Advanced Computer Architecture

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Prerequisite: CMSC 411 or equivalent

Text: Computer Architecture: A Quantitative Approach, by Hennessy and Patterson.

- Measuring Performance & Cost
  Performance measurement
  Benchmarks

- Costs of building computers
  Price/performance
  Instruction Sets
  Classifying instruction sets
  Interactions between languages and instruction sets
  Measuring instruction set usage
  Instruction set examples

- Improving CPU Performance: Pipelining
  Basic pipelining
  Data & control hazards
  Dynamic instruction scheduling
  Branch prediction
  Instruction-level parallelism

- Vector Processors
  Vector architecture & design
  Vector performance

- Memory Hierarchies
  Evaluating memory hierarchy performance
  Cache design & optimization
  Virtual memory design
  Memory protection
  Memory coherency

- Storage Systems
  Types and uses of storage devices
  Interfacing I/O to the rest of the system
  Reliability and availability
  I/O system design

- Multiprocessors
  Classifying parallel architectures
  Centralized vs. distributed shared memory
  Interconnection topologies
  Synchronization
  Memory consistency