Stellingen

Behorende bij het proefschrift

Hybrid quantum-classical metaheuristics for automated machine learning applications

1. Encoding Maximum Relevancy/Minimum Redundancy (mRMR) heuristics as quadratic unconstrained binary optimization (QUBO) routines provides an effective approach to the problem of feature selection in regression and other supervised learning tasks (Chapter 3 of this thesis).
2. While mRMR heuristics can be encoded as QUBO routines, the choice of distance or similarity metric significantly impacts the performance of feature selection (Chapter 3 of this thesis).
3. Encoding mRMR heuristics as QUBOs for selection operators in evolutionary algorithms yields improvements over traditional ranked or greedy selection methods (Chapter 4 of this thesis).
4. QUBO-enhanced selection operators for evolution strategies improve hyperparameter optimization of machine learning (ML) models and neuroevolution of reinforcement learning agents (Chapter 5 of this thesis).
5. QUBO-enhanced selection methods improve data selection and kernel sparsification in Gaussian process regression (Chapter 6 of this thesis).
6. Using random Fourier features in concert with QUBO-enhanced selection increases the efficacy of kernel-estimator supervised learning on classical datasets (Chapter 6 of this thesis).
7. Sparse quantum kernel estimators provide improvements in supervised learning from simulated quantum-generated data compared to purely classical estimators.
8. Bayesian optimization with quantum-enhanced surrogate models can improve hyperparameter optimization in machine learning applications.
9. Integrating quantum-enhanced and quantum-inspired optimization techniques into classical learning frameworks offers novel approaches to feature selection, training, and inference.
10. Encoding quantum circuit-derived kernels as QUBOs enables sparse, discriminative feature selection in high-dimensional quantum machine learning tasks.
11. Through the execution of a practical idea, greater results follow than from an exceptional idea never realized.

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