

GPU-Accelerated Algorithms for Discrete Optimization

The immense parallel processing power of GPUs offers a transformative opportunity for tackling complex discrete optimization problems. In this talk, we present two novel GPU-accelerated algorithms designed to significantly accelerate solution times and enhance scalability. First, we introduce a primal-dual reformulation that casts Quadratic Unconstrained Binary Optimization as a minimax problem, enabling efficient parallel updates. Second, we take a complementary approach for general nonlinear integer programs by leveraging the power of Graver Bases. We will demonstrate how both methods are architected from the ground up to exploit massive parallelism on GPUs. Extensive experiments on public benchmarks confirm that our algorithms consistently outperform state-of-the-art solvers, yielding high-quality solutions to discrete optimization problems very efficiently.



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Dr. Akang Wang is a Research Scientist at Shenzhen Research Institute of Big Data and an Adjunct Assistant Professor at The Chinese University of Hong Kong, Shenzhen. He received his Ph.D. in Process Systems Engineering from Carnegie Mellon University in 2020. His research focuses on integer programming, learning to optimize, and grid optimization, supported by grants including the National Natural Science Foundation of China and the National Key R&D Program. His work is published in top-tier venues such as EJOR, ICLR, ICML, and NeurIPS. Dr. Wang is also a champion in competitive optimization, having earned first place in the NeurIPS 2021 ML4CO competition and second place in the INFORMS 2022 RAS Problem Solving Competition.



Speaker

Dr. Akang Wang

Research Scientist
Shenzhen Research
Institute of Big Data