Concurrency Theory

1: Introduction

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Course Participants

- Who are you?
- What is your study programme?
- What would you like to do in the future?
- Why did you register for this course?

Topic

- Concurrency Theory:
  The study of systems where multiple tasks run at the same time.

- Focus is on:

  - Models for the unambiguous definition of concurrent systems.

  - Definition of interesting properties (e.g., “no participant gets stuck”).

  - Reasoning techniques for proving interesting properties.

Course Structure

- Frontal Lectures.
- Reading Group (student seminars).
- Exercises.

Course Material

- Slides.
- Online lectures notes.
- Research papers.

Expected Learning Outcomes

- Represent concurrent systems in the abstract models covered in the course.
- Identify and formalise typical useful properties of concurrent systems.
- Prove properties of concurrent systems.
- Prove general properties of formal models for concurrency.

The General Objective

- Understand and reason about bleeding-edge techniques for concurrency.
- Many of these are already influencing the development of modern programming languages (Go, Jolie, Scala, …).
- Strong mutual influence with mathematical logic and category theory.

Reading Group and Attendance

- We will select and assign papers to a different “reader” (one of you).
- The reader has to read the paper and prepare a presentation.
- In the following week, the reader presents the paper (seminar).
- During and after the presentation, we discuss the paper.
- Everybody has to read the paper!
- Attendance is important, because of these seminars.
- I will be the first reader, to give an example.

Evaluation and Assignment

- Written exam with exercises based on the content of the course.
- There is an obligatory assignment that you have to hand in during the course: solutions to a selection of exercises.
  - You must select exercises from the lecture notes for at least 6 points in total.
  - Each exercise is 1 point, unless marked with !.
  - Exercises marked with ! give 2 points.