HPC

Introduction

2020/21

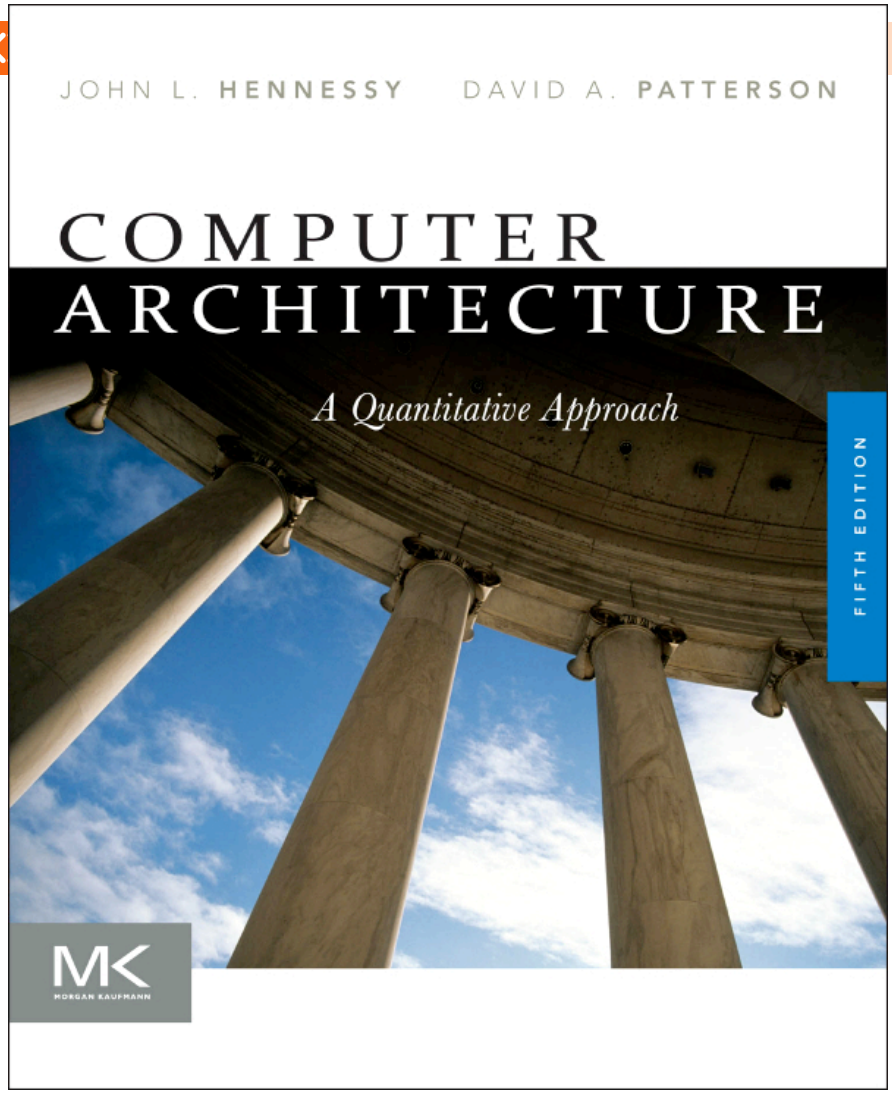
Key components of Advanced Computing

- Physical resources (*computing systems*)
  - Infrastructures
- Development of efficient parallel app's
  - Multi-threads in a shared memory environment (a server)
  - Multi-processes in a distributed memory environment (a cluster)

Physical Resources: computing systems

- Sets of interconnected parallel servers
  - HPC systems: TOP500 rankings
  - Each server
    - with several PUs that share memory address space
    - may have computing accelerators *(GPU, ...)*
  - Each PU
    - supporting several levels of parallel execution:
      ILP, multi-scalar single-threaded, data parallel (vector),
      multi-threaded, multi-process in shared/distributed memory
- A memory system hierarchy
  - RAM distributed among servers (*communicate with MPI*)
  - RAM may shared among servers (*requires special h/w*)
  - Storage on dedicated servers of the “computer” file system

Key textbook in Advanced Architecture



Computer Architecture, 5th Edition

Hennessy & Patterson

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Printed Text

Chap 1: Fundamentals of Quantitative Design and Analysis
Chap 2: Memory Hierarchy Design
Chap 3: Instruction-Level Parallelism and Its Exploitation
Chap 4: Data-Level Parallelism in Vector, SIMD, and GPU Architectures
Chap 5: Multiprocessors and Thread-Level Parallelism
Chap 6: The Warehouse-Scale Computer
App A: Instruction Set Principles
App B: Review of Memory Hierarchy
App C: Pipelining: Basic and Intermediate Concepts

Online

App D: Storage Systems
App E: Embedded Systems
App F: Interconnection Networks
App G: Vector Processors
App H: Hardware and Software for VLIW and EPIC
App I: Large-Scale Multiprocessors and Scientific Applications
App J: Computer Arithmetic
App K: Survey of Instruction Set Architectures
App L: Historical Perspectives

Recommended textbook (1)

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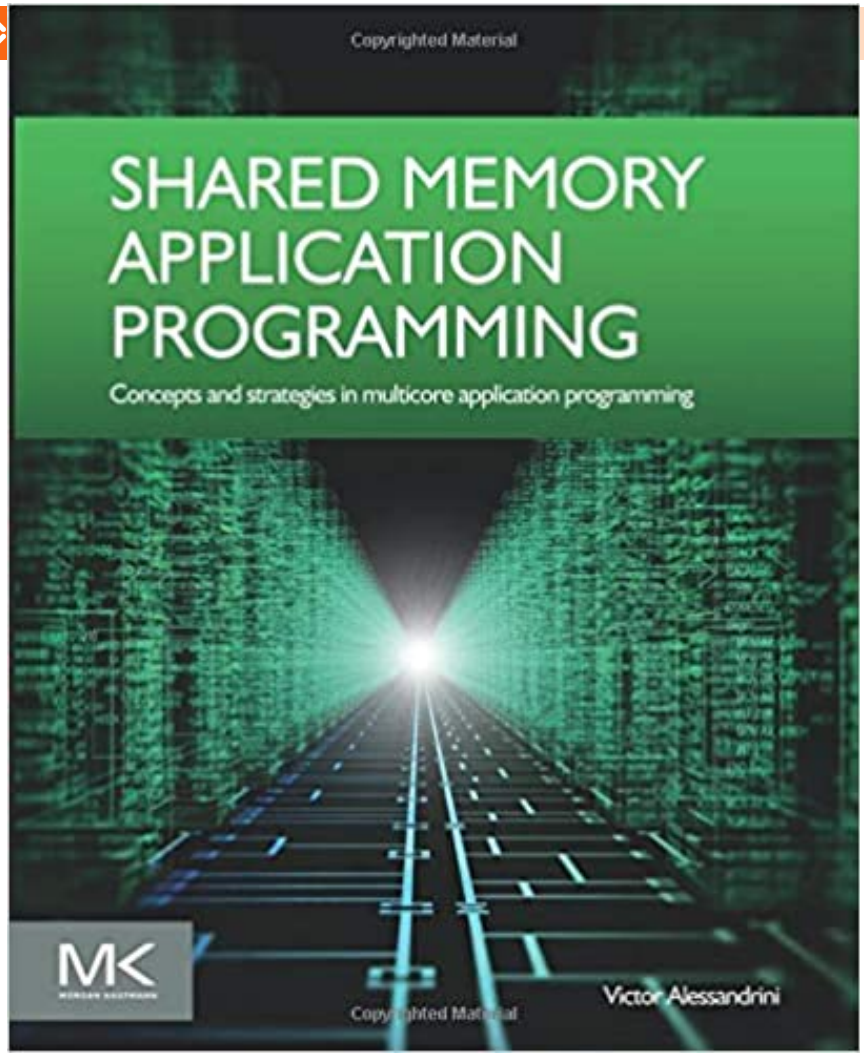
Recommended textbook (1)



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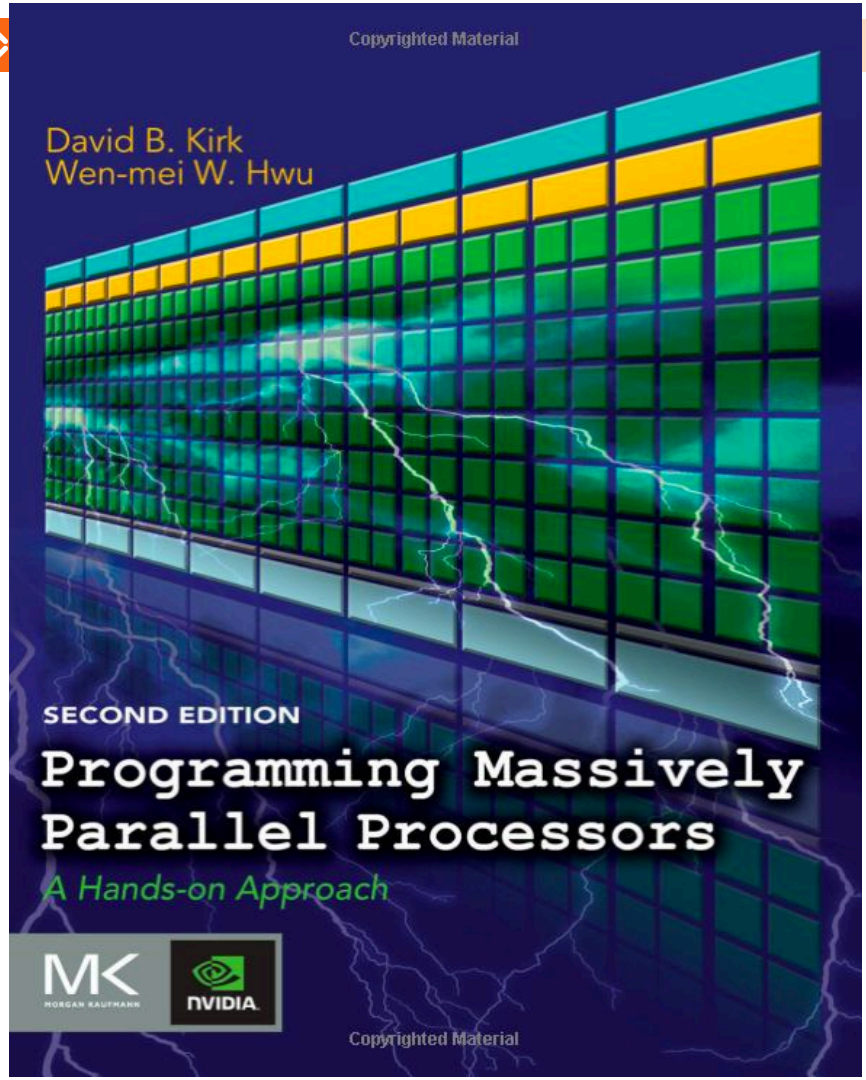
Recommended textbook (2)



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