18-344 Recitation 5

Lab2 - Memory Hierarchy
Design Space Exploration

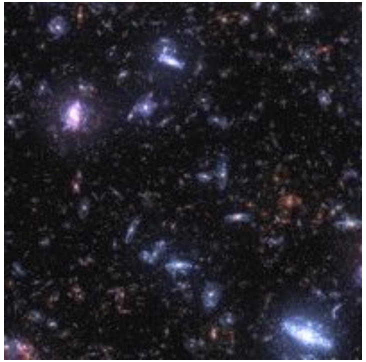
Logistical Notes

- Lab2 is due Oct. 5th
- Check the course calendar for updates to the schedule
- Benchmarks can take a while to run
  - Leave time for testing, split benchmarks between team members
  - Limit parameter sweeps to reasonable values
- Remember to kill runcpu processes

Logistics Cont

- HW 4 is out (Due Oct 5, 9:30am)
- Lab 1 Grades are out (please review feedback before submitting Lab 2)

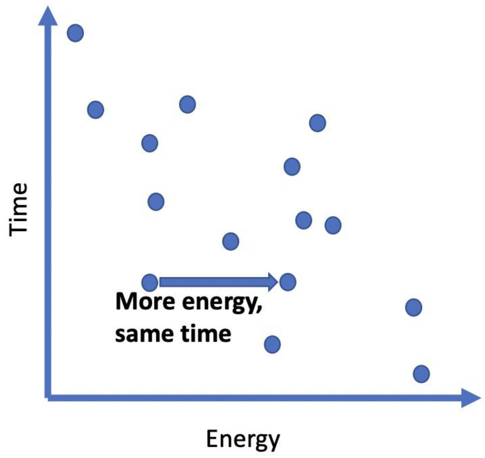
Defining a design space

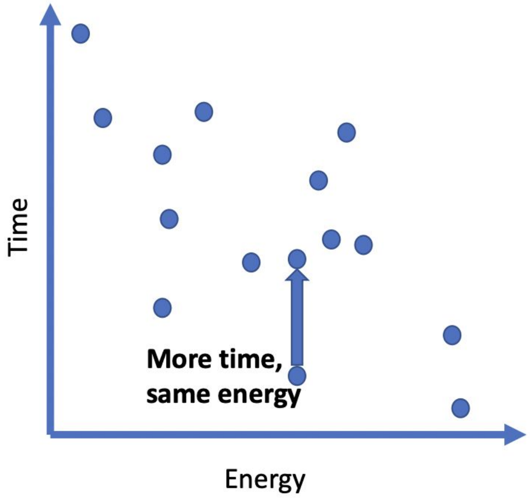


- A design space is a set of possible incarnations of a system
- A design space is defined over a set of parameters
- A point in the design space is a concrete system with a concrete value for each of the design space’s parameters
- Design spaces exist to allow systematic exploration of a collection of possible designs, like architectures.

Plotting many designs to study a trade off

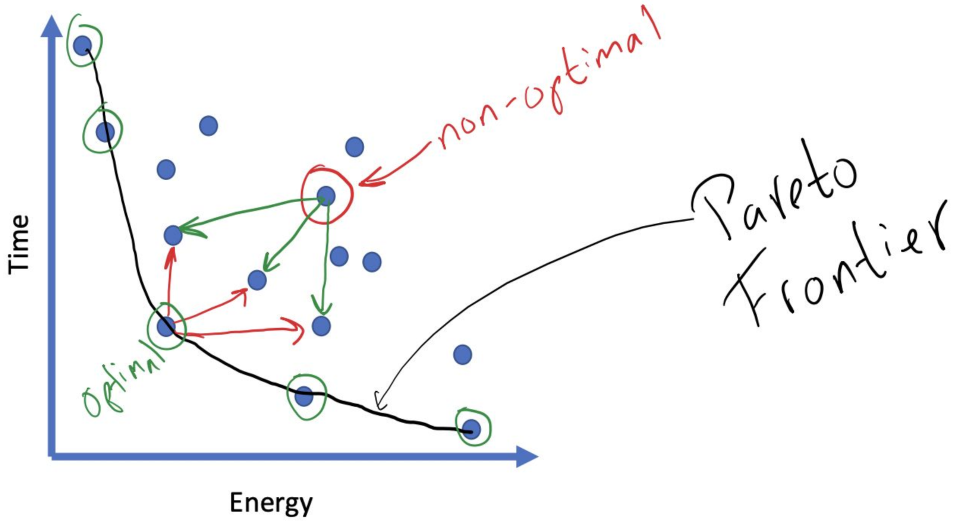
- Branch predictor example
  - GHT size, BHT # entries, hash func, BHT entry size, BTB # entries, BTB assoc





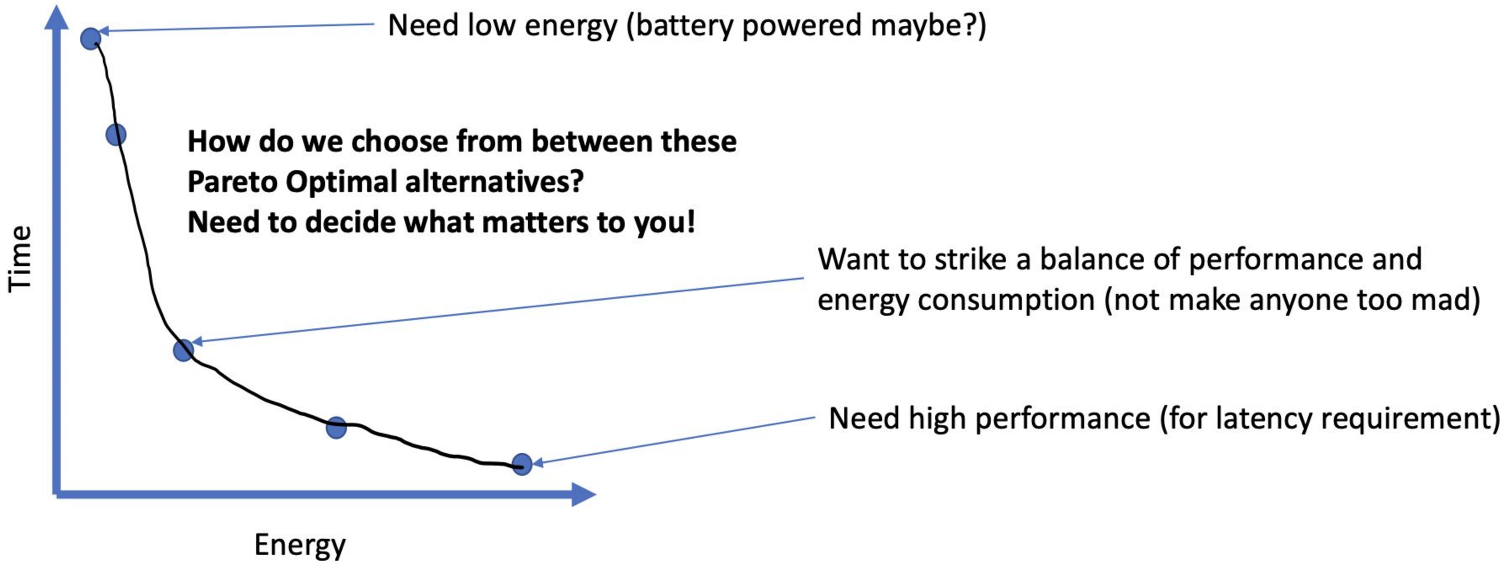
Pareto Optimality of Design Alternatives

- A design is optimal if no change leads to improvement in one dimension without a loss in at least one other dimension



Design Consequence of Pareto Optimality

- A design is optimal if no change leads to improvement in one dimension without a loss in at least one other dimension



Design Space Exploration - Find the best feasible system

- Define a system’s important design parameters
  - Example: L1 L2 associativity, L1 L2 block size, L1 L2 size, L1 L2 replacement
- Define a system’s figure(s) of merit
  - Example: AMAT, latency, power
- Define a set of constraints on the feasibility of a binding of design parameters
  - Example: 5MB of cache that you can split across the layers of cache in your system
- Choose a feasible parameter setting and measure its merit
- Iterate until satisfied:
  - If this system is better than the last one, keep it. If worse, discard it.
  - Choose a parameter and change it

Lab1 Post Mortem