

The Use of Volume Scene Graphs in Very Large Dataset Visualisation Part 2

David Chisnall

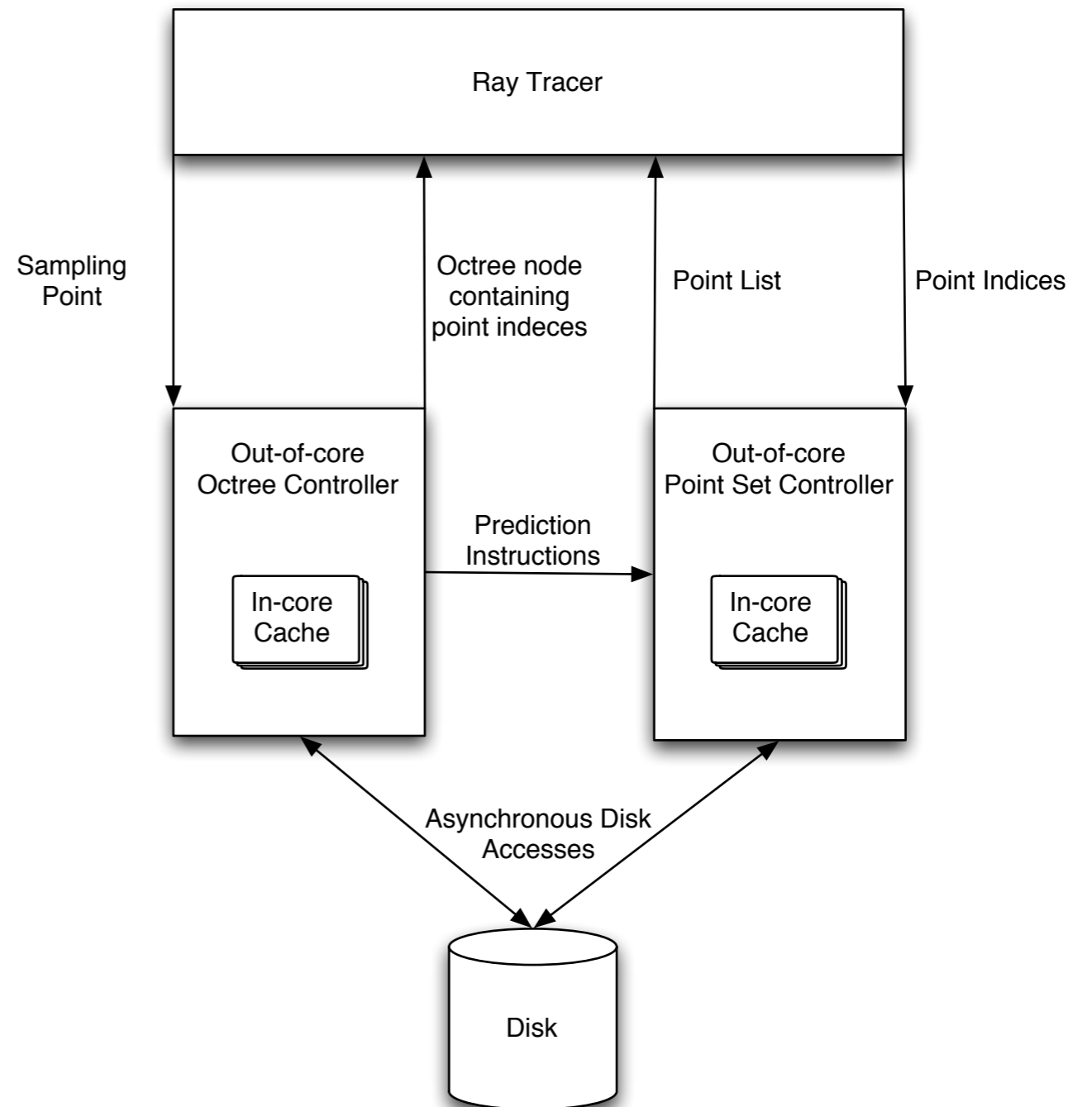
Min Chen

Charles Hansen

csdavec@swan.ac.uk m.chen@swan.ac.uk hansen@cs.utah.edu

Test Renderer

- Point datasets
- Ray tracing
- Octree partitioning
- Pluggable prefetching algorithm



A Taxonomy of Out-of-core Approaches

- Algorithm Based
- Data Structure Based
- Knowledge Based

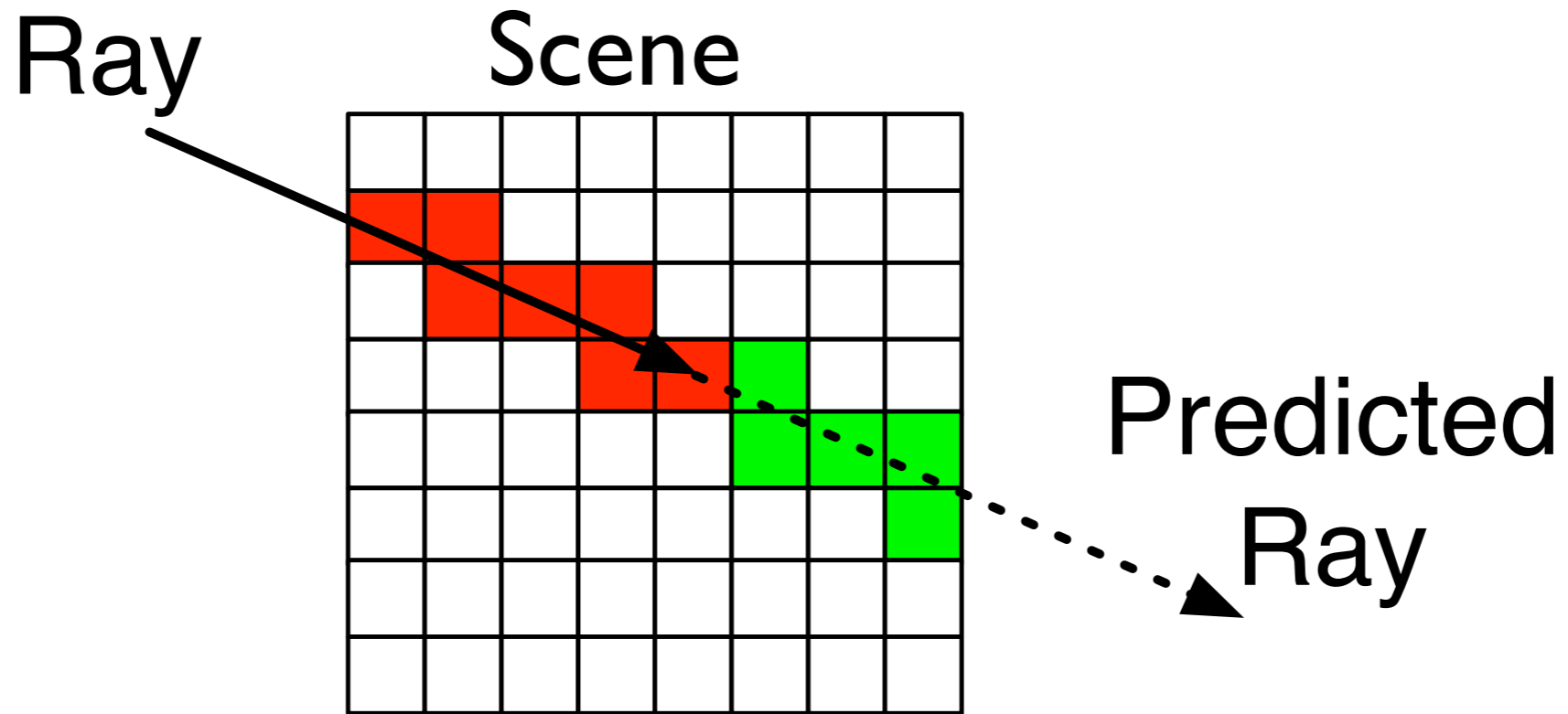
The Components

- Eviction Strategy
- Prefetching Strategy
- Data layout strategy
 - Only important if your out-of-core device is sequential-access
- (Small working set algorithms)

Ray Driven Predictor

- Algorithm based approach for ray tracing
- ‘Understands’ ray paths
- Predicts assuming infinite-length rays
- Faults at ray termination and secondary rays

Ray Driven Predictor



Disk File



Knowledge Based

- Records previous interactions
- Deduces future behaviour from acquired knowledge
- Does not rely on information provided by other means

Four Algorithms

Algorithm	Acquires Knowledge	Uses Render Information
Least Recently Used	X	X
Ray Driven Predictor	X	✓
Access Path Predictor	✓	X
History Access Predictor	✓	X

Least Recently Used

- Naive approach
- Finer grained than OS
- Demand paging

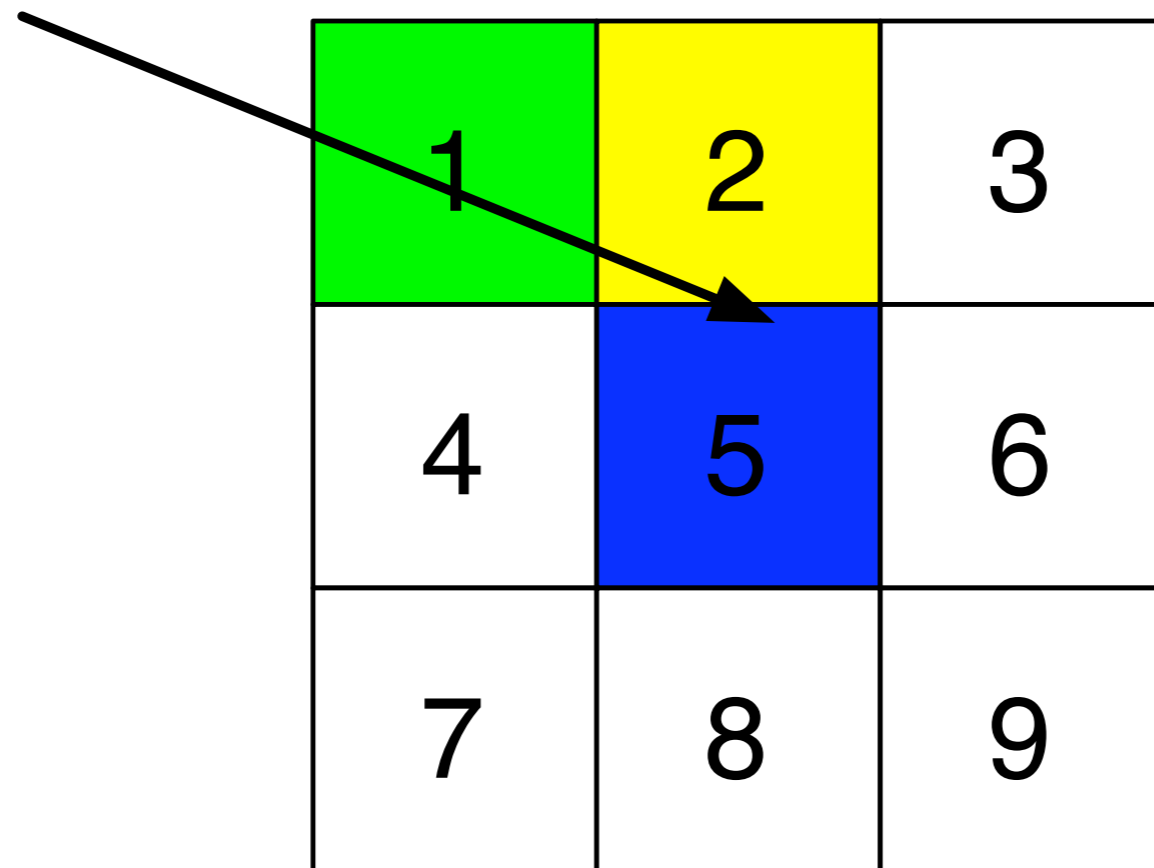
Access Path Predictor

- Assumes (predecessor, current, successor) relationship
- Stores four previous accesses
- Falls back to guessing any previous successor if the (predecessor, current, _) relationship does not hold

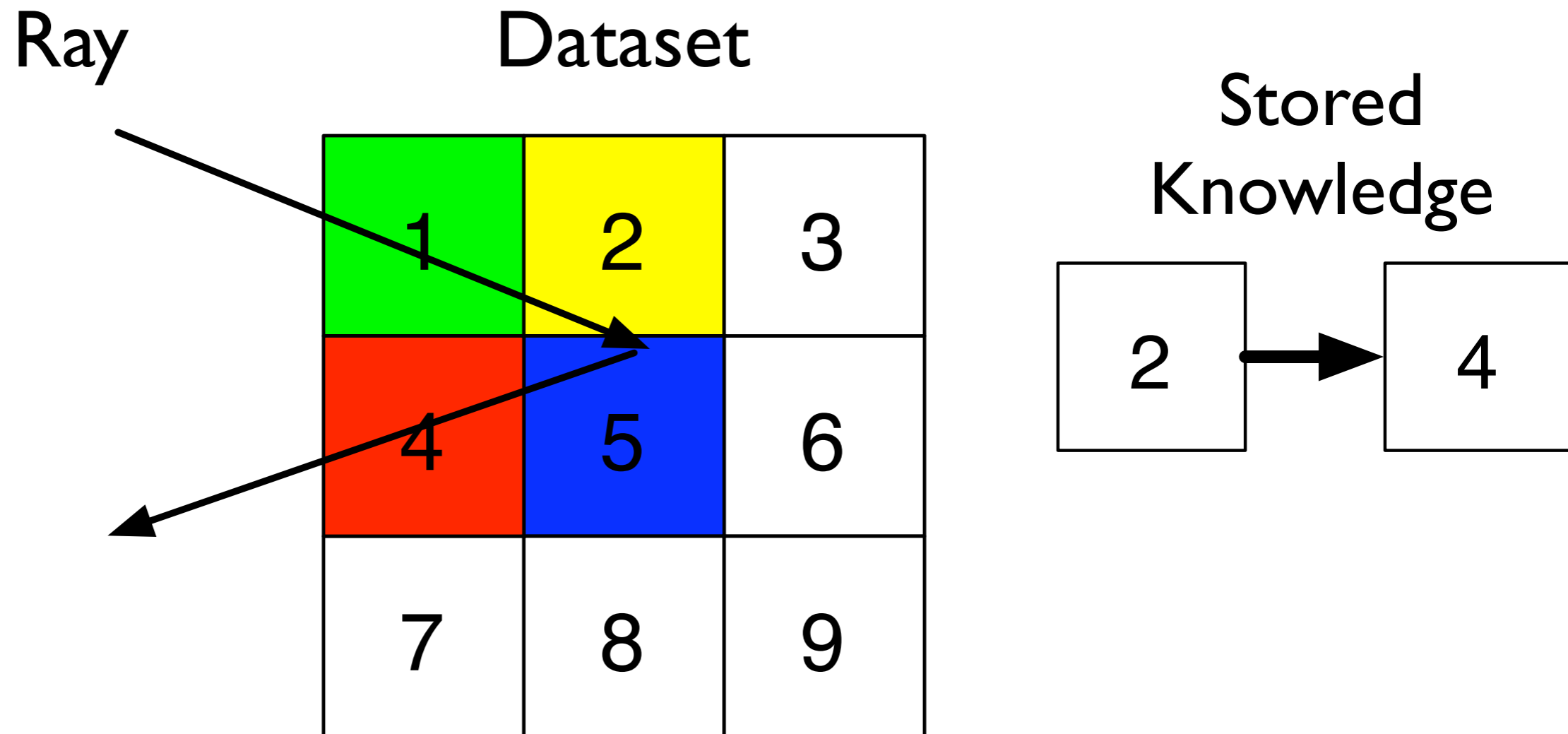
Access Path Predictor

Ray

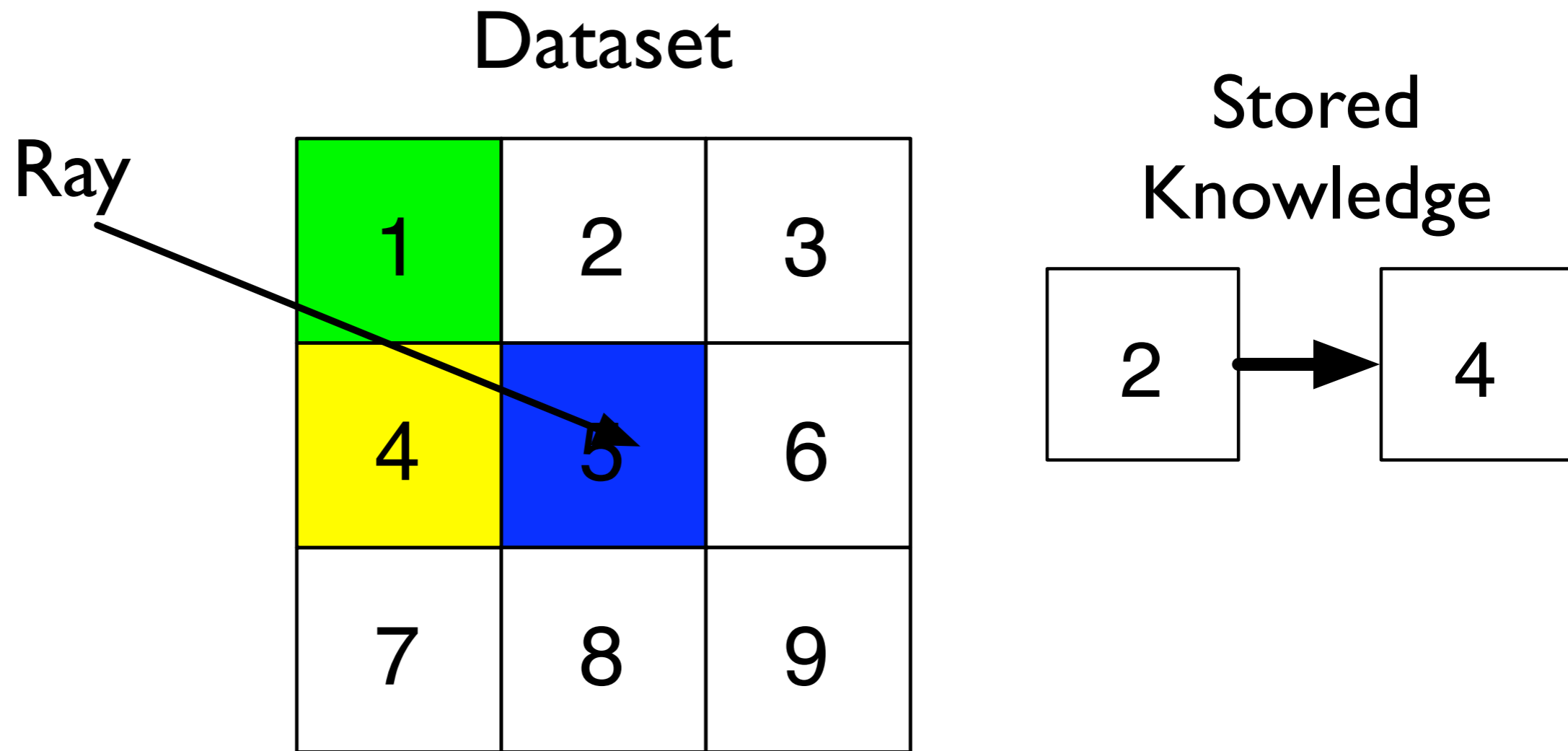
Dataset



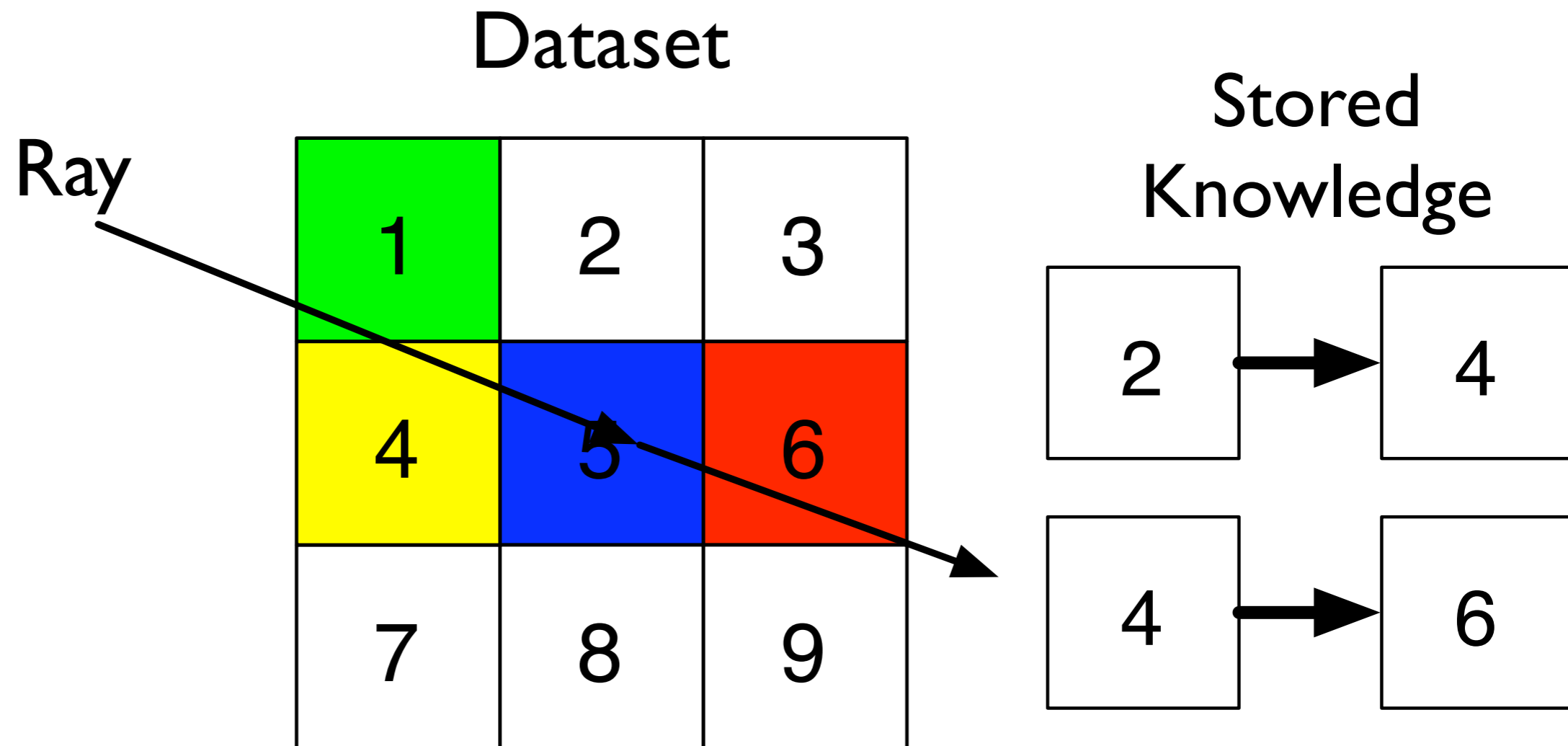
Access Path Predictor



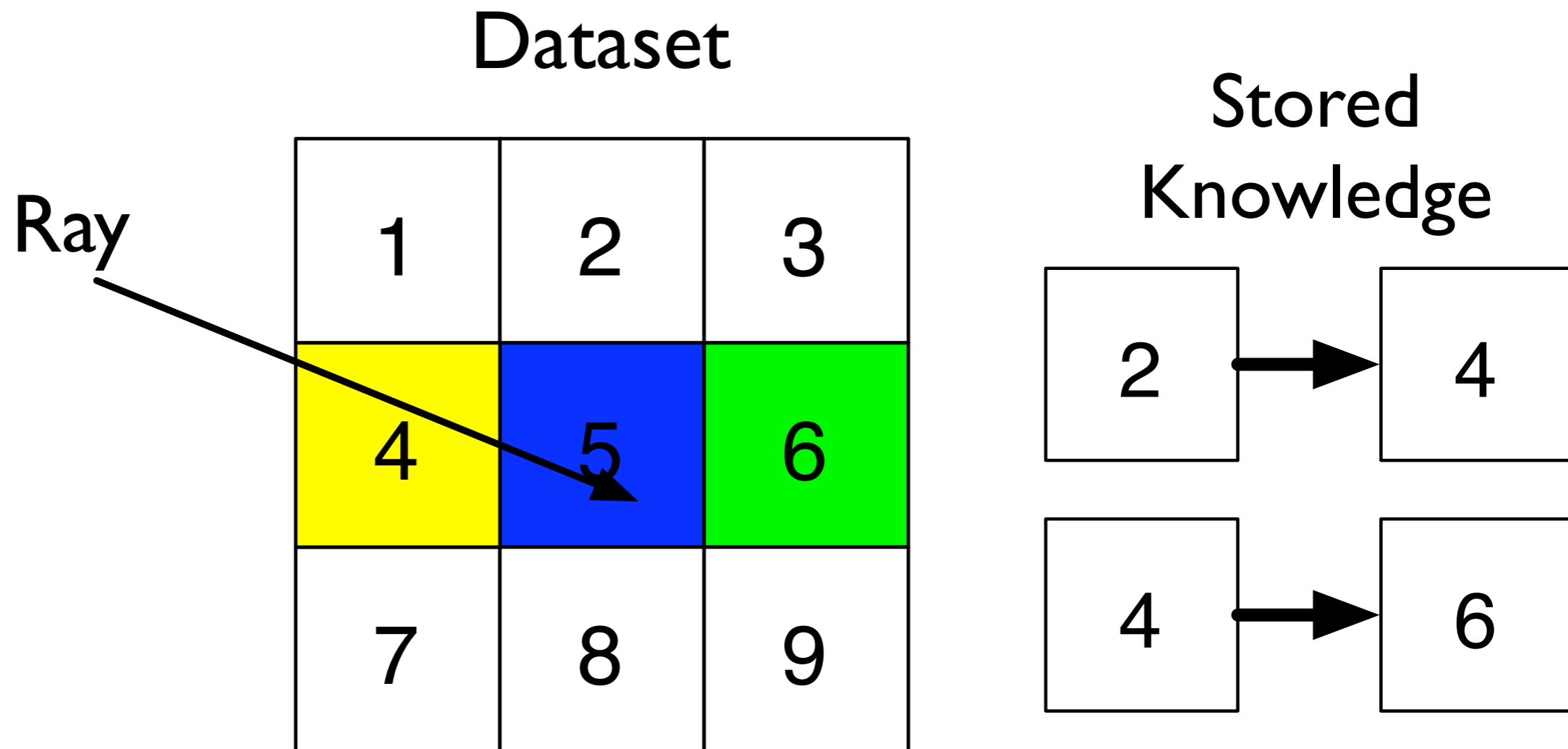
Access Path Predictor



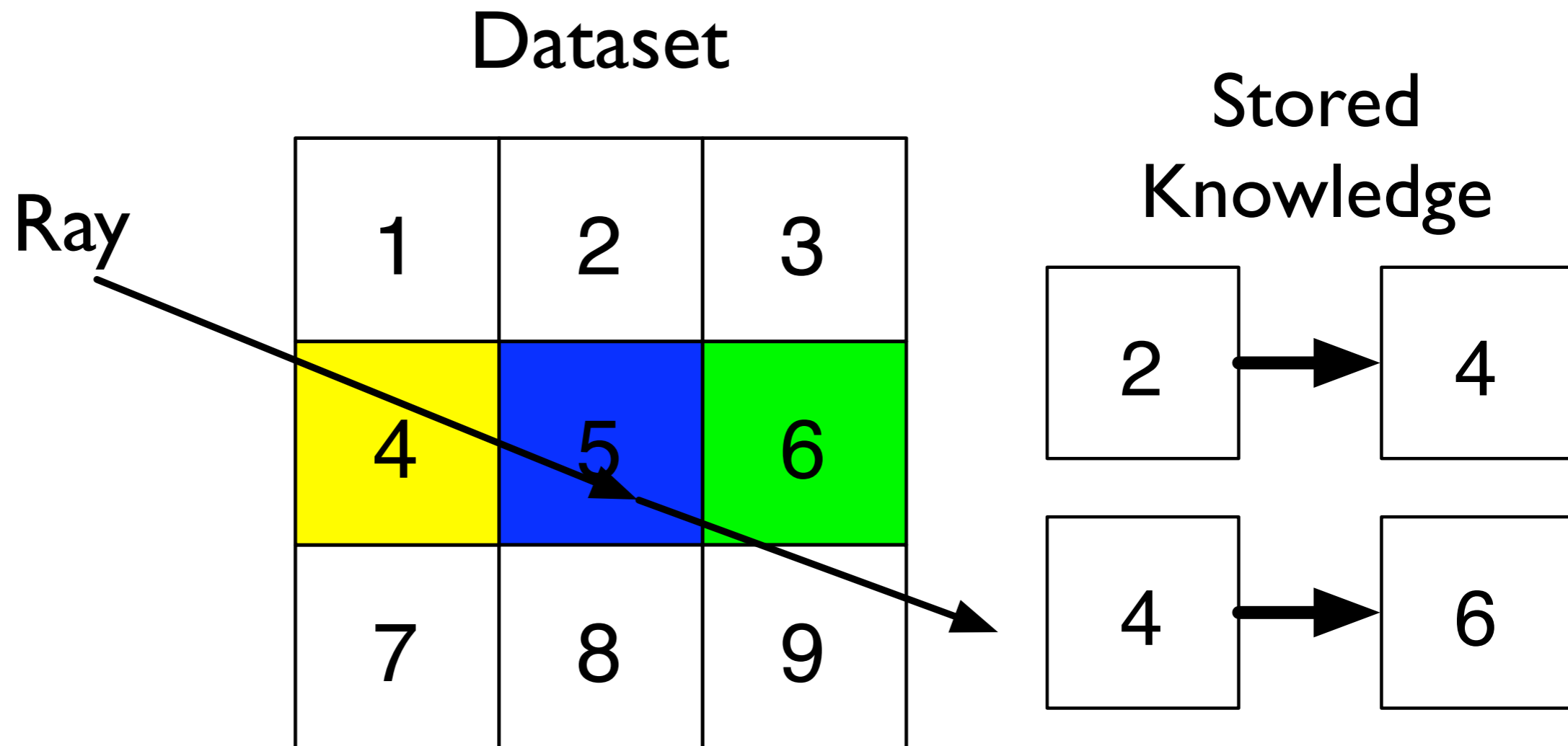
Access Path Predictor



Access Path Predictor



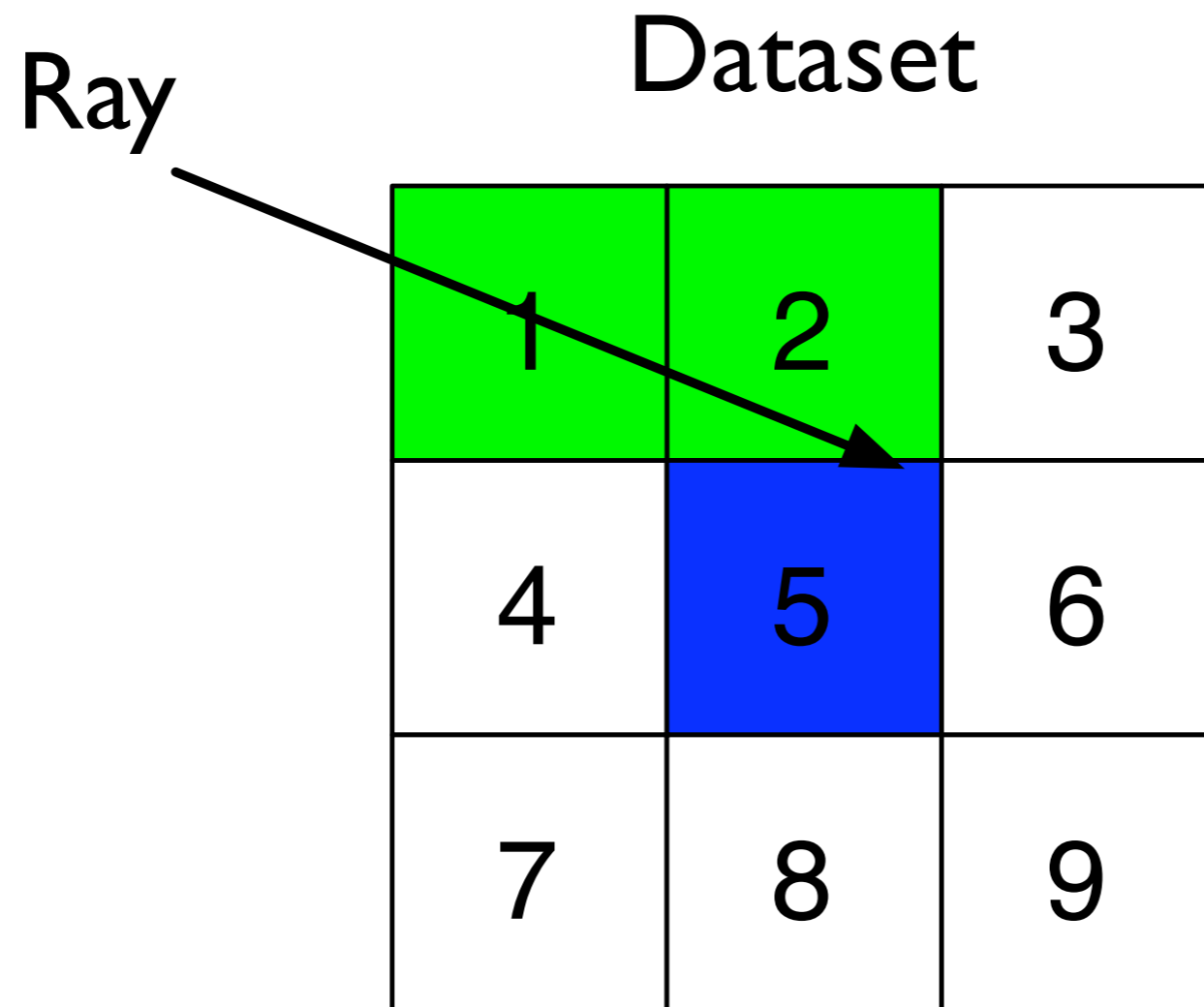
Access Path Predictor



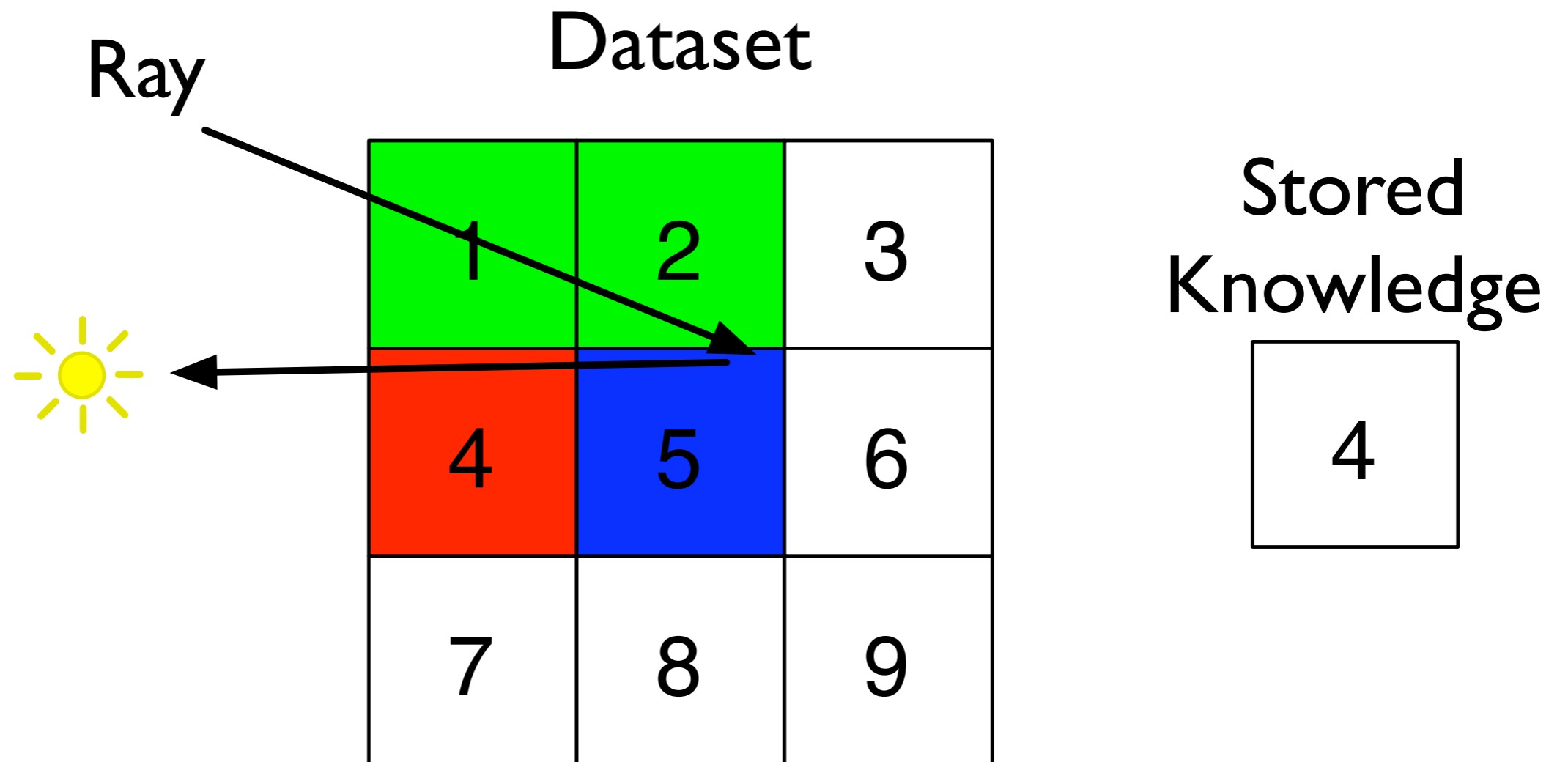
History Access Predictor

- Assumes repeated successor pattern
- Stores eight previous successors
- Loads all previous successors when a node is accessed

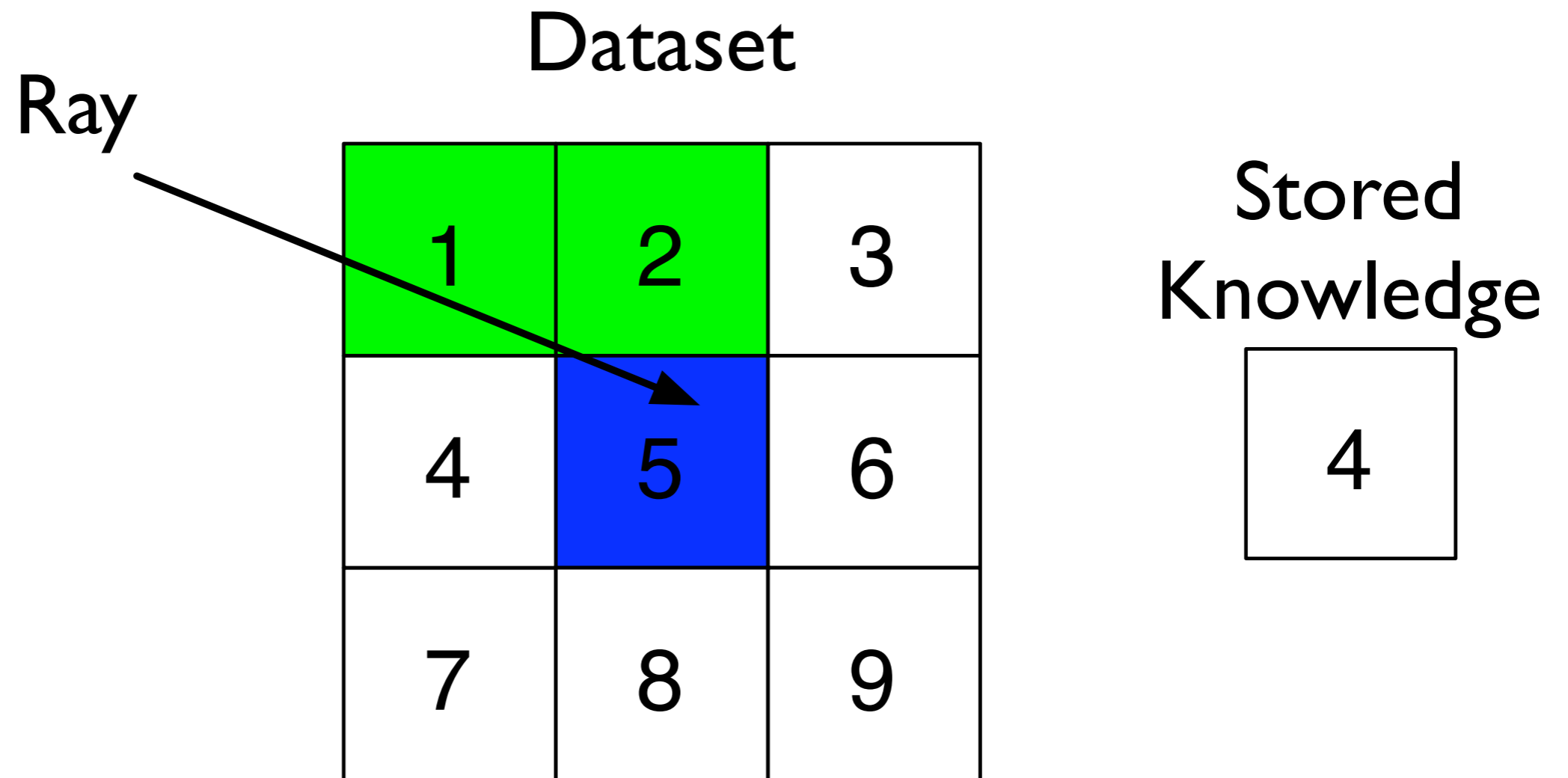
History Access Predictor



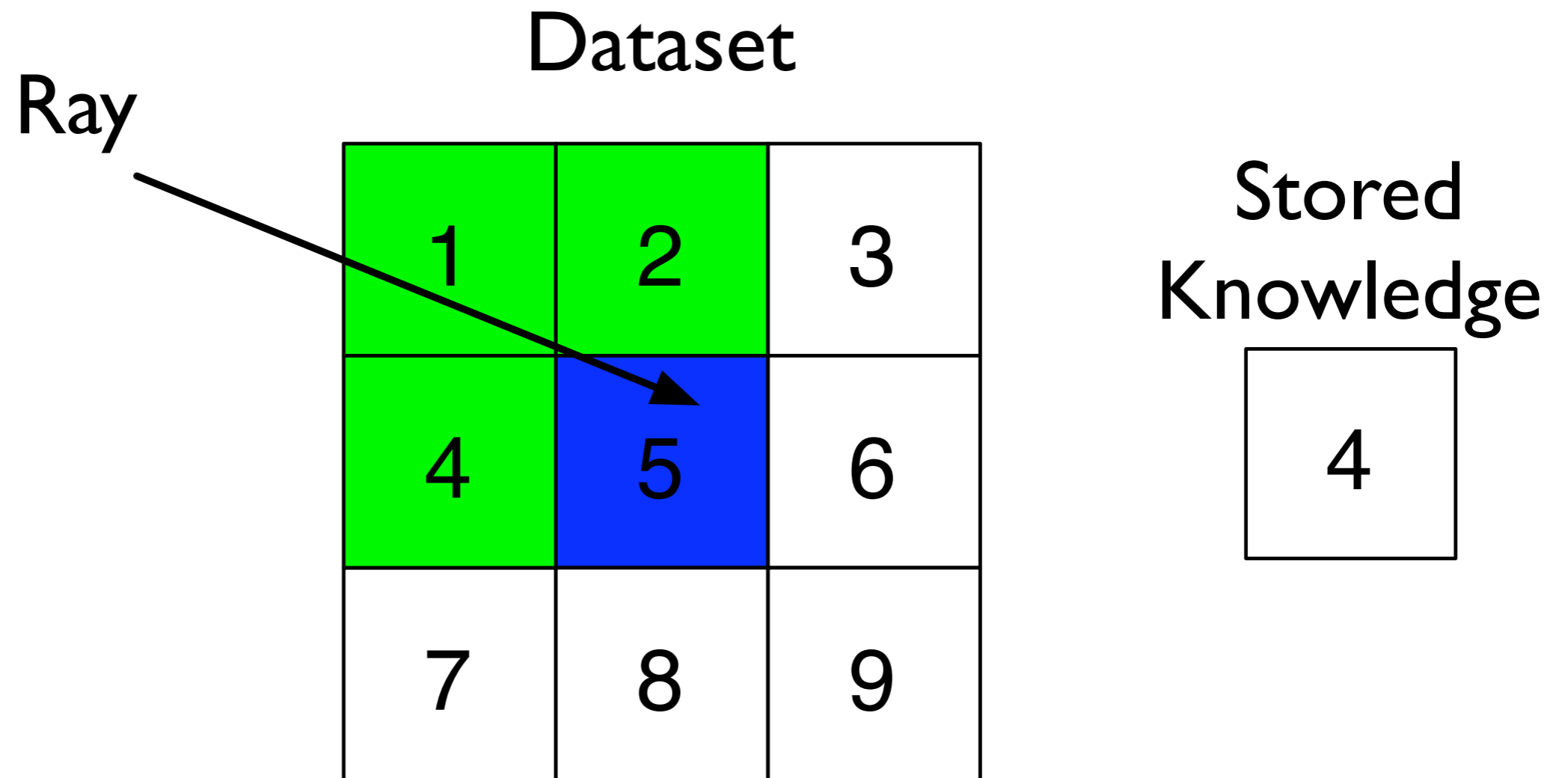
History Access Predictor



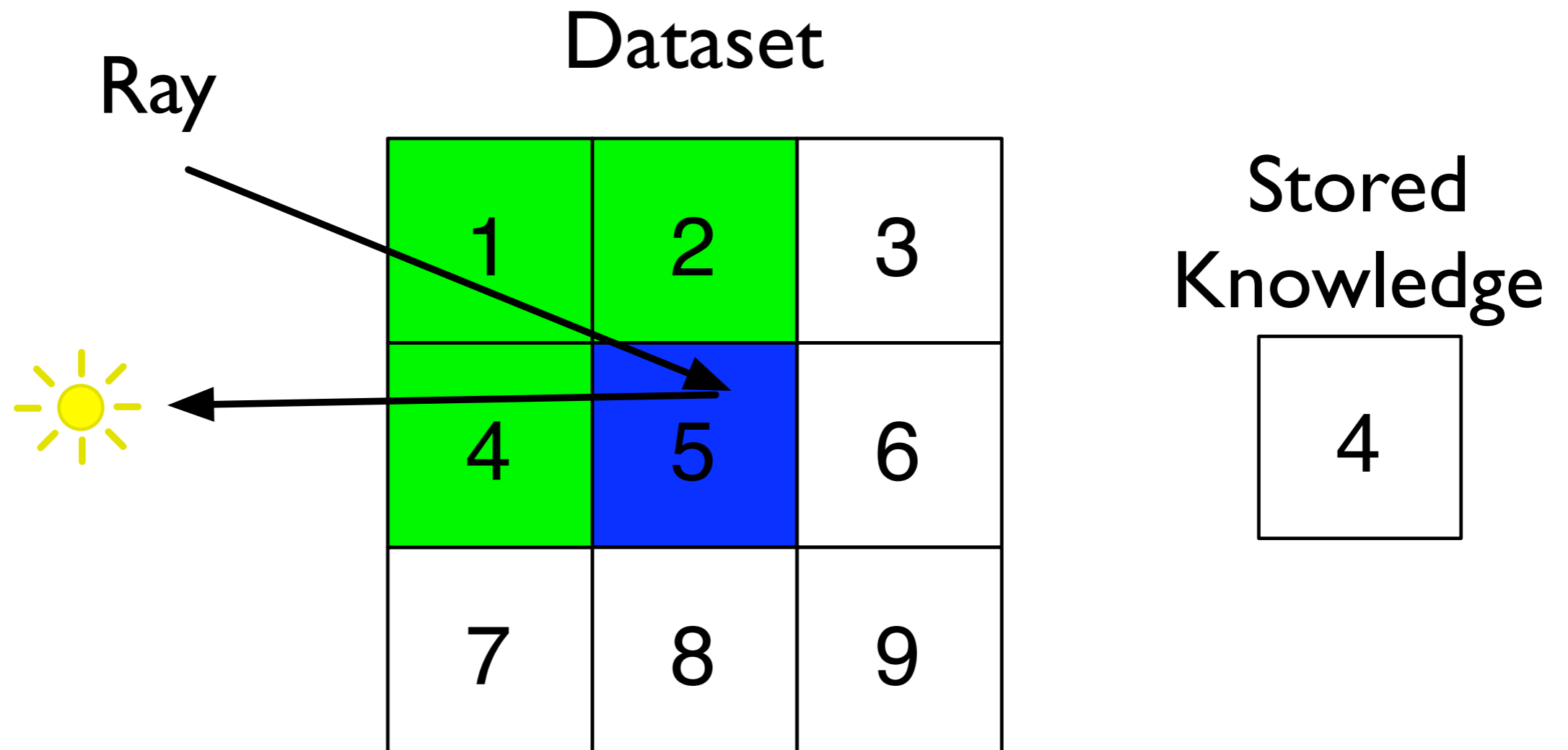
History Access Predictor



History Access Predictor



History Access Predictor



Performance Metrics

- Total disk accesses
- Cache hit rate
- Rendering time

Testing Results



Normalised Disk Reads

	LRU	RDP	APP	HAP
Best	1	0.4	0.3	0.8
Average	1	1.8	0.8	1.9
Worst	1	5.1 (38)	1.4	4.9
Rank	2	3	1	4

Cache Hit Rate

	LRU	RDP	APP	HAP
Best	99.9%	100%	99.9%	99.9%
Average	98.9%	99.8%	99.8%	99.7%
Worst	91.1%	99.3%	99.2%	99.0%
Rank	4	1	2	3

Normalised Timings

	LRU	RDP	HAP	APP
Best	1	0.88	0.87	0.96
Average	1	0.91	0.90	1.01
Worst	1	1.05	1.03	1.05
Rank	3	2	1	4

Conclusion & Questions