Day 1

Nicholas Chancellor, Durham University

Title: A domain wall encoding of variables for quantum annealing

Abstract:
I will discuss the application of a relatively new method for encoding discrete variables into binary ones on a quantum annealer. This encoding is based on the physics of domain walls in frustrated Ising spin chains and can be shown to perform better than the traditional one-hot encoding both in terms of efficiency of embedding the problems into quantum annealers and in terms of performance on actual devices.
I first review this encoding strategy and contrast it with the one-hot technique as well as numerical evidence of an embedding advantage following the discussion in [Chancellor Quantum Sci. Technol. 4 045004]. Next, I will discuss recent experimental evidence presented in [Chen, Stollenwerk, Chancellor arXiv:2102.12224] which shows that this encoding can lead to a large improvement in the performance of quantum annealers on coloring problems, this improvement is large enough that using the domain-wall encoding on an older generation D-Wave 2000Q quantum processing unit yields superior result to using the one-hot encoding on a more advanced Advantage QPU, indicating that better encoding can make a large difference in performance.