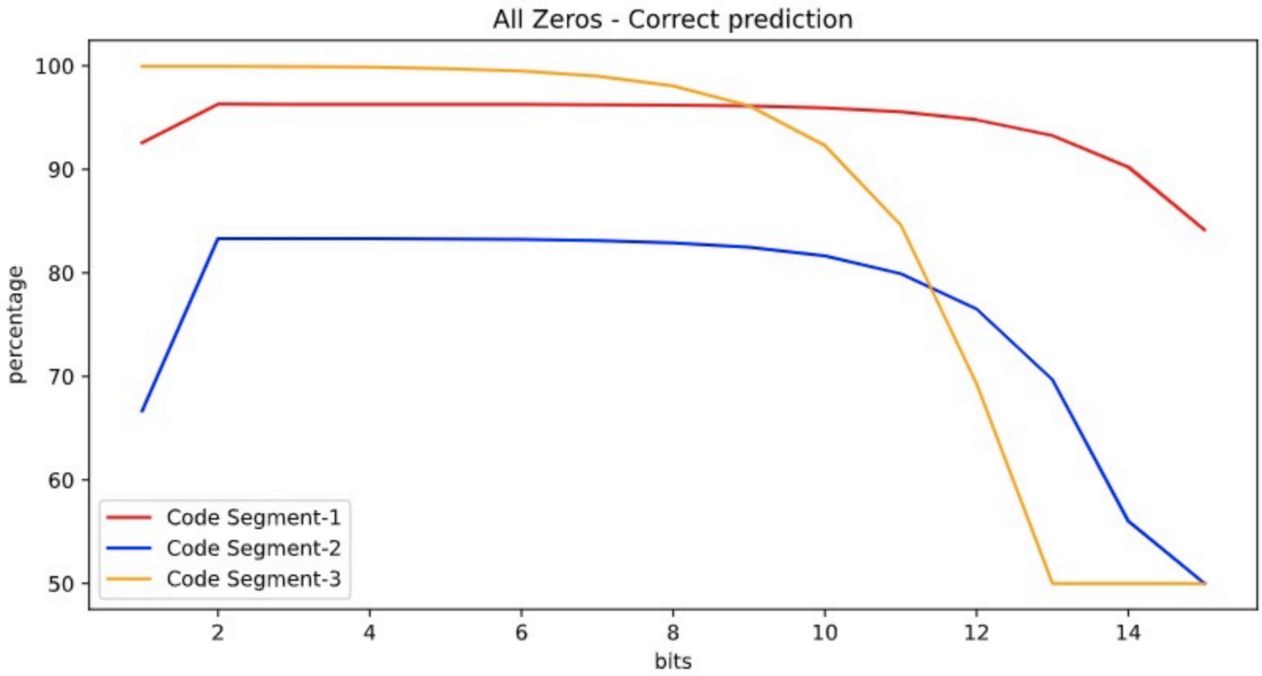


The down trend in code segments is due to growth of bits in predictor.
For example for 13-bit prediction, total possible values are 8192.
We have range from values 0-4095 inclined towards NOT TAKEN prediction.
We have range from values 4096 - 8191 inclined toward TAKEN prediction.

In Code Segment 1, the true outcome is

T,T,T,T,T,T,T,T,T,T,T,T,T,T,T,T,T,T,T,T,T,T,T,T,T,T,NT,T,T,T,T,T,T,T,T,T,T,T,T,T,T,T,T,T,T,T,T,T,T,T,T,T,T,NT,T,T,T,
T,T,T,T,T,T,T,T,T,T,T,T,T,T,T,T,T,T,T,T,T,T,T,NT,T,T,T,T,T,T,T,T,T,T,T,T,T,T,T,T,T,T,T,T,T,T,T,T,T,T,NT,T,T,T,T,T,T,
T,T,T,T,T,T,T,T,T,T,T,T,T,T,T,T,T,T,T,T,NT,T,T,T,T,T,T, ...

When we start from all zeros. We can clearly seen to predict the right outcome, 4096 states of 13-bit predictor will give wrong predictions.

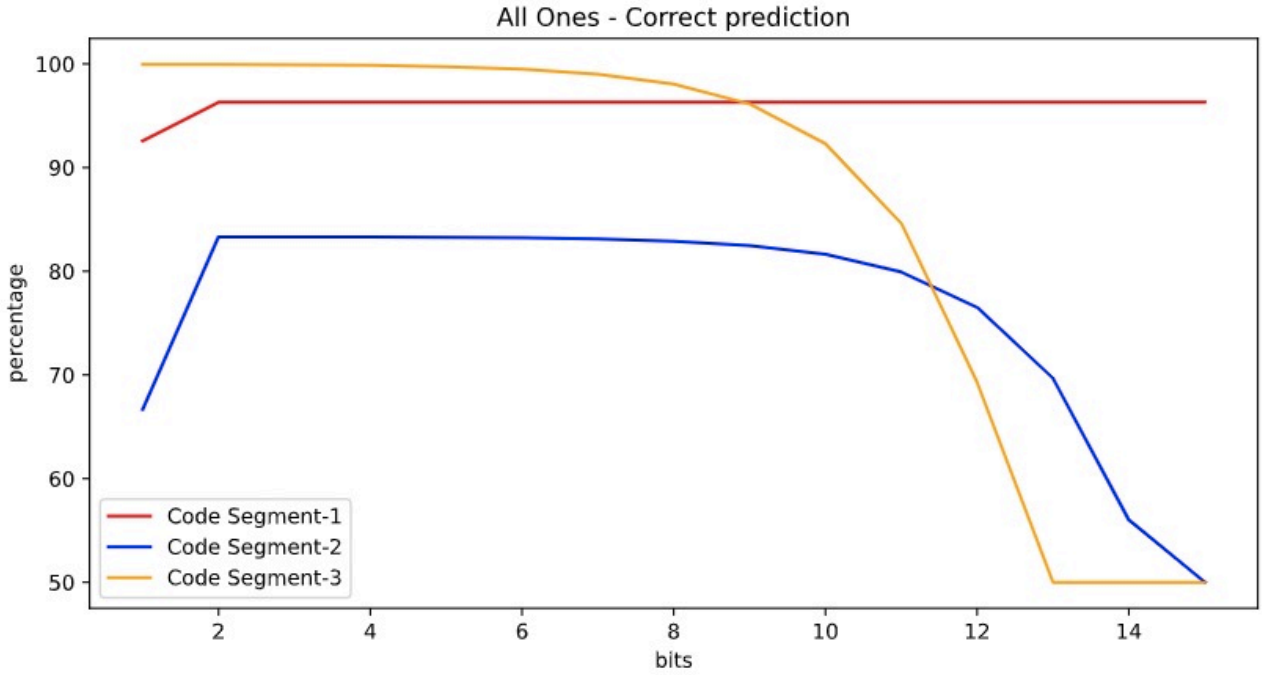
With the increase in bit's of the predictor the number of states to reach such state from where the prediction becomes correct, we need to cross over many false prediction with exponential growth in miss-prediction rate. Hence, we can see a decline pattern while increasing the bits in predictor for code segment-1.

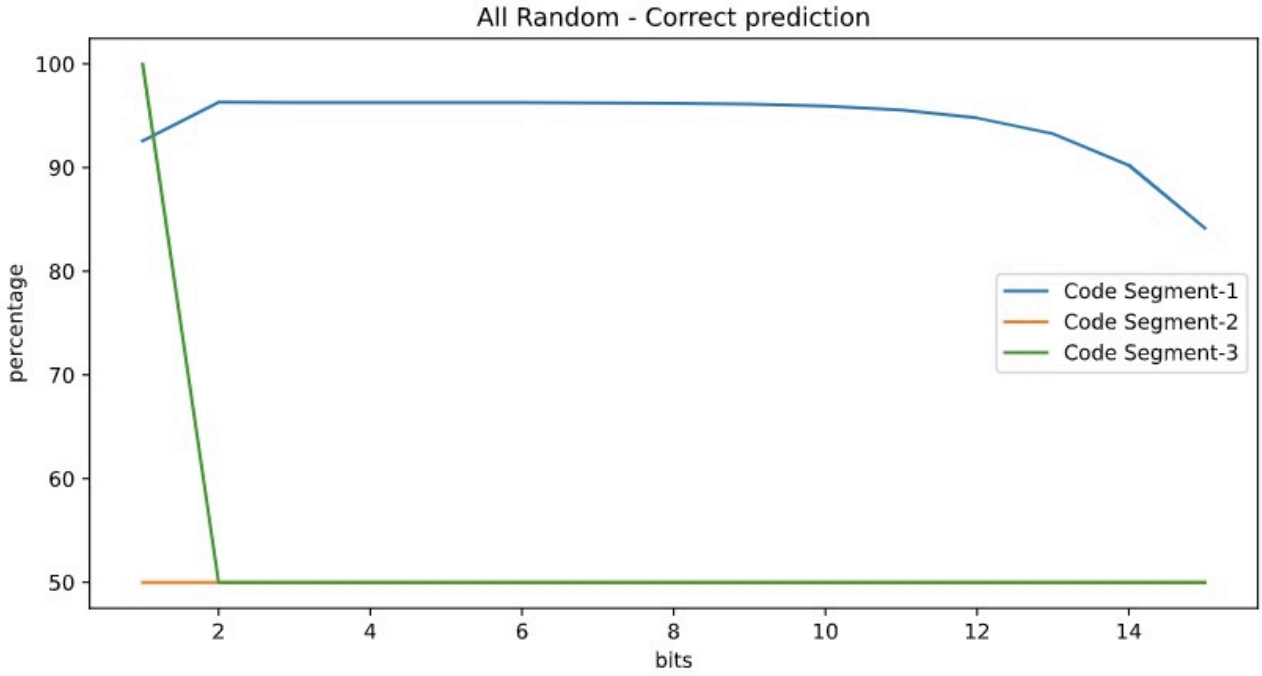
Therefore for large value of n-bits, the predictions are most likely to hold towards the initialisation side.

1. If it's initialised to all 0's then large bit predictor will be inclined towards NON_TAKEN. In this case if there are many TAKEN outcomes then it will add huge in miss-prediction where as if there are many NON_TAKEN outcomes then if will add huge in right-prediction.
2. If it's initialised to all 1's then large bit predictor will be inclined towards TAKEN. In this case if there are many TAKEN outcomes then it will add huge in right-prediction where as if there are many NON_TAKEN outcomes then if will add huge in miss-prediction.

Therefore, prediction accuracy depends upon the true outcomes and n-bit predictors initialisations.

Trends of all ones and random for all three segments are attached. The decline is due to the same reason mentioned above.





Observation -
The optimal value observed is **2 bit predictor.**