

Discussion 9: Branch prediction

Thursday, March 7, 2019 1:47 PM

Outline

- Getting stats
- Prediction table
- Storing predictions
- Indexing prediction table
- Perceptron paper

Parts of branch predictor

one bit

1) prediction + how to store → 2 bits :-

2) storing many predictions → table

3) how to choose predictor → PC
→ global history

actual T T T T N T T T
br br br br br br br br
pred T T T T N T T T
C C C C I I C C 0

3/9 prediction accuracy

2 bit T T T T T T T T

I I

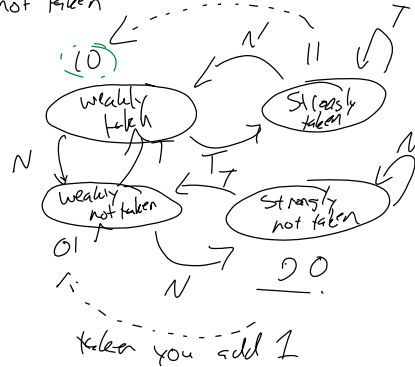
8/9 correct

1 0 1

1 0 1 1 1 1 1 1

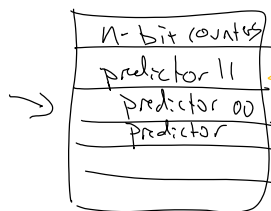
1 → taken
0 → not taken

not taken
subtract



prediction Table

How to choose a predictor?



Use PC

PC [... index 00]

of index bits?

$\log_2(\text{table entries})$



global history of branches

T N T N T N T ← global history register
↳ shift reg w/ branch outcomes
predictor table

1 0 1 0 1 0

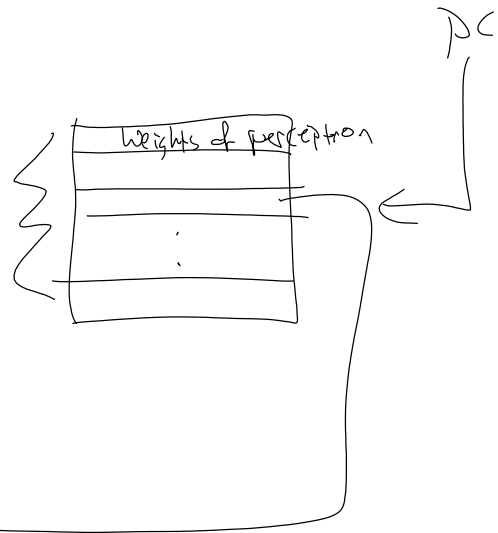
Use global history to
pick predictor



Perceptron

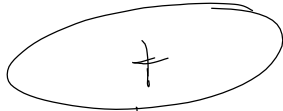
- 1) how is prediction stored? → as a prediction
- 2) have a table of predictions
- 3) choose a predictor?

learned based
on global
history



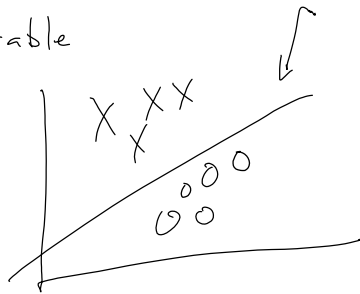
T N T N N T T N

w_i w_i w_i w_i ↓ ↓ ↓ ↓



prediction → y

Linear separable



linear inseparable

T N T N	X	O
	X	O
	O	X
	O	X
	T	N