

# Algorithm Engineering

(2014, Q3, 5 ECTS)

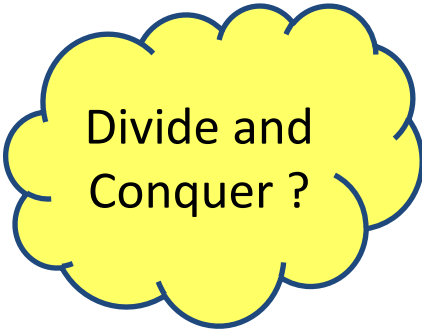
Gerth Stølting Brodal

# 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



Pseudocode

```

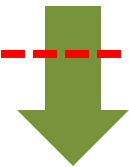
...
for each x in m up to middle
  add x to left
for each x in m after middle
  add x to right
...
    
```



(Java-)code

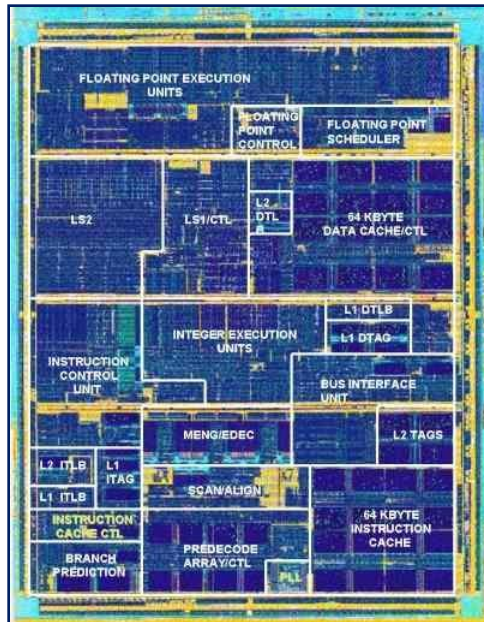
```

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



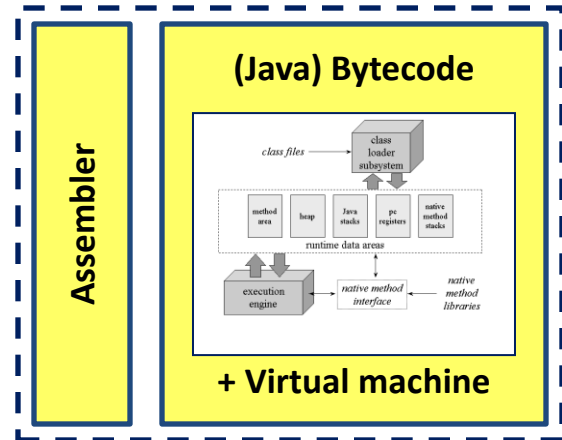
Compiler

- Microcode
- Virtual memory/ TLB
- L1, L2,... cache
- Branch Prediction
- Pipelining
- ...

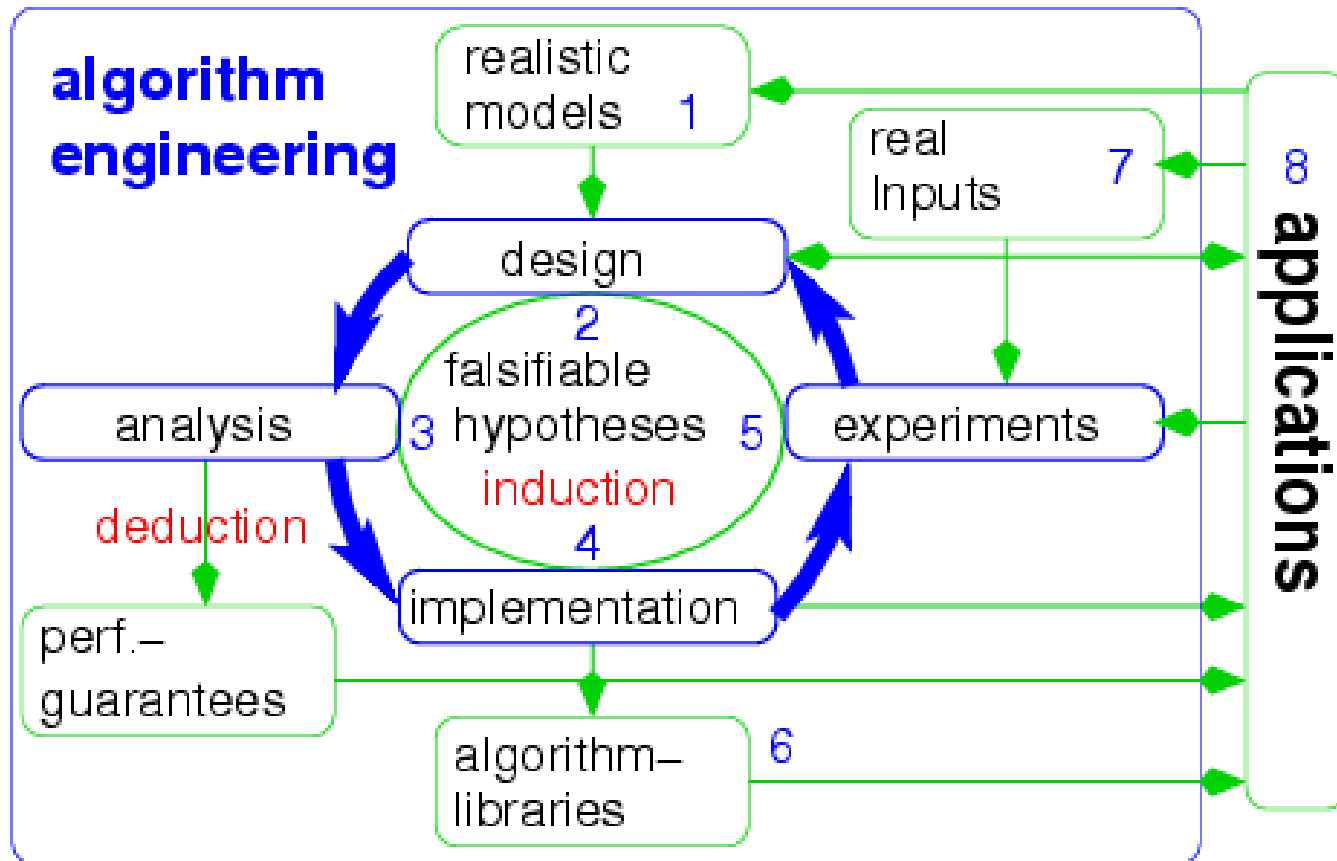


Program execution

Machine code



# 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"*