

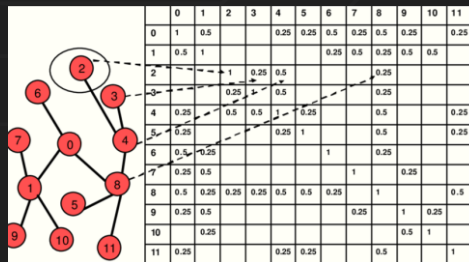
SPARSE MAT-MUL ON THE GPU

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BACKGROUND



Scientific Computing



Graph Algorithms



Machine Learning

OUR IMPLEMENTATIONS



Sparse Matrix Representation

1	0	0
0	2	0
0	3	0

Row pointers

0	1	2	3
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Column indices

0	1	1
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Values

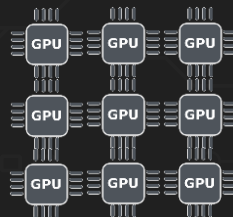
1	2	3
---	---	---

1	0	0
0	1	0
0	0	1



GPU

1	0	0
0	1	0
0	0	1



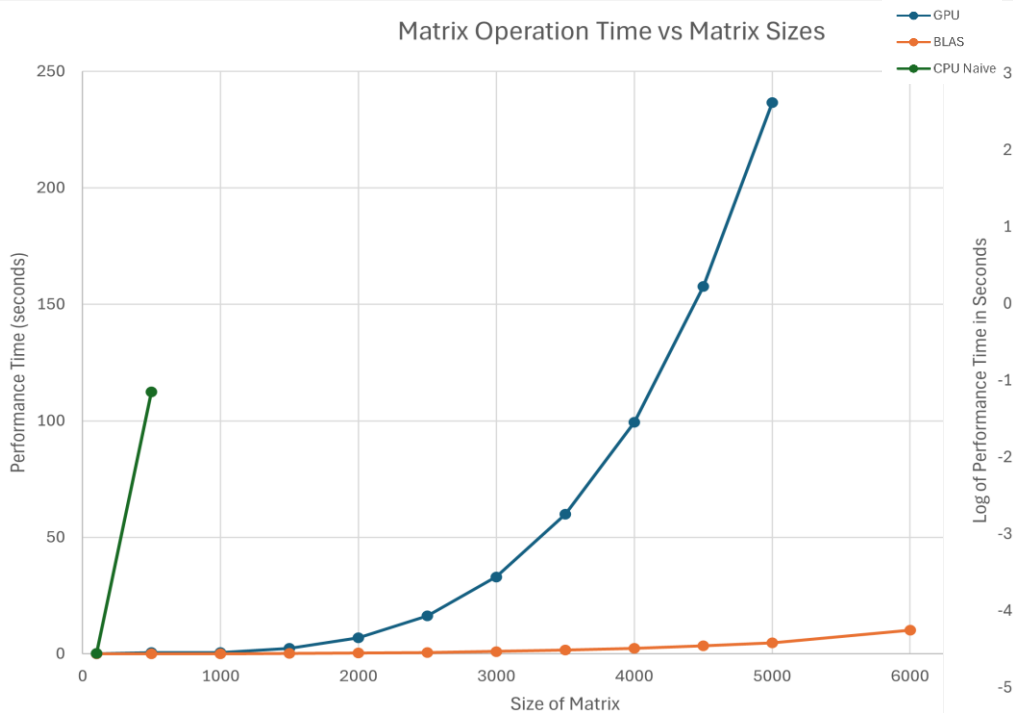
1	0	0
0	1	0
0	0	1

Serial

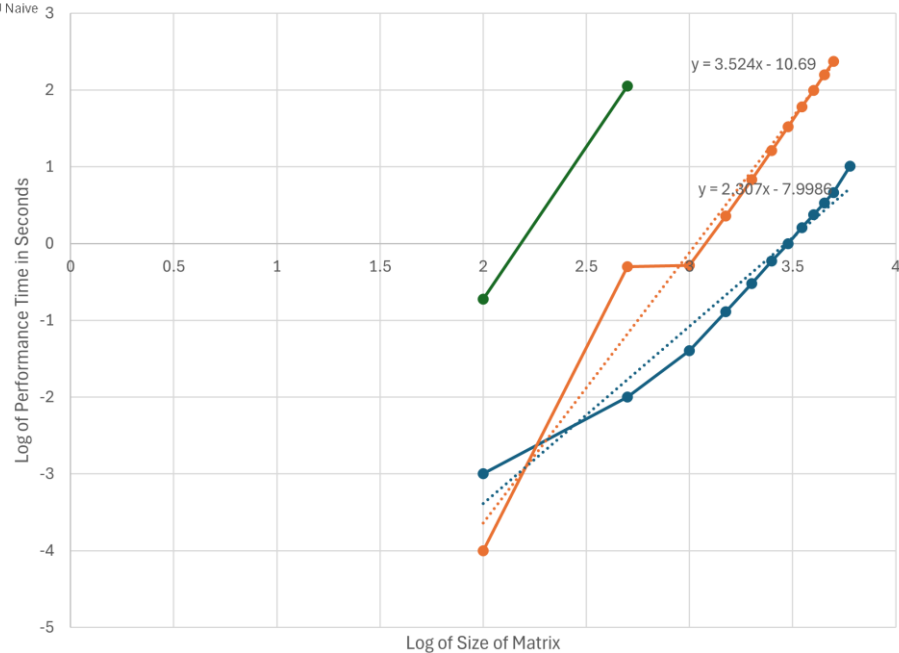
$$\begin{bmatrix} a_1 & a_2 & a_3 \\ a_4 & a_5 & a_6 \\ a_7 & a_8 & a_9 \end{bmatrix} \begin{bmatrix} b_1 & b_2 & b_3 \\ b_4 & b_5 & b_6 \\ b_7 & b_8 & b_9 \end{bmatrix} = \begin{bmatrix} c_1 & c_2 & c_3 \\ c_4 & c_5 & c_6 \\ c_7 & c_8 & c_9 \end{bmatrix}$$

PERFORMANCE RESULT

Matrix Operation Time vs Matrix Sizes



Log of Performance Time vs Log of Size



OPTIMIZATIONS

MEMORY

1

Reducing overhead of
host-device
communication.

NEW ALGORITHMS

2

Gustavson's Algorithm.

CSC

3

Compressed sparse
column

