**CMPEN 431 WR1 Report**  
Design Space Exploration of Branch Predictors

[Student Name]  
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This document serves as a writing template for you to use for your report. You do not need to strictly adhere to the style guidelines, but it makes things easier for us to read and is pleasant to the eyes. In general, please keep your document in single spaced, 12pt Times New Roman or Linux Libertine font, justified text paragraph width. Any images you use please center in the document and provide a small figure description in 9pt font when necessary. Here is an example:

A diagram of a number

Description automatically generated  
A state diagram of a 2-bit bimodal branch predictor.

In your writeup be sure to explain your Custom branch predictor; what it does, why you chose to implement what you did, and what tradeoffs your predictor has against others. These could be things like cost, simplicity, area, accuracy… You don’t need to build a “better” predictor, (as you will find predictors excel at different benchmarks) rather, build one that tackles some design constraint or niche. You can implement a static or dynamic predictor, and it can be a novel idea or not (meaning you could look at other branch predictors, past or present, and implement those, just be sure to cite where it’s from).

As a reminder, your technical writeup should be > 500 words in technical prose and include data on ~50 runs across a variety of parameters for each branch predictor type. Of course, static predictors like Always Taken have no parameters so you will only need one run, but for others – such as Bimodal – you may expect to have anywhere from 5-15 experiments (1 bit, 2 bit, 3 bit, across table sizes of 256, 512, 1024…) per predictor. The number of experiments is not strict, rather rough guidelines – please pick as many as you need to research and understand the design space. You could even look at existing CPU architectures to see what they use as inspiration or a starting point, should you wish. Please be sure to only use reasonable parameter values (ex: table sizes in excess of MBs are unreasonable), if you’re unsure, do some research or ask.

Finally, along with discussions comparing predictor performance across a variety of parameters and benchmarks, also include discussions comparing and contrasting predictors against one another. Be sure to use plots, charts, etc. to visually describe your conclusions and results.

If you are unclear about anything, feel free to ask or visit office hours. Happy exploring!