# Geavanceerde Computerarchitectuur Project Introduction

**Goals, examples, and grading**

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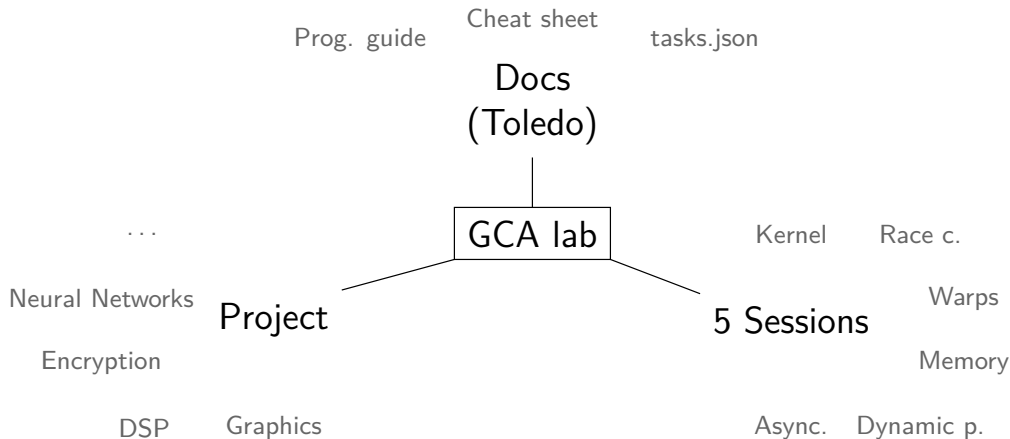# 0 Outline

❶ Recap from the first session

❷ Project

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# 1 Outline

**❶** Recap from the first session

**❷** Project

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# 1 Organization of the lab and docs

Prog. guide    Cheat sheet    tasks.json

Docs
(Toledo)

...    GCA lab    Kernel    Race c.

Neural Networks    Project    5 Sessions    Warps

Encryption    Memory

DSP    Graphics    Async.    Dynamic p.

# 1 Responsibilities and evaluation

Lab sesions, 50 %

| Short report | | Short report |

| Short report | | Short report |

| | | Short report |

Project, 50 %

Project report

Project Presentation

Code release

# 2 Outline

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# 2 Goal and organization

▶ The goal of the project is to tackle a computational challenge using the GPU.

▶ This should be something that aligns with your interests – to support your thesis or another lab; to implement something for a hobby / private project; to boost your portfolio and get a better job.

▶ We will allocate 5 lab sessions to development and 1 session to the presentations.

# 2    Implementation

▶ Use the concepts we have gotten acquainted with so far and feel free to explore other paradigms. You can use another programming language and also build on another library – keep in mind that you should still understand and describe the intricacies of the implementation.

▶ At the lab, you can use the B230 PCs, an Nvidia Jetson Nano ("Raspberry with a GPU"), or the two Nvidia Teslas in the server. You are free to use other devices if you can/want.

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## 2   Some topic examples

In case you don't know where to start, here are a few biased examples:

▶ An RF **ray tracer** to determine how Wi-Fi waves propagate in (and outside of) your kot.

▶ An **optimization algorithm** to determine where to put the Wi-Fi router for optimal coverage (considering either only yourself or all inhabitants).

▶ **Data compression** on an edge device that collects sensor samples and analyzes/compresses/transforms these in order to send the information over a low-throughput link.

▶ Real-time **statistical analysis** of a video stream.

## 2 Some topic examples

In case you don't know where to start, here are a few biased examples:

▶ Implement a neural network using CUDA: fully connected layers, convolution layers, pooling layers, ... (training can be done in python)

▶ Implement game of life on CUDA (cellular automaton)

▶ Anomaly Detection in Time Series Data

▶ Implement Clustering algorithms (K-means, DBSCAN, ...)

▶ Implement and optimize a support vector machine using CUDA

▶ Implement backpropagation for simple MLP

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# 2 Grading – guidelines based on thesis evaluation matrix

Implementation

▶ The implementation works, while clearly addressing the tackled problem

▶ Includes the concepts introduced in the lab or sufficiently motivates other approaches

Report (no min/max length – try to be concise)

▶ Clearly describes the problem and motivates the usage of the GPU

▶ Introduces the implementation and methods in detail (includes references to the repository or code listings)

▶ Highlights the shortcomings and possible improvements

Presentation (up to 10 min + 10 min for Q&A)

▶ Clearly describes the problem and motivates the usage of the GPU

▶ Provides a high-level overview of the implementation

▶ Highlights the shortcomings and possible improvements

# 2  Important dates

Please submit the reports on time, so we can close off the lab on the day of the presentations (focus on the thesis / exams afterwards).

TO BE DETERMINED
The important dates for Monday's and Friday's group are:

▶ Project sessions – 17/03, 24/03, 28/04, 05/05, 12/05

▶ Hand in the reports – 14/05

▶ Presentations and finish – 19/05

the session of 31/03 will be cancelled!.

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