# ISYS30221 Artificial Intelligence 2021-22

## Coursework Documentation Template

## 1- About this submission

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| Student Name | Matthew Archer |
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| Chatbot Topic | Animals |
| Tasks implemented in this submission (a,b,c,or d) | A,B,C |
| Files inventory (excluding this file) | Animalchatbot.py  animal-kb.csv  AnimalsQA.csv  CNN.py  CNN-Model.h5 |
| Demo video URL | <https://myntuac-my.sharepoint.com/:v:/g/personal/n0916601_my_ntu_ac_uk/Eat_tuwQfmpImdCv0XY_lR4BexvnbB2MU_Tzndl8YeFuzg?email=amir.pourabdollah%40ntu.ac.uk&e=QgqfCw>  I couldn't follow the guide as I’m not running windows but hopefully this link works. |
| Checklist | I will submit this file separately (without compression) into DropBox  All other files are zipped and will be submitted into DropBox  The demo video is recorded as instructed, and the sharing link is inserted above  I have made sure that the demo video is shared according to the instructions, so that I allowed everybody in the university to view it.  All the sections below are populated accordingly. |

## 2- Design notes (shrink/grow as needed, add images where applicable)

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| General explanations of the system and its goals | This program is an AI based chatbot on the topic of animals. The program should be able to give realistic and useful responses to the users varied inputs and answer different questions related to animals. All of this should be done based on the internal decision-making processes of the program rather than just being a simple call and response chatbot. The system works using pattern matching and similarity matching in order to link up the users input to different outputs and then these outputs can in turn call other functions within the program to expand the functionality of the overall program.  A first order logic knowledgebase is implemented in order to expand the understanding that the program has access as well as to stop it from contradicting itself. Finally, the system has access to a CNN model which has been trained to tell the difference between pictures of cat and dogs. The user can enter a picture of their choice and the model will determine what percentage the image looks like a cat and what percentage it looks like a dog. |
| The system requirements, i.e., the list of what the system should do/have from a user’s perspective | The user should be able to enter messages that are sent to the chat bot. The chat bot should respond to many common greetings with predetermined responses. If the user tells the chatbot their name, then the chatbot should remember this name and then use it again when the chatbot says goodbye. If the user enters a message that doesn’t correspond to any of the patterns, then the message will be treated as a question and the answer for the questions that is most similar to the message will be returned to the user. If the user asks a question about which animal category an animal belongs to, they should receive an answer that comes from the program's knowledgebase. The user should also have the ability to add to the knowledgebase however each new item should be checked against the current base for contradictions and if one is found then the new item should not be added. If a question is asked that is not contained within the knowledgebase, then the response should be “Sorry, I don’t know.” Finally, if the user asks what an image is of then they should have the option to enter the filename of their image. This file should then be checked against a premade CNN model and the user should be told if the image is more similar to a cat or to a dog. |
| The employed AI techniques, and the explanation of program codes and the supplied files. | Task A uses the aiml.kernal object in order to generate responses from the pattern matching file shown below (animalchatbot.xml)  The animalsQA.csv file contains 10 pairs of questions and answers related to animals.  The code shown below determines which of the QA questions the message is more similar to. It does this by creating a tf/idf vector for the sentences and then using the consine\_similarity function to tell which are most similar. The corresponding answer is then returned.  The knowledgebase is simply an array of all of the first order logical statements. It can be queried or checked for contradictions using the ResolutionProver function.  If a query made comes back false then it has to be determined if the answer is false of if the knowledgebase doesn’t contain the queried animal. This is done using the below function which simply checks each of the animal categories to see if the queried animal already exists there.  The final task is done using a simple CNN model which is trained on a dataset of pictures of cats and dogs. The data is first loaded into the program before being augmented to fit the model, next the model is built and complied before being fit to the training dataset. Once the model has finished execution it is saved in a file called CNN-Model.h5 This file can then be loaded and used by the chatbot program. |

## 3- Conversation log (insert text, screenshots and/or images as required)

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| **When the program is first loaded you are greeted with a loading time and the wecome message**  Loading animalchatbot.xml...done (0.00 seconds)  Kernel bootstrap completed in 0.00 seconds  Welcome to the animal facts chatbot! Please ask an animal related question.  **Task A: pattern matching**  > hi  Hello! How are you?  >I am well  Glad to hear. Do you have a question?  >I am matt  Hello matt  **Task A: Similarity matching for a knowledgebase**  > what is the fastest animal  The fastest land animal is the cheetah which has a max speed of 75 mph however, the fastest member of the animal kingdom is the perigrine falcon which can dive up to a speed of 242 mph  > how many animals are there  There are about 30 million animal species! Most of them being insects. There are 5000 species of mammals and 10000 species of bird  > what is the strongest aminal  The strongest animal is the African bush elephant who can carry 9000kg.  > how much animals are there  There are about 30 million animal species! Most of them being insects. There are 5000 species of mammals and 10000 species of bird  **Task B: Querying, adding to and checking contradictions of a knowledgebase**  > is the giraffe a mammal  True, the giraffe is a mammal  > is the bear a mammal  Sorry, I don't know what the bear is.  > the bear is a mammal  OK, I will remember that bear is a mammal  > is the bear a mammal  True, the bear is a mammal  > the bear is a fish  Sorry, this statement contradicts my knowledgebase.  **Task C: Identifying images using a CNN**  > what is this image of  Enter the image name: cat.jpg  This image is 87.19% cat and 12.81% dog  > what is this image of  Enter the image name: dog.jpg  This image is 28.36% cat and 71.64% dog  >goodbye  Bye! Nice taking to you matt – Goodbye!. |

(no word count is necessary)