**Roles:**

Work was split equally among team members.

**Notes about code assumptions:**

One assumption made was that the address to hash on for branch prediction modes 1 and 2 was the address stored in the branch command, not the pc address of the actual instruction.

**Submission part 2:**

Run with hash table of size 64:

|  |  |  |  |
| --- | --- | --- | --- |
| File | Cycle Count by Prediction Type | | |
|  | 0 | 1 | 2 |
| sample.tr | 1905 | 1899 | 1907 |
| sample1.tr | 2353611 | 2058200 | 2053645 |
| sample2.tr | 2162718 | 2129755 | 2114962 |
| sample3.tr | 2277801 | 2304944 | 2181439 |
| sample4.tr | 6794185 | 6492910 | 6350008 |
| sample\_large1.tr | 213191677 | 199581132 | 195569031 |
| sample\_large2.tr | 215096623 | 212560091 | 202257089 |
| sample\_large3.tr | 204823906 | 197983616 | 196622900 |

For most of the files run, prediction type 2 resulted in the shortest number of cycles before completion, with the exception of the smallest file. Prediction type 1 produced the second smallest cycle count and type 0 produced the longest count. This makes sense because the branch prediction produces more reliable results in files with branches that are part of loops that are repeated taken rather than always assuming that the branch is not taken. The branch prediction allows processor the better decide which to assume. It makes sense for type 2 to be better than type 1 because the branch condition will not change due to one outlier case.

**Submission part 3:**

Hash table of size 32

|  |  |  |  |
| --- | --- | --- | --- |
| File | Cycle Count by Prediction Type | | |
|  | 0 | 1 | 2 |
| sample.tr | 1905 | 1899 | 1907 |
| sample1.tr | 2353661 | 2058200 | 2053645 |
| sample2.tr | 2162718 | 2129755 | 2114962 |
| sample3.tr | 2277801 | 2304944 | 2181439 |
| sample4.tr | 6794185 | 6492910 | 6350008 |
| sample\_large1.tr | 213191677 | 199581132 | 195569031 |
| sample\_large2.tr | 215096623 | 212560091 | 202257089 |
| sample\_large3.tr | 204823906 | 197983616 | 196622900 |

Hash table of size 128

|  |  |  |  |
| --- | --- | --- | --- |
| File | Cycle Count by Prediction Type | | |
|  | 0 | 1 | 2 |
| sample.tr | 1905 | 1908 | 1902 |
| sample1.tr | 2353661 | 2058337 | 2053654 |
| Sample2.tr | 2162718 | 2118662 | 2101620 |
| sample3.tr | 2277801 | 2304650 | 2180126 |
| sample4.tr | 6794185 | 6481655 | 6335420 |
| sample\_large1.tr | 213191677 | 199694981 | 195566007 |
| sample\_large2.tr | 215096623 | 212535555 | 202173055 |
| sample\_large3.tr | 204823906 | 197144763 | 195158533 |

Switching to a smaller hash table appeared to have no effect on the cycle count, but increasing the table size had mixed effects. For some of the files it improved the cycle count, and for others it hurt the count. This is likely due to collisions in the table due to the changing hash function and changing the bits that hashing was based on.