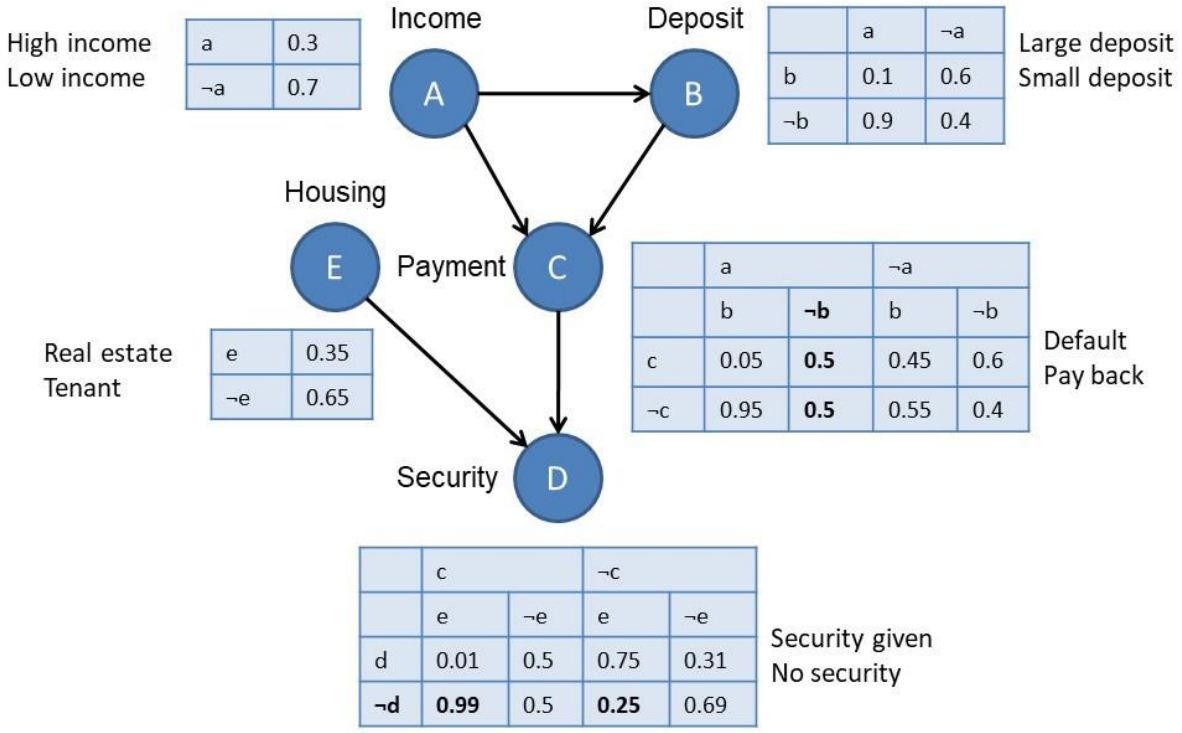
Probabilistic Graphical Modelling Assignment1

Q1) The question below encodes a set of independencies among the following variables Income (a), Deposit(B), Housing(E), Payment(C) and Security(D). Answer the following sub questions.



a	0.3
¬a	0.7

	a	¬a
b	0.1	0.6
¬b	0.9	0.4

	e	0.35
	¬e	0.65

	a		¬a	
	b	¬b	b	¬b
c	0.05	**0.5**	0.45	0.6
¬c	0.95	**0.5**	0.55	0.4

	c		¬c	
	e	¬e	e	¬e
d	0.01	0.5	0.75	0.31
¬d	**0.99**	0.5	**0.25**	0.69

I) Indicate whether the following independence statements are true or false according to this model. Provide a very brief justification of your answer (not more than two or three sentences)

1. Income ⊥ Security
2. Income ⊥ Security | Payment
3. Income ⊥ Payment
4. Income ⊥ Security | Payment, Deposit
5. Deposit ⊥ Payment
6. Income ⊥ Payment | Deposit

II) Show the factorized form of the joint distribution over all of the variables, P(A, B, C, D, E)

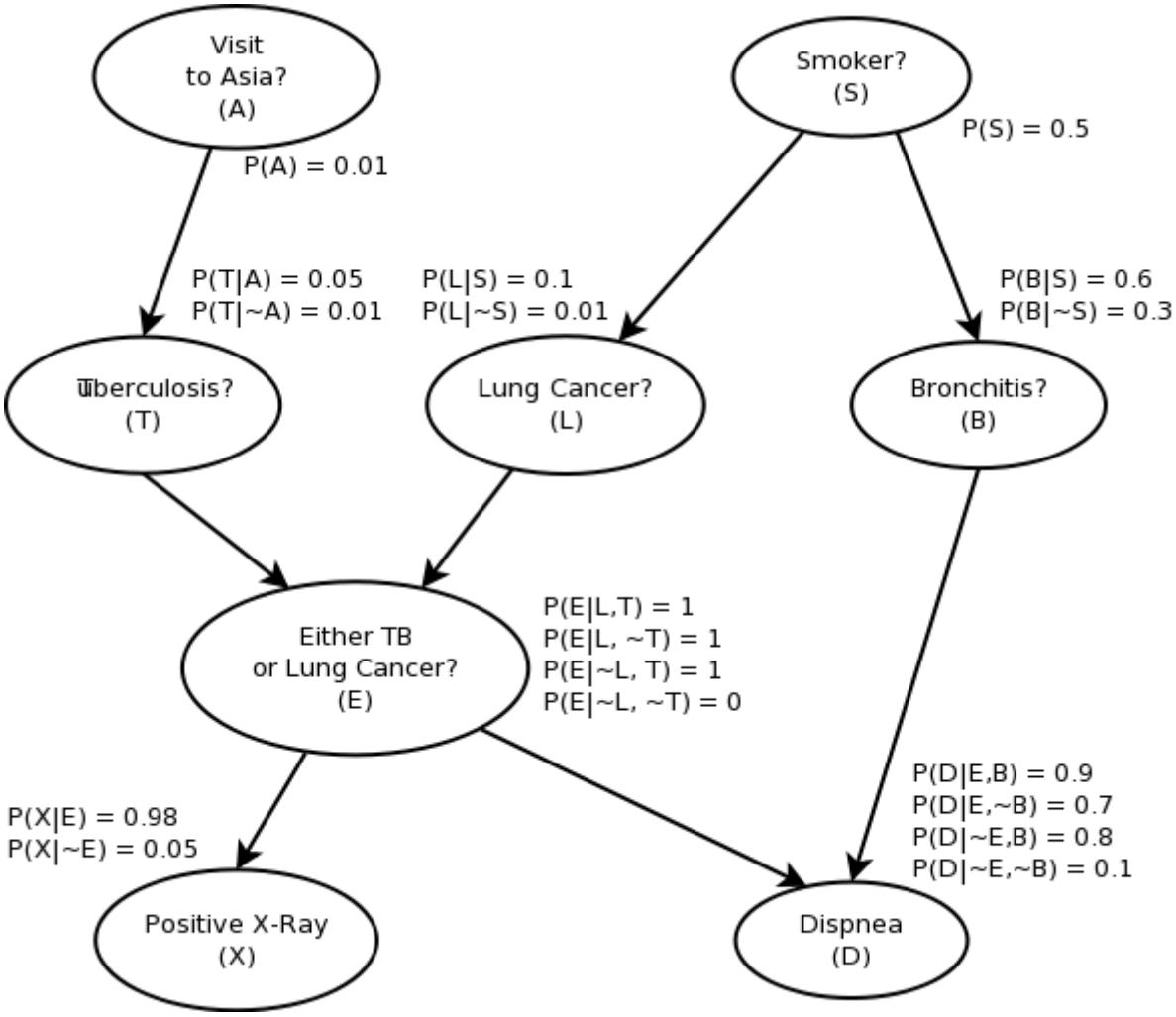
III) Find out probability for payment is false, when no prior information is available.

IV) What is the probability that you have got Payment, given that the income is low?

V) What is the probability that you have got Payment, given that the income is low and you have large deposits?

VI) What is the probability that you didn't default in payment given high income and no security is given?

Q2) Given the Bayesian network, answer the below mentioned questions.



I) Does knowing that you have Lung Cancer increase or decrease your likelihood of having Bronchitis? Intuitively, does this make sense?

II) What is the probability that you have the tuberculosis, given that you have visited Asia, you have Lung Cancer, and you know that you have positive x-ray?

III) What is the probability of having Dispnea given that you have positive x-ray.

IV) Find out all the independencies in the graph.