Algorithm Engineering
(2014, Q3, 5 ECTS)

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Motivation for the course...

- Narrow the gap between theoretical algorithm courses and implementing algorithms
- Systematic experimental evaluation
- Algorithm vs hardware understanding
- ... new theory
From Idea to Program Execution

- Idea
- Divide and Conquer?
- Pseudocode
- ...for each x in m up to middle
  add x to left
- for each x in m after middle
  add x to right
- ... for each x in m up to middle
  add x to left
- for each x in m after middle
  add x to right
- ...for each x in m up to middle
  add x to left
- for each x in m after middle
  add x to right
- if ( t1[t1index] <= t2[t2index] )
  a[index] = t1[t1index++]
  else
  a[index] = t2[t2index++];
- ... for each x in m up to middle
  add x to left
- for each x in m after middle
  add x to right

Compiler

- Machine code
  - Assembler
  - (Java) Bytecode
    + Virtual machine

- Microcode
- Virtual memory/
  TLB
- L1, L2,... cache
- Branch Prediction
- Pipelining
...
Theory–Experiment Cycle
Project 1

- Store a set \( S \) of \( N \) integers to support the query:
  
  \[ \text{Pred}(x) = \text{return } \max \{ y \in S \mid y \leq x \} \]

- Throughout testing of the performance of the Pred operation

- Groups 2-3 persons

- Next Tuesday: A slide with your results so far
Statement:

"I implemented my fancy algorithm and ran it on this big input I found on the internet. It took 87.32 seconds to run the program"