

AI Use Cases for Quantum Computing

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Current projects

- Generate new quantum circuits using reinforced learning
- Finding optimal quantum circuit parameters using transfer learning
- Quantum noise mitigation (using both neural networks and deep generative models like diffusion models)
- Finding new Yang-Baxter type relationships using genetic algorithm and later AI to predict new relationships

In all cases we rely heavily on our tensor network simulators and running large-scale simulations on Argonne's supercomputers

LLM projects

- Generate knowledge graph for quantum information science using an LLM. Preliminary experiments with NaLLM by Neo4j. Training will be done on caption of lectures participating in QSteam.
- Project with IBM to create quantum circuit database, which will be used later for AuroraGPT and other AI projects.

What format to use to store data and where to store it (cloud is preferred). Is Pinecone vector database good choice? Who will cover Standard (\$70/month) plan? Estimated for one index on one s1 pod running for 30 days at \$0.096/hour.