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Benchmarking using Frustrated Ising Problems with Planted Solutions JOSHUA JOB, University of Southern California, ITAY HEN, Information Sciences Institute, TAMEEM ALBASH, University of Southern California, TROELS RØNNOW, Nokia, MATTHIAS TROYER, ETH Zurich, DANIEL LIDAR, University of Southern California — We introduce a method for generating families of benchmark problems that have a certain degree of tunable "hardness," achieved by adjusting the amount of frustration. We construct such frustrated problems around "planted solutions," representing a known ground state configuration. We construct such problems on the Chimera graph and use them to benchmark various optimization algorithms: simulated annealing (SA), simulated quantum annealing (SQA), the Shin-Smolin-Smith-Vazirani thermal rotor model (SSSV), and the Hamze-Freitas-Selby (HFS) algorithm, as well as the D-Wave device (DW2). We observe a universal hardness peak for all methods, and we observe that the optimal time for the numerical methods scales exponentially with the problem size.

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