PARALLEL COMPUTING

Summer Semester 2020

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Topics

Application of concurrency to speed-up computations.

- Multi-core processors, multi-processor systems, computer clusters, computational grids.
- Shared memory (multi-threaded) and distributed memory (message passing) programming.
- Task parallel and data parallel algorithms.
- Strategies for parallel program design.
- Performance measures and complexity models.
- Performance analysis and debugging.

Various interrelated aspects (many of which we will discuss).

Preliminary Schedule

- March 3 (Schreiner): Parallel Architectures and Performance.
- March 10 (Biere): Parallel Algorithms and Complexity.
- March 17 (Schreiner): Concurrency in Java and OpenMP.
- March 24 (Biere): Shared Mem. Prog., Lockless Data Struct.
- March 31 (Biere): Shared Mem. Prog., Cilk, Lace, Work Stealing
- April 21 (Schreiner): Presentations of Solutions 1.
- April 28 (Schreiner): Message Passing Programming with MPI.
- May 5 (Biere): Shared Memory Programming with PThreads.
- May 12 (Biere): Presentations of Solutions 2.
- May 19 (Schreiner): Designing Parallel Programs.
- June 9 (Biere): Presentations of Solutions 3.
- June 23 (Schreiner): Presentation of Solutions 4.

Individual meetings for discussing the assignments.

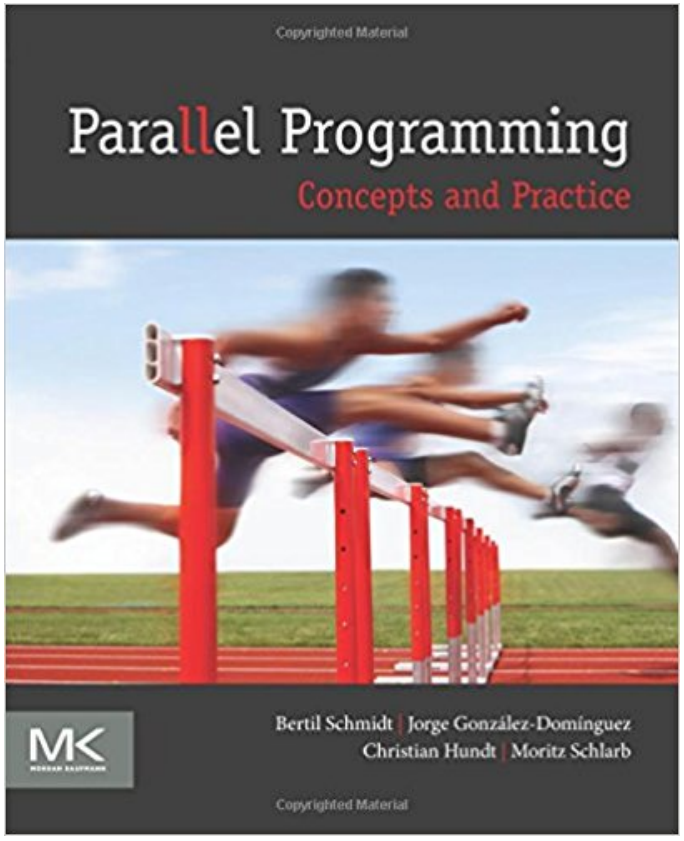
Organization and Grades

- Moodle Course
  - Materials and links.
  - Forums for announcements and Q&A.
  - Submission of assignments.
- Assignments
  - 4 programming assignments will be handed out.
  - At least 3 have to be turned in and graded positively.
  - Elaboration individually or in groups of twos.
  - Selected submissions will be invited for presentation.

No exam, grade will be entirely based on assignments/presentations.

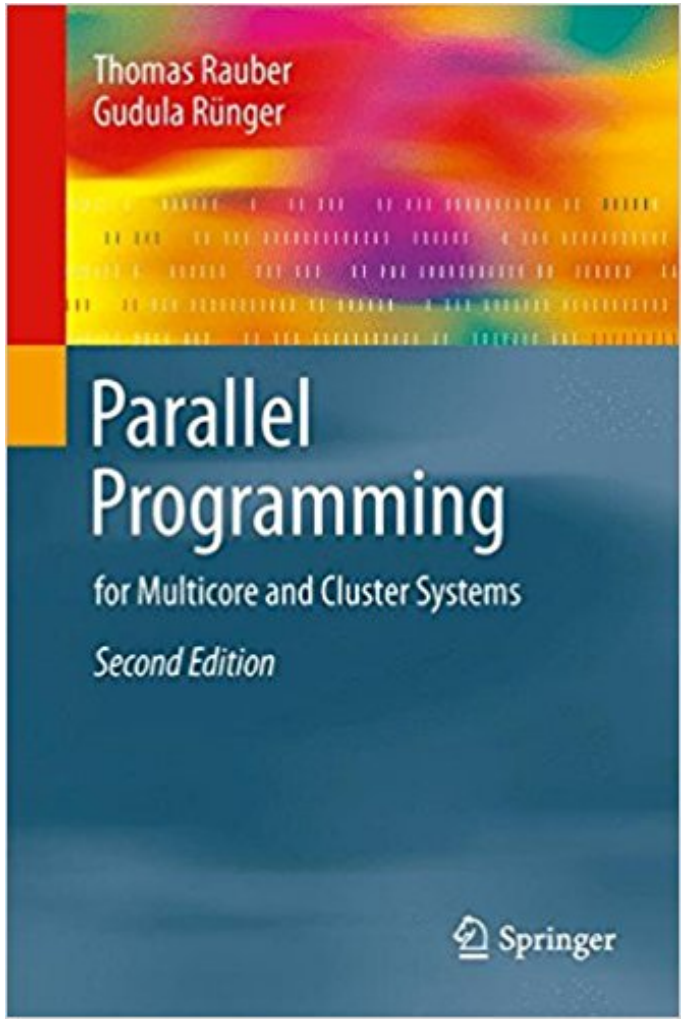
Literature

Bertil Schmidt et al. *Parallel Programming: Concepts and Practice*, Morgan Kaufmann, 2017.



Literature

Thomas Rauber and Gudula Rünger, *Parallel Programming: for Multicore and Cluster Systems*, Second Edition, Springer, 2013.



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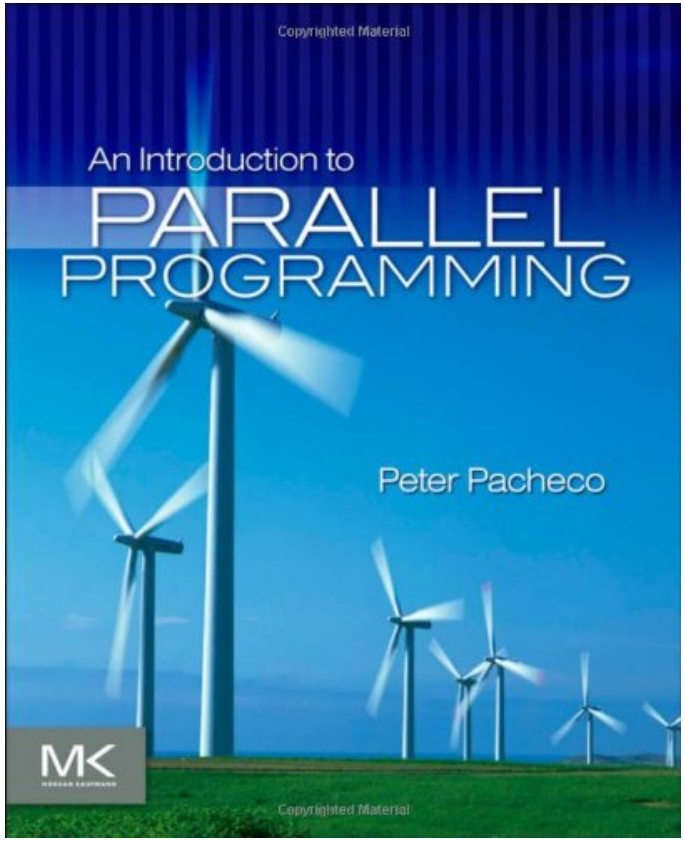
Peter Pacheco, *An Introduction to Parallel Programming*, Morgan Kaufmann, 2011.



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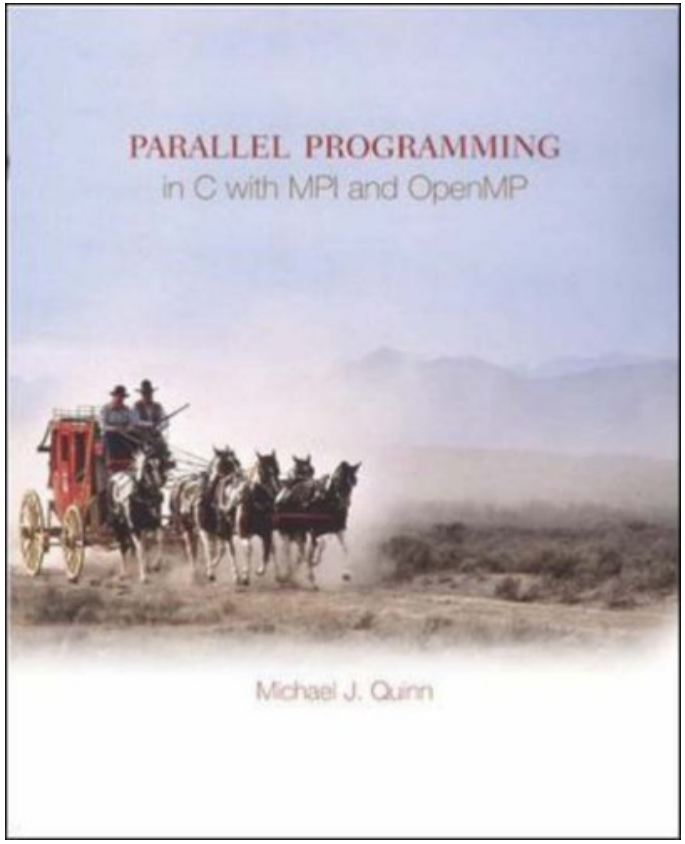
Michael J. Quinn, *Parallel Programming in C with with MPI and OpenMP*, McGraw-Hill, 2003.



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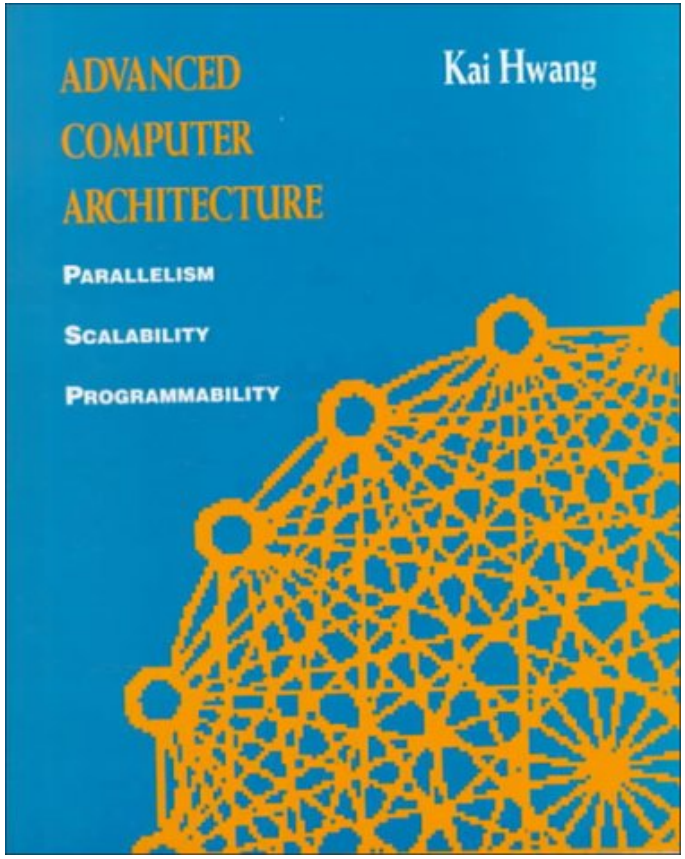
Kai Hwang, *Advanced Computer Architecture — Parallelism, Scalability, Programmability*, McGraw-Hill, 1993.



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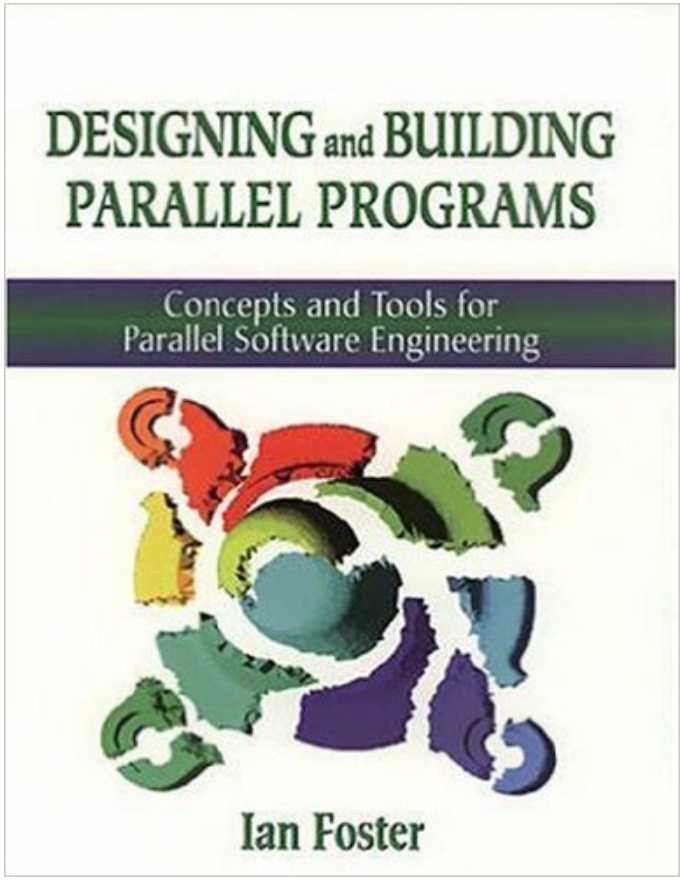
Ian Foster, *Designing and Building Parallel Programs*, Addison-Wesley, 1995.



Free online version at `http://www.mcs.anl.gov/~itf/dbpp`.