

## Day 2 (Poster C)

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Title: Vehicle Routing Optimization using a Quantum Annealing

Abstract:

Quantum annealing technologies aims to solve computational optimization and sampling problems. QPU (Quantum Processing Unit) machines such as the D-Wave system, use the form of the QUBO (Quadratic Unconstrained Binary Optimization) formula to modeling optimization problems for quantum annealing. This machine takes advantage of quantum effects to speed up computing time better than classical computers. We propose a vehicle routing problem which can be formulated in the QUBO model as a combinatorial problem, which gives the possible route solutions increasing exponentially. The solution made aims to optimize the vehicle's journey to reach a destination. The study presents a QUBO formulation to solve traffic congestion problems on certain roads. The resulting route selection by optimizing the distribution of the flow of alternative road vehicles. Constraints formulated as a condition for the level of road density. The cost function for each road choice influenced by the road weight parameter. The simulations on the d-wave quantum annealer show optimal results on the route deployment of several vehicles. So that each vehicle will be able to accurately go through different road options, and can reduce road congestion. This provides an opportunity to develop QUBO modeling for more complex vehicle routing problems for road congestion.