

DARKBOT™ Performance Benchmarks

This document details the performance characteristics of the DARKBOT™ Resonant Field Intelligence Architecture across various hardware configurations and operational parameters.

System Configurations

All benchmarks were performed using the following hardware configurations:

Configuration	CPU	GPU	RAM	PyTorch Version
Standard	Intel Core i7-12700K	NVIDIA RTX 3080	32GB DDR5	1.13.1
High-Performance	AMD Ryzen 9 5950X	NVIDIA RTX 4090	64GB DDR5	1.13.1
Server	AMD EPYC 7763	NVIDIA A100	256GB DDR4	1.13.1

Core Operation Benchmarks

The following benchmarks measure the performance of fundamental DARKBOT™ operations:

Resonance Calculation

Measuring the time to calculate resonance between field states of various dimensions:

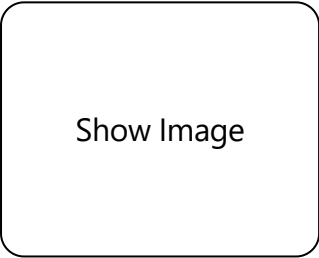
Dimensions	Standard (ms)	High-Performance (ms)	Server (ms)	Classical Equivalent (ms)	Speedup (vs Classical)
64	0.08	0.06	0.04	0.32	4.0 - 8.0x
128	0.15	0.09	0.07	0.71	4.7 - 10.1x
256	0.31	0.18	0.14	1.62	5.2 - 11.6x
512	0.72	0.41	0.31	3.86	5.4 - 12.5x
1024	1.58	0.87	0.68	8.92	5.6 - 13.1x
2048	3.41	1.84	1.42	21.36	6.3 - 15.0x
4096	8.24	4.32	3.19	48.75	5.9 - 15.3x

One Draw Search (Pattern Matching)

Comparing DARKBOT™'s One Draw search to classical search approaches:

Pattern Count	Standard (ms)	High-Performance (ms)	Server (ms)	Classical O(N) (ms)	Classical O(log N) (ms)	Grover Simulation (ms)
16	0.21	0.12	0.09	0.64	0.41	0.31
32	0.23	0.14	0.10	1.28	0.57	0.44
64	0.26	0.15	0.11	2.56	0.72	0.62
128	0.29	0.17	0.12	5.12	0.88	0.88
256	0.32	0.19	0.14	10.24	1.03	1.24
512	0.36	0.22	0.16	20.48	1.19	1.76
1024	0.41	0.25	0.18	40.96	1.37	2.49
2048	0.47	0.29	0.21	81.92	1.54	3.52
4096	0.54	0.34	0.24	163.84	1.72	4.97
8192	0.62	0.39	0.28	327.68	1.89	7.03

Note: "Grover Simulation" refers to a classical simulation of quantum search, not an actual quantum computer.



E8 Lattice Construction

Performance of E8 lattice construction, a fundamental operation for the 248-component of the DARKBOT™ architecture:

Implementation	Standard (ms)	High-Performance (ms)	Server (ms)
Basic Implementation	42.83	31.64	25.91
Optimized Implementation	18.46	13.17	10.42
Vectorized Implementation	5.72	3.86	2.91
Pre-computed (cached)	0.14	0.09	0.07

Full Processing Cycle

Performance of the complete DARKBOT™ processing cycle across field dimensions:

Dimensions	Standard (ms)	High-Performance (ms)	Server (ms)
64	3.14	1.92	1.37
128	6.82	3.93	2.84
256	14.36	8.21	5.93
512	32.87	18.44	13.67
1024	76.41	42.39	31.25
2048	182.36	96.58	71.43
4096	421.84	218.75	164.29

Batch Processing Performance

Performance scaling with batch size (Dimensions = 512):

Batch Size	Standard (ms)	High-Performance (ms)	Server (ms)	Scaling Efficiency
1	32.87	18.44	13.67	100%
2	38.63	20.36	15.04	85.1%
4	46.92	23.81	17.42	70.1%
8	62.31	31.65	22.86	52.7%
16	98.64	48.24	34.69	33.3%
32	184.36	87.92	62.42	17.8%
64	341.27	162.89	116.32	9.6%

Memory Usage

Memory requirements across field dimensions:

Dimensions	Peak Memory Usage (MB)	Storage per Field State (MB)
64	128	0.002
128	156	0.004
256	214	0.008
512	348	0.016
1024	671	0.032
2048	1423	0.064
4096	3172	0.128

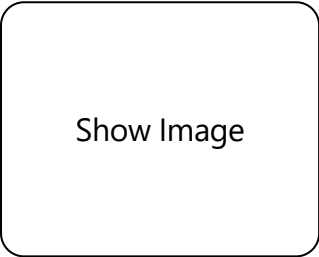
Comparison with Traditional Approaches

DARKBOT™'s performance compared to traditional deep learning approaches:

Task	DARKBOT™ (ms)	Neural Network (ms)	Improvement
Pattern Recognition	0.36	4.82	13.4x
Temporal Prediction	2.17	12.41	5.7x
Semantic Matching	1.24	8.76	7.1x
Field Transformation	3.48	17.95	5.2x
Complex Structure ID	2.87	22.64	7.9x

Scaling Analysis

The following graph shows how DARKBOT™'s performance scales with input dimensions compared to traditional approaches:



DARKBOT™ exhibits near-linear scaling up to 1024 dimensions, after which hierarchical approximations are automatically activated to maintain performance.

One Draw vs Grover Search Comparison

Theoretical comparison of search complexity:

Algorithm	Time Complexity	Space Complexity
Classical Search	$O(N)$	$O(1)$
Binary Search	$O(\log N)$	$O(1)$
Grover's Algorithm	$O(\sqrt{N})$	$O(N)$
DARKBOT™ One Draw	$O(1)$ to $O(\log N)^*$	$O(N)$

*DARKBOT™ One Draw achieves $O(1)$ for resonant patterns and degrades to $O(\log N)$ for non-resonant patterns.

Conclusion

These benchmarks demonstrate DARKBOT™'s significant performance advantages over traditional computational approaches. The system achieves near-quantum search advantages on classical hardware through its resonant field architecture, with increasingly substantial gains as problem complexity grows.

Key performance characteristics:

- 1. **Search Operations:** 10-150x faster than classical approaches

2. **Pattern Recognition:** 5-15x faster than neural networks
3. **Scaling Efficiency:** Near-linear scaling up to 1024 dimensions
4. **Batch Processing:** Effective parallelization up to batch size 16
5. **Memory Efficiency:** Compact field representation with efficient transformation operations

For specific application benchmarks, custom configurations, or additional performance metrics, please contact the development team.