ML Assignment 5

Probability of opening the correct Door $= \frac{1}{3}$

We need the probability of the correct door being chosen given the initial door we selected and the door selected by host $P(C/A, B)$

from bayes theorem.

$$P(C/A,B) = \frac{P(A \cap B \cap C)}{P(A \cap B)}$$

$$P(C/A,B) = \frac{P(B/A,C) * P(A \cap C)}{P(A \cap B)}$$

$$P(C/A,B) = \frac{P(B/A,C) * P(C/A) * P(A)}{P(A,B)}$$

$$P(C/A,B) = \frac{P(B/A,C) * P(C/A) * P(A)}{\sum_{c=n} P(A,B,C)}$$

$$P(C,A,B) = \frac{P(B/A,C) * P(C/A) * P(A)}{\sum_{c=n} P(B/A,C) * P(A \cap C)}$$

$$P(C/A,B) = \frac{P(B/A,C) * P(C/A) * P(A)}{\sum_{C=n} P(B/A,C) * P(C/A) * P(A)}$$

$$P(C/A) = P(C)$$

$$P(C/A,B) = \frac{P(B/A,C) * P(C)}{\sum_{C=n} P(B/A,C) * P(C)}$$

$$P(C/A,B) = \frac{P(B/A,C) * P(C)}{\sum_{C=n} P(B/A,C) * P(C)}$$

$$P(C/A,B) = \frac{P(B/A,C)}{\sum_{C=n} P(B/A,C)}$$

Now lets calculate these probabilities lets say we chose door 1, and the host choose door 2 the we get,

$P(B=2/A=1, C=1) = 1/2$

$P(B=2/A=1, C=2) = 0$

$P(B=2/A=1, C=3) = 1$

$$P(C=1/A=1, B=2) = \frac{P(B=2/A=1, C=1)}{\sum_{C=n} P(B/A,C)}$$

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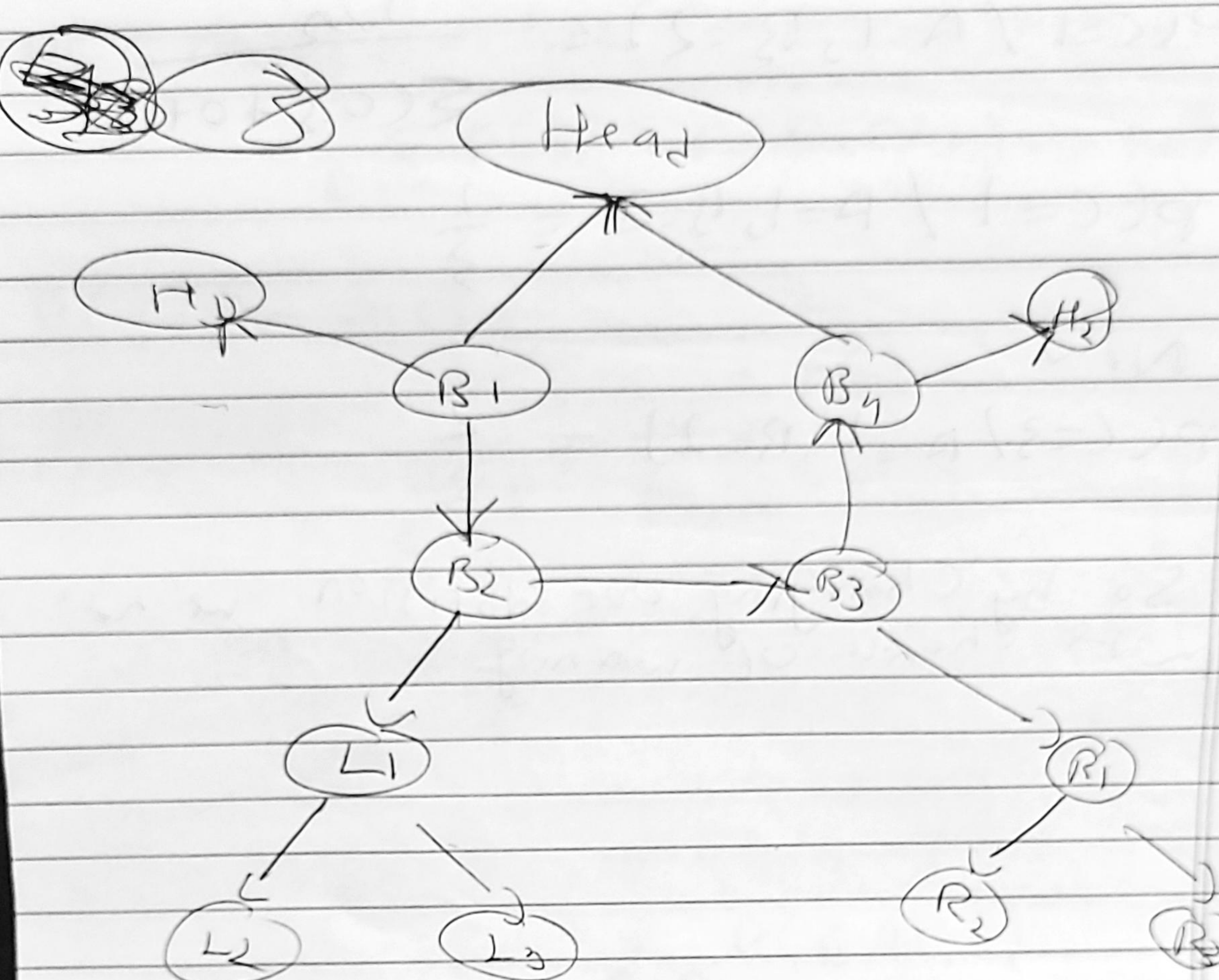
$$P(C=1 / A=1, B=2) = \frac{1/2}{\Sigma(0.5+0+1)}$$

$$P(C=1 / A=1, B=2) = \frac{1}{3}$$

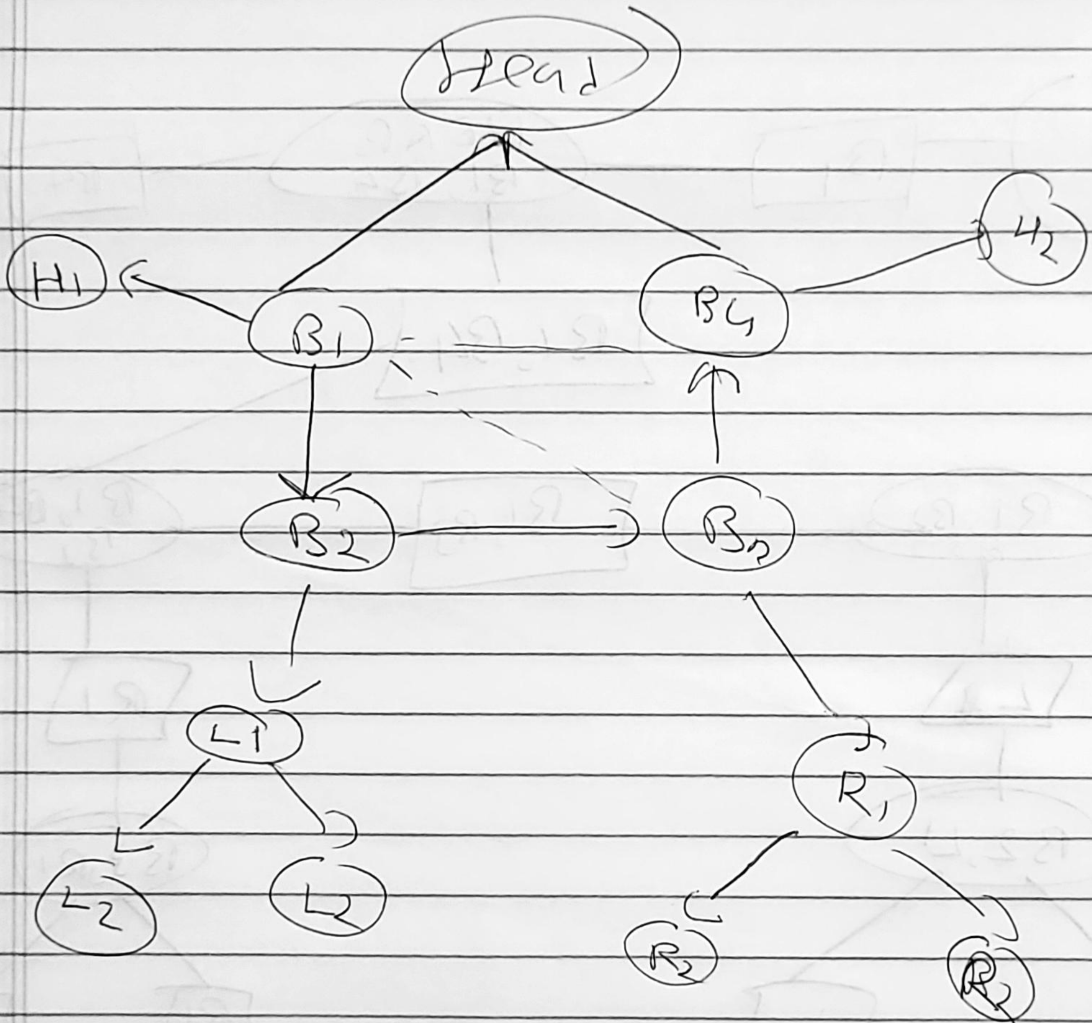
Now

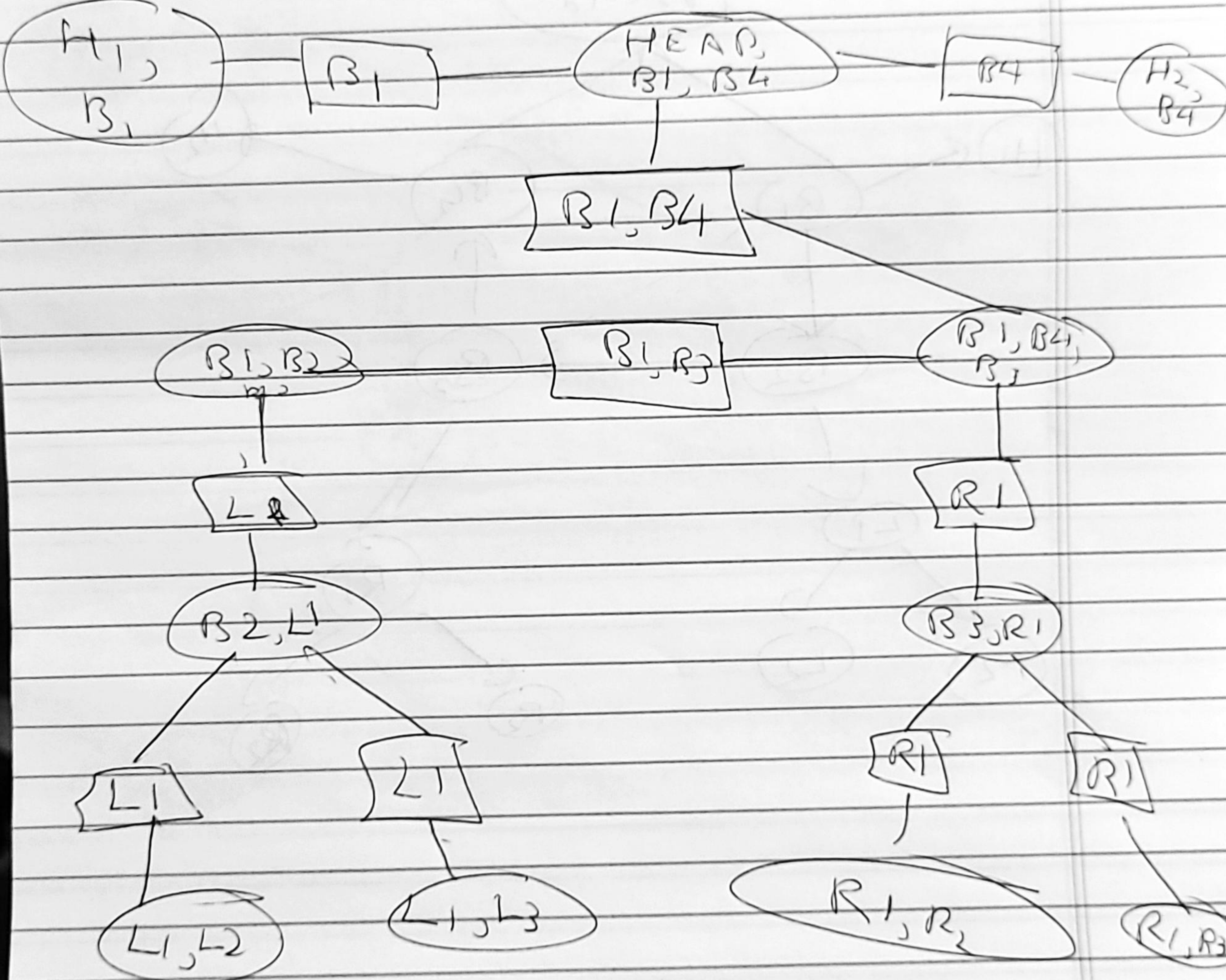
$$P(C=3 / A=1, B=2) = \frac{2}{3}$$

So by changing our decision we have more chance of winning



Head
H1
B1
B4
H2
B2
B3
L1
R1
L2
L3
R2
R3


Head
H1
B1
B4
H2
B2
B3
L1
R1
L2
L2
R2
R2



H1, B1
B1
HEAP, B1, B4
B4
H2, B4
B1, B4
B1, B2
B1, B3
B1, B4, B3
L1
R1
B2, L1
B3, R1
L1
L1
R1
R1
L1, L2
L1, L3
R1, R2
R1, R3

4 Junction tree Algorithm

The joint probability distribution is.

$P(x_1, x_2)$	$x_2 = 0$	$x_2 = 1$	
$x_1 = 0$	0.040462	0.445087	0.485549
$x_1 = 1$	0.323699	0.190751	0.514451
$P(x_2)$	0.364162	0.635838	

$P(x_2, x_3)$	$x_3 = 0$	$x_3 = 1$	$P(x_2)$
$x_2 = 0$	0.260116	0.104046	0.364162
$x_2 = 1$	0.057803	0.578035	0.635838
$p(x_3)$	0.317919	0.682081	

$p(x_2, x_3)$	$x_4 = 0$	$x_4 = 1$	$p(x_3)$
$x_3 = 0$	0.119220	0.198699	0.317919
$x_3 = 1$	0.639451	0.042630	0.682081
$p(x_4)$	0.758671	0.241329	

$p(x_4, x_5)$	$x_5 = 0$	$x_5 = 1$	$p(x_4)$
$x_4 = 0$	0.569003	0.189668	0.758671
$x_4 = 1$	0.060332	0.180997	0.241329
$p(x_5)$	0.629335	0.370665	

(5)

The most likely sequnce of mario's emotional states for next five day are

Day 1 → Happy
Day 2 → Angry
Day 3 → Angry
Day 4 → Angry
Day 5 → Angry