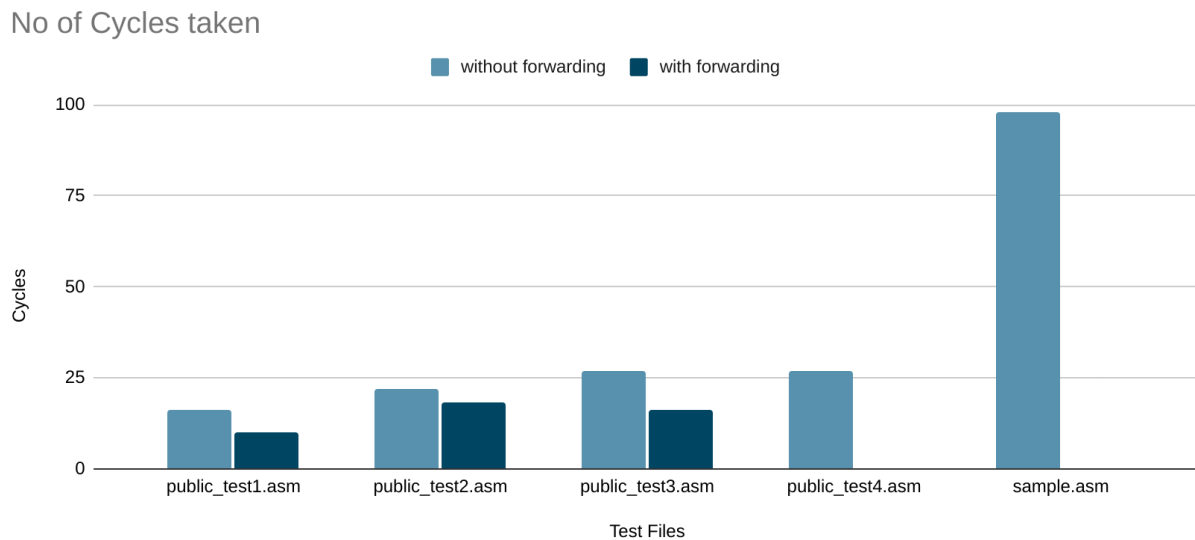# COL 216 Assignment 2 Report

No.of cycles taken for each file(5 stage)

No of Cycles taken

(no data means wrong output was recorded)

Branch Predictor:

Saturating Branch Predictor:

Prediction:In this case we've stored 2^14 saturating counters in a table indexed by the 14 LSB's of the PC. Whenever we encounter a branch, we go to the counter assigned to that PC in the table and predict the branch outcome based on counter[1] bit. If it is one, we predict that the branch is taken and vice versa.

Updating:Now, If the branch is taken, we go to the counter assigned to the PC and if the counter is not "11" we increase the counter by 1. If the branch is not taken, we decrease the counter by 1 whenever counter is not equal to "00"

BHR Branch Predictor:

Prediction: In this case, we store a bhr-table which is indexed by the bhr(the history of two immediate previous branches whether they were taken or not). Whenever we encounter a branch, we go to the bhr-table[bhr] and predict the branch outcome based on its first bit as done in the saturating branch predictor.

Updating: We update the values in the table the same way we've done in the saturating branch predictor. Here additionally we also update the bhr based on the outcome of the branch.

Saturating BHR branch predictor:

Prediction: In this case, we have a combination table indexed by 14LSB's of PC concatenated with bhr so that we are able to predict the branching based on the instruction itself and the history of branches both. Now in the same way, we go to the counter assigned to the pc+bhr and predict based on the value of counter[1]. {Combination table has 2^16 elements}.

Updating: In this case as well, we update the counter in the combination table in the same way we've done in both the cases of bhr and saturating counter. Additionally, we also update the bhr based on the outcome of the branch.

The table of accuracies of each counter for the given branch trace file is given below. As the accuracies of all counters change based on the initialized values of the counters in the table. So for all the counters, we put the initialized value to be zero.

S.no	Initialized counter value in all tables	Type of predictor	Total branches	Correctly guessed	Accuracy
1	0	Saturating branch Predictor	548	433	79.01

2	0	BHR branch predictor	548	392	71.53
3	0	Saturating BHR branch predictor	548	416	75.91