

High Performance Computing

Introduction 2023

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You are attending the course

High performance computing / Högprestandaberäkningar

Chalmers TMA881

Gothenburg University MMA620.

Our Team

Martin Raum Professor at the mathematics department. Working on modular forms (theoretical mathematics). Lecturer, examiner, course responsible.

Kasper Bågmark PhD Student at the mathematics department. Assistant for the computer lab sessions.

Guillaume Bellier PhD Student at the mathematics department. Assistant for the computer lab sessions.

Petar Jovanovski PhD Student at the mathematics department. Assistant for the computer lab sessions.

Vincent Molin PhD Student at the mathematics department. Assistant for the computer lab sessions.

This is an overview course, which most appropriately might be referred to as

Introduction to programming and computer systems
in the setting of High Performance Computing.

The heart of the course are the programming assignments and the computer lab sessions.

On you, the audience

Students attending this course, each year, have been starting from very diverse levels. The course is inherently built for a heterogeneous audience.

You measure your progress relative to where you start. Many students have made incredible advancements in past years.

Support each other

In the computer lab sessions, advanced students can take the opportunity to support less experienced ones.

They profit by deepening their skill through explaining it, the others profit from additional explanations complementing the official code counseling.

Course organization

Canvas registration

You submit assignments 2-5 via Canvas. You have to be registered there.

You have to be registered in Ladok to be allowed receiving any grade.

Student representatives

Student representatives for the course TMA881 High performance will be listed on the course PM in Canvas. They will also present themselves during one of the first global discussion sessions.

See Canvas or the course website for details on examination.

Assignments are an essential part of the course and yield a passing grade for the course.

In addition to the video material, we have global discussion sessions. They are anchored in the videos, practice ideas from them, and provide the opportunity to address frequently encountered problem.

Computer lab sessions

During the lab sessions you can work on the assignments, and have the opportunity to ask questions to any of the teachers.

The first two assignments are peer-assessed. This is an opportunity to learn about basics from and with each other. You can also ask the teachers for advice. They are not submitted via Canvas, instead you check them off with me or the teaching assistants during one of the lab sessions.

Assignments

Do not underestimate the time it takes to solve an assignment.

| Name | Description |
|-------------------|----------------------------------------------------------------------|
| basic programming | Basic programming and development tools |
| optimization | Performance measurement, diagnosis, and basic optimization |
| OpenMP | A compiler parallelization framework |
| threads | Threads library |
| OpenCL (optional) | Framework for heterogeneous computing environments (GPU, FPGA, etc.) |
| MPI (optional) | Message passing interface for distributed computing |

You need an account on the computer “gantenbein”. I will send out account names and initial passwords to emails registered in Canvas.

All accounts expire end of November.

There is a video on how to log in to gantenbein and I will showcase it in the global discussion session.

Student tasks

Tasks instead of topics

The course layout is highly modularized and topics interleave, granting time to internalize and practice specific topics while not stalling course progress.

This leaves a lot of freedom, both for fruitful, individualized learning and for confusion.

On the website I have published a list of weekly tasks, which each student should ideally work on. If you have reasons, you may diverge, but these tasks are structured to cater the completion of assignments.

Large Language Models (aka AI)

The examiner of each course decides which use of chatbots is permitted in examinations and which use is appropriate in learning situations.

Assume that any data you share with [a chat] bot is owned by the company that owns the bot [...] do not share [...] data that may not be disseminated or used by a third party.

Don't trust what a bot says about

[...] most bots that are free may be put behind a paywall or may be down when you intend to use them.

Quite possibly, competence in LLM-supported programming is an important qualification at the time of your graduation.

Chalmers does not provide locally hosted LLMs. This means they are by no means required.

You are nevertheless encouraged to explore how to use them to assist your learning and programming. Please report back about your experience, so that I can develop the course in this direction.

The only exception: You are not allowed to use LLMs *during* the exam presentation.