Artificial Intelligence 2 – SS 2020
Assignment 7: Markov Models
– Given May 29., Due June 7. –

Hint: Exercises need to be handed in via StudOn at 23:59 on the day they are due or earlier. Please use only the exercise group of your tutor to hand in your work.

If any concepts here seem unfamiliar to you or you have no idea how to proceed, consult the lecture materials, ask a fellow student, your tutor, or on the Forum.

If a problem asks for code, comment it or make it otherwise self-explanatory. You do not need to write a lot, but it should be enough to convince your tutor that you understand what the code does. We may deduct up to 30% for uncommented and unclear code, but would prefer not to.

Problems with no points (0pt) will not be graded, but might appear on the exam in a similar form. For these, we will provide a reference solution after the submission deadline. If you find the reference solution unclear, ask about it on the forum or in in a tutorial.

Problem 7.1 (Markov Mood Detection)

On any given day d, your flatmate Moody is in one of two states – either he is happy (H_d) or he is not. Usually when he's in a bad mood, it's because he had a fight with his partner and those tend to go on for a couple of days, so $P(\neg h_{d+1}|\neg h_d) = 0.7$, but aside from that he's a cheery guy, so $P(h_{d+1}|h_d) = 0.85$.   50pt

Notably, you can hear his music blasting all day which tends to shift depending on his mood. On a good day he often listens to Jazz (i.e. $P(j_d|h_d) = 0.6$), on a bad day he usually blasts Death Metal at full volume ($P(\neg j_d|\neg h_d) = 0.85$). He has a limited taste in music, so it's always one of the two.

It's Wednesday now and today and on Tuesday you were bombarded by Death Metal through your paper thin walls. You need to talk to him about his disregard for kitchen hygiene, but you would prefer to only do so if he is already in a good mood.

30 pt

1. Assume you happen to know he was in a good mood on Monday. Which algorithm is adequate for computing the probability that he's in a good mood today (Wednesday)? What is that probability?

20 pt

2. You want a better probability than that, so you wait until Friday. On Thursday he continued listening to Death Metal, but switched to Jazz on Friday. Would it have been better to talk to him on Wednesday? Which algorithm is best suited for figuring this out, and what is that probability? For no particular reason, you order lunch from your favorite Chinese restaurant. The contents of the fortune cookie that came with it are a bit mysterious: $\mathbf{P}(j_4|H_3) = \langle 0.53, 0.29 \rangle$.