1 Reasoning under uncertainty I (08/11/2018)

1.1 Objectives

At the end of this repetition you should be able to:

- Apply Bayes rules, independence and marginalisation appropriately to compute probabilities

1.2 Exercises

a ≈ 10 min

Let two events A, B of the probability space Ω; Is it possible to get $P(A) = 0.4$, $P(B) = 0.3$, and $P(A \vee B) = 0.5$? If so, what range of probabilities would be possible for $A \wedge B$?

b ≈ 15 min

Given the probability table of Figure 1 compute the following probabilities:

1. P(toothache)
2. P(cavity)
3. P(toothache | cavity)
4. P(cavity | toothache $\vee$ catch)

	toothache		*¬toothache*	
	catch	*¬catch*	*catch*	*¬catch*
cavity	0.108	0.012	0.072	0.008
¬cavity	0.016	0.064	0.144	0.576

Figure 1: Probablity Table of Toothache and Cavity

c ≈ 10 min

After your yearly checkup, the doctor has bad news and good news. The bad news is that you tested positive for a serious disease and that the test is 99% accurate (i.e., the probability of testing positive when you do have the disease is 0.99, as is the probability of testing negative when you don't have the disease). The good news is that this is a rare disease, striking only 1 in 10,000 people of your age. Why is it good news that the disease is rare? What are the chances that you actually have the disease?

1.3 Supplementary material

https://www.youtube.com/watch?v=x-2uVNze56s