

A2 FAQ

This is a compilation of frequently asked questions regarding Assignment A2. Please study it in detail **before** you ask a question online on Canvas. It might already have been answered.

We are covering the following categories:

Technical questions: These questions center around technical issues such as "How do I get the code to run on my operating system?"

Theoretical questions: These questions center around theoretical issues such as "I did not understand the difference between observations and states, is there any?". Some theoretical misunderstandings might lead to practical problems, so check this one as well when you are in trouble!

Practical questions: These questions center around practical issues such as "What do I have to do to achieve X grade"?

Kattis questions: These questions center around Kattis specific issues such as "What does the feedback from Kattis mean"?

1 TECHNICAL QUESTIONS

These questions center around technical issues such as "How do I get the code to run on my operating system?"

Question 0: HMM: To pass the tests on Kattis, where should we read the input from, is it in the args from main(args[]) or in the console or anywhere else? You need to take in the inputs from the standard input (the console). We recommend to work with this system on your computer as well so that you do not need to adjust too much when moving to Kattis.

Question 1: HMM: Can someone explain the exact meaning of the test cases? How will we interpret them? You should not concern yourself with the structure of the test cases. Read the files in the code skeleton (Java/C++) carefully. They will take care of the parsing. Hint: Take a look at the Client class.

Question 2: HMM: The solutions obtained by my code are really similar to the ones shown as an example but not exactly the same (e.g., 0.543726 vs 0.545455), is that an issue? The most probable reason for these slight differences are that you might not be using double precision for everything or/and there are some implicit castings on your code. However, if passing the Kattis test is your concern, these differences should not be a problem.

Question 3: HMM: My solutions are right but I can not pass the Kattis tests. Please make sure you are outputting the answers correctly. I.e.,

- In Java use **System.out** instead of **System.err**
- In C++ use **cout** instead of **cerr**

Just use the standard error outputs for debugging.

Question 4: HMM0: We should get "1 3 0,3 0,6 0,1" but we obtain "1 3 0,300000000000000004 0,6 0,1" instead because of the doubles. Do we need to round it up to 0,3? There is no need to round in this case. The most probable reason for these slight differences are that you might not be using double precision for everything or/and there are some implicit castings on your code. However, if passing the Kattis test is your concern, these differences should not be a problem.

Question 5: HMM1: I am obtaining `ArrayIndexOutOfBoundsException` in HMM1 for test case 4, despite passing the previous first cases. Which could be the problem? Think about what are rows and what are columns in the observation matrix. Make sure that your code handles non-square matrices.

Question 6: HMM2: If there are multiple paths with the maximum probability, should we print all of them or just one? The Kattis tests do not test for multiple paths.

Question 7: HMM2: Kattis still gives me "wrong answer" for the second test of Viterbi. Can I get an explanation on what exactly $\text{argmax for } \delta_{i_{dx}}$ is? I think something might be wrong when calculating the path, although I get the correct answer for the sample input. Most errors arise due to incorrect or missing backtracking. When you are computing $\delta_t(i)$ you have to take into account which was the most like preceding state. You store the number of that state into another data structure $\delta_t^{idx}(i)$. That way, if you know that for time t and state i you come from state k in $(t-1)$, then $\delta_t^{idx}(i) = k$. Finally you need to backtrack. So, in simple terms, the " $\text{argmax for } \delta_t^{idx}$ " gives you the most probable previous state given the current observation, where you are (in t) and the matrices.

Question 8: HMM3: Shall we use the scaling like in the stamp tutorial? (pseudocode page 13) In HMM3 the length of the observation sequence is quite long (significantly longer than in HMM1). Using some kind of scaling might definitely be useful. It might also be useful to try to implement a solution without any scaling to see whether and which kinds of problems arise.

Question 9: DuckHunt: What do you mean by "species displays only a few flight pattern"? Does it mean for each bird only follow one flight pattern in each environment or round, or could be a few patterns instead? Each species has a few characteristic flight patterns and a bird can fly in one of its characteristic flight patterns or a combination of those. It could be that the birds of the same species may follow different flight patterns in a particular round and an environment.

Question 10: DuckHunt: Are all birds flying for all the 100 steps in each round? Or do they appear with some transition relationship? Yes all birds fly for 100 time steps BUT it would be good if you check if a bird is alive or not before taking action on that bird (for sanity purpose).

Question 11: DuckHunt: Sometimes I get wrong answer even though my output format is correct. Why could that happen? Please be careful with the return deadlines. Those make sure your program does not take too long to decide the bird species or where to shoot. If you do not respect them, there is a forceful return request from the server which might yield to a wrong answer.

Question 12: DuckHunt: The problem definition on Kattis is dominated by explanations of the various birds, is this information completely irrelevant to the task at hand? To me it's a bit confusing that so much space is dedicated to this, when the assignment says the birds' behavior is completely different in Kattis anyway. Yes, the description of the birds is irrelevant for the problem. You only need to know that there are several birds and that one of the species is in danger, so you must not shoot it.

Question 13: DuckHunt: I am trying to execute the "mkfifo" command to generate the pipes for the Duckhunt server/client but I get an error: Operation not permitted both on Ubuntu and OSX systems at KTH. Do we need to run it on a private machine? Lab computers use AFS file system and hence, you cannot create the Duckhunt pipes as mentioned in the readme. You need to create your named pipes in the `/tmp` directory : `mkfifo /tmp/player2server /tmp/server2player` and then replace the necessary pipes in the execution commands with the pipes that you just created.

2 THEORETICAL QUESTIONS

These questions center around theoretical issues such as "I did not understand the difference between observations and states, is there any?". Some theoretical misunderstandings might lead to practical problems, so check this one as well when you are in trouble!

Question 0: In the Stamp introduction, it is mentioned that uniform values in A , B and π would result in a local maximum for lambda estimation. Why exactly is that, and why would it not happen in some other case where the values are not uniform? The uniform distributions in the parameters will render all states and observations equally likely such that the updates of A , B and π in each iteration will be uniform. Thus, we are not able to move away from these parameters. Say, you have observed *head, head, head, head, head, tail* (observations) from one of two coins (hidden state). Obviously, you see that at least one coin turns out to be *head* more often. Under a uniform distribution however, any combination of the two coins will result in the same distribution over the observations. Thus, the uniform distribution explains the data so well, that the learning algorithm will not move away from it. We are never guaranteed not to end up at a local maximum, as the Baum-Welch algorithm is not guaranteed to converge to the true values. However, the likelihood that you hit such a spot in the parameter space randomly is pretty low.

Question 1: Could we use the gammas instead of Viterbi to determine the most likely state sequence? The gammas give you the most probable hidden state at each time step. That means that you might get an impossible hidden state sequence as a solution. The probability of transition from state 1 to state 2 might be zero, but the gammas might still indicate that state 1 is most probable at time t and state 2 is most probable at time $t + 1$. Viterbi guarantees a possible and the most likely state sequence.

Question 2: I have troubles passing the Kattis tests on estimating a sequence of states. Please, take a closer look at how the Viterbi algorithm is defined in Section 2.4 of the assignment description. Pay special attention at the dimensions of each of the arrays.

Question 3: My probability computations are OK for short sequences but get really wrong when scaling to longer ones. Why could that be? Please remember the underflow problem taught at the lectures. Try to overcome this problem either by working in the logarithm world or by scaling.

3 PRACTICAL QUESTIONS

These questions center around bureaucratic issues such as "What do I have to do to achieve X grade"?

Question 0: Do we need to submit the assignment questions somewhere? No, but you should bring them to the presentations and be ready to show your understanding of them.

Question 1: Do we need to upload any code in Kattis for a C grade? No. It is sufficient to have conducted the experiments on a computer and be ready to answer the questions on the presentation.

Question 2: Is the last submission to Kattis the one that counts? No. We count the submission that you state when you book a slot for the oral presentation/redovisning. Make sure to indicate the right Kattis ID in your presentation slot booking!

4 KATTIS QUESTIONS

These questions center around Kattis specific issues such as "What does the feedback from Kattis mean"? Kattis feedback is very sparse in nature, this is on purpose as it is not a debugging tool. Please only submit to Kattis if the problem works on your local machine.

Question 0: What does the feedback from Kattis mean? The official answer documentation can be found here: <https://open.kattis.com/help/judgements>

Question 1: I keep getting "Compile Error" from Kattis but it works fine on my machine? Check if you included a exotic library. Kattis does not have Windows specific library for example. Submit the Skeleton without your code and add library's one by one to find the culprit and solve the problem without that specific library.

Question 2: I changed stuff in the game specific files but the changes do not make a difference in Kattis Kattis has it's own version of the game specific files. please use the provided skeleton and solve the problem there.

Question 3: I keep getting "Wrong Answer" but all is good in my local copy? Check if your answer format is correct. Kattis expects the answer in a defined way, make sure your code produces that. Check if you included debugging messages to the standard output. Kattis will interpret it as your answer! Use the error output or comment out the messages.