The Bunker Cache for Spatio-Value Approximation

Joshua San Miguel, Jorge Albercio, Natalie Enright Jerger and Aamer Jaleel

### Bunker Cache Overview

The Bunker Cache exploits spatio-value similarity, mapping approximately similar data to the same cache storage location based solely on their memory address. This enables efficiency gains via reductions in 1) last-level cache misses, 2) off-chip memory accesses and 3) cache storage requirements.

The Bunker Cache requires only modest changes to cache indexing hardware, integrating easily into commodity systems.

#### Spatio-Value Similarity

Data elements that are similar in value exhibit spatial regularity in memory. This is inherent to 1) the data values of real-world applications, and 2) the way we store data structures in memory.

The figures below show output quality with varying similarity strides, demonstrating significant spatio-value similarity in our applications.

#### Application Speedup

![Application Speedup Chart](Image)

#### Dynamic Energy Savings

![Dynamic Energy Savings Chart](Image)

#### Leakage Power Savings

![Leakage Power Savings Chart](Image)

#### Output Quality

![Output Quality Chart](Image)