Sycamore 53 Qubits 20 Cycles Benchmark
Parameter Scan Results

Scan Configuration
All benchmarks are performed on CPU: Intel(R) Xeon(R) Gold 6226R CPU @ 2.90GHz, restricted to single thread.

This report presents benchmarking results for the **sycamore_53_20_0** instance, comparing different tensor network contraction order optimizers with various parameter settings.

Parameter Configuration Table

Optimizer	Parameter	Values
Treewidth	algorithm	MF, MMD, AMF
KaHyParBipartite	sc_target	25
	imbalances	0.0:0.1:0.8
TreeSA	niters	{1, 2, 4, 6, 8, 10, 20, 30, 40, 50}
	score	TC (tc_weight=1), SC (sc_weight=1)
GreedyMethod	α	{0.0, 0.1, 0.2, ..., 1.0}
HyperND	variant	base, METISND, KaHyParND
	imbalances	100:10:800 (METISND/KaHyParND only)
	score	TC (tc_weight=1), SC (sc_weight=1)
cotengra_greedy	max_repeats	{1, 5, 10, 20, 50}
	minimize	flops, size
cotengra_kahypar	imbalance	{0.01, 0.1, 0.3, 0.5, 0.8}
	minimize	flops, size

Note: TC = Time Complexity (minimize FLOPs), SC = Space Complexity (minimize max tensor size)

Results: Time Complexity Objective

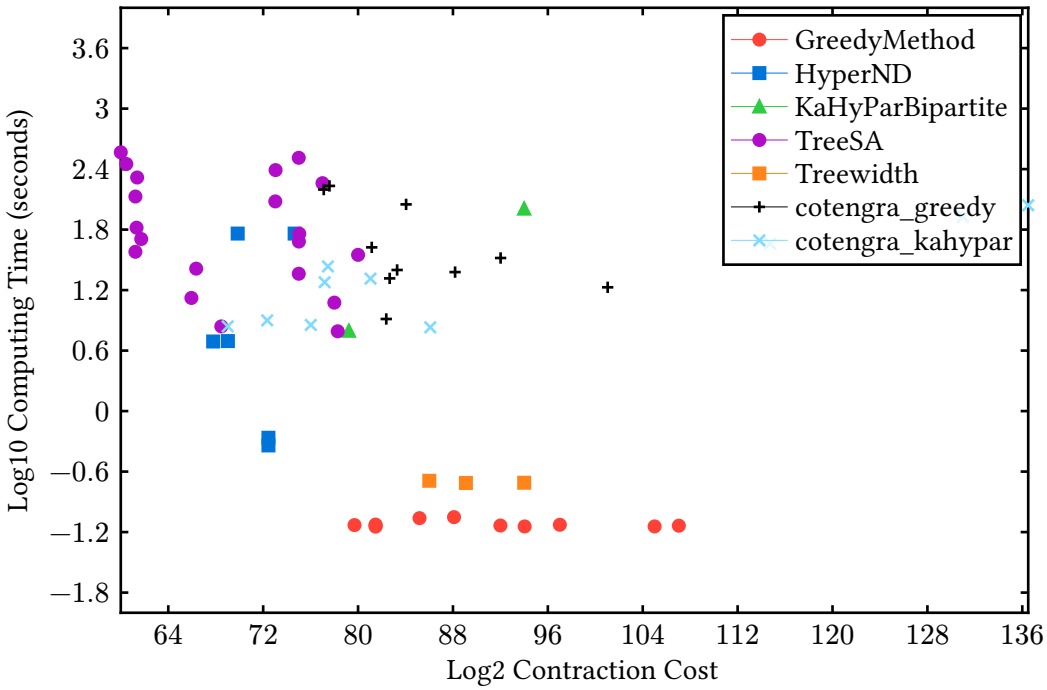

Figure 1: Scatter plot showing **time complexity** (log2 FLOPs) vs computing time for different optimizers on sycamore_53_20_0.

Results: Space Complexity Objective

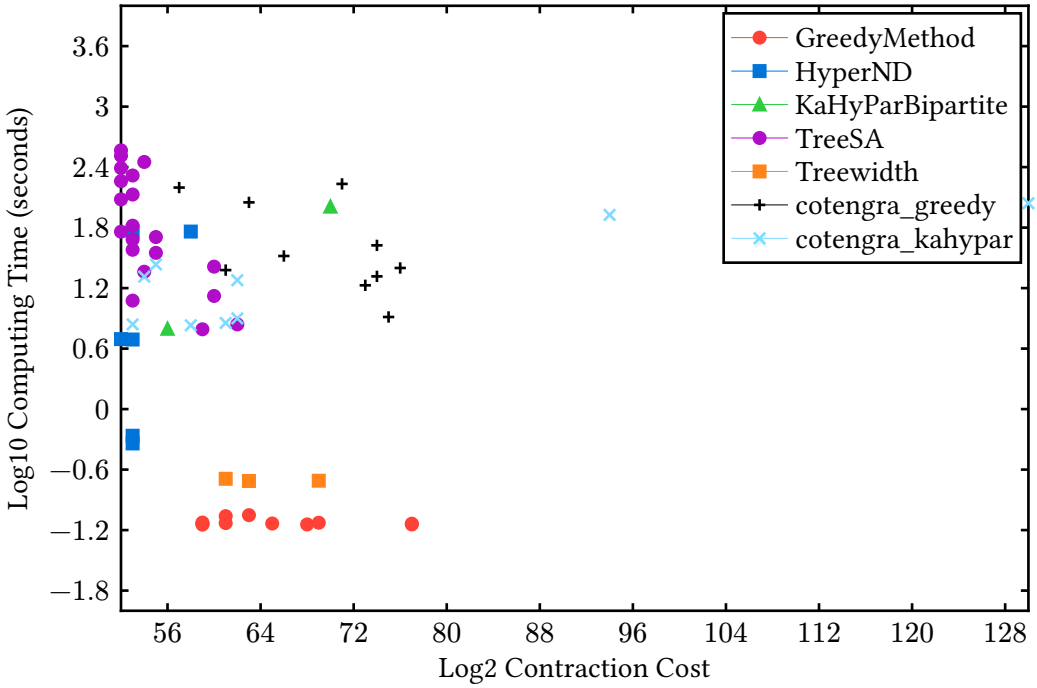

Figure 2: Scatter plot showing **space complexity** (log2 max tensor size) vs computing time for different optimizers on sycamore_53_20_0.