

# Labwork 1 - October 13, 2024

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## 1 Introduction

This report explains how to use Numba's CUDA module to retrieve and display information about a GPU. The code demonstrates how to access key characteristics such as device name, core information, and memory size.

## 2 Code Breakdown

### 2.1 Importing Required Modules

First, we import the necessary modules:

```
1 import numba as nb
2 from numba import cuda
```

### 2.2 Detecting and Selecting CUDA Device

We detect available CUDA devices and select the first one:

```
1 devices = cuda.detect()
2 device = cuda.select_device(0)
```

### 2.3 Retrieving GPU Information

We then retrieve various pieces of information about the GPU:

```
1 device_name = device.name
2 multiprocessor_count = device.MULTIPROCESSOR_COUNT
3 core_count = multiprocessor_count * 128
4
5 free_mem, total_mem = cuda.current_context().get_memory_info()
6 memory_size_gb = total_mem / (1024 ** 3)
```

## 2.4 Displaying the Information

Finally, we print out the gathered information:

```
1 print(f"Device Name: {device_name}")
2 print(f"Multiprocessor Count: {multiprocessor_count}")
3 print(f"Estimated Core Count: {core_count}")
4 print(f"Total Memory Size: {memory_size_gb:.2f} GB")
```

## 3 Explanation of GPU Characteristics

- **Device Name:** This is the model name of the GPU, obtained directly from the device properties.
- **Multiprocessor Count:** This represents the number of Streaming Multiprocessors (SMs) in the GPU. Each SM can process multiple threads concurrently.
- **Estimated Core Count:** This is calculated by multiplying the multiprocessor count by 128, which is a common number of CUDA cores per SM for many NVIDIA GPUs. However, the actual number can vary depending on the specific GPU architecture.
- **Memory Size:** This shows the total global memory available on the GPU, converted to gigabytes for readability.

## 4 Results

When run on the provided GPU, the code outputs:

```
Device Name: b'Tesla T4'
Multiprocessor Count: 40
Estimated Core Count: 5120
Total Memory Size: 14.75 GB
```

## 5 Conclusion

This code provides a simple yet effective way to retrieve key information about a CUDA-capable GPU using Numba. It demonstrates how to access device properties and memory information, which can be crucial for optimizing GPU-accelerated computations and understanding the capabilities of the available hardware.