

Actividad 6

A – Programme bayésien

$$\text{PartyBN}() = \left\{ \begin{array}{l} \text{Description} \\ \left\{ \begin{array}{l} \text{Specification} \\ \left\{ \begin{array}{l} \text{Relevant Variables:} \\ RI, RP, We, LI, E, JA, MA, AA, BA, JP, MP, AP, VP, BP \\ \text{Decomposition:} \\ P(RI \ RP \ We \ LI \ E \ JA \ MA \ AA \ BA \ JP \ MP \ AP \ VP \ BP \mid \pi) = \\ P(RI \mid \pi)P(RP \mid \pi)P(We \mid \pi)P(LI \mid \pi)P(E \mid \pi) \\ P(JA \mid RI \ \pi)P(BA \mid LI \ \pi)P(AA \mid We \ \pi)P(AP \mid AA \ \pi) \\ P(MA \mid JA \ AA \ \pi)P(MP \mid MA \ \pi)P(VP \mid AA \ BA \ \pi) \\ P(JP \mid JA \ RP \ \pi)P(BP \mid BA \ E \ \pi) \\ \text{Parametric Forms:} \\ \text{See Figure3} \\ \text{Identification:} \\ \text{All tables provided by the user} \\ \text{Question:} \\ P(RI \mid MP \ We \ \pi) \end{array} \right\} \end{array} \right\}$$

Here are the questions we want to find an answer to :

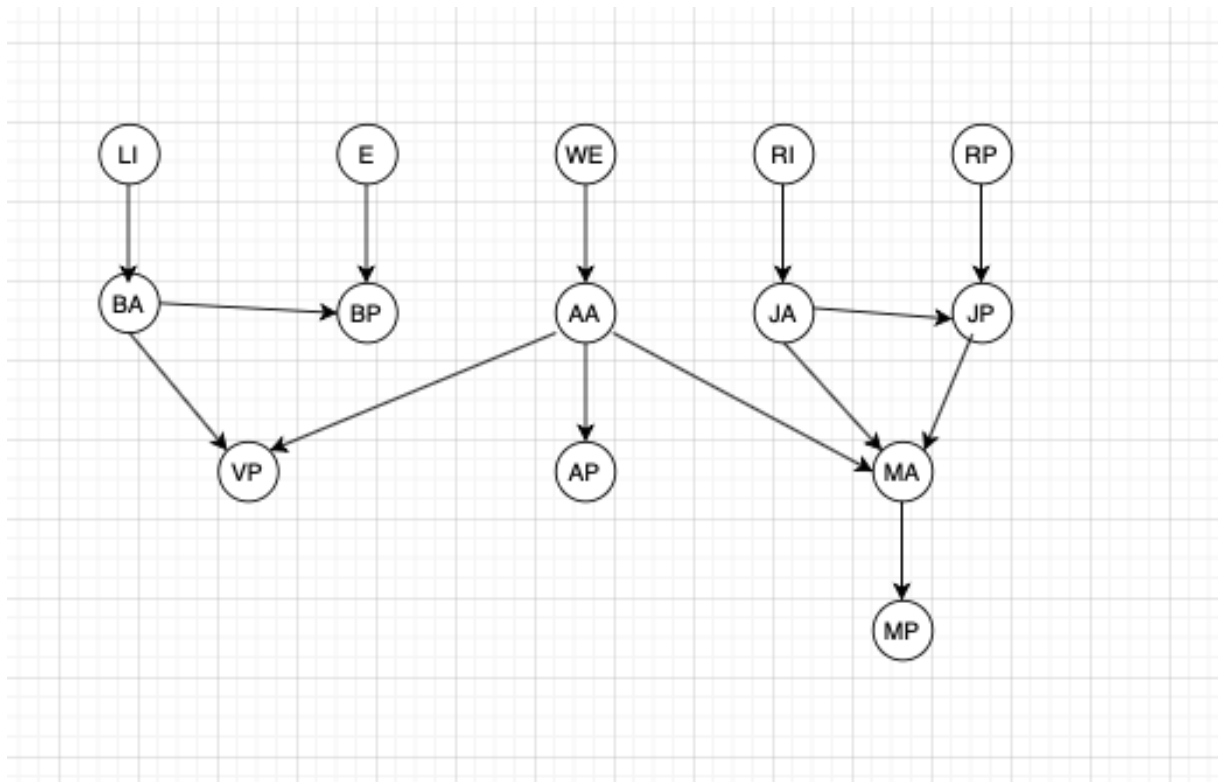
$$P(RI=1 \mid MP=0, WE=0)$$

$$P(JP=1, MP=1, AP=1, BP=1, VP=1 \mid RP=0, LI=0, WE=0, E=0)$$

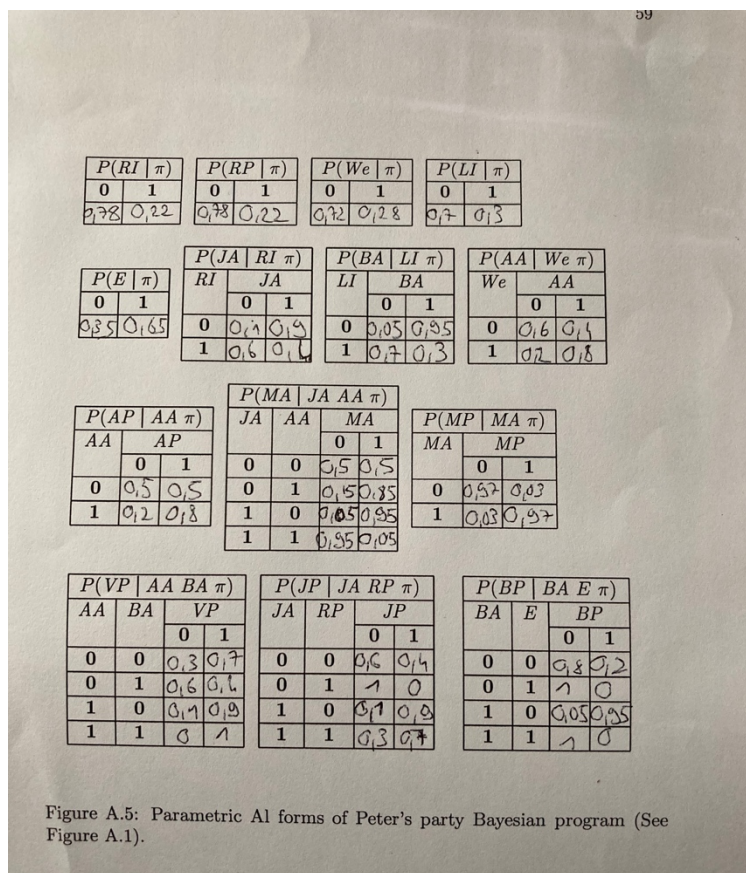
$$P(AP=1, VP=1, BP=1)$$

$$P(VP=1, MP=1 \mid AP=1, JP=0)$$

B – Dessiner le programme bayésien



C – Tableau de proba



D – Code pour répondre aux questions

1-

iv. Write the expressions for the following questions:

- (a) What is the probability that it was raining when John received the invitation knowing that Mary didn't attend the party and that the party is on Monday?

P(RI) =	
RI	Probability
0	0.691366109180621
1	0.308633890819379

Here the second value, equal to 0.3086

2-

- (b) What is the probability that all Peter's friends attend the party knowing that it will take place on a sunny Saturday, knowing that Bill received the invitation in time and no emergency was present at the hospital?
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print(P_tout)
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JP	AP	MP	VP	BP	Probability
0	0	0	0	0	0.00612448869246892
0	0	0	0	1	0.000851950676645275
0	0	0	1	0	0.0202501804363048
0	0	0	1	1	0.00344160011175975
0	0	1	0	0	0.00897271124884434
0	0	1	0	1	0.00136984931471801
0	0	1	1	0	0.041794619322511
0	0	1	1	1	0.00689459984806076
0	1	0	0	0	0.00874117605172632
0	1	0	0	1	0.00150612251645962
0	1	0	1	0	0.0578183346656431
0	1	0	1	1	0.00932914667008888
0	1	1	0	0	0.0156296238535381
0	1	1	0	1	0.00303407746589144
0	1	1	1	0	0.137368864575614
0	1	1	1	1	0.0218726532086216
1	0	0	0	0	0.00873660648612039
1	0	0	0	1	0.00158410812310764
1	0	0	1	0	0.0656378965650746
1	0	0	1	1	0.0105233691177846
1	0	1	0	0	0.0199261935725663
1	0	1	0	1	0.00263409188552907
1	0	1	1	0	0.0521573036761096
1	0	1	1	1	0.00910043092239492
1	1	0	0	0	0.0210254167810805
1	1	0	0	1	0.00465631069684767
1	1	0	1	0	0.242070101514145
1	1	0	1	1	0.0381731922814449
1	1	1	0	0	0.0252437833136551
1	1	1	0	1	0.00396348932080126
1	1	1	1	0	0.128502699244598
1	1	1	1	1	0.0210650078398446

Here the value equal to 0.021 (the last one)

3-

(c) What is the probability that Alice, Victor and Bill attend the party?

P(AP VP BP) =

AP	VP	BP	Probability
0	0	0	0.0585914412291975
0	0	1	0.0116778393123297
0	1	0	0.169582007006344
0	1	1	0.0465487130958585
1	0	0	0.0737012913933367
1	0	1	0.0203630289275198
1	1	0	0.494820259402844
1	1	1	0.124715419632569

Here the last value equal to 0.124

4-

- (d) Alice answer the phone at Peter's house, "Hi John". What is the probability that Mary and Victor attended the party? (Note: No, no, no, John is not calling from a cell phone).

P(MP VP)

MP	VP	Probability
0	0	0.05065166868012
0	1	0.278841195519429
1	0	0.0811649238166721
1	1	0.589342211983778

Here the last value equal to 0.589