

**COMP 3710 - 3**

**Applied Artificial Intelligence (3,1,0)**

**Fall 2017**

**Seminar/Lab 11.**

**Uncertainty in Environments**

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2.

P (a) = 0.04

P (b) = 0.05

P (a | b) = 0.6

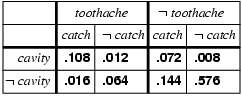
P (a | ¬b) = 1 / 95

P (a ∧ b) = p (a | b) \* p (b) = 0.6 \* 0.05 = 0.03

P (b | a) = p (b∧a) / p (a) = 0.03 / 0.04 = 0.75

P (¬b | a) = 1- P (b | a) = 0.25

3.





= P (toothache ∧ (cavity ∨ ~ catch)) / p (cavity ∨ ~ catch)

= (0.108 + 0.012 + 0.064) / (0.108 + 0.012 + 0.072 + 0.008 + 0.576)

= 0.184 / 0.84

= 0.219

4.

P (cavity) = 0.2

P (catch | cavity) = 0.9

P (catch | ~cavity) = 0.2

P (toothache | cavity) = 0.6

P (toothache | ~cavity) = 0.1

1. P(toothache) = P(toothache ∧ cavity) + P(toothache ∧ ~cavity)

= P (toothache | cavity) \* P (cavity) + P (toothache | ~cavity) \* P (~cavity)

= 0.6 \* 0.2 + 0.1 \*(1 – 0.2)

= 0.2

1. P(catch) = P (catch ∧ cavity) + P (catch ∧ ~cavity)

= P (catch | cavity) \* P (cavity) + P (catch | ~cavity) \* P (~cavity)

= 0.9 \* 0.2 + 0.2 \* (1 – 0.2)

= 0.34

1. P(cavity | toothache) = P(cavity ∧ toothache) / P(toothache)

= P (toothache | cavity) \* P (cavity) /P (toothache)

= 0.6 \* 0.2 / 0.2

= 0.6

1. P(cavity | catch) = P(cavity ∧ catch) / P(catch)

= P (catch | cavity) \* P (cavity) /P (catch)

= 0.9 \* 0.2 / 0.34

= 0.529

5.

+: positive result;

-: negative result;

D: disease;

P (+ |D) = 0.99

P (- |~D) = 0.99

P (D) = 0.0001

P (+) = P (+ ∧ D) + P (+ ∧ ~D)

= [P (+ | D) \* P (D)] + [P (~D) – P (− ∧ ~D)]

= [0.99 \* 0.0001] + [(1- 0.0001) – P (- | ~D) \* P (~D)]

= 0.000099 + [0.9999 – 0.99 \* 0.9999]

= 0.000099 + 0.009999

= 0.010098

P (D | +) = P (+ |D) \* P (D) / P (+)

= 0.99 \* 0.0001 / 0.010098

= 0.0098