GRUNDLAGEN DER WISSENSVERARBEITUNG
COMPUTER SCIENCE
UNIVERSITÄT HAMBURG

Tutorial 9 : Belief Networks

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Exercise 9.2

Describe properties of the resulting sequences: what are the similarities and differences to "real" texts?

Similarities are that sometimes the grammar is correct (excepting the words that has the same form for sustantive and adjective for example, where the program can't distinguish between them or more difficult constructions like weil and the verb at the end) but the whole sentences don't usually makes any sense.

Exercise 9.3

Compute the following probabilities:

- $P(\text{Battery\_Wk}) = P(Battery\_NotBrk) = 0{,}9$

- $P(\text{Starter\_Wk}) = P(Starter\_NotBrk)*P(IgnitionKey\_Wk)*P(Battery\_Wk) = 0{,}9 * P(IgnitionKey\_NotBrk\|Battery\_Wk) * 0{,}9 = 0{,}9*P(Battery\_Wk\|IgnitionKey\_NotBrk)*P(IgnitionKey\_NotBrk)*0{,}9 = 0{,}9*0{,}9*0{,}9*0{,}9 = 0{,}6561$

- $P(\text{Engine\_Wk}) = P(Engine\_NotBrk) * P(Starter\_Wk) * P(Filter\_Wk) = 0{,}9*0{,}6561*P(Filter\_NotBrk\|(FuelPump\_NotBrk\|(FuelTank\_Wk, EFR\_Wk)) = 0{,}9 * 0{,}6561 * P(Filter\_NotBrk\|(FuelPump\_NotBrk\|(FuelTank\_NotBrk, (EFR\_NotBrk, Battery\_Wk, IgnitionKwy\_Wk)) = 0{,}9 * 0{,}6561 * 0{,}9 * 0{,}9 * 0{,}9 * 0{,}9 * 0{,}9 * 0{,}9 * 0{,}9 = 0{,}282429536$

- $P(\text{Engine\_Wk} \| \text{FuelPump\_Wk}) = P(Engine\_NotBrk)*P(Starter\_Wk)*P(Filter\_Wk) = 0{,}9 * 0{,}6561 * 0{,}9 = 0{,}531441$

Exercise 9.4

Complete the missing probabilities and draw the probability network

Smuggler	F	0.99
	T	0.01
Fever	F	0.987
	T	0.013

Fever	Smuggler	Sweat	Probability
F	F	F	1
F	F	T	0
F	T	F	0.6
F	T	T	0.4
T	F	F	0.4
T	F	T	0.6
T	T	F	0.2
T	T	T	0.8

Smuggler	DogBk	Probablity
F	F	0.95
F	T	0.05
T	F	0.2
T	T	0.8

Give an example of 'explaining away' in the given network

If someone is not a smuggler nor has a fever then the likelihood that that person is sweating is zero, so sweating has ben explained away by fever and been smugger.

Compute the following probabilities

- P(Smuggler||DogBk) = (DogBk||Smuggler) * P(Smuggler) = 0.8*0.001 = 0.0008

- P(Sweating) =P(Sw||Fev,Smug) + P(Sw|| Fev,Smug) + P(Sw||Fev, Smug) + P(Sw|| Fev, Smug)
  = 0.99 * 0.987 * 0 + 0.01 * 0.987 * 0.4 + 0.99 * 0.013 * 0.6 + 0.01 * 0.013 * 0.8
  = 0.011774