Quantum Computing Use Cases for Emergency Response, Defense and Space

Our customers, collaborators, and users have built **hundreds of early quantum applications** in areas as diverse as scheduling, logistics management, quantum chemistry simulation, preventative healthcare, traffic optimization, defense, emergency response, and so much more

Emergency Response:

- **Sigma-I**, a Tokyo based start-up, used quantum-hybrid technologies to build a powerful personnel management tool to help address the need to safely reduce in-house presence during the pandemic without compromising the ability to have essential team members present at the same time.
- **Australian Department of Defence** worked with D-Wave and NEC-Australia to develop a last-mile resupply quantum computing application to showcase the ability to optimize autonomous vehicles resupplying forces.
- **Sigma-I** used D-Wave's quantum cloud to optimize evacuation routes during a tsunami or other disasters.

Missle Defense:

- **Davidson Technologies** built a threat analysis application with cross-industry use cases which addressed a hypothetical attack. The application reviewed 67 million scenarios and provided a solution in approximately 13 seconds.

Space and Satellite:

- Researchers at the **German Aerospace Center (DLR) & Airbus** looked at image acquisition planning for earth observation satellites and presented a comparison between the D-Wave™ 2000Q and classical optimization methods. The problem looked at how to acquire high value images while obeying the attitude maneuvering constraint of the satellite.
- **Artificial Brain** won the myEUSpace award for its quantum-hybrid algorithm for optimizing real-time scheduling for multiple Earth Observation Satellites (EOS). Bringing groundbreaking solutions in the integration of EU space data with cutting-edge technologies like Artificial Intelligence (AI) and Quantum Computing.
- Researchers at **NASA Ames Research Center, Jet Propulsion Laboratory** at the California Institute of Technology, & the **Center for Quantum Information Science and Technology, and Information Sciences Institute** at the Univ. of Southern California showed how quantum annealers can be used to map a sampling of the hardest artificial intelligence problems in space exploration.
- Researchers from **Booz Allen Hamilton, Los Alamos & USRA** concluded that for satellite optimization problems, heterogeneous quantum techniques will be required to solve the problem at larger scales.
- **NASA Quantum artificial Intelligence Lab (QuAIL)** team is working to demonstrate that quantum computing and quantum algorithms may someday dramatically improve the agency's ability to address difficult optimization and machine learning problems arising in NASA's aeronautics, Earth and space sciences, and space exploration missions.

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Autonomous Support & Battlefield Readiness:

- **DENSO Corporation**, a leading supplier of advanced automotive technology, systems, and components developed a proof-of-concept aimed at optimizing control of automated guided vehicles on their factory floors resulting in 15% efficiencies.
- Quantum computing applications could help with better understanding of adversary movements through magnetometers. **Lockheed's** chief scientist says a magnetometer is great at detecting magnetic anomalies which not only allows navigators to determine where militaries are, but, because a magnetometer also indicates the orientation of magnetic fields, it has the capability to determine the direction of ships and submarines.

Logistics/Transportation:

- **SavantX** built a quantum application to optimize Pier 300 at The Port of Los Angeles. Their Hyper Optimization Nodal Efficiency (HONE) quantum powered AI engine increased the capacity and velocity of cargo movement at the port where it doubled cargo handling equipment productivity and produced more predictable cargo flows. With the quantum application, the port was able to see increased efficiencies of crane delivery and utilization by 60% and reduced turn times for trucks.
- **Groovenauts, Inc.**, a Japanese technology company using AI and quantum computing, has built a proof-of-concept quantum-hybrid application to optimize construction sites. By looking at GPS tracking, Groovenauts was able to analyze the truck movement, speed, and other behaviors to optimize construction operations by 10%.
- **Groovenauts, Inc.**, launched a commercial service integrating quantum annealing computing technology into their technology offering since they found quantum computing to be the best tool to efficiently plan staff schedules for distribution logistics companies.
- **Mitsubishi Estate** worked with **Groovenauts, Inc.** to enable AI with D-Wave's quantum computing techniques to solve the problem of labor shortages for waste collection staff, while also lowering overall CO2 emissions for Tokyo. This proof-of-concept optimized waste collection routes and reduced CO2 emissions showing a 57% reduction in emissions, 59% reduction in vehicles needed, and 38% reduction in worktime.

Fleet Management:

- **GE Research** built a logistics management application that can help with preventive maintenance and scheduling repairs for equipment. more predictable cargo flows. With the quantum application, the port was able to see increased efficiencies of crane delivery and utilization by 60% and reduced turn times for trucks.

Find Out More:
www.dwavequantum.com/applications