Data Science & AI

Artificial Intelligence

Logics

Lecture 02

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Recap of Previous Lecture

Topic

Topic

Topic

Topic

Topic

Certainty in AI

Topics to be Covered

- Topic — Uncertainty in AI
- Topic
- Topic
- Topic
- Topic

Uncertainty — Probabilistics Reasoning

$0 \leq P(A) \leq 1$

$$P(A) = \frac{\text{No of Possible Sample for event A}}{\text{Total Number of outcome}} = \binom{3}{13} =$$

A → GATE

B → DPP

$$P(A|B) = \frac{P(B \wedge A)}{P(B)} = \frac{P(B|A) \cdot P(A)}{P(B)}$$

Bayes theorem

(Q) A Company is manufacturing tyre for car.

Prob of tyre being Faulty = 0.02 $P(T)$ $1-0.02=(.98)$

Prob of a test detecting a fault when there is a fault $P(T|F) = 0.98$ (Test, Faulty)

Prob of a test detecting a fault when there is no fault $= P(T|\neg F) = 0.03$

Find the probability of a tyre actually being faulty given a positive test

$$P(F|T) = \frac{P(T|F) \cdot P(F)}{P(T)} = \frac{0.98 \times 0.02}{0.02 \times 0.98 + 0.98 \times 0.03} \approx (0.4)$$

$P(T)$ = tyre is faulty and test detect it + tyre is not faulty and test incorrectly detected

$= 0.02 \times 0.98 + 0.98 \times 0.03$

$=$

Medical test Accuracy

Probablity of having corona $= 0.01$ $P(C) = 0.01$

Probablity of Positive test if you have corona $= 0.95$ $= P(T|C) = 0.95$

Probablity of Positive test if you dont have corona $= 0.05$ $P(T|\neg C) = 0.05$

Find the probability of having corona given a positive test result

$$P(C|T) = \frac{P(T|C) \cdot P(C)}{P(T)} = 0.16$$

$P(T) = P(T|C) \cdot P(C) + P(T|\neg C) \cdot P(\neg C)$

$= 0.95 \cdot 0.01 + 0.05 \cdot (1 - 0.01)$

(Q) Email Problem

Probability of an email being Spam $P(S) = 0.15$

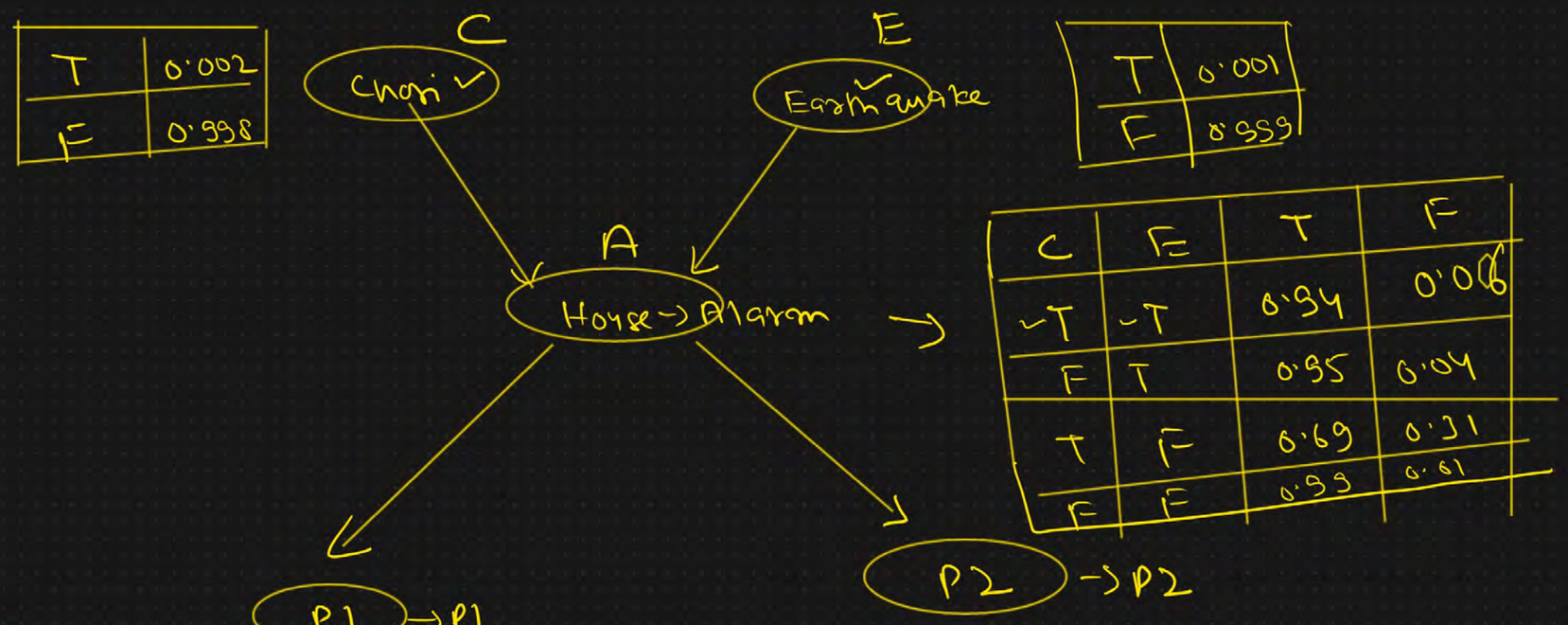
Probability of certain keyword appearing in Spam $P(K|S) = 0.8$

Probability of keyword being Spam $P(K) = \cancel{0.02}\ (0.2)$

Probability of Email being Spam given those keyword are present

$$P(S|K) = \frac{P(K|S) \cdot P(S)}{P(K)} = \frac{0.8 \times 0.15}{0.2} = (0.6)$$

Bayesian Network



T	0.002
F	0.998

T	0.001
F	0.999

C	E	T	F
~T	~T	0.94	0.06
F	T	0.95	0.04
T	F	0.69	0.31
F	F	0.99	0.01

P1

	T	F
T	0.91	0.09
F	0.05	0.95

	T	F
T	0.75	0.25
F	0.02	0.98

$$P(P1, P2, A, \neg C, \neg E) = P(P1 \mid P2, A, \neg C, \neg E) \cdot P(P2, A, \neg C, \neg E)$$

$$= P(P1 \mid P2, A, \neg C, \neg E) \cdot P(P2 \mid A, \neg C, \neg E) \cdot P(A, \neg C, \neg E)$$

$$= P(P1 \mid A) \cdot P(P2 \mid A) \cdot P(A \mid \neg C, \neg E) \cdot P(\neg C, \neg E)$$

$$= P(P1 \mid A) \cdot P(P2 \mid A) \cdot P(A \mid \neg C, \neg E) \cdot P(\neg C) \cdot P(\neg E)$$

$$= 0.91 \times .75 \times 0.99 \times 0.998 \times 0.999$$

$$= (0.67)$$

$P(P1, P2, \neg A, C, \neg E) =$

$P(P1, P2, A, C, E) =$

$P(P1, P2, A, \neg C, E) =$

2 mins Summary

- Topic
- Topic
- Topic
- Topic
- Topic

THANK - YOU