Part One

A. Explain the functionalities of the chatbot and how they will address the needs of the career advisor as described in the scenario.

The career advisor's primary concern is being able to help every student with choosing a career path in Computer Science. Considering how many students there are, along with the limited amount of time to do this, the career advisor needs help achieving this. The chatbot will be able to take a large workload away from the advisor due to how many students are likely to only need some fairly basic guidance rather than an in-depth analysis. The chatbot allows students to narrow down their career options based on their preferences. Their preferences are determined by the questions that the chatbot asks each student. Any students that do not seem to fit any of the job descriptions that are currently within the bot's range of functionality are given the suggestion to seek additional guidance from a real person.

B. Summarize other outside works or articles describing bot implementation that represent each of the key elements of the bot you created. These other works must have been published in the past 5 years.

There are three separate works that I decided to include here, two of them being relatively small, but informational articles, and one being an educational paper. All sources are included at the bottom of this paper.

The first article, *How to automate your customer service using chatbots* (Avinash, 2020), explains essentially the same things that are needed for the chatbot for this project. There is a difference in why they are needed, however. Avinash explains that chatbots are needed due to the patience and attention span of customers constantly decreasing. This clearly does not relate to the chatbot I have created, although Avinash does explain other needs for chatbots. Specifically, he goes over the increasing demand that companies are facing, along with how so many of the tasks that people do are simple and repetitive, making it a perfect opportunity for a bot to help out while actual people can focus on other work. These chatbots also reduce the cost of labor considerably.

The second article, *Using Real Estate Chatbots to Help You Find the Perfect Apartment* (Gaskell, 2020), gives a much more specific example of a chatbot than Avinash's article did. Gaskell's article discusses using real estate chatbots in the midst of the current pandemic, as real estate has been one of the most impacted industries. The chatbot in this article, Luke, works similarly to the chatbot I created in that it asks you several questions to help you narrow down your search. Similarly to my bot, this bot will also recommend that you contact a real person if your search is not going well. Also like my bot, this one is used to decrease the workload for real people, which saves time and reduces costs.

Lastly, we have the paper *An Overview of Chatbot Technology* (Adamopoulou, Eleni, and Lefteris Moussiade, 2020). This paper goes over, in a lot of detail, the history of chatbots, what exactly chatbots are able to do, why they are becoming so popular, and many applications in which they can be used. As the two previous articles have mentioned, this paper explains that chatbots are primarily used to automate simple and/or repetitive tasks. Companies benefit greatly from automating tasks, not just by saving a ton of time, but also by saving money. This paper also goes over the future of AI, and how chatbots (among other AI) have already started to become a lot more than just task aids.

C. Identify 5 or more computing job types that your created bot can recommend based on the interaction with the bot. Provide the generated chatbot code files to support the identified job types.

The code files have been included in the attached zipped folder. The following job types are able to be recommended by the bot based on the answers to each question:

- Database Administration
- Game Development
- Quality Analysis
- Computer Technician
- Software Engineer
- Technical Writing
- Cybersecurity
- Project Manager
- Web Developer

D. Explain how the chatbot training cases were selected and how the AIML or other programming languages were used to enhance the functionality of the bot. Provide examples of the chatbot functionality (that represent the selected case and languages) at the end of the training process in support of your explanation.

Training case selection was done by providing users with access to the bot, and allowing them to test it. The conversations were logged and analyzed, which allowed for improvement of the bot based on whether the conversation made sense. The primary way to train the bot is to provide it with keywords, AKA patterns, and having those patterns matched with responses, AKA templates. The bot was developed with the idea that the user is not meant to lead the conversation, but rather, the bot will ask questions that solicit simple answers from the user, leading to further conversation from the bot. Questions require yes/no answers.

Example 1:

Stephanie has started using the chatbot. It asks her multiple yes/no questions. Stephanie is not interested in programming, but does enjoy problem solving. She is not interested in QA, but is interested in working with databases. The chatbot suggests that she look into Database Administration as a career path.

Example 2:

Sarah has started using the chatbot. She has given the chatbot information that suggests that she is uninterested in any of the topics, until she reaches the question about writing about technology. The chatbot then suggests that she look into Technical Writing as a career path.

Example 3:

Zach has started using the chatbot. It asks him multiple yes/no questions, but he answered No to every question.

In this situation, the chatbot recommends that Zach speak to a guidance counselor.

E. Explain how AI optimization methods were used to optimize the chatbot by providing examples that represent the optimization methods used at the end of the optimization process.

The primary optimization method used for this bot was to make everything as simple as possible without losing any functionality. Users generally prefer a very simple, intuitive interface, which led to using buttons as the primary input. The only time a user is not pressing buttons is when they initially start using the bot, during which they will type something to get a response. The bot responds to things like “hello”, or will tell the user that it doesn’t recognize what they are saying and will give them the option to click a button to start over at the beginning. Another optimization that was used, and could be further improved upon, was adding more than the initial five career options. Adding more to a program isn’t considered a typical optimization (it is often the opposite), but in this case, it allows a student to further narrow down their career path so that they can look into more specific paths rather than relatively broad ones.

F. Create an installation manual for the chatbot.

Installation:

After downloading the Career Chatbot zip file and extracting it, do the following:

1. In a browser, navigate to www.pandorabots.com.
2. Log in and go to your dashboard. On the left side next to "MY BOTS", click the + icon to create a new bot.
3. Name your bot and make it a Blank Bot.
4. On the left side, select the bot that you just made, click Edit, then click Code Editor.
5. Click File in the code editor and select Upload. Click Select Files to open File Explorer. Find the files in the Career Chatbot folder that you extracted earlier, and select the following 11 files:

   computertechnician.aiml

   cybersecurity.aiml

   databaseadmin.aiml

   gamedev.aiml

   projectmanager.aiml

   qa.aiml

   softwareengineer.aiml

   start.aiml

   techwriting.aiml

   udc.aiml

   webdeveloper.aiml

6. Select Upload, and all of the files should show up in your bot’s file system.
7. Now if you click the orange chat icon in the bottom-right, it will open a chat window for you to interact with the bot.
8. (Optional) You can now change the code for the bot to add/remove functionality.

Part Two

G. Explain how you measured the effectiveness of the bot and how the bot will be monitored and maintained to improve the final user experience.

The effectiveness of the bot is currently measured by how accurately the outcome reflects the answers given. It also makes sure that the user is told to seek advice from a guidance counselor if none of the career paths seem like a good option, given their preferences. More measurements will be added as more functionality is given to the bot.

The bot can be monitored, maintained, and improved through user feedback and by auditing logs to check for accuracy in the chatbot's responses. This will allow for the bot to be improved in terms of both quality and functionality. There are plenty of additional functionalities that could be given to this bot over time, and user feedback is a great way to see what people actually want.

H. Describe the challenges faced during the development process and summarize their resolution.

There were not too many challenges faced during the bot's development process, but there were a few.

First, there was the matter of deciding how extensive the bot's responses will be. Initially the bot was going to have much more detailed answers to each user response, but this ended up being unnecessary for the purposes of this bot. This was resolved by keeping the entire process as simple as possible, at least for the time being. Simple yes/no questions were enough for the initial requirements.

Second, going along with the first issue, was deciding what sort of inputs will be accepted. The bot was going to have an extensive list of inputs that it accepted for a wide variety of interactions, but this seemed like a waste of time until more functionality was added. This was resolved by giving users a "restart" button to click any time that they enter input that the bot does not recognize.

Lastly, there was an issue in determining the Computer Science fields that the bot would cover. The bot could use several more fields than it currently has to point students in more specific directions, but it ended up being given nine different fields that are fairly different from each other. Ex: Technical Writing vs. Database Management.

I. Assess the strengths and weaknesses of the bot development environment and explain how they supported or impeded the construction of the chatbot.

The bot development environment, Pandorabots, had many strengths that I enjoyed, but definitely had some weaknesses as well. The primary strength is that AIML is a very easy language to learn, and it has plenty of documentation if you need it. Another strength is that the chatbot is very easy to use, and doesn't require you to restart the program any time you make a change to the code. The weaknesses mostly come in the form of limitations. While there are plenty of types of chatbots that you could make with Pandorabots, it is very limited as an AI type of software and the applications do not vary much in what exactly they could be used for. That said, I did find this to be a great learning experience, and it helps with understanding how AI works and some of the things it could be used for.

Sources

Avinash. “How to Automate Your Customer Service Using Chatbots.” *Medium*, Chatbots Journal, 30 Nov. 2020, chatbotsjournal.com/how-to-automate-your-customer-service-using-chatbots-2eeeb0be88fb.

Gaskell. “Using Real Estate Chatbots to Help You Find the Perfect Apartment.” *Discover.bot*, 15 Oct. 2020, discover.bot/bot-talk/real_estate_chatbots_to_find_the_perfect_apartment/.

Adamopoulou, Eleni, and Lefteris Moussiades. “An Overview of Chatbot Technology.” Edited by Ilias Maglogiannis et al., *Artificial Intelligence Applications and Innovations: 16th IFIP WG 12.5 International Conference, AIAI 2020, Neos Marmaras, Greece, June 5–7, 2020, Proceedings, Part II*, U.S. National Library of Medicine, 6 May 2020, www.ncbi.nlm.nih.gov/pmc/articles/PMC7256567/.