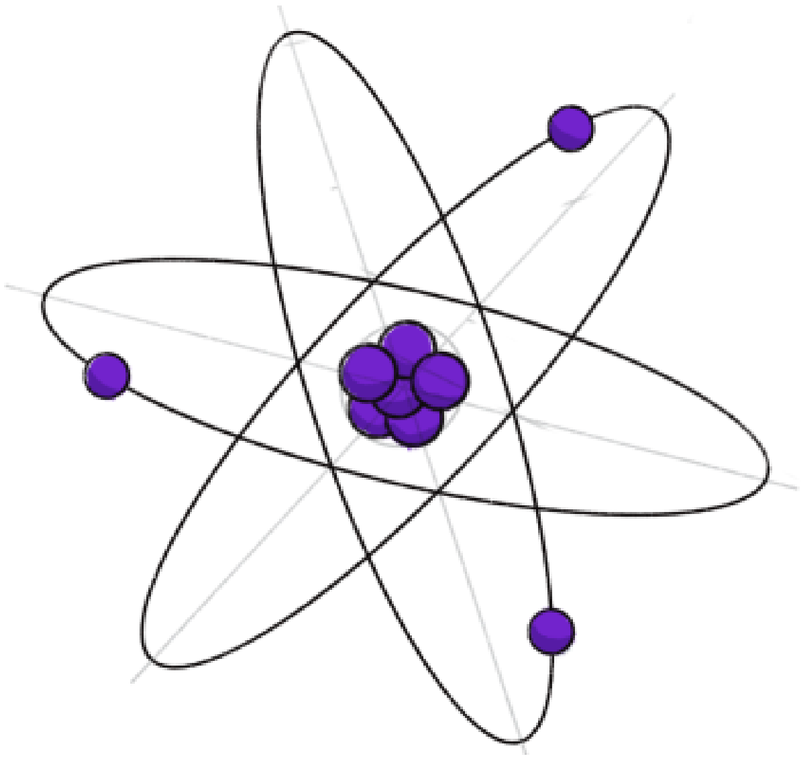
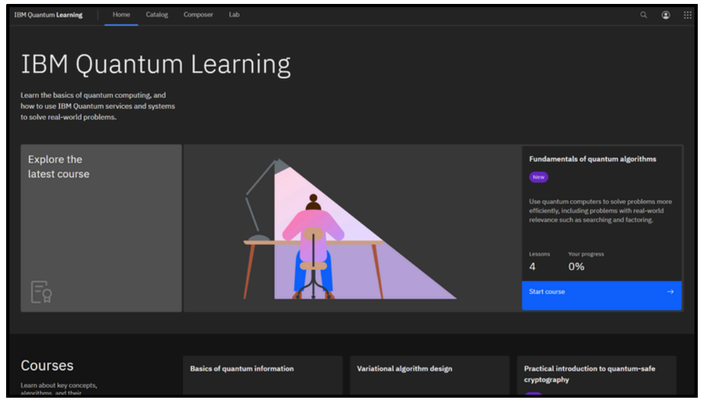
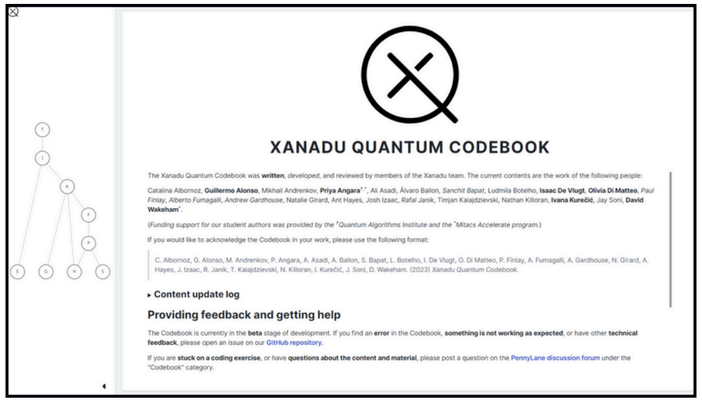


Image Source: Qiskit Textbook

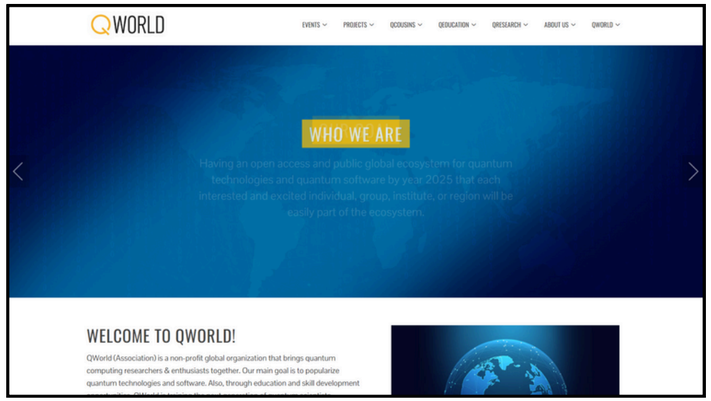
Learning Resources for Beginners



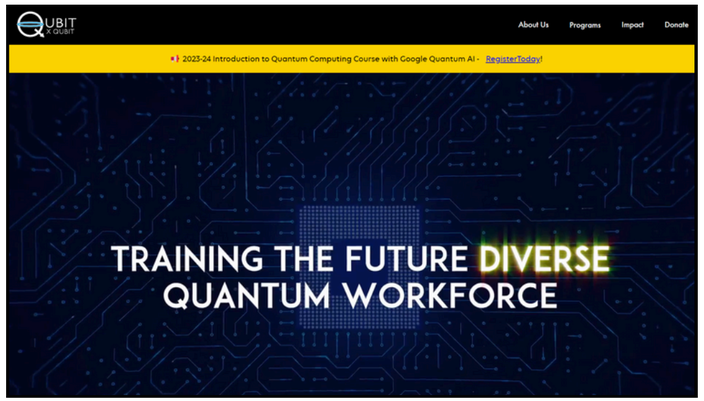
IBM Quantum Learning



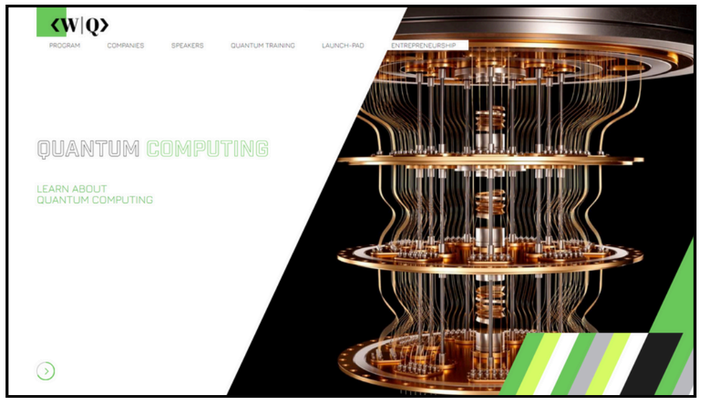
Xanadu Quantum Codebook



Courses by QWorld & QCousins



Courses by Qubit x Qubit



Womanium Quantum Program

And many more listed here🚀

Surprise for Quantum Game Developers:

Quantum Circuit Game Engine (QCGE) for Pygame based Quantum Games

Features:

- You can use it simply by creating an object of the **QuantumCircuitGrid** class stored in the **quantum_circuit.py** file.
- Easy to change size of Quantum Circuit by passing optional parameters: tile_size, and gate_dimensions.
- Easily change theme by passing optional parameters: background_color, wire_color and gate_phase_angle_color.
- Developers can create Quantum Circuit for any number of qubit/wires and circuit width (max. number of gates which can be applied in a wire) of their choice.

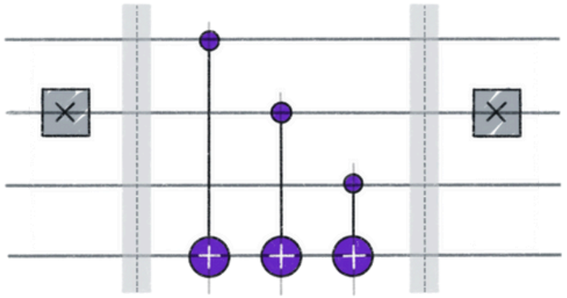


Image Source: Qiskit Textbook

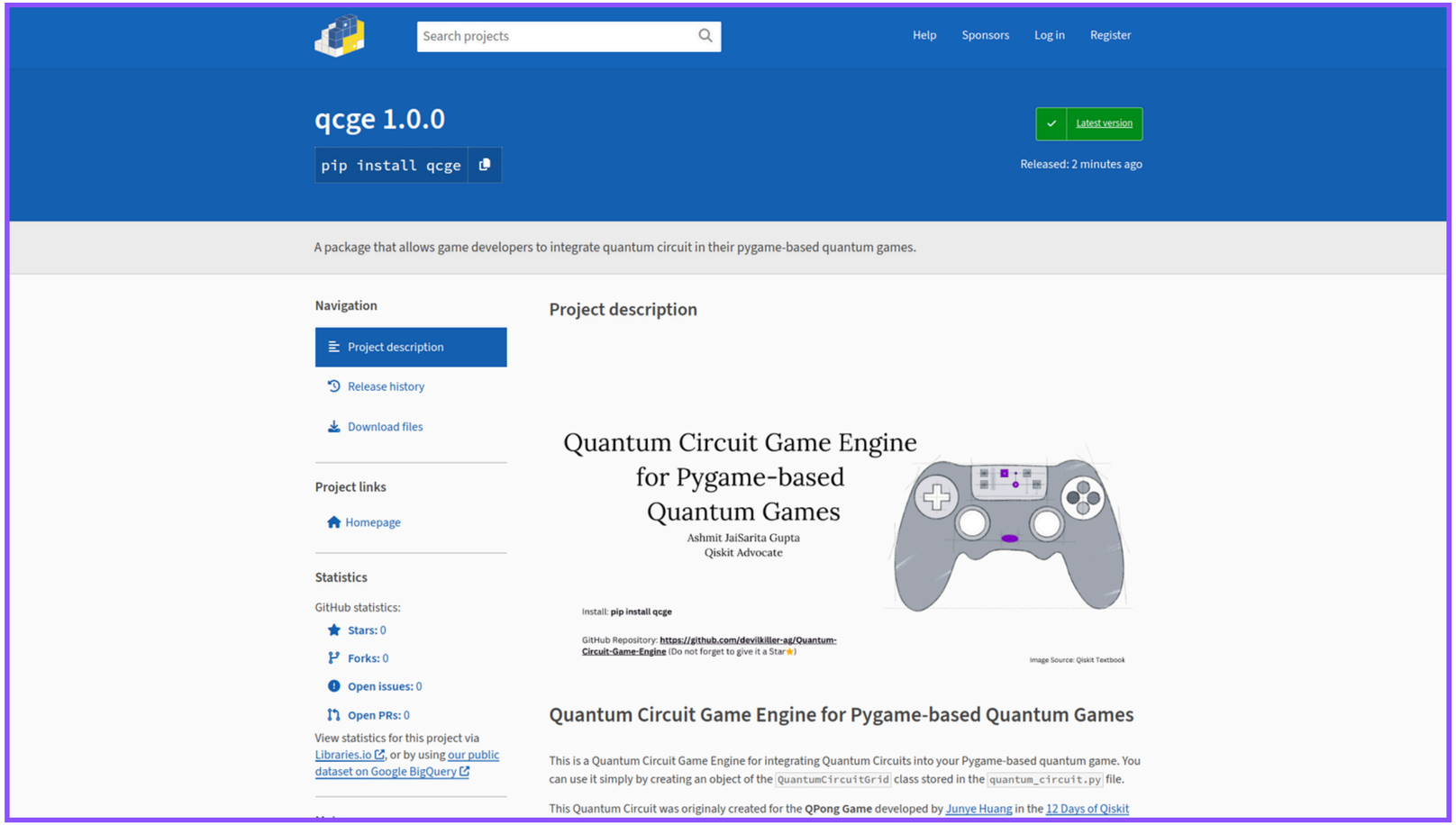
Install: **pip install qcge**

GitHub Repository: **https://github.com/devilkiller-ag/Quantum-Circuit-Engine-for-Pygame-based-Quantum-Games** (Do not forget to give it a Star⭐)

Future Updates:

- Functionality to add custom graphics for gates and qubits.
- **Major:** Functionality to allow players to run this quantum circuit on real and simulated quantum backends provided by different quantum providers on credit basis.

Install: **pip install qcge**



Visit: **https://pypi.org/project/qcge/** for more details!

OCEŃ PRELEKCJĘ

QuantaVania: A Quantum Computing Sandbox Platformer Game

Aniket Das
Ashmit Gupta

http://dssconf.pl/user.html#!/lecture/DSS23-69a3/rate

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Thank you for watching!

Remember to leave your questions and rate the presentation in the section below.

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