ECEn 528
Study Guide – Evaluation techniques

- Read the paper by Skadron, Martonosi, and Clark
  - Things to focus on
    - How the experimental methodology is described
    - Choice of benchmarks
    - Independent vs. dependent variables
    - Presentation of data
    - Simulation speed

  - Clarifications
    - A number of terms may be unfamiliar to you; some are defined below, but you should, in general, focus on the experimental methodology rather than the exact experiments
      - Instruction window size refers to how many instructions may be considered for out-of-order execution at one point in time; we will discuss out-of-order execution in much more detail later in the semester.
      - Branch prediction refers to "guessing" which direction a branch will go and speculatively executing the instructions along that path. We will examine different kinds of branch predictors later in the semester

  - Answer the following questions:

1. What do the authors tell us about their simulator and the processor which is being simulated?

HydraScalar models an OOE, 5-stage pipeline with varying branch prediction. The baseline model is loosely based on an Alpha 21264

2. What benchmarks are used?

The SPEC integer benchmarks: go, m88ksim, gcc, compress, xlisp, ijpeg, perl, vortex, tomcatv

3. How clear is the presentation of the experimental data? Why is it clear or not clear?

The graphs are very hard to read, and the tables are too large to really understand what is being conveyed. I relied on the textual explanation of the results.

4. How are the results analyzed and explained?

The trade-offs of cache size, register update unit (RUU) size, and branch prediction accuracy are explained: a large RUU isn't helpful regardless of cache size unless prediction accuracy is very high. With high accuracy, increasing RUU or cache size limits the effectiveness of increasing the other. Instruction cache size, on the other hand, is always important, regardless of branch prediction accuracy.

5. What statistical techniques are used?

In examining multiple variables (cache size, RUU size, prediction accuracy), only one variable is changed at a time, and results are compared when keeping the other variables set to a constant.

6. What technique is used to reduce the amount of simulation time required?

Only 50M instructions are simulated rather than the entire program. This window is chosen carefully after the "initial phase" has passed, in order to get more representative results.