• Left over from last time
  – Introduce student who wasn’t in class last time
  – Homework policy: perfectly okay to talk to other people—encouraged in fact! But you should write, do the code, etc. on your own. What you submit should have enough thought “visible” that I can tell you understand

• Today is all about mistakes

• Mistakes from the book:
  – * No goals: identify problem (metrics, workloads, and methodology)
  – * Biased goals: prove my system better than theirs
    * Big problem in research
    * This is a reason you need to start evaluation early: don’t get stuck having to prove the worth of something after the fact
  – Unsystematic approach: If you miss things, your conclusion may be wrong
  – * Analysis without understanding the problem
    * “A problem well stated is half solved’.
    * Especially a problem when applying solutions to areas outside expertise
  – Incorrect performance metrics:
    * Metrics that solve the problem, comparing apples to apples (eg. MIPS for CISC vs. RISC)
    * Often chose easy rather than relevant
    * Know community expectations, but don’t be blind
  – Unrepresentative workload: Representative of actual usage
    * Very hard to come by
  – Wrong technique:
    * Using the hammer that you have.
    * Are you capturing all important parts of the environment?
  – Overlooking important parameters:
    * Choice of parameters matters a lot
    * If you pick ones that make one system look better than another, need to cover that in your assumptions/scope
  – * Ignoring significant factors:
    * Factors are the parameters you vary
* Scientific method; control vs. variables.
* Sensitivity analysis: something we rarely do but is important (CF. ignoring the future)

- Inappropriate experiment design:
  * How many experiments, how many trials, parameter choice

- Inappropriate levels of detail:
  * “Forest for the trees”

- * No analysis:
  * Don’t just show graphs and tables, assume the reader will figure it out
  * Have to tell the reader what they see
  * In talks, I say things like “higher is better” even if it seems obvious
  * Try to understand “odd” things on graph, sometimes they reveal important underlying truths
  * Pay attention to trends

- Erroneous analysis:
  * Base analysis on bogus techniques such as average of ratios or bad experiments
  * We will talk more about these in coming weeks

- * No sensitivity analysis:
  * Analysis gives you evidence, not facts.
  * What would change if setting changes?
  * CF ignoring the future

- Ignoring errors in input:
  * Errors may be systematically biased (eg. queues too long, drop work)

- Improper treatment of outliers:
  * Is it an artifact of the evaluation environment, or can it really happen?
  * System effects like GC, routing updates, ARP timeout, etc.–you have to understand why they matter

- * Assuming no change in the future:
  * Big one for research, which is supposed to be forward looking—assumptions and sensitivity analysis.
  * Research that leverages trends (eg. increasing core counts) can be very powerful
  * “Don’t estimate the capacity needed for a bridge based on how many people swim across today.”

- * Ignoring variability
  * Don’t just present mean! - eg. bimodal high/low distribution
  * Sometimes a bit higher but predictable is preferable

- Too complex analysis:
  * Don’t make it complex just for the sake of seeming hard

- Improper presentation of results:
  * Remember, about persuasion

- * Ignoring social aspects:
  * Again, about persuasion.
  * Remember: you know a lot that the audience doesn’t.
* Audience is rarely as expert as you in the details of the thing you’re writing about.
* Beliefs, values, language, jargon.
  - Omitting assumptions and limitations:
    * Important in research—under what conditions do you expect your conclusions to be true?

• Other mistakes you’ve seen?

• For next time
  - Read 2.2
  - HW #2 due Thursday at midnight
  - HW #3 will be handed out by class time Thursday
  - Need two volunteers to go first for paper analysis—prefer students who feel comfortable with reading and discussing papers