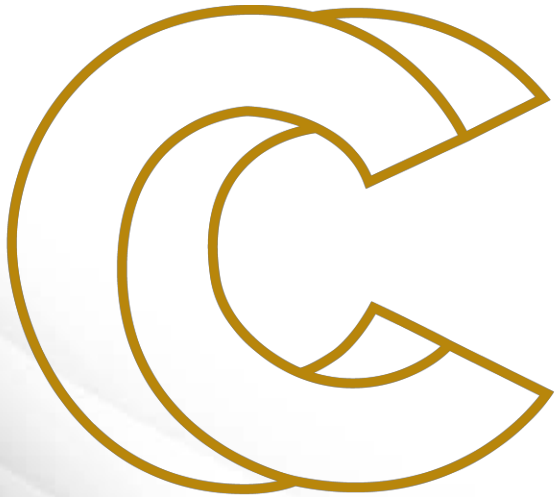
TÜBİTAK

Sabancı Üniversitesi



EURO^2

Performance Engineering on CPUs and GPUs:

- GPUs: Things to be Careful for Performance -

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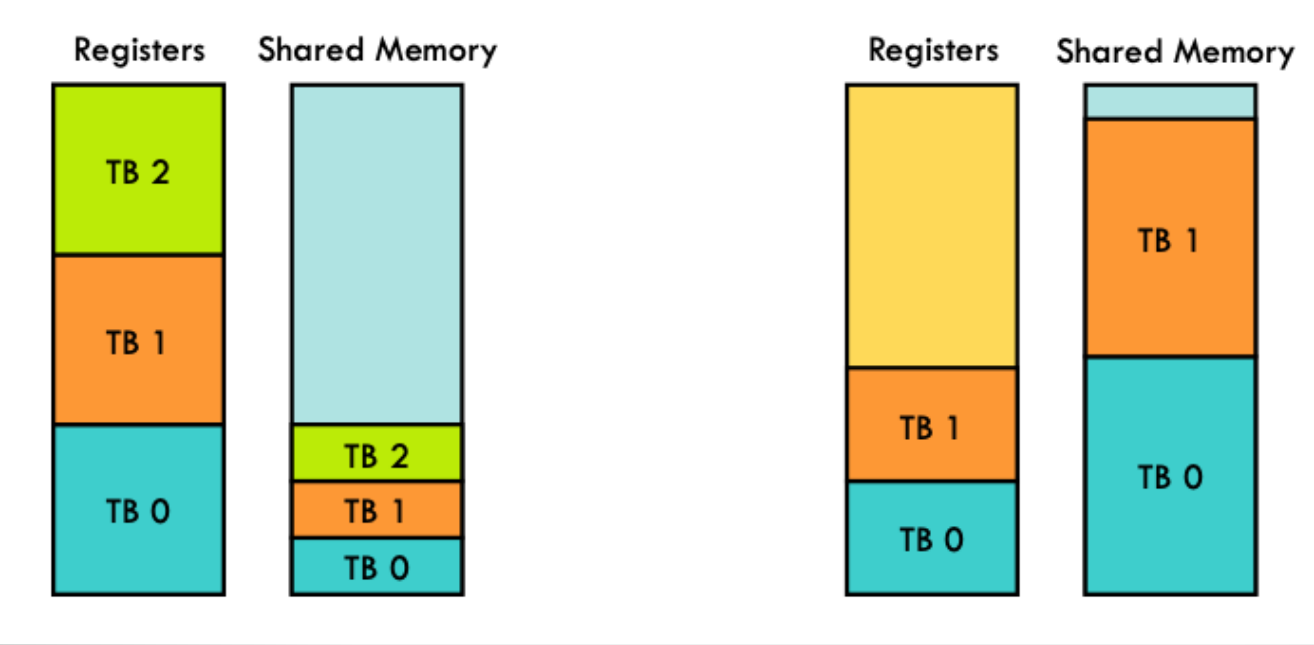
Things to be Careful for Performance: (4) Occupancy

EURO²

- What determines occupancy?
- Limited resources
  - Register usage per thread.
  - Shared memory per thread block.

Things to be Careful for Performance: (4) Occupancy

```
Total amount of shared memory per block:       49152 bytes
Total shared memory per multiprocessor:        98304 bytes
Total number of registers available per block: 65536
Warp size:                                     32
Maximum number of threads per multiprocessor:  2048
Maximum number of threads per block:           1024
```

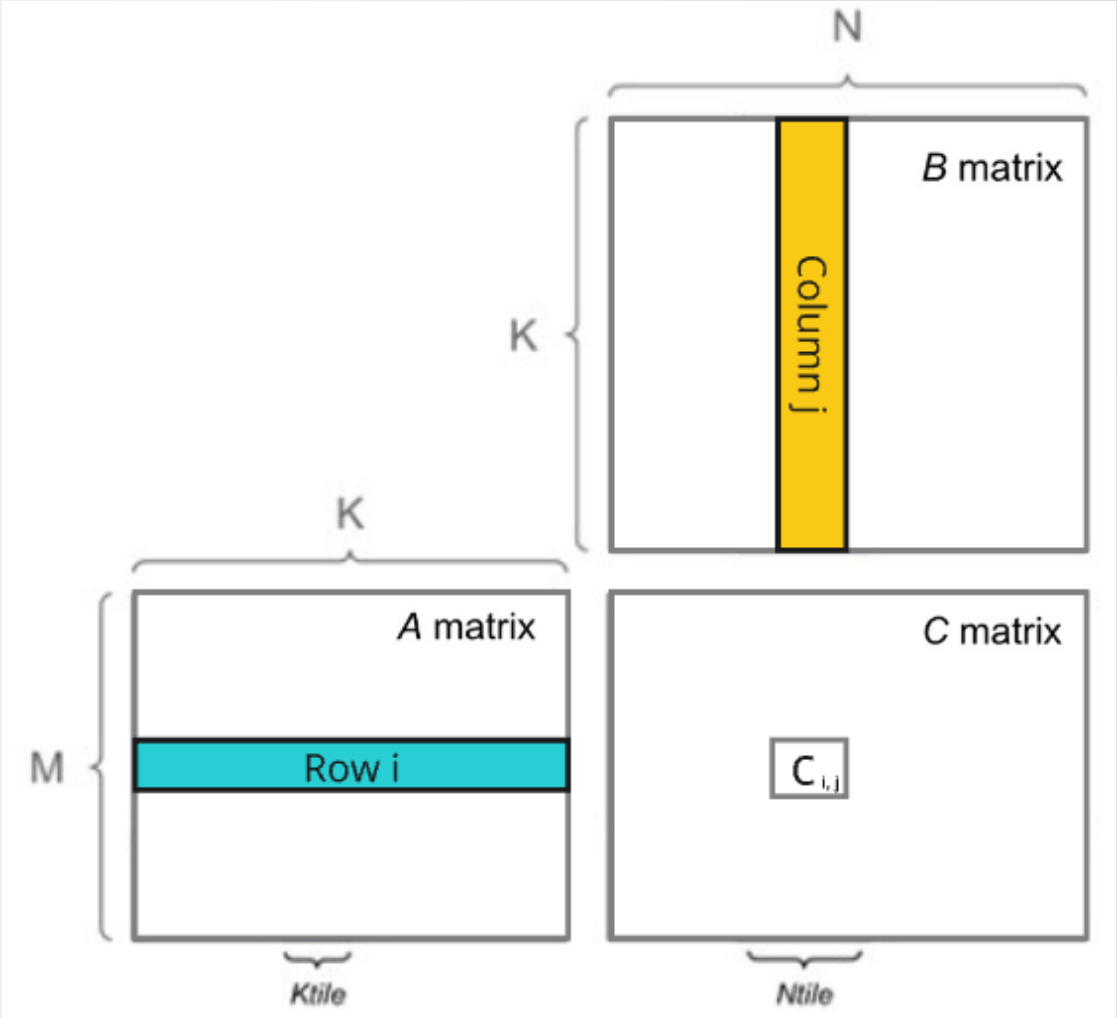


Summary: Matrix Multiplication

EURO²

$$C = A \times B$$

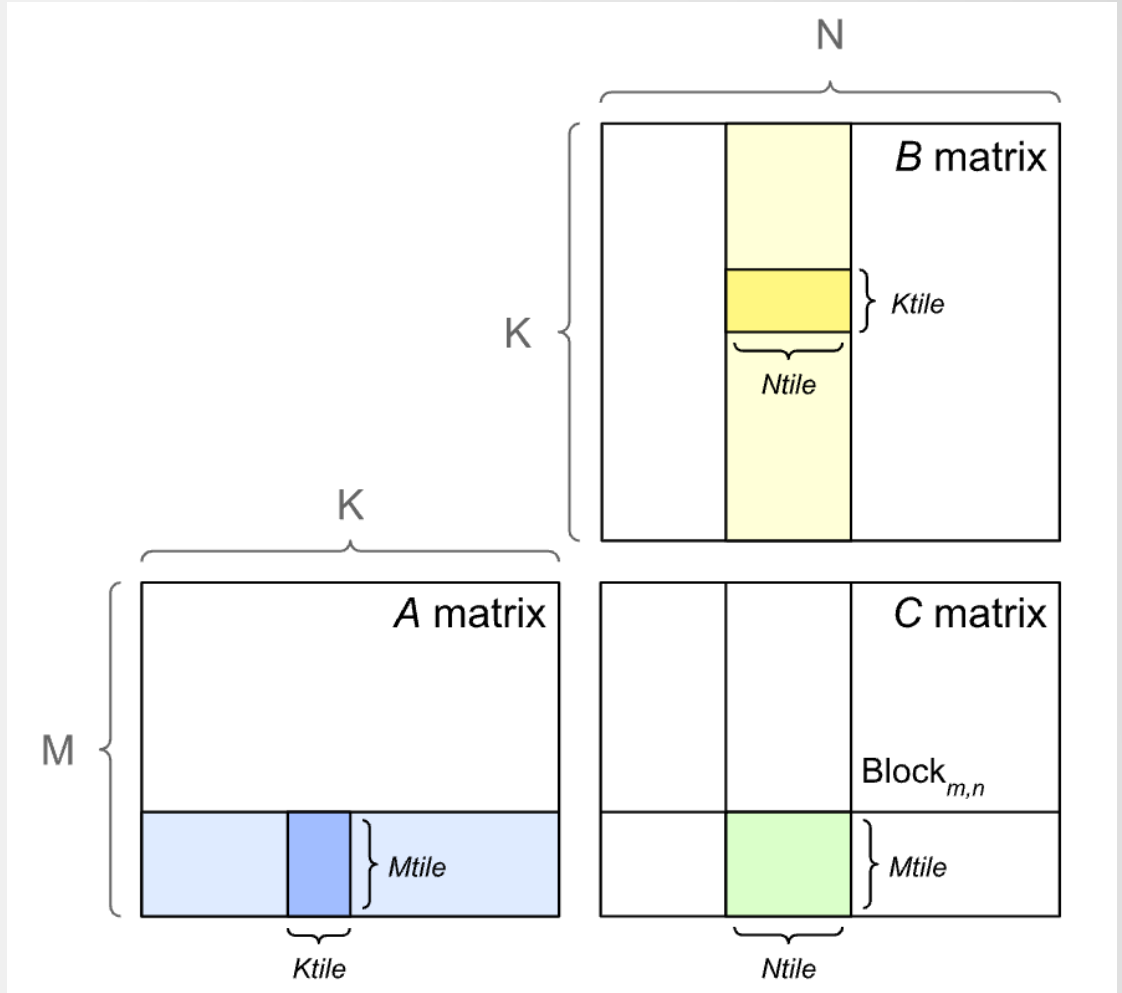
Trivial approach: Assign each entry to a single thread. Each thread will perform a dot product.



Summary: Matrix Multiplication

Another approach with shared memory use: Assign a **C** tile to a single block.

- The **A** and **B** tiles are brought to shared memory
- Computation will be performed with these tiles.
- The block will process the next tiles from **A** and **B**.



Summary: Matrix Multiplication

Let’s check the code.

Thanks

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