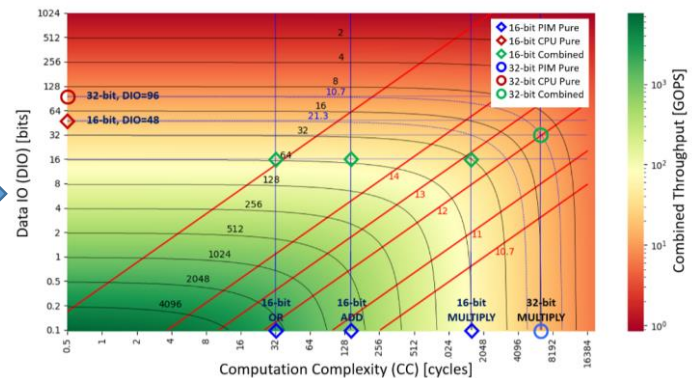


ASIC² Project

The Bitlet Model user interface: new features and GUI to increase usability

	B	C	D	E	F	G
1				1a	1b	1c
2						
3						
4						
5	Parameter Name	Notation	Units	16b-OR	16b-AND	16b-MULT
6	PIM operation complexity	OC	cycles	32	144	6,400
7	PIM Place & Align	PAC	cycles	-	-	-
8	PIM computational complexity	CC=OC*PAC	cycles	32	144	6,400
9	PIM cycle time	CT	sec	1.0E-08	1.0E-08	1.0E-08
10	PIM array dimension (Rows)	R	#	1,024	1,024	1,024
11	PIM array count	MATs	#	8,192	8,192	8,192
12	PIM energy for op (OC*1) per bit	EbMat _{op}	Joules	1.0E-13	1.0E-13	1.0E-13
13	CPU memory bandwidth	BW	ops	6.0E-12	6.0E-12	6.0E-12
14	CPU data in-out bits (CPU Pure)	DIO _{CPU}	bits	48	48	96
15	CPU data in-out bits (PIM+CPU)	DIO _{combined}	bits	16	16	32
16	CPU energy per bit transfer	EbMat _{cpu}	Joules	1.5E-11	1.5E-11	1.5E-11
17	Entity	Notation	Units			
18	PIM Throughput	TP _{PIM}	GOPS	26,214	5,825	183.1
19	CPU Throughput (CPU Pure)	TP _{CPUpure}	GOPS	125.0	125.0	62.5
20	CPU Throughput (PIM+CPU)	TP _{CPUcombined}	GOPS	375.0	375.0	183.5
21	Combined Throughput	TP _{combined}	GOPS	368.7	352.9	372.1
22	PIM Power	P _{PIM}	Watts	83.9	83.9	83.9
23	CPU Power	P _{CPU}	Watts	80.0	80.0	80.0
24	Combined Power	P _{combined}	Watts	89.9	89.6	86.4
25	CPU Energy per Computation	EPC _{CPU}	J/GOP	0.72	0.72	1.44
27	Combined Energy per Computation	EPC _{combined}	J/GOP	0.24	0.25	1.14



Background: The memristive Memory Processing Unit (mMPU) is a new processing-in-memory computer architecture, which performs the computation without moving the data from the computer's main memory (RAM). The logic implementation in the mMPU is based on emerging memory technology of ReRAM (resistive RAM), transpose memory array, and the MAGIC NOR operations, which exhibit massive vector operations.

The Bitlet model is a new analytical, parameterized, modeling tool, developed in the ASIC² lab. The Bitlet model can be used to estimate the performance and the power of a PIM-based system and thereby assess the affinity of workloads for PIM as opposed to traditional computing.

In order to make Bitlet more beneficial, it has to be made more accessible to users by equipping it with new features and interactive graphical user interface. These additions will allow easy evaluation of various tradeoffs and clear visualization of relations among parameters.

Project Description:

1. Acquire knowledge and understanding of the mMPU design and operation, and of the Bitlet model.
2. Study relevant graphical user interface and visualization tools
3. Defining the Bitlet new features and GUI.
4. Implement the Bitlet user interface; optimize for fast response time.
5. Prepare an installation kit, a demo, and few templates.

Prerequisites: Experience in GUI design is a big advantage. Knowledge of logic design and computer architecture is an advantage.

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