

# Performance analysis of edge detection in an image using cuda

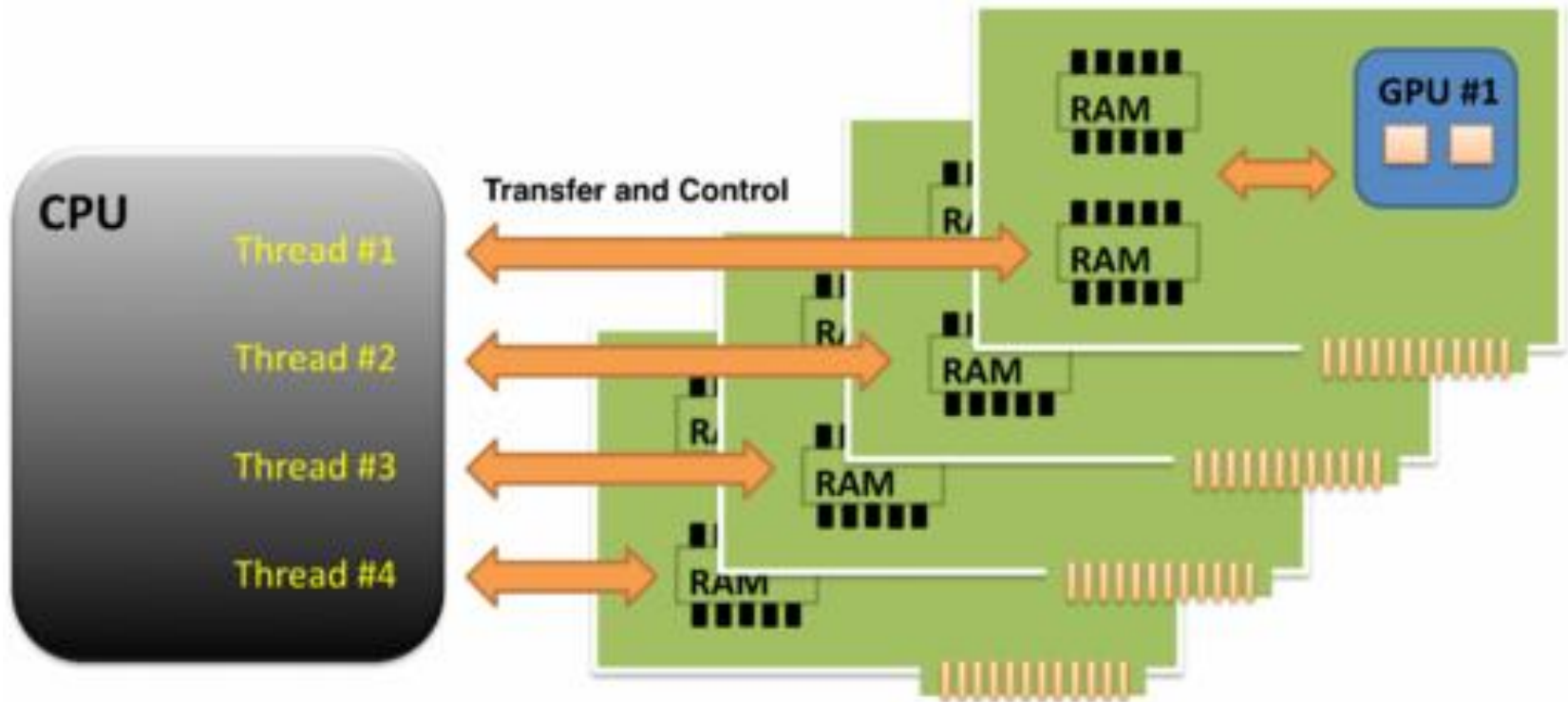
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# Agenda

1. Locality and Parallelism
2. Coordination
3. Purpose of using GPU
4. Machine properties
5. Parallelism
6. Overheads

# Locality and Parallelism

- CPU Vs GPU



# Purpose of using GPU

- Parallel implementation of edge detection should reduce the time complexity.
- Convolution: Tiled Convolution should further reduce the execution time of algorithm
- Using constant memory for storing various masks and should also enhance the performance

# Coordination

- Computation partition
- Data partition
- Concurrency management

# Different approach

## **Serial approach**

- Calculate Laplacian of Gaussian
- Read Input Image
- Convolve the image with mask
- Write image to output

## **Parallel approach**

- Calculate Laplacian of Gaussian in CPU
- Read Input image from CPU
- Copy image and Mask data to GPU
- Convolve the image data and mask
- Copy output data to CPU
- Write image to output

# Device Properties

- CPU

Name	i3-380M
Processor Frequency	2.53 GHz
Cache	3MB
Number of core	2
Number of Threads	4
Max Memory Bandwidth	17.1 GB/s

# Device Properties

## GPU

```
bk@k: ~/coding/kokil/src

--- General Information for device 0 ---

Name:      GeForce GT 540M
Compute capability:  2.1
Clock rate:  1344000
Device copy overlap:  Enabled
Kernel execution timeout :  Enabled

--- Memory Information for device 0 ---

Total global mem:  2147155968
Total constant Mem:  65536
Max mem pitch:  2147483647
Texture Alignment:  512

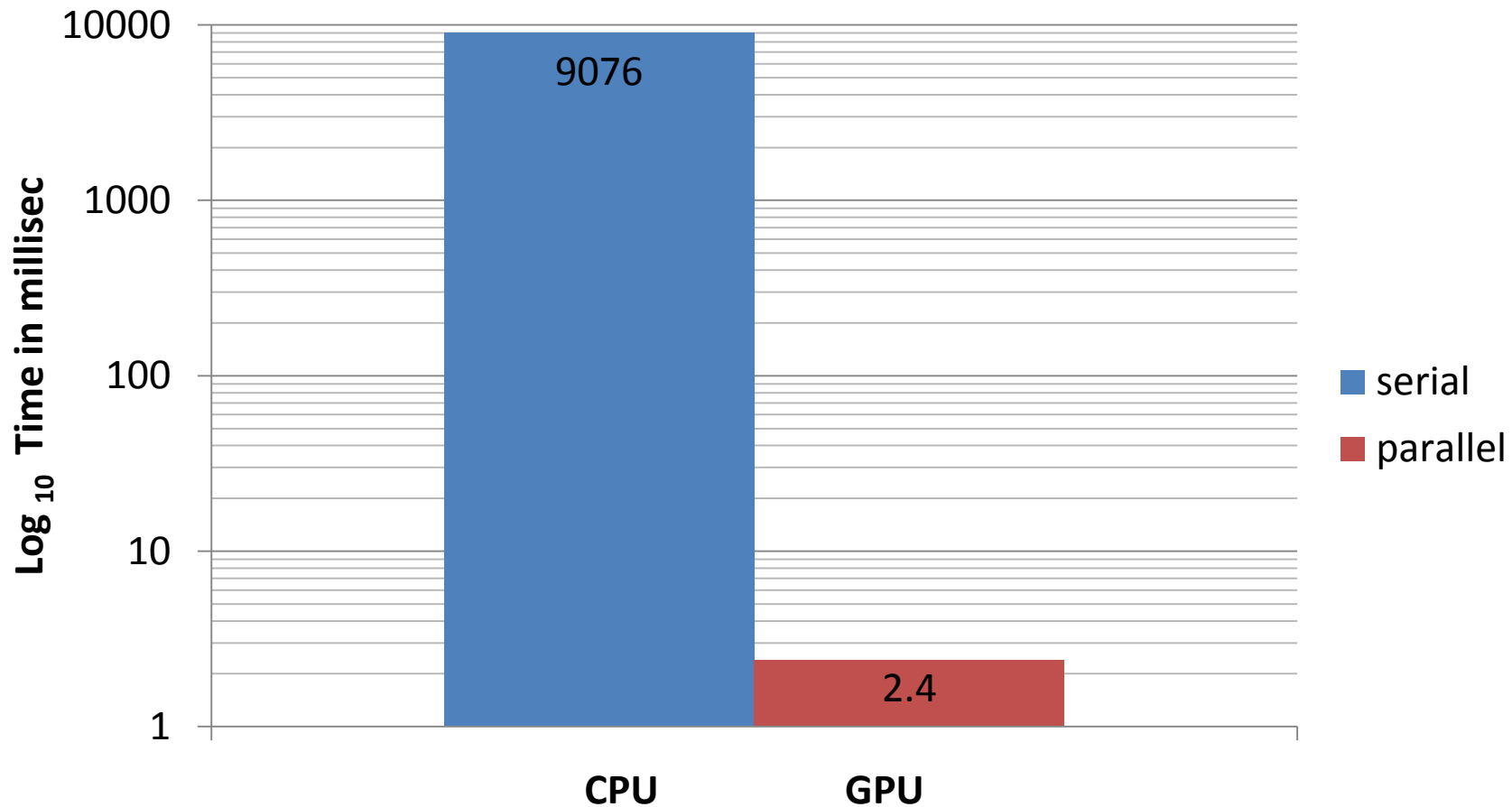
--- MP Information for device 0 ---

Multiprocessor count:  2
Shared mem per mp:  49152
Registers per mp:  32768
Threads in warp:  32
Max threads per block:  1024
Max thread dimensions:  (1024, 1024, 64)
Max grid dimensions:  (65535, 65535, 65535)
```



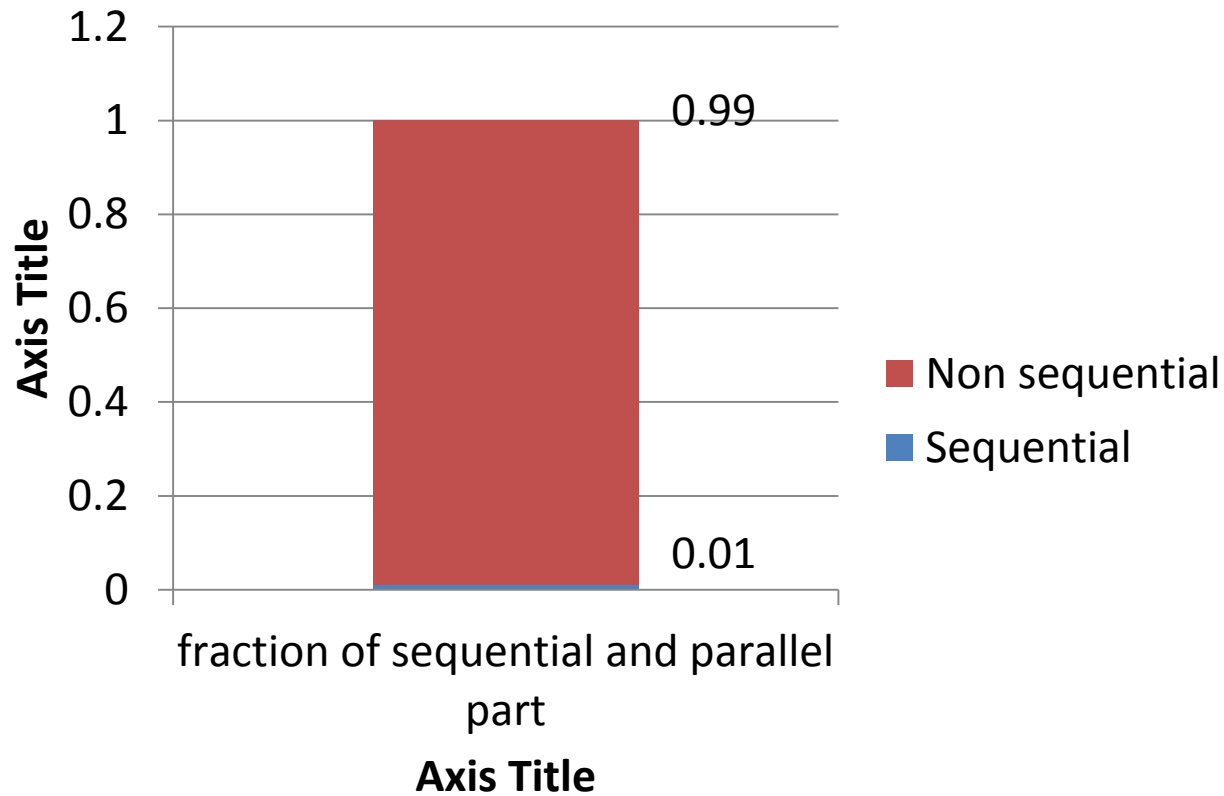
# Parallelism

Speed up time in log scale



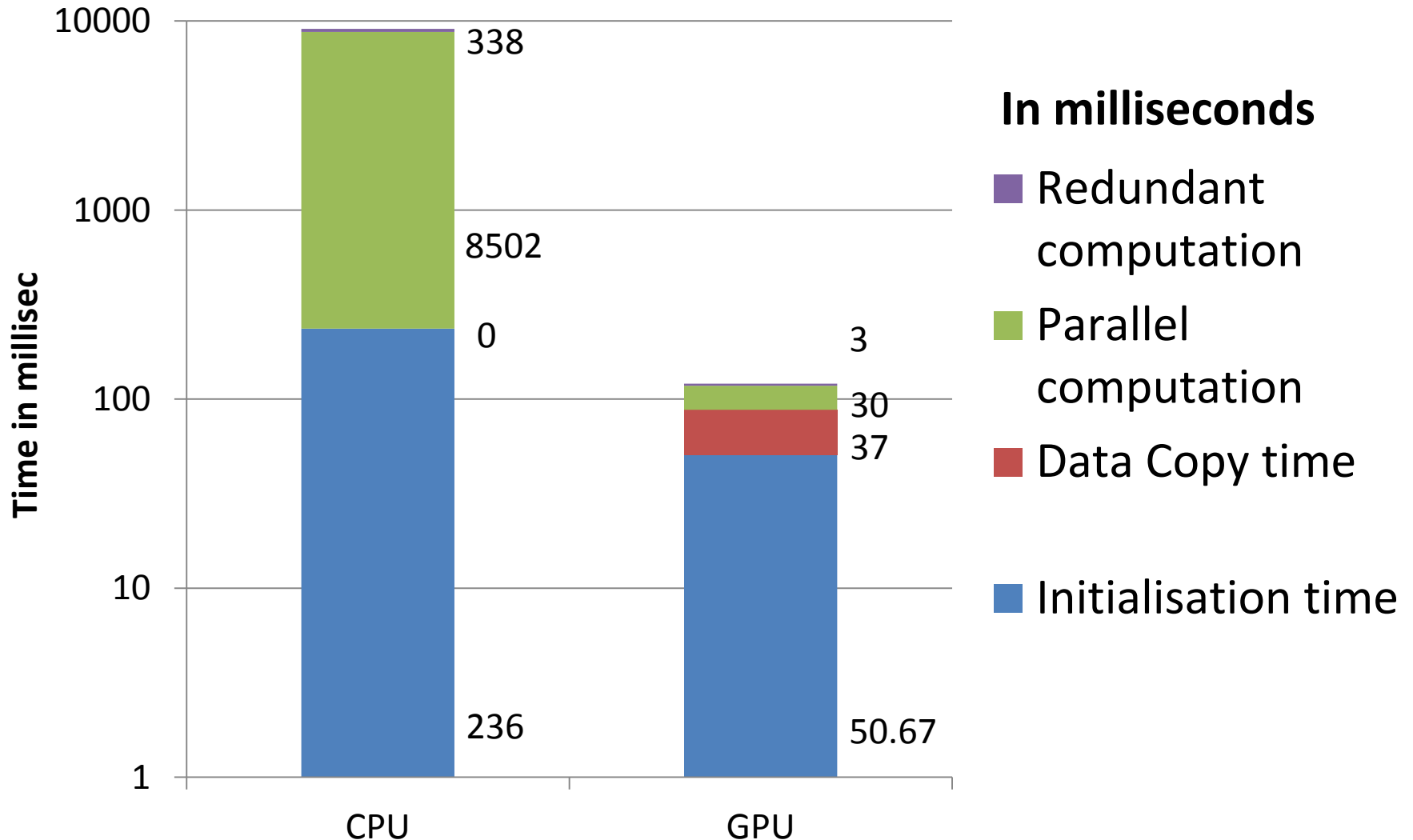
# Parallelism

## Amdahl's law



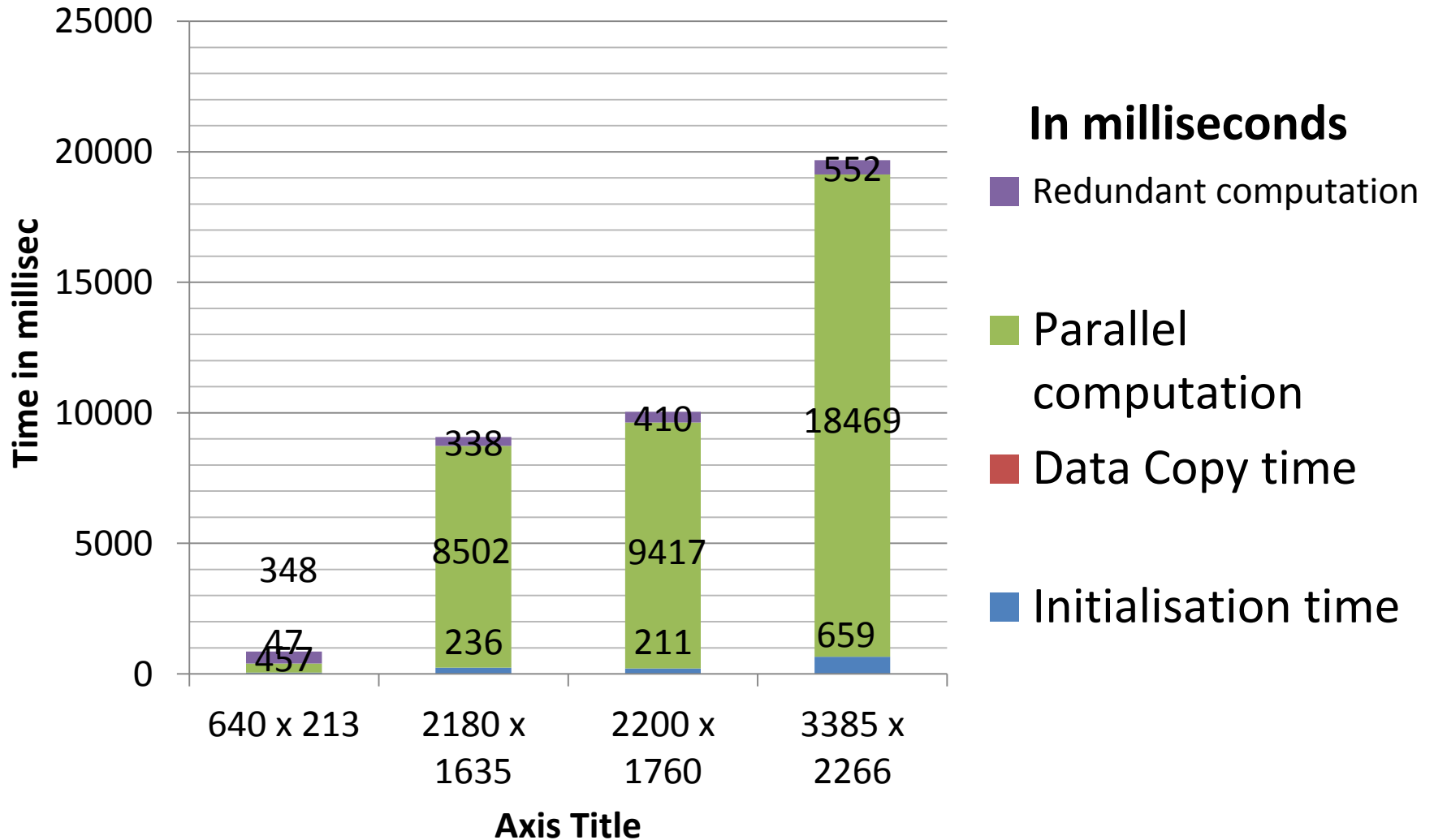
# Performance comparison

## CPU Vs GPU



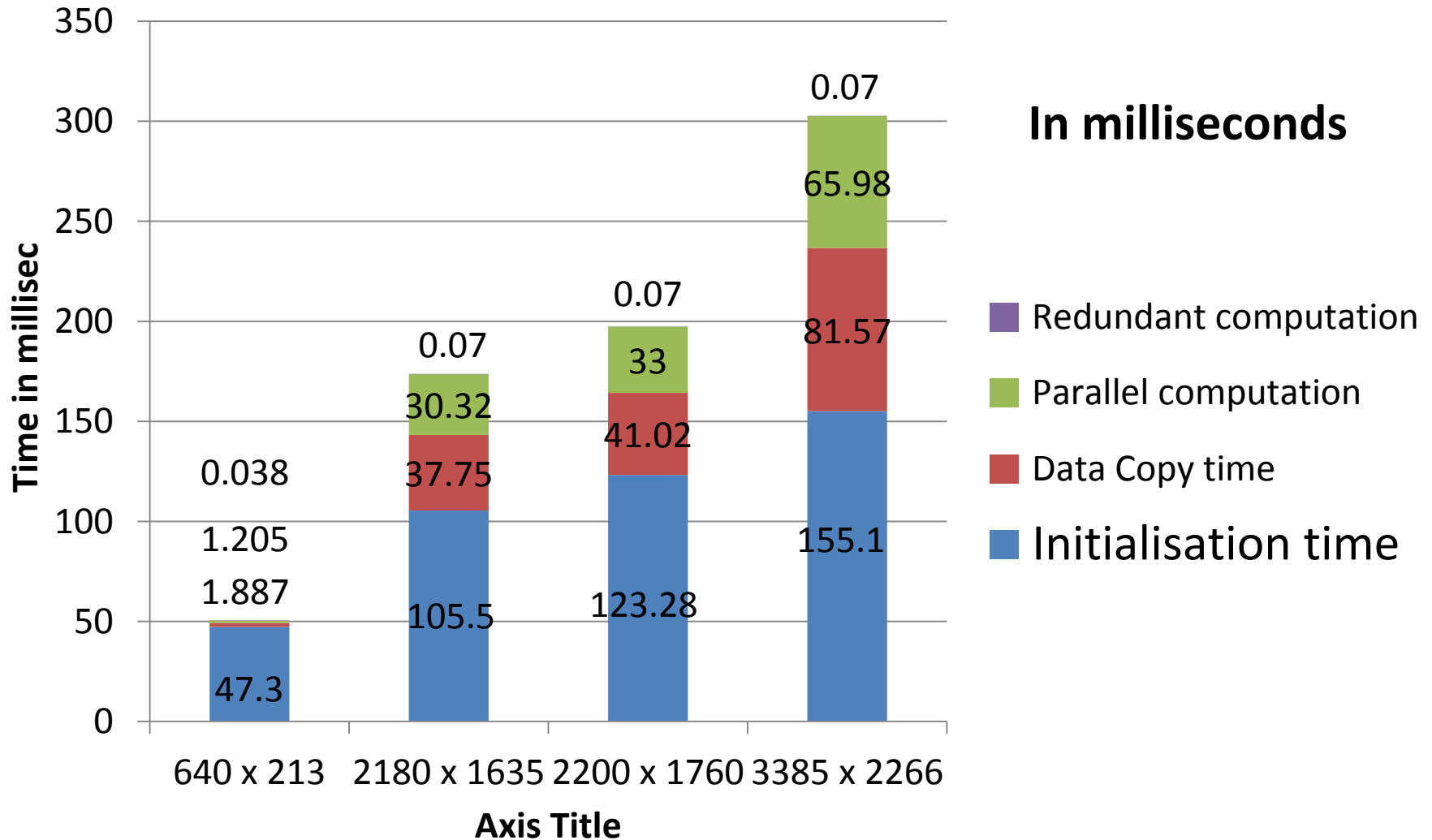
# Performance comparison

- CPU execution time at various size



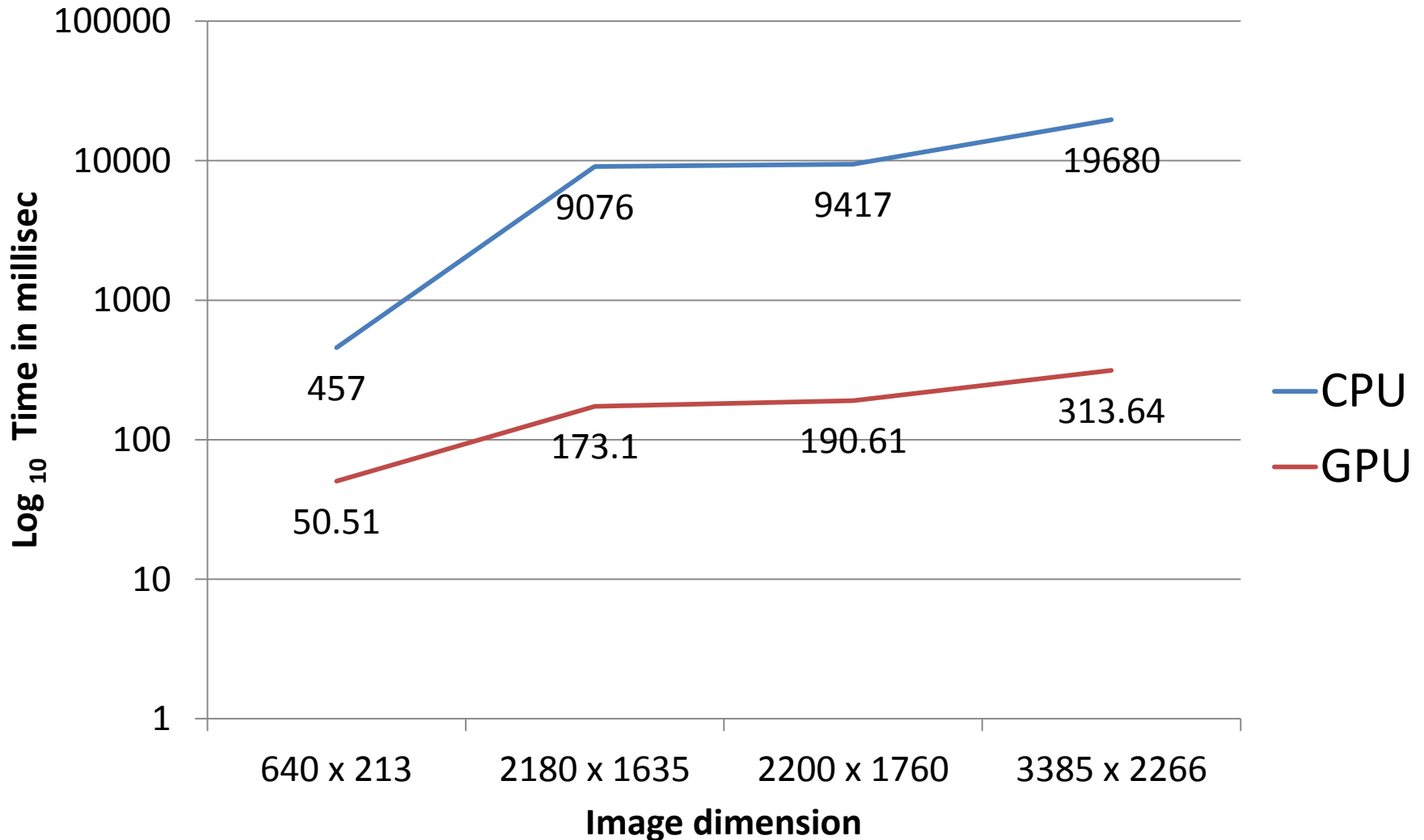
# Performance comparison

- GPU execution time at various size



# Overheads

- CPU Vs GPU execution time at various size



# Demo