
Requirements:

Download the GEM5 configuration script for this problem along with cross-compiled executables for matrix multiplication and nqueens from (Exercises→Code→CH2). Copy the executables in your `gem5/tests/test-progs` directory. Here's a brief description of the files

File	Description
br_pred.py	GEM5 Configuration script for simulating the workloads
matmul_ijk_64.out	Performs multiplication of two integer 64*64 matrices
matmul_ijk_128.out	Performs multiplication of two integer 128*128 matrices
nq8.out	Solves the n-queens problem for n=8
nq10.out	Solves the n-queens problem for n=10

Make sure to edit the name of the executable in configs/tutorial/br_pred.py before running the simulation

---

I.1: Evaluating the performance of branch predictors available in GEM5

For power ISA in the table below, make appropriate changes in configs/tutorial/caches.py to set L1D cache size, L2 cache size, and L2 data latency

	Power 9
L1D cache size	**32kB**
L2 cache size	**512kB**
L2 data latency	**20**

When running the simulation, use the flag `--bp-type=<predictor_name>` to specify the type of branch predictor. `<predictor_name>` can be set to one of the following –`(LocalBP, TournamentBP, TAGE)`

For ex., the command below will simulate the workload with TAGE branch predictor and generate the simulation stats in `out_stats_tage` directory.

```
build/POWER/gem5.opt -d out_stats_tage configs/tutorial/br_pred.py --bp-
type=TAGE
```

Answer the following questions:

A. Simulate the provided .out files in GEM5 for three types of branch predictors – LocalBP, Tournament, and TAGE. Generate the stats.txt files for each simulation. Upload the stats.txt files on canvas. (You will have twelve (12) stats.txt files, three (3) for all three branch predictors for a single `.out` file. 12 in total for four `.out` files.
B. In your writeup, report the following metrics from stats.txt in a table for all 12 combinations of .out files and branch predicters,
   1) `system.cpu.branchPred.condPredicted`
   2) `system.cpu.branchPred.condIncorrect`

C. Is there a predictor which consistently performs better than others in terms of `system.cpu.branchPred.condIncorrect` ?
D. Based on the GEM5-based problems assigned in this assignment, write a detailed paragraph about extensions to this case study on the POWER memory hierarchy that could be pitched as potential (modest) project proposals.