Lab Report-2 Part A

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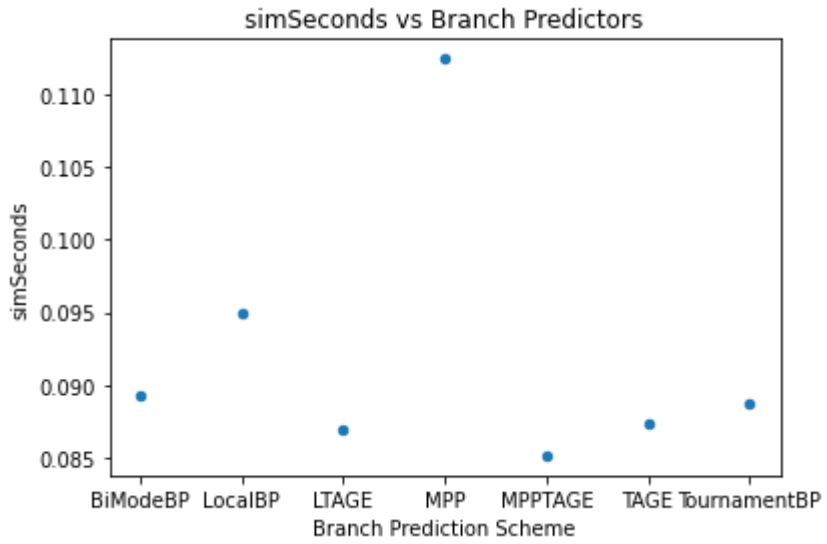
Types of branch prediction schemes- TournamentBP, LocalBP, BiModeBP, TAGE, LTAGE, MultiperspectivePerceptron, MultiperspectivePerceptronTAGE

TAGE stands for tagged geometric length predictor. LTAGE works by merging TAGE predictors with loop predictors. Tournament branch predictors choose between local and global branch history patterns to optimise the next branch prediction results.

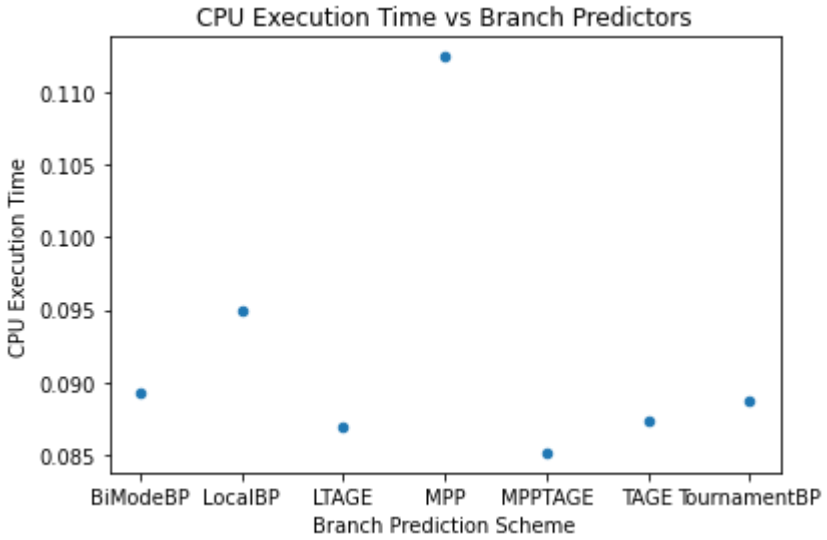
The clock frequency has been fixed at 1 GHz.

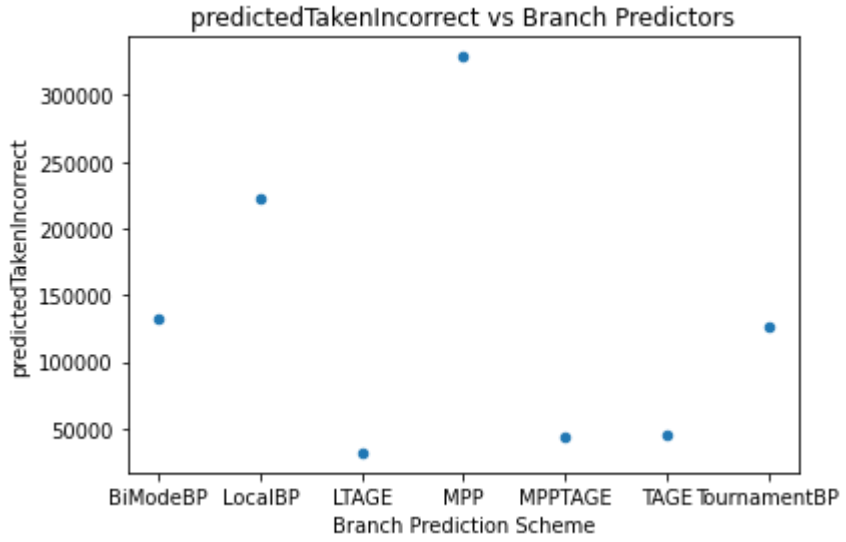
Keeping CPU Type as O3CPU and cache size at 16 kB for L1i, 64 kB for L1d and 256 kB for L2, the results for different branch prediction schemes are as follows:

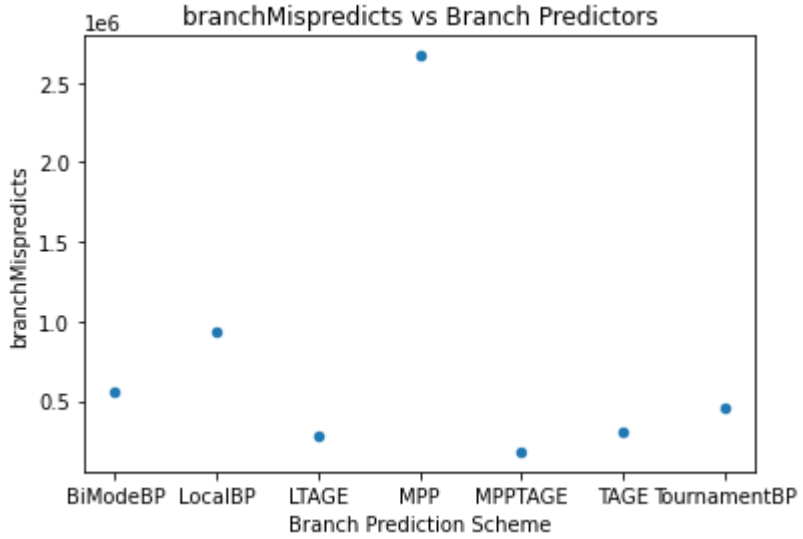
	Branch Prediction Scheme	simSeconds	CPU Execution Time	predictedTakenIncorrect	branchMispredicts
0	BiModeBP	0.089339	0.089339	132990.0	552718.0
1	LocalBP	0.094937	0.094937	222453.0	929122.0
2	LTAGE	0.086869	0.086869	31861.0	281656.0
3	MPP	0.112481	0.112481	328900.0	2670883.0
4	MPPTAGE	0.085138	0.085138	44418.0	179781.0
5	TAGE	0.087320	0.087320	45597.0	308089.0
6	TournamentBP	0.088780	0.088780	125979.0	457630.0



$$\text{CPU Execution Time} = \frac{\text{No of instructions} \times cpi}{\text{clock frequency}}$$

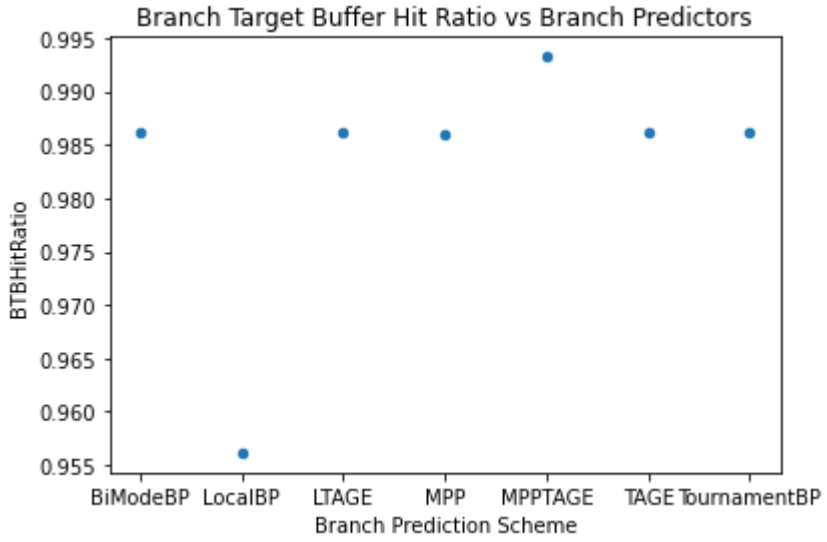






Keeping CPU Type as TimingSimpleCPU and cache size at 16 kB for L1i, 64 kB for L1d and 256 kB for L2, the results for different branch prediction schemes are as follows:

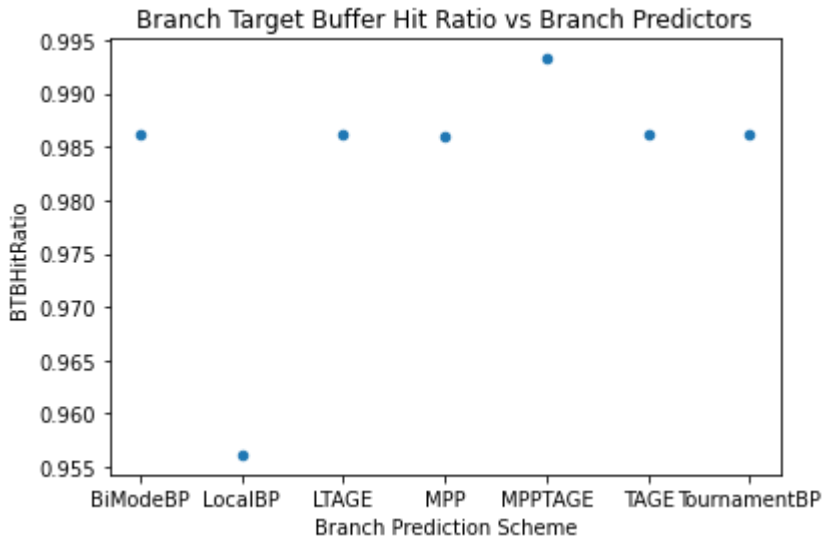
	Branch Prediction Scheme	simSeconds	CPU Execution Time	BTBHitRatio
0	BiModeBP	0.421254	0.421254	0.986120
1	LocalBP	0.421254	0.421254	0.956159
2	LTAGE	0.421254	0.421254	0.986151
3	MPP	0.421254	0.421254	0.986021
4	MPPTAGE	0.421254	0.421254	0.993249
5	TAGE	0.421254	0.421254	0.986145
6	TournamentBP	0.421254	0.421254	0.986181



The branch predictors were observed to have taken the same time to execute the simulation.

Keeping CPU Type as AtomicSimpleCPU and cache size at 16 kB for L1i, 64 kB for L1d and 256 kB for L2, the results for different branch prediction schemes are as follows:

	Branch Prediction Scheme	simSeconds	CPU Execution Time	BTBHitRatio
0	BiModeBP	0.233288	0.233288	0.986120
1	LocalBP	0.233288	0.233288	0.956159
2	LTAGE	0.233288	0.233288	0.986151
3	MPP	0.233288	0.233288	0.986021
4	MPPTAGE	0.233288	0.233288	0.993249
5	TAGE	0.233288	0.233288	0.986145
6	TournamentBP	0.233288	0.233288	0.986181



The results are similar to the ones corresponding to timing CPU, with the only difference being that the simulation executes faster when the CPU type is atomic.

OBSERVATIONS:

It can be observed that MPPTAGE(MultiperspectivePerceptronTAGE) is the most efficient predictor. For O3 CPU Type, the MultiperspectivePerceptron predictor turned out to be the least efficient, while for atomic and timing CPU types, LocalBP was the worst performer.