Research vs Scholarship

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What I want to do today

- Visions of the future
- Research or Scholarship
Before I do any of that, Uri’s slide

• The slide said: 100x from process, 20x from uarch

• A data point: DEC EV4 to EV8
  – Performance increased by 55x
  – Frequency increased by 7x
  – Where did the other 55/7 come from?
Room at the top, requirements at the bottom

• At the top:
  – Leiserson et.al. white paper

• At the bottom:
  – run-time unit (Per said it yesterday)
What else

• On the chip: One ISA, multiple microarchitectures

• Multiple Single threads
  – Amdahl
  – Critical sections
  – Lagging threads

• Accelerators (I called them Refrigerators)
  – Embracing the whole transformation hierarchy
  – Plenty of transistors
  – Powered on when you need them, off when you don’t

• Can we partition data better
  – The Dick Sites experiment. EV5 running at 6%
  – And a flag inserted by the compiler when the unit is dead
Research or Scholarship

• Andre said: I need to understand what I am doing

• UT Discussion: Research in the undergraduate curriculum
  – Engineering means something different than everyone else

• The two-level branch predictor
  – It wasn’t the history, it was what we did last time that history

• HPS
  – Tomasulo had out-of-order and it broke the ISA
  – Separate the ISA from the microarchitecture
  – Tomasulo did floating point out-of-order
  – More micro-ops than just floating point
    AND, some of our implementation was bad!

• Machine learning → Compile-time branch prediction
Is Engineering out of step?

Do we value understanding, or do we value the artifact?
Thank you!