

ECE 6100 Project 2: Branch Prediction Report

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Optimum Branch Predictor for 50-Stage Pipeline

Using a brute force search of the parameter space, the optimal configuration was determined to be:

- S 18
- P 8
- O 2

The average CPI of this configuration across the four traces for N=50 was 1.0923055.

Looking at Table 1 below, the TAGE-S simulator performs noticeably better than GShare, but only at larger values of the total size of the predictor. The two predictors perform more similarly than expected for lower values of S. More tables in TAGE-S did not necessarily mean better performance either; there appears to be an ideal number of tagged tables for optimal performance, rather than a positive correlation between average CPI and P. This relationship is likely due to the increasing latency in the partial tag search for more tables and a larger total size. In the GShare predictor, the different hash functions did not alter performance in a significant way, and performance was mostly affected by the total size of the predictor.

	13	14	15	16	17	18	19	S
0	1.4538310	1.3582926	1.2844349	1.2269464	1.1862330	1.1587047	1.1420086	
1	1.4787428	1.3759090	1.2861552	1.2263202	1.1868885	1.1575649	1.1409464	
2	1.4588482	1.3642236	1.2831308	1.2247831	1.1856423	1.1594971	1.1427594	
3	1.4055023	1.2739931	1.1897903	1.1493923	1.1291902	1.1202618	1.1201120	
4	1.3754589	1.2507265	1.1662197	1.1265683	1.1092274	1.1014258	1.1027154	
5	1.4067882	1.2892697	1.1888753	1.1352845	1.1009300	1.0986805	1.0999391	
6	1.4018962	1.2788472	1.1831566	1.1326961	1.0978481	1.0954829	1.0964646	
7	1.3989775	1.2740783	1.1778806	1.1296997	1.0974379	1.0974309	1.0961607	
8	1.4440848	1.3100275	1.2140468	1.1477463	1.1230634	1.0923055	1.1026465	
9	1.4470088	1.3133795	1.2139531	1.1504337	1.1235931	1.0925687	1.1032820	
10	1.4401353	1.3255467	1.2174159	1.1522213	1.1271520	1.0955932	1.1068651	
P								

Table 1: Average CPI of Different Branch Prediction Simulator Configurations for N=50