# Algorithm Engineering

(2017, Q3, 5 ECTS)

Gerth Stølting Brodal

# 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
…
```

(Java-)code

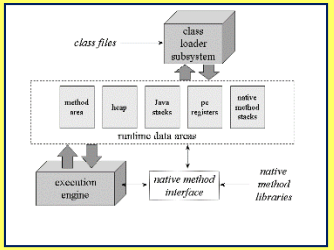
```
…
if ( t1[t1index] <= t2[t2index] )
    a[index] = t1[t1index++];
else
    a[index] = t2[t2index++];
…
```

Compiler

Machine code

Assembler

(Java) Bytecode




+ Virtual machine

Program execution

Microcode

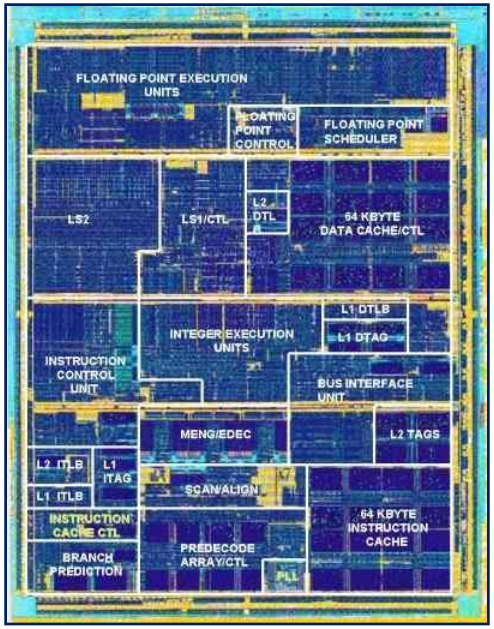
Virtual memory/ TLB

L1, L2,… cache

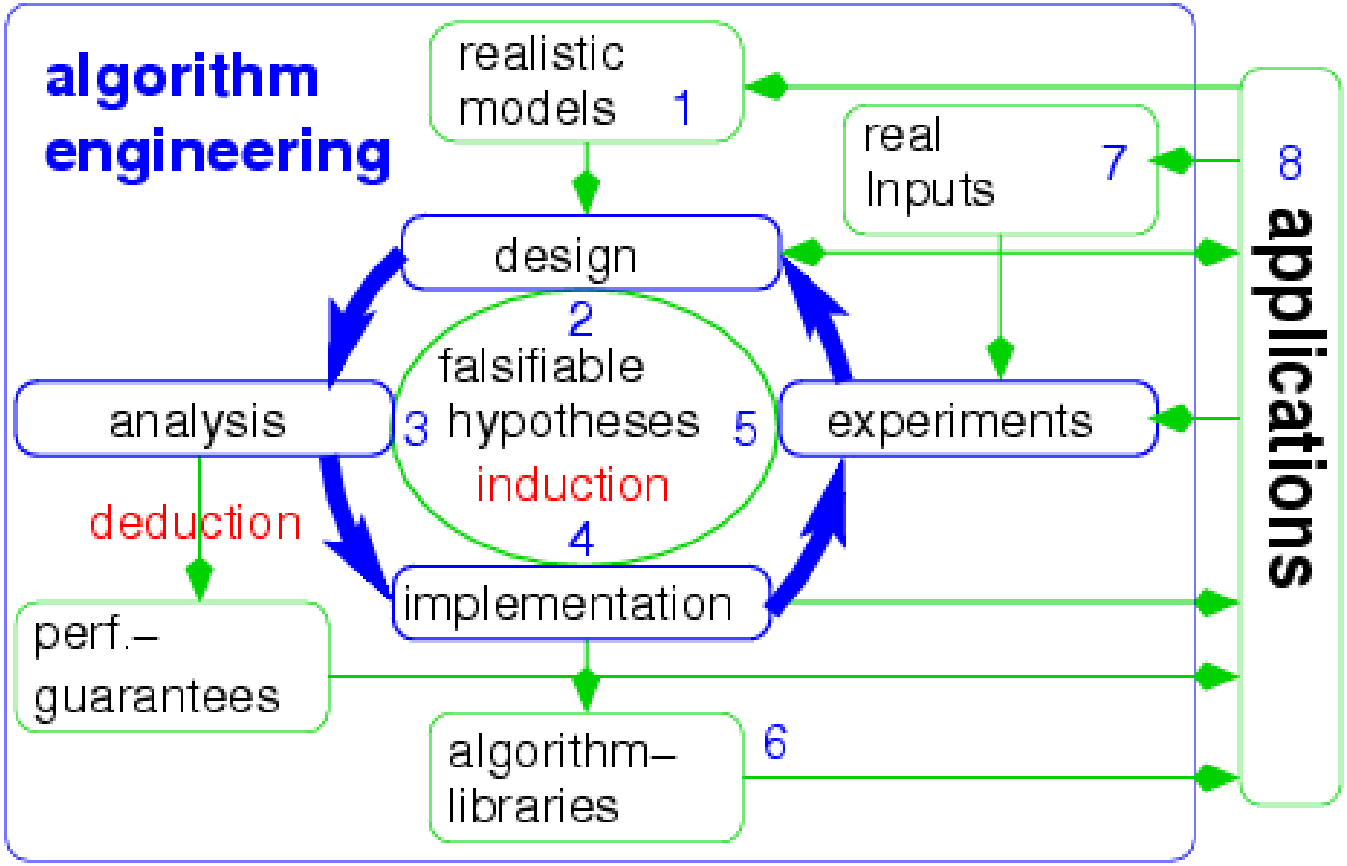
Branch Prediction

Pipelining

…



# Theory–Experiment Cycle



# Project 1

- Store a set *S* of *N* integers to support the query:

  Pred(x) = return max { $y \in S \mid y \leq x$ }

- Throughout testing of the performance of the Pred operation

- Groups 2-3 persons

- Next Tuesday (optional) :
  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”*