IN2080

1. Introduction and Regular Languages

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Details on the Course

- Two parts:
  - Computability theory (first half of semester, held by Einar Broch Johnsen), and
  - Complexity theory (second half, held by Lars Kristiansen)
- The course will closely follow Michael Sipser's book

  Introduction to the Theory of Computation (3rd International Edition)

  both in course content and exercises
- Prerequisites are IN1150 and chapter 0 of the book
  (very brief and incomplete refresher soon)
- Remember: lectures are useful, but doing exercises yourself is the most important!
  → **group exercises** (held by Eirik Ergon Aung)

Course Structure for Part 1 Computability Theory

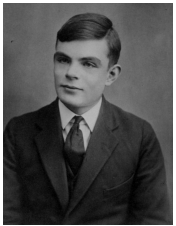
For the first half of the course:

- Tuesday lecture: new theory and material
- Wednesday lecture: can also feature new theory and material, but mostly reserved for in-depth discussion, examples, open Q&A

  $\rightarrow$ . . . but for weeks with only zoom, we will do it differently

- Do you have questions outside of the lectures?
  $\rightarrow$ group exercises, Mattermost(?)

So what's it all about?



- Alan Turing (1912-1954)
- "Father" of modern computing
- very interesting (and sad) story

→ Turing machines



- Noam Chomsky (1928-)
- "Father" of modern linguistics
- classification of formal languages

→ Chomsky hierarchy

So what's it all about?

- What is an "algorithm"?
- Automata and formal languages (part 1 of the course)
  - programs with *very* limited memory
  - programs to recognize/generate "words" in a language
  - typically used in compilers
- Turing machines (part 2 of the course)
  - programs with unrestricted memory
  - how expensive is a program?
  - $\rightarrow$ complexity

Self-study Material for Next Week

- **Finite automata:** simple formal model of computability with limited memory
- **Regular languages:** the class of languages that can be recognised by FAs
- **We study some aspects for RLs:**
  - Composition: Can we compose RLs?
  - Determinisation: Do all FAs have an equivalent, deterministic formulation?
- **Material for self-study:**
  - **Book:** Kap 0, Kap 1.1., Kap. 1.2 in Sipser
  - **Screencast from Daniel Lupp** (link under "Timeplan" on the course page)
  - **Slides** available same place
- **Next Tuesday:** We discuss this material together.
- **Important:** We will not cover all the material in the lecture, so you need to study the material before next Tuesday and prepare questions!