DDARING: Dynamic Data-Aware Reconfiguration, INtegration & Generation

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Specialized Functions: Software Defined Hardware (SDH)

Overview





Static Data-aware Optimizer (SDO)

Generate variants a store then library	all nd ^{n in a} Algorithm	ו	KM	eans	DBScan
Use input knowledg to select k	data + e base Initializat best	ion	byd	User	Random
variant at runtime	Distance	Eucl	idean	Manhattan	Silhouette
Record ru in knowled base for fi use	ntimes dge Stop Crite uture	eria Conve	ergence	# Limit	Random
D T, C Lightweight cost estimation					TA1 interfac Profile monitor Profile monitor
	K_1 K_1, K_2 K_2		for mapp kernels/ to HW bi bloc Edge labels data (dense Edge labels (mapping to	<i>D</i> represent meta- e vs sparse, etc.) s (<i>T</i> , <i>C</i> represent	 Profile monitor Lowest level run- Profiling is input When a new pha
kflows	Kernel/Tasks (Some frequently co- occurring kernels may be merged)	HW Configuratio	parametrize	ed cost models) This rese	where cache mis populated by the Distribution Sta arch was developed with

Answers to Heilmeier Questions 1 to 4

tool chain to a-intensive n near-ASIC and programmability econfigure hardware and algorithm	 2. Current practice: H/w reconfiguration is o of magnitude slower that Tool chains do not dynatic reconfigure hardware not exploit data characterist Programmability of current chains for accelerators i accessible to "ninja" explored.
driven co- algorithmic vare configurations formations h-level Python- d programming figurable hardware	 4. Impact: Near-ASIC performance data-intensive algorithm high programmability Transition to open source/vendor products Adoption by transition p in DoD community
Dynamic Ke Best programmer effort	rnel Reoptimization (D Profiling & optimization c[k] += a[i] * b[j] [132, 134, [128, 129, [4, 5,]





into the trained LSTM to detect phase changes during dynamic execution. ase is detected, it is looked up in a code & configuration cache (CCC) ses from this are handled by the knowledge base (which in turn was auto-tuner)

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funding from the Defense Advanced Research Projects Agency (DARPA).

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