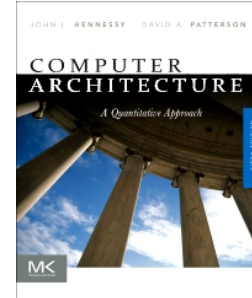


## Bachelor/Master Project

### Quantitative Analysis of Advanced Computer Architecture Techniques

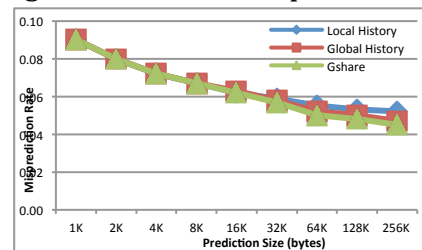
#### Background and Motivation

The textbook “Computer Architecture – A Quantitative Approach” by John Hennessy and David Patterson [1] is the de facto textbook in computer architecture. Although it is very well written, IMHO it still can be improved. While it contains many quantitative / experimental results, the techniques described in the book are not always quantitatively motivated. For example, no experimental results are provided that demonstrate the performance benefits of dynamic scheduling, out of order execution, speculation, etc. The performance improvements due to these techniques are mainly demonstrated using paper-and-pencil examples.



#### Project Goal

The goal of this project is to design and perform several experiments that demonstrate the performance benefits of the advanced computer architecture techniques described in [1]. This involves comparing different modern processor simulators and selecting the most suitable one. The best simulator may then have to be extended. Depending on the amount of work, this project can be performed as a bachelor or master project. For example, a bachelor project may focus mainly on techniques that exploit instruction-level parallelism, while in a master project also other techniques such as multithreading and advanced caching techniques need to be covered. The final goal is to include the results in future editions of the course “Advanced Computer Architecture” offered by AES. Perhaps we can even convince Hennessy and Patterson to include some of our results in future editions of their textbook.



#### Prerequisites

- Basic computer architecture / organization course.
- The course “Advanced Computer Architecture” offered by AES or a similar course, or the willingness to study (parts of) [1].
- Proficiency in C/C++.

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#### References

- [1] David Patterson and John Hennessy, *Computer Architecture – A Quantitative Approach*, 5<sup>th</sup> edition, Morgan Kaufmann, Paperback ISBN: 9780123838728.