

# Programming Assignment – QA System

Implement a Question Answering (QA) system in Python called `qa-system.py`. Your system should be able to answer **Who**, **What**, **When** and **Where** questions (but not **Why** or **How** questions). Your system should handle questions from any domain, and should provide answers in complete sentences that are specific to the question asked. Please do not provide any information beyond what is asked for by the question.

Your system should take an approach similar to that of the AskMSR system, and simply reformulate the question as a series of "answer patterns" that you then search for in Wikipedia, where you are hoping to find an exact match to one of your patterns. For example, suppose the question was "Where is Malosky Stadium?". You could reformulate that question using the answer patterns "Malosky Stadium is located in", "Malosky Stadium is found in" or even "The address of Malosky Stadium is". You should have multiple patterns associated with each possible type of question (Who, What, When, and Where).

Your system only needs to answer questions for which it can find an exact match to at least one of your answer patterns. At this point, you do not need to attempt to construct answers from partial information (but may do so for extra credit). Your program should be able to recognize questions it can't answer and respond appropriately.

You should use existing toolkits to interact with Wikipedia.

Your program should run interactively, and prompt the user for questions until the user says "exit". When your program starts it should output a message with your name and a short description of what the system does (see below). Then, a user should enter their question and the system should respond with an answer that is a complete sentence, and should not contain any information beyond that which is asked by the question. Note that this is not a conversational agent, so your system does not need to remember previous questions or answers, nor does it need to engage in "small talk". You may assume that your user will cooperate and only ask well-formed questions.

You should also keep a log file that records the user's questions, the searches you actually execute, the raw results you obtain from Wikipedia, and finally the answer you generate. You may also include any additional information in your log file that you might think would be helpful in debugging your program. The name of this log file should be given on the command line.

```
$ python qa-system.py mylogfile.txt
```

```
*** This is a QA system by YourName. It will try to answer questions
that start with Who, What, When or Where. Enter "exit" to leave the
program.
```

```
=> When was George Washington born? (user)
=> George Washington was born on February 22, 1732. (system)
=> What is a bicycle?
=> A bicycle has two wheels and is used for transportation.
=> Where is Duluth, Minnesota?
=> I am sorry, I don't know the answer.
=> exit
```

Thank you! Goodbye.

You may assume that the questions are well formed and grammatical, and that they are in fact questions. You may assume that all questions start with either Who, What, When or Where. Your system should recognize when it can't answer a question, and say something like "I am sorry I don't know the answer." This is preferable to giving no answer or providing gibberish.

Your answers must be complete sentences. "George Washington was born on February 22, 1732" is an example of an acceptable response. "February 22, 1732" or "Your answer is February 22, 1732" would not be acceptable. Your answer must not contain any information beyond that which is asked for in the question, so "George Washington, the First President of the United States, was born on February 22, 1732" would not be acceptable (since we only asked for his birthday, not his most notable achievement or position). Each question should be assumed to be independent and separate from any other question asked (thus, your system will not be expected to make use of previous questions or answers when processing a question).

In addition to your program, please submit a plain text file called `qa-samples.txt` which includes 20 factual questions - five for each of the Who, What, When, and Where type. You must also include answers that you have verified are correct, and the answers as given by your system. Include 10 examples where the system answer is correct, and 10 where the system answer is incorrect. The format you should use is as follows:=

Question : When was George Washington born?

Correct Answer : George Washington was born on February 22, 1732.

My System Answer : George Washington was born to a poor family. (incorrect)

Note that I will use these examples to formulate my own questions to evaluate your systems. So if one of your examples that your system answers correctly is "Who was George Washington?" I will likely ask a related question like "Who was Thomas Jefferson" since the questions and answers are fairly similar (and it seems fair to expect your system to get a similar question with similar answer correct.) If your system can answer other types of questions, please show those too.

Please upload your submission to blackboard.

**NOTE:** if you use **jupyter notebook**, you can have all comments and required running outputs/logs in the notebook(s). And then save into HTML(s) and zip all notebook file(s), HTML files, and other files into ONE zip file. Please submit **only one zip file**.