Lecture 1 Review

- Introduction
- History of computers
- Performance determined by
  - Technology
  - Architecture
  - Compiler
- We will focus mostly on architecture and compiler

Lecture 2 Review

- Start of Chapter 1
- 3 levels of abstraction
  - Instruction Set Architecture
  - Organization
  - Hardware
- Trends → Architectural improvement

Lecture 3 Review

- Cost
  - Yield
  - IC cost model
    - Cost of IC ~ (Die Area)$^{\beta}$ ($\beta = 2 \rightarrow 4$)
- Response (execution) time
- Throughput
- Measuring Performance
  - Performance always measured relative to another machine (speedup n)
- Different times
- Benchmarks – none are perfect
  - SPEC is the best we have

Lecture 4 Review

- Summarizing performance
  - Execution time is the only reliable measure
  - Arithmetic mean tracks execution time
  - Can use weights with the arithmetic mean
  - If given ratios, use the geometric mean
- Quantitative Principles
  1. Make the common case fast
  2. Principle of locality
  3. Parallelism
- Make the common case fast
  - Amdahl's Law
    - Speedup = $1 / ((1 - f_{enh}) + (f_{enh} / s_{enh}))$

Lecture 5 Review

- Ahmdahl's Law (law of diminishing returns)
  - Speedup = 1 / ((1 – f_{enh}) + (f_{enh}/s_{enh}))
  - Can not speed up a task by more than 1/(1- f_{enh}) !
- CPU performance equation
  - CPUtime = IC * CPI * CC
  - Depends on all three factors – tradeoff

Lecture 6 Review

- **Principle of Locality**
  - Temporal locality: If you recently used an item, it is likely to be used again sooner rather than later
  - Spatial locality: If you access an item, the next few accesses are likely to be items close by.

- **Parallelism**
  - Perform many operations simultaneously