

Performance matters:  
inside loops

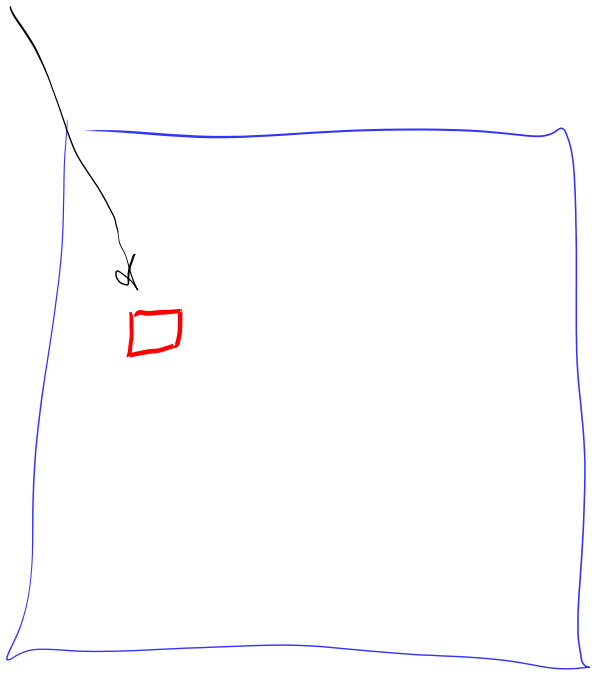
Matrix Multiplication

Optimize operations:  
repeat work

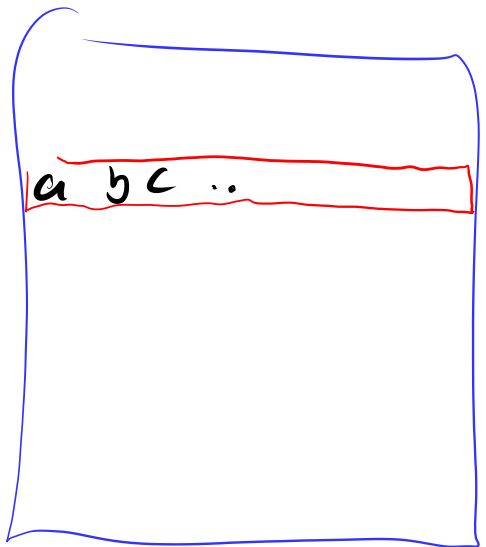
Matrix  $\sim$  2D  $\begin{matrix} \uparrow \\ \text{square} \end{matrix}$  array of numbers

$$\begin{bmatrix} 1 & 2 & 3 \\ 4 & 7 & 0 \\ -5 & 2.1 & 3 \end{bmatrix} \times \begin{bmatrix} 2 & 2 & 2 \\ 3 & 3 & 4 \\ 4 & 5 & 5 \end{bmatrix}$$

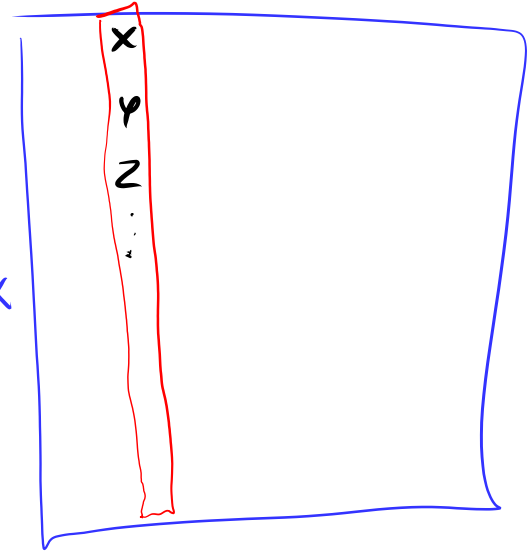
$$ax + by + cz + \dots$$



1)



x



Row-major

0	1	2	3	4
5	6	7	8	9
10	11	12	13	14
15	16	17	18	19

column-major

0	5
1	6
2	7
3	↓
4	

# define CIDX(r, c)

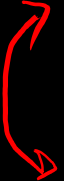
→ # define RIDX(r, c)

$$((3) * N + (4))$$
~~$$RIDX(3, 4)$$~~

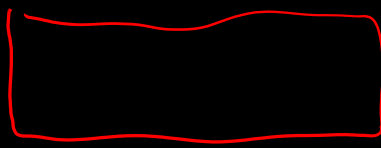
$$((r) + N * (c))$$

$$((r) * N + (c))$$

~~$$RIDX(\text{this \& is bad}, \text{so bad!})$$~~



|



part of a line



multiple cache lines