NC State University

Department of Electrical and Computer Engineering

ECE 463/521: Fall 2014

Project #2: Branch Prediction

by

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NCSU Honor Pledge: "I have neither given nor received unauthorized aid on this test or assignment."

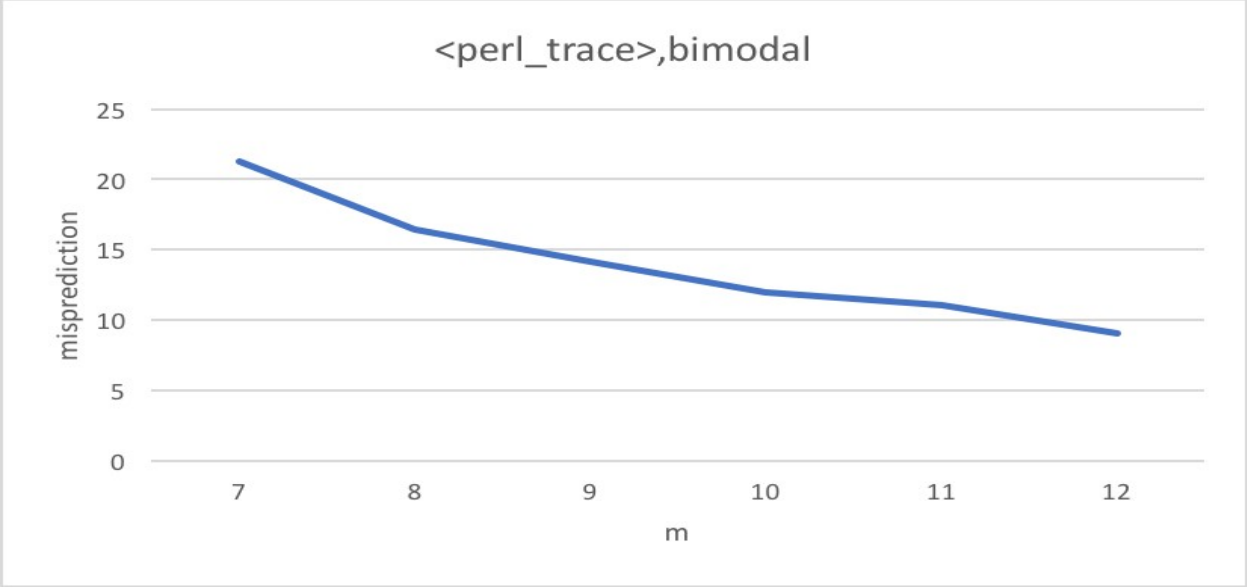
Student's electronic signature: _____Sopan Patra_____
(sign by typing your name)

Course number: _____521_____
(463 or 521 ?)

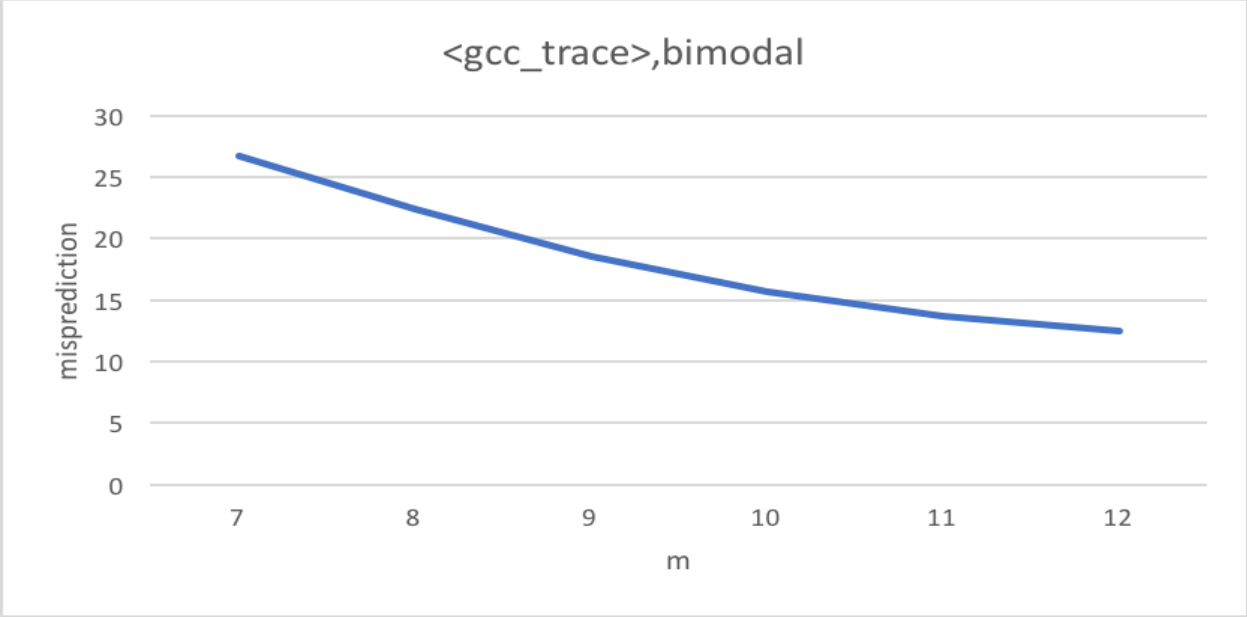
PART A
(BIMODAL BRANCH PREDICTOR)

Graphs:

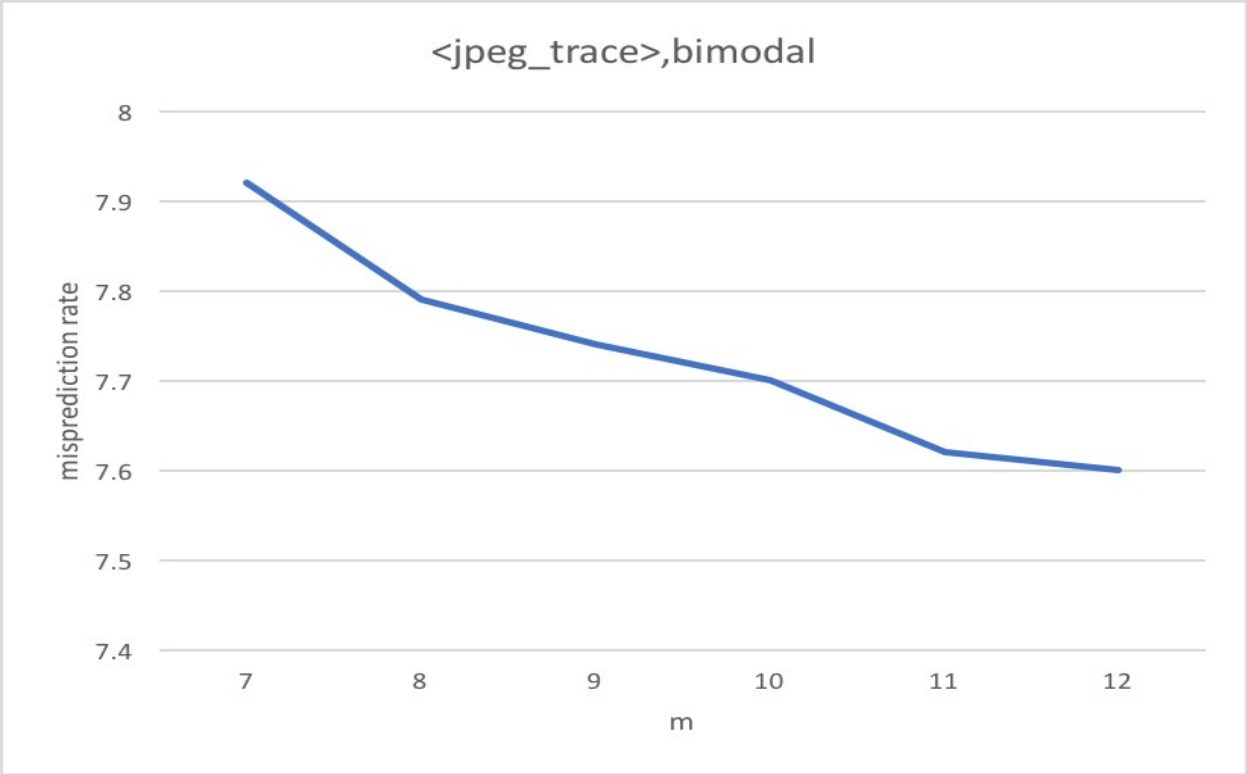
1)perl_trace



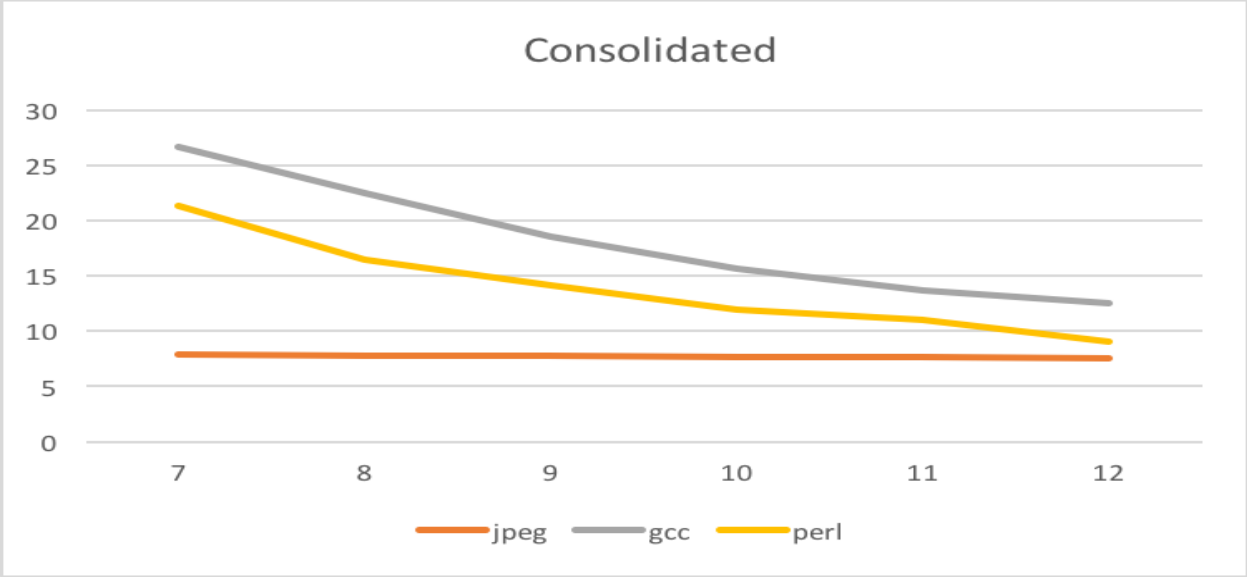
2)gcc_trace



3)jpeg_trace



4)Consolidated



Analysis:

1)Conclusion

Bimodal Predictor predictor has the least misprediction rate in the given subset of m i.e (7,12) for jpeg_trace.

2)Trends

Misprediction rate goes down with an increase in m in the given subset across all the traces. At lower values of m, this value is significantly higher for gcc_trace and perl_trace but the gap starts narrowing from m=11.

3)Similarities

Misprediction rate for Bimodal Predictor goes down with an increase in m across all the traces.

4)Differences

perl_trace and gcc_trace have a sharper gradient of misprediction rate fall. jpeg_trace stays moreover constant over the given subset of m.

Design:

1)Optimal design for jpeg_trace:

Given budget: 16 kB
So, upper limit on #bits that can be used to index the predictor table = 17

The perl_trace.txt seems to be flat in the given subset of m. So, designing it at the lowest value of m seems to be the optimal choice.

I would design the Bimodal Predictor with m=7.

2)Optimal design for gcc_trace:

gcc_trace seems to flatten out from m=12. So, I would design the Bimodal Predictor with m=12.

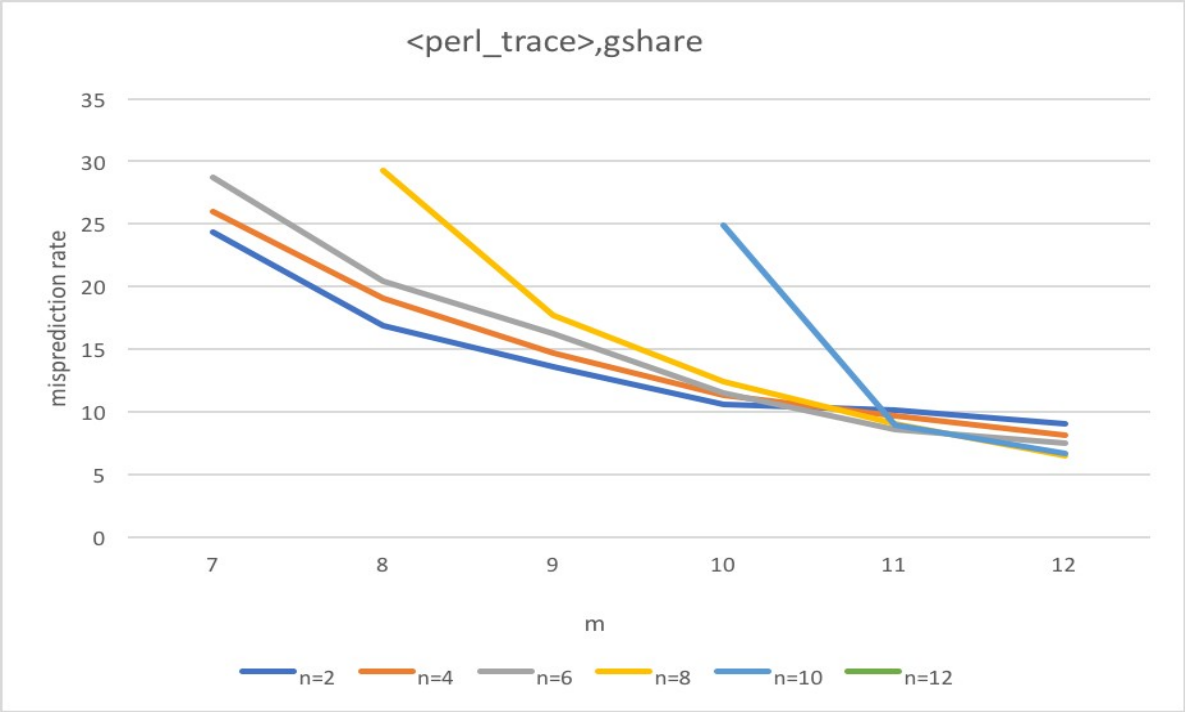
3)Optimal design for perl_trace:

perl_trace seems to have a dip even at m=12. Since I have been provided the subset m=(7,12), I would design the Bimodal Predictor at m=12.

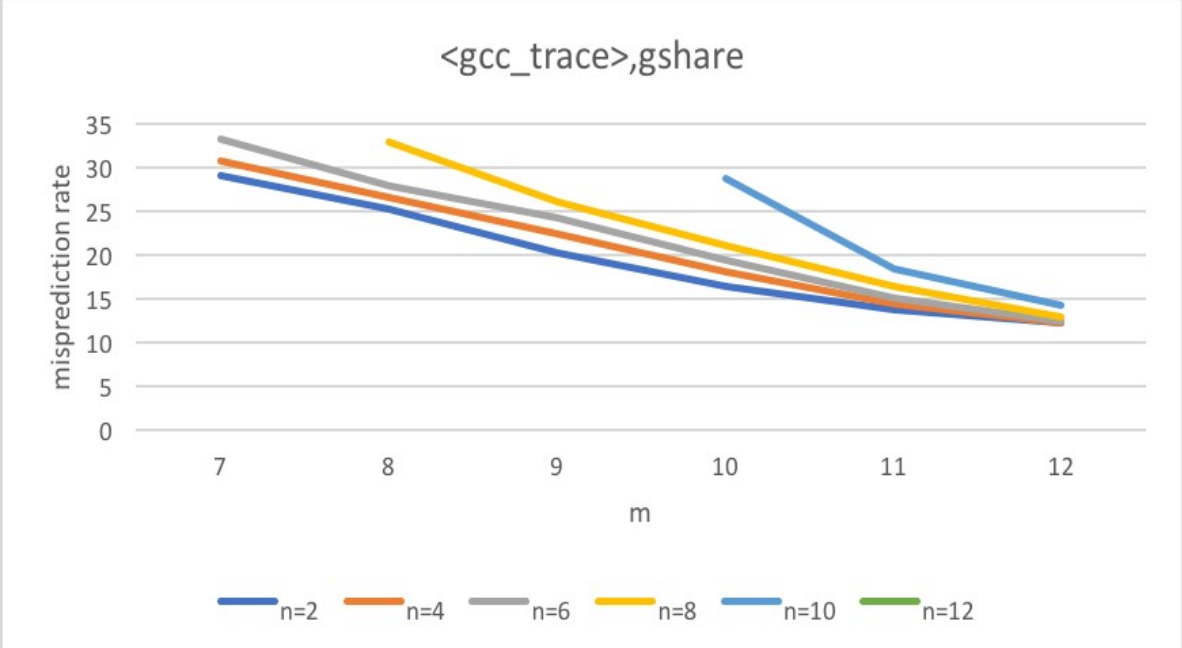
PART A
(GSHARE BRANCH PREDICTOR)

Graphs:

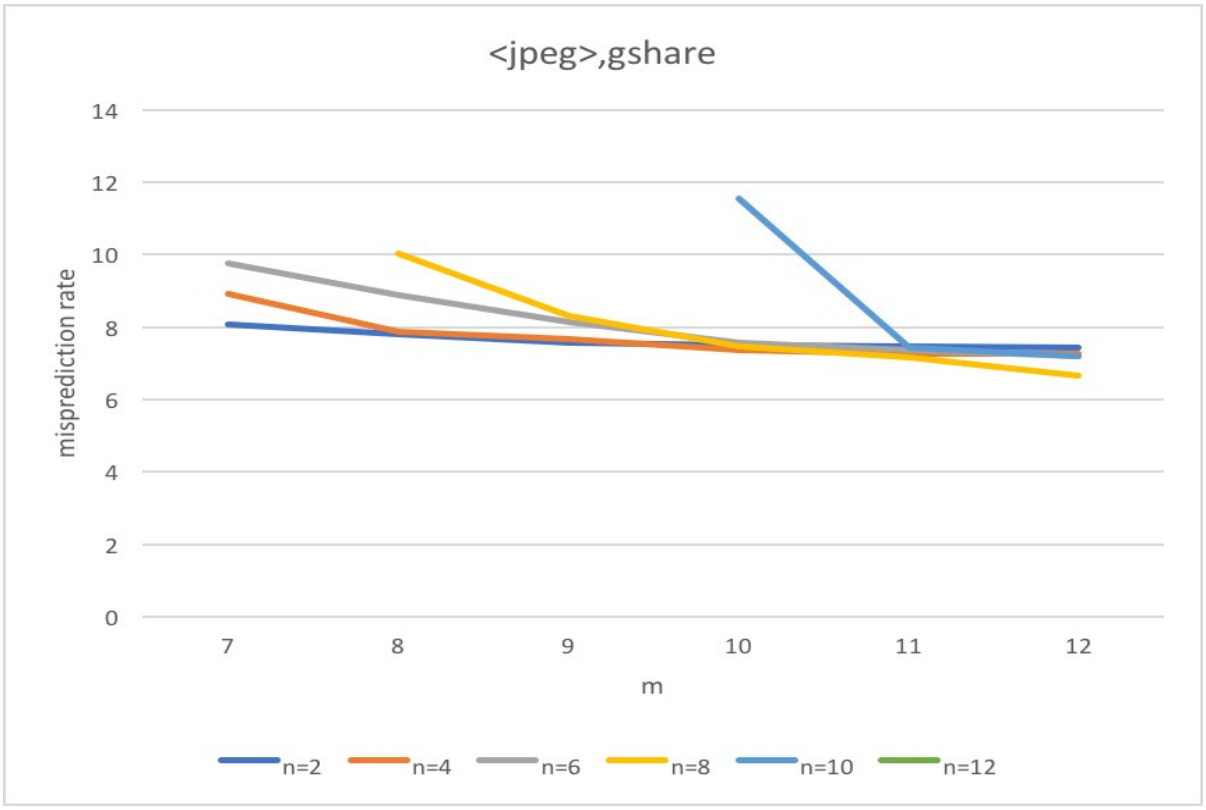
1)perl_trace



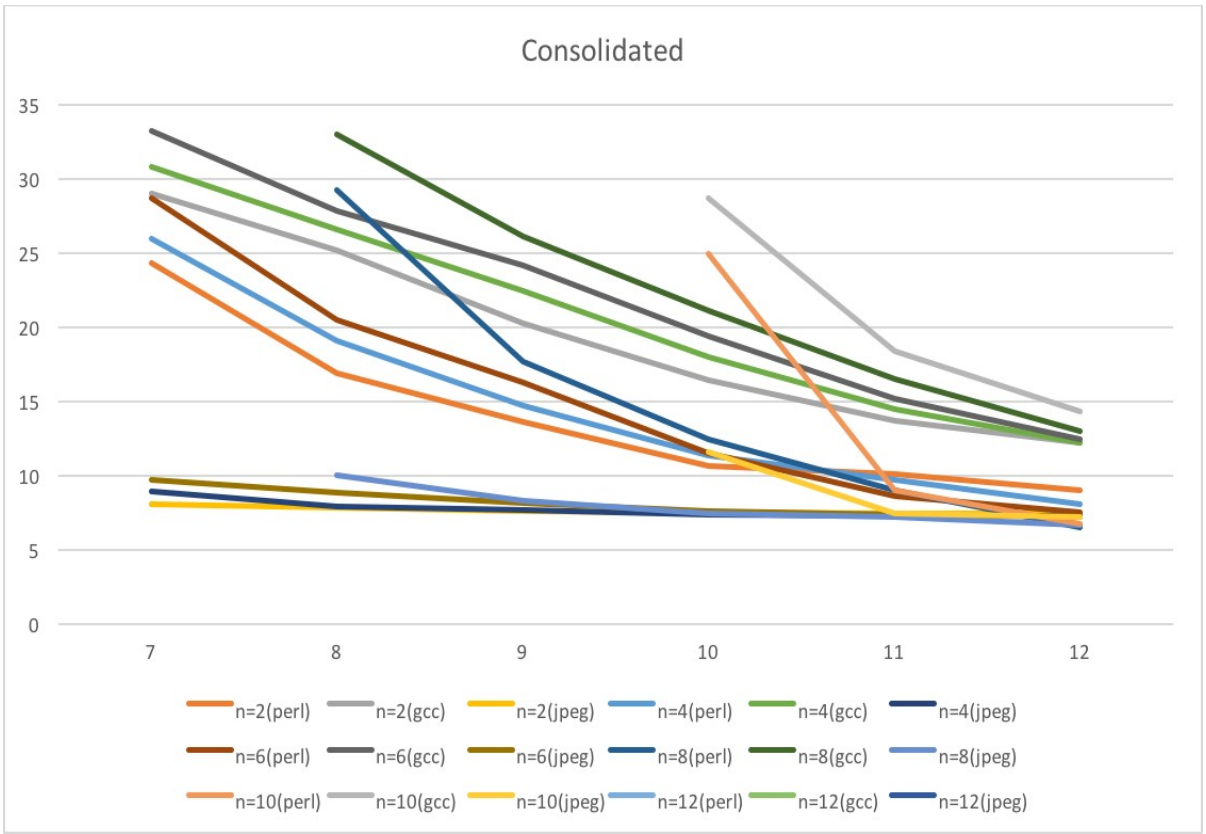
2)gcc_trace



3)jpeg_trace



4)Consolidated



Analysis:

1)Conclusion

GShare Predictor predictor has the least misprediction rate in the given subset of m i.e (7,12) for jpeg_trace for all n except n=10.

2)Trends

Misprediction rate goes down with an increase in m in the given subset and for all n across all the traces. At lower values of m, this value is significantly higher for gcc_trace and perl_trace but the gap starts narrowing from m=11. For n=10, I observe an abnormally high misprediction rate across all traces.

3)Similarities

Misprediction rate for GShare goes down with an increase in m across all the traces(for all n).

4)Differences

perl_trace and gcc_trace have a sharper gradient of misprediction rate fall. jpeg_trace stays moreover constant over the given subset of m. (Excluding the case when n=10)

Design:

1)Optimal design for perl_trace:

Given budget: 16 kB
So, upper limit on #bits that can be used to index the predictor table = 17

The perl_trace.txt seems to be flattening out from m=12
For n=m=12, I observe the least misprediction rate for n=10

I would design the Bimodal Predictor with m=12,n=10

2)Optimal design for gcc_trace:

gcc_trace seems to flatten out from m=12. So, I would design the Bimodal Predictor with m=12,n=10

3)Optimal design for jpeg_trace:

perl_trace seems to have a flattening trend from m=11(even for all n's) . At this point n=8
So, I would design the Bimodal Predictor with m=11,n=8