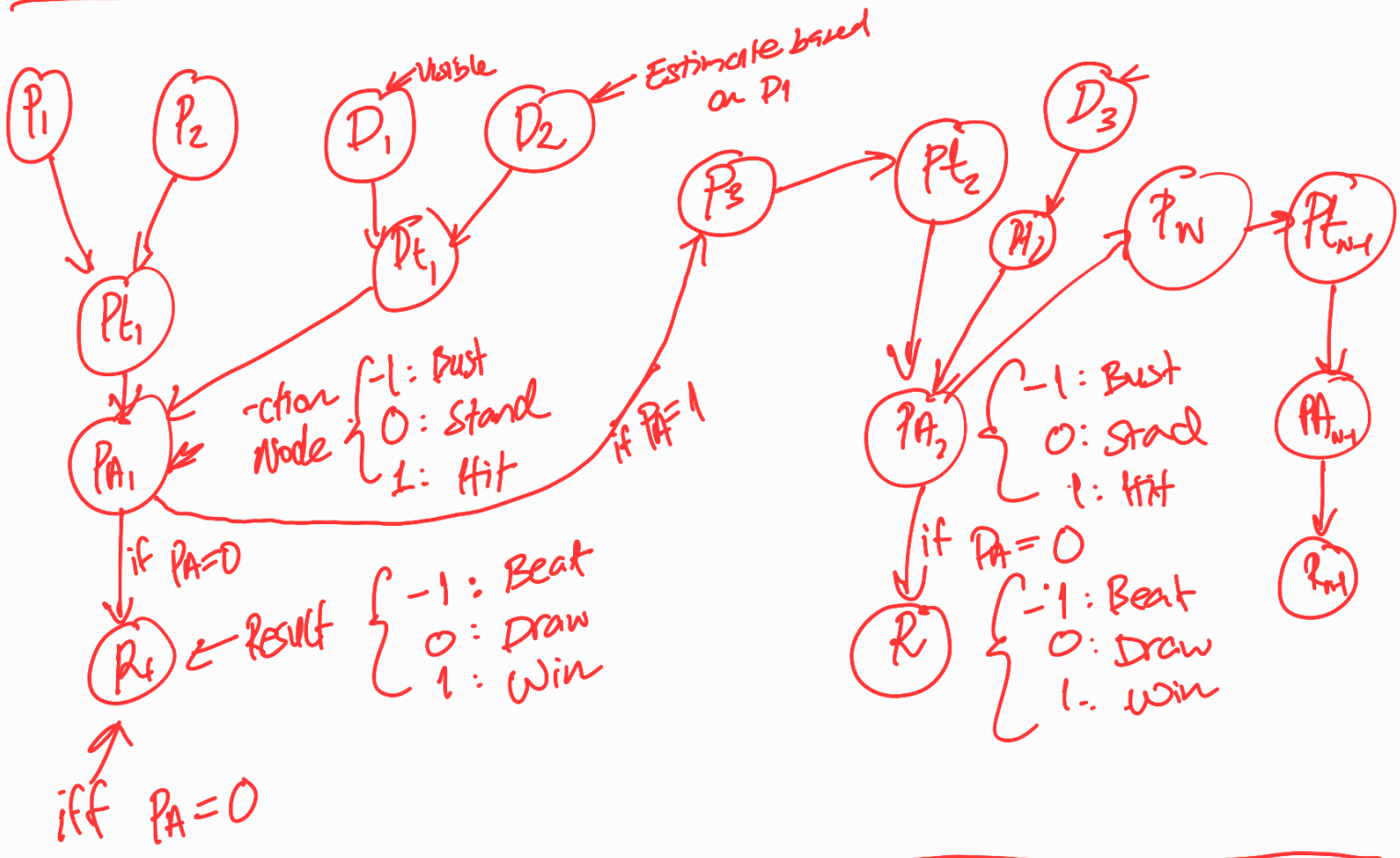


Player Matrix

Round 1 →
Round 2 →
Round 3 →
Round 4 →

$$\left[\left[(P\text{-}S_1, C_2), P\text{-}S_2 \right], \left[(P\text{-}S_2, C_3), P\text{-}S_3 \right], \left[(P\text{-}S_3, C_4), P\text{-}S_4 \right], \left[(P\text{-}S_4, (5)), P\text{-}S_5 \right] \right]$$

$P\text{-}S_1$: first sum of hand (1st card drawn)

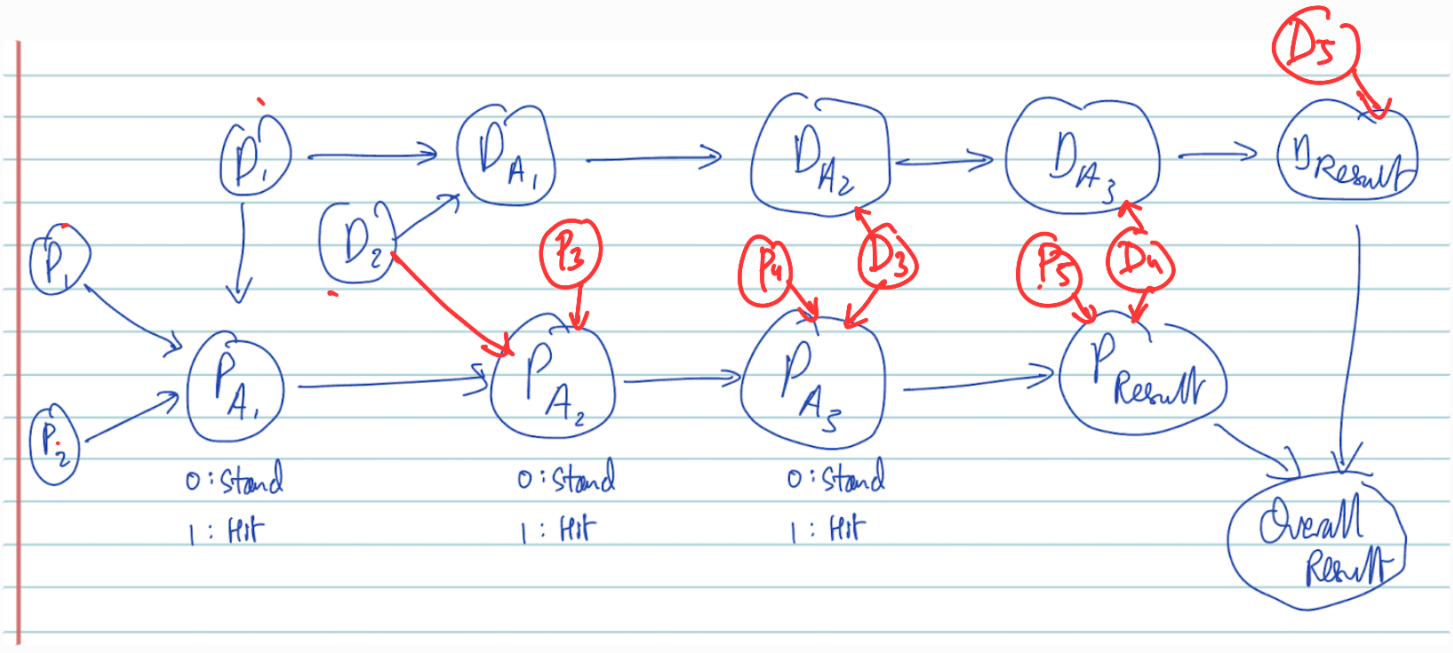
C_u: u^{th} card drawn $u \in [2, 5]$

$P\text{-}S_i$: i^{th} sum of hand $u \in [1, 5]$

Deck Composition

4 aces, 16 Ace, 0
16 Low, -1
16 Medium, omit
16 10s, 1

c1 → c5 , a_1



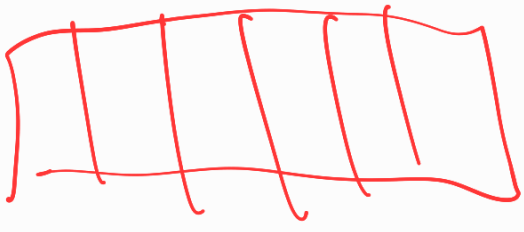
Agent :

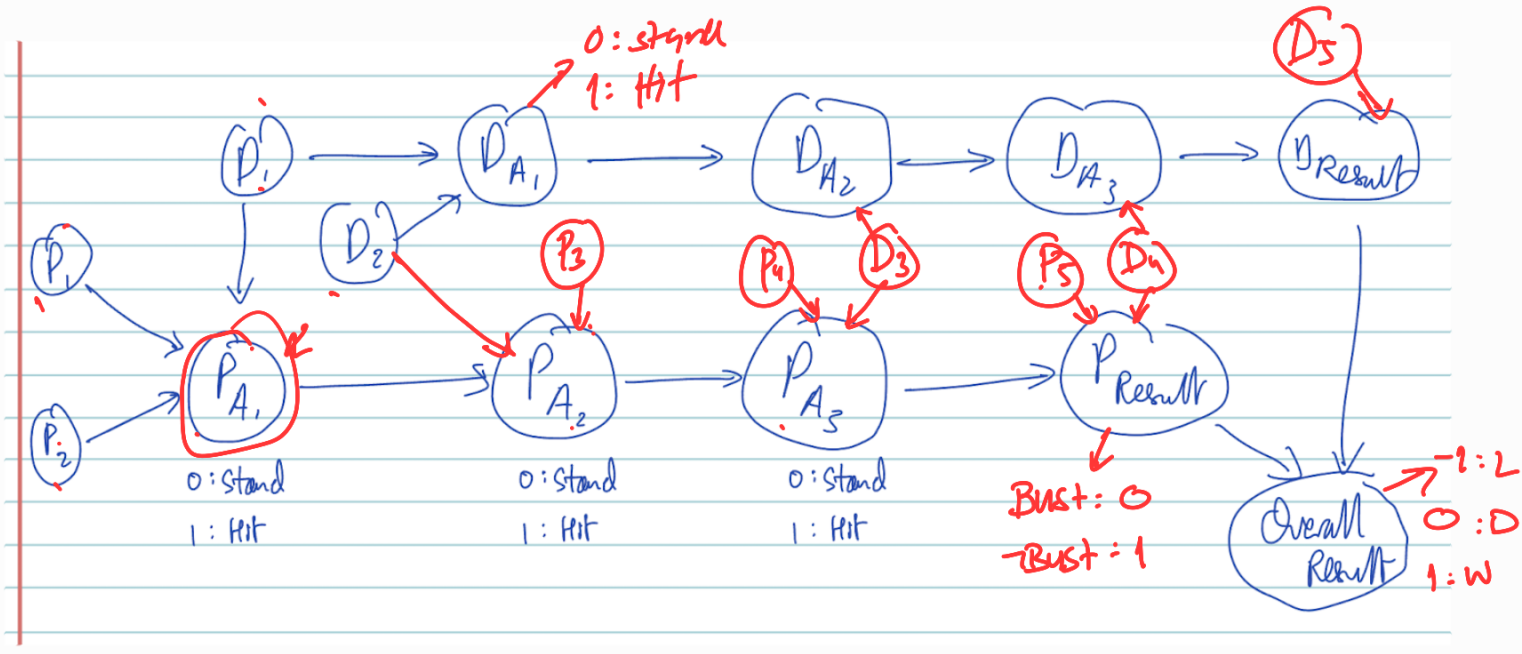
Able to estimate the dealer's sum

Action

H

S





Player CPT:

$P(P_{A_1} \mid P_1, P_2, D_1)$

$P(P_{A_2} \mid P_{A_1}, P_3, P_2)$

$P(P_{A_3} \mid P_{A_2}, P_4, D_3)$

$P(P_r \mid P_{A_3}, P_5, D_4)$

Dealer CPT:

$P(D_{A_1} \mid D_1, D_2)$

$P(D_{A_2} \mid D_{A_1}, D_3)$

$P(D_{A_3} \mid D_{A_2}, D_4)$

$P(D_r \mid D_{A_3}, D_5)$

9 possible CPTs

$P(R \mid P_r, D_r)$

Assume that the deck is always 52!

Player CPT:

$P(PA_1 | P_1, P_2, D_1)$

$P(PA_2 | PA_1, P_3, P_2)$

$P(PA_3 | PA_2, P_4, D_3)$

$P(P_r | PA_3, P_5, D_4)$

Dealer CPT:

$P(DA_1 | D_1, D_2)$

$P(DA_2 | DA_1, D_3)$

$P(DA_3 | DA_2, D_4)$

$P(D_r | DA_3, D_5)$

$P(R | P_r, D_r)$

Ace, Low, 10s

0 -1 1

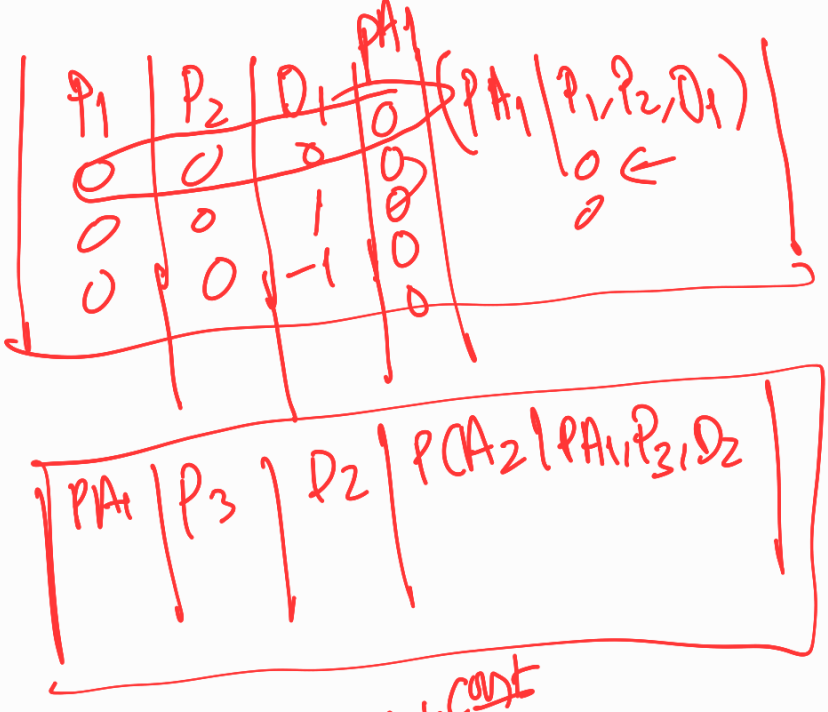
900,000 hands

Filter observations for

$P_1 \to P_5$, $D_1 \to D_5$,

$PA_1 \to PA_3$, $DA_2 \to DA_3$

P_r, D_r, R



another dictionary (cost) to keep a counter for each observation

↓ use it to compute CPT

Yeah!

9 empty dictionaries

5 keys → 27 entries

observed dictionary

{P1 : {0: x , 1: y , -1: z}} ← observation nested dictionary

Count (P_1, P_2, D_1, PA_1)

Count $(P_{Ai}, P_{i+2}, D_{i+1})$ $i \in [1,3]$

Count (D_1, D_2, DA_n)

Count $(PA_{n+1}, DA_n, D_{n+2})$ $n \in [1,4]$

numerator + denominator

1) Look at the dataset and count all the observations
   ↳ stored them in a dictionary

2) Compute CPT

	P_1	P_2	D_1	PA_1	Count
Ex.1	0	0	0	0	x
					y

$P_1\text{-}P_2\text{-}d_1\text{-}PA_1\text{-}dict = \{(0,0,0,0): count, \dots\}$

$P_1\text{-}P_2\text{-}d_1\text{-}dict = \{(0,0,0): counts$

||

18 dictionaries

Brute-forcing Method

Modeling Bets

75% after like 10 rounds
↳ increment betting
else
50% ⇒ stay conservative

$P(X_1) \cdot E(X) + P(X_2) \cdot E(X_2)$
$\nearrow \quad \dots \quad P(X_n) \cdot E(X_n)$