



Minerva Development Team Blog

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Blog Entry - Team

Date - 10/10/2023

- Start of Project Blog
- Project is a data assistance chatbot that interacts with users to help them access and retrieve relevant results/data from an SQL database
- We made and added First Proposal draft to the repo a few days and sent off to supervisor to get feedback
- After feedback from supervisor we made changes and have committed the second and final draft of the proposal to our repo
- Making preparations for the proposal meeting and what we want to say
- Finishing up housekeeping like setting up repo and labelling things



Blog Entry - Team

Date - 11/11/2023

- We have nearly completed functional spec, our first draft has been uploaded to our repo and we sent it off for review by our supervisor a few days ago
- We got feedback from our supervisor and have started to review all the suggested changes and what we wanted to change
- We hope to have finished and uploaded a final version of the spec by the end of the day
- Outside of project work we are very busy coming up to the end of semester and with assignments
- We hope to finish functional spec and then take a break to focus on sem 1 exams and then after christmas get back into research and proper development



Blog Entry - Gareth

Date - 10/01/2024



- New year time to start getting our teeth into the project and developing
- I set up a new directory in the res/ part of the repo to start prototyping with the chatterbot library and figure out how to set up our chatbot
- Began by making the most basic bot which was demonstrated in the documentation
- The chatbot example worked well and was easy enough to set up but after reading through the rest of the documentation I realised that this library did not have a wealth of functionality to do things differently
- The chatbot is trained mostly on string pairs, if it sees the first it says the second, this method requires a lot of training data and also does not allow for more complex things such as calling functions or manipulating input
- Overall feeling a bit stumped as chatterbot is by far the most popular resource to make bots by code but it does not compare to tools like IBM watson assistant which is where my experience comes from
- More thinking required

Blog Entry - Jack

Date - 27/01/2024

- Did research on the Text-to-SQL model we will be using to translate the queries gotten from the chatbot into SQL code for the database to understand.
- Reached out to our lecturer and researchers asking for their advice on possible Text-to-SQL models that we could use.
- Found a website that ranks the best Text-to-SQL models with code that we can download and use.
- Went to our supervisor to ask for advice on how best to implement the Text-to-SQL model to avoid any mistakes that could cost us in the final presentation.
- Found and finalised the databases that Minerva will be using for returning the information to the user.
- Set up mySQL on my home machine and uploaded the databases alongside looking into the mySQL API.

Blog Entry - Gareth

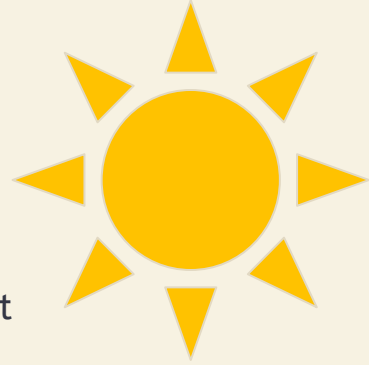
Date - 27/01/2024



- After some rough periods and being busy starting semester 2 I have motivated myself again to look again at how I am going to approach building Minerva
- When I last tried to do it I jumped right in at the code level and realised the chatterbot library was nowhere near advanced as the tools I had used and which gave me the idea for her design in the first place
- I was pretty defeated after the last prototyping session but today I took a step back and tried to figure out what to do
- I have decided to take a step back and try working on design, what exactly Minerva needs to respond to and say and only then go to the code
- I have also pushed the prototyping directory to the repo as I had forgotten to do that after my defeat last time

Blog Entry - Gareth

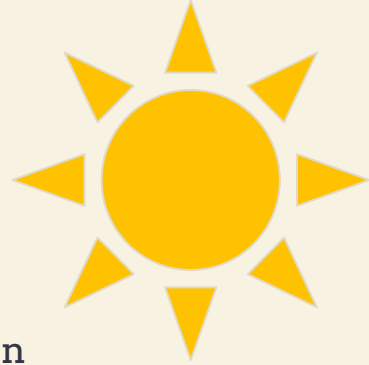
Date - 28/01/2024



- I am feeling much better about how things are going now
- I took a step back and stopped worrying about how I was going to implement the more advanced things and how I could use the chatterbot library to implement them as I was jumping ahead of myself
- Today I stepped back and looked at implementing and training minerva to respond to the basic set of queries: "Who are you?", "What can you do?", etc.
- I also implemented a catch logic adapter for if Minerva does not know what to say she can say she doesn't understand
- Reworked the way I am training her each time from using a txt file to using a dictionary in another python file, this way the file is less repetitive and I can link more queries to the same response that minerva should say
- Overall feeling much better that I took a step away and went back to the basics, now I can start moving slowly towards the more advanced responses and displaying Minerva on a webpage

Blog Entry - Gareth

Date - 02/02/2024



- Today I looked at starting to build up a framework/design to automatically tests Minerva
- I want to start this early before Minerva becomes more complex and so it can evolve with her
- System started with a gitlab pipeline file and a shell script which will run some simple prompts through Minerva and check if she responds correctly
- While setting up the system found out that currently Minerva is inconsistent when responding to trained prompts, sometimes she says the right answer sometimes she says she doesn't understand, looking into this currently
- In addition to the simple tests we will need to plan more system scale tests and begin looking at ethics to get user testing done, we should plan this well in advance
- Testing is paramount to a good system and is worth a good chunk of marks

Blog Entry - Jack

Date - 05/02/2024

- Since the last entry I have sent an email to our supervisor asking on what would be the best way to implement our text-to-sql system.
- We have decided that it would be best to use models downloaded from the Spider leaderboard and integrate them into our code as we can then learn more about the model and make changes if needed.
- I have downloaded and tested multiple models to find one that is usable and effective for use in our project.
- The models make use of gpt-4 but has the option to use many other models each having their own benefits, drawbacks and price points.
- Over the next few days we will discuss what we think would be best for the project as the only thing stopping the model from working is the API paywall.

Blog Entry - Jack

Date - 05/02/2024

- More work has been done on the MYSQL API that we will be using to send our generated query code and receive the output
- The API can be used with multiple languages but since we are coding in python we will be using the python API
- I downloaded and set up the API and over the next few days will start testing the API and continue researching and testing Text-to-SQL models

Blog Entry - Gareth

Date - 05/02/2024



- After finishing the testing last day I found an issue where Minerva seemingly randomly would not understand simple inputs such as "hi" if done multiple times, or even just randomly in isolation
- I tried to track down the issue and found it when I turned on logs and saw that the bot has a filter on it that removes recently used responses, it is intended to make it not repeat itself but on such a simple and small bot like Minerva it just means it doesn't respond correctly
- The more I work with chatterbot the less I like it, the documentation is sparse and there is no mention of default filters or how I turn off the repeat response filter, I have asked on StackOverflow
- In the meantime I further cleaned up the tests framework now I knew what the problem was
- I also had to change and install requirements in the docker image for the CI testing
- They now pass but with the wrong responses so work still has to be done

Blog Entry - Gareth

Date - 09/02/2024



- Since last time I have been able to fix the repeated response filter problem
- The documentation was poor but I found help on stackoverflow as to how to override the library and turn off the filter
- Now happy with how Minerva is performing I looked at flask, I wanted to start the flask app soon and move Minerva into it so then I didn't have a big migration project later on in the project
- I set up a simple webpage and flask app with a chat interface and then successfully moved the code for Minerva into it from the prototype terminal version
- I still need to move the ability to train and produce logs from the proto to flask version
- Next I want to look at hosting the flask app somewhere other than localhost and then move onto more complex training and responses from Minerva

Blog Entry - Jack

Date - 12/02/2024

- Over the weekend I continued looking into completely offline Text-to-SQL models that would not require us to pay for the OpenAI API service.
- The reason for doing this was also to allow users to download our project off of the gitlab and not have to enter in their own API key and pay for their own account. The financial risk of putting my own information on to the gitlab is far too great.
- The offline model that I found was from seven years ago and is written in Python2.7 and utilises an older version of Pytorch.
- At first I tried to update the models code to python3 to make it compatible with the most recent version of pytorch but that resulted in errors.
- I went into the models code and through research figured out what one of the problems was but fixing this caused another error, this time pointing back to the torch library.

Blog Entry - Jack

Date - 12/02/2024

- This error was caused by an incorrect number of arguments being passed through but with the complexity of the model, the error going back into the library, and after following the flow of the code it was far too difficult an error to solve.
- What I tried next was to keep the model in python2 but download an older version of pytorch so they would still be compatible with each other.
- The oldest version of pythorch that I could download was version 1.11.0 but running the code would cause an import error.
- Having looked at where all the packages were being downloaded i realised that in order to have this work in python2.7 i would have to download all the older dependencies and packages using an older version of pip.

Blog Entry - Jack

Date - 12/02/2024

- Due to the large number of dependencies that have to be redownloaded using on older version of pip I decided to not use this model and continue search for an offline Text-to-SQL model.
- The reason being that if someone were to download our project they too would need to get the older versions of all the dependencies and go through the long process of setting it up.
- Also by continuing this part of the project in python 2.7 we risk the possibility that the front end chatbot, written in python 3, would be incompatible with the backend of the project resulting in large amounts of wasted time and effort.

Blog Entry - Gareth

Date - 16/02/2024



- Over the last week or so I have been trying to figure out how to host the flask app somewhere like Vercel, Heroku or PythonAnywhere to give it a true online presence and I think it is cooler than hosting on localhost
- Unfortunately, everything I have tried so far has failed
- Heroku I couldn't figure out how to upload to
- Vercel is complex and I got the files up to it but flask is not natively supported on it and the css and js don't work
- And pythonanywhere is very promising for flask apps but it was short lived as I exceeded the free storage limit while just installing the required packages for Minerva
- I am going to stop trying for now and might return to this later, at the moment it is not worth all the trouble and I need to move on
- I may suck it up and pay for the higher plan for pythonanywhere as that service is very good for flask apps

Blog Entry - Jack

Date - 16/02/2024

- Over the past week I have been downloading and attempting multiple Text-to-SQL models that do not require an external connection.
- Some of the models I have tried are SQLNet, Seq2SQL, BertSQL, IRNet, and Few-shot-NL2SQL-with-prompting.
- A lot of these models are 5+ years old and due to updates regarding python and pytorch, that all these models use, it makes it difficult to bug fix and resolve these issues.
- I believe it would be possible to get these models to work but i have spent a lot of time working on just these models and have yet to test out the MYSQL API.
- It is for this reason that I will be using the model I found on the spider leaderboard that was given to us by academics working in DCU.
- This model uses gpt-4 and as such requires us to pay for the api but it is the most up to date model and allows us to achieve what we are looking for.
- Changes may still need to be made to this model to ensue it does exactly what we want it to do.

Blog Entry - Gareth

Date - 3/3/2024

- This is the blog for what I did over reading week
- To start out reading week after I took a break I knew we needed to get onto our ethics submission if we wanted to be able to organise and conduct user testing for Minerva
- I spent a day filling out the ethics form and making our questionnaire and consent forms for user testing, this has now been sent off to our supervisor to be reviewed and signed, we can submit it when he returns it
- I then moved onto advancing Minerva and her functionality, firstly I combined all my prototypes and moved development into the SRC directory as now I work on the final version of Minerva, knowing what files and directory structure I need
- Unfortunately I have found further problems with the Chatterbot library and I think it is hampering how intelligent and responsive Minerva can be, it is too late to change now so I have to compromise and go for a less fluent chatbot so that she can at least work
- I then moved onto more html and js to support this less responsive version, adding suggestion buttons as to what you can say to her, as well as functionality to change the database that is loaded in Jack's backend
- I can feel myself approaching the point where myself and jack need to combine our parts as I need access to his system to test and expand what minerva can say



Blog Entry - Jack

Date - 04/03/2024

- Over reading week I made great progress when it came to developing the Text-to-SQL api and the MYSQL api.
- I ended up experimenting with multiple different models but after hours of trial and error for each model it became clear that i would have to use an API and create my own file.
- I made the file in python3 as that is what me and gareth agreed on at the start of the project, alongside that this ensures that both are sections of the project are compatible with each other.
- The first API I implemented was the Text-to-SQL as we would need a query to send to the database.
- This was done using python's requests library and learning the correct order of information, what needs to go in headers, what needs to go in data.
- By using a request.get() function I am able to get a response from the Text-to-SQL model, it took extra steps in order to remove unnecessary additions such as syntax and the layout of the returned information.

Blog Entry - Jack

Date - 04/03/2024

- Once I was getting the prompt translated into SQL successfully I then moved on to setting up the MYSQL API in order to send that query to the database and get the information returned.
- This was far more complex than the Text-to-SQL API as it required setting up permissions, getting a connection between the MYSQL server and WSL and Going into config files.
- Through researching the errors that were returned I slowly managed to work through all the problems and ended up getting the results I was looking for.
- More work is still needed to be done such as improving the layout of the information the query returned, setting it up so the prompt isn't hardcoded, and adding in additional code that determines which database the query will be sent to.
- All of these I am confident i can achieve without much issue it is simply a matter of time.
- Gareth and I will be meeting up in person to discuss the project at this time and start the process of combining our individual parts in order to create the whole project.

Blog Entry - Gareth

Date - 10/3/2024



- This weekend I focused on preparing things to integrate Jack's code into Minerva
- While Jack was making his code into functions and I had yet to setup the required components to run it on my laptop I focused on some cosmetics to make Minerva really feel like a system
- I started to fine tune the messages that Minerva would say to their final state, and training her more and more, working on additional synonyms
- I also fixed the splash page overlay when the page is loaded and the background css of the page
- I then also set out a game plan for these closing weeks of the project, what we needed to get done and how, what documents were needed, features we wanted
- We are still waiting for our supervisor to return the ethics document to us but we are meeting him on wednesday and will chase him for it so we can complete user testing

Blog Entry - Jack

Date - 13/03/2024

- Gareth and I met up and discussed the best way to combine are two parts of the project.
- While I had everything working when running the file getting it to wok as a whole required splitting the file into functions.
- Some functions were simple to implement like the Text-to-SQL and MYSQL API while others that were in charge of changing variables were more difficult.
- This past week I have been focusing on completing other assignments as with them out of the way I can then spend more time fully focusing on this project.
- In the coming weeks I plan to get all the functions working and also start looking at remote connection to the database.

Blog Entry - Gareth

Date - 24/3/2024



- Now that all our other assignments have been completed we put all our effort into minerva
- This weekend I focused on integrating Jack's text-to-SQL api into Minerva to make our first version of the final system
- Overall it went well, the first day I was able to refactor Jack's code to make it flow better and easier to import into Minerva, then I was able to link in and call the functions from my logic adapter I had set up previously
- Now Minerva users are able to submit queries which are passed back to the API, transformed into SQL and queried to the database
- Styling of how the results are shown needs a bit of work still but at least it is working
- Unfortunately one thing that stopped working because of this change was the gitlab CI/CD pipeline, which now needed mysql installed
- I spent nearly a full day trying to fix the pipeline with no luck, I believe that with the current setup it is impossible to get the right version of chatterbot, python and mysql in the docker instance to run the tests so I am going to move those automated tests and expand them into unit tests which can be run manually

Blog Entry - Jack

Date - 31/03/2024

- Over the past couple of weeks I have been focusing on the project, getting the code functional with Gareth's sections and working on the documentation.
- Both Gareth and I have been working on the technical specification each of us taking a section that we know how to do and doing it or doing parts of the section that are relevant to the work we have been doing on the project.
- I took charge of the user manual as and got it finished, over the coming weeks I will be continuing progress on the technical specification and reviewing the user manual to make sure that it is up to our standards.

Blog Entry - Gareth

Date - 8/4/2024



- Over the past week or two I have been focusing on finishing off the website, fixing things up and preparing for user testing and the final stretch
- Last week we did our first user tests, we learned a lot from that and instantly got to changing things and making things easier and better for further user testing this week
- We also had a meeting with our supervisor today where he also went through some things to change in our UI design, I have implemented a lot of those changes and will keep it up to polish off the design
- This weeks focus will be on finishing off the website and then completing the rest of the user tests, after those are done we can implement any of the changes suggested from those
- Then once that is done we are on the final week and will be looking at finishing off the documentation
- I have also worked on the testing a lot since last update, moving tests to manual user testing format and doing more documentation on the system level tests and runthroughs

Blog Entry - Gareth

Date - 14/4/2024



- Since the last update we have completed user testing and also a review of the final webpage with our supervisor
- We got a lot of useful information and feedback from those and have implemented a lot of changes to make our final website better
- We have now fully moved onto documentation and the code of the system should mostly be finalised now
- The tech spec is coming along well I have just completed the biggest sections today which are Design and Implementation, I have left backend implementation for Jack to do
- I need to do an overhaul of the user manual to finish that and then it really is finishing touches

Blog Entry - Gareth

Date - 15/4/2024



- Today I overhauled the user manual, it uses lots of pictures to show how to use Minerva, I wanted to use gifs but pdfs can't use gifs
- I also commented a lot of my code, cleaned up some bits and fixed some small bugs
- I moved the testing results to where they need to be
- I wrote out the root readme to describe out project and where everything is

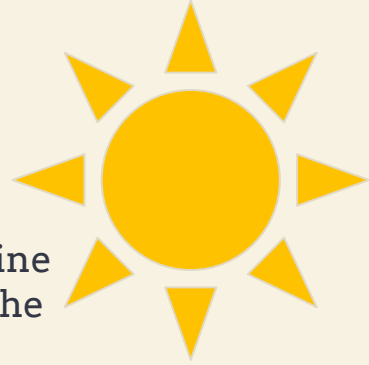
Blog Entry - Jack

Date - 15/04/2024

- Over the past couple of weeks I have been focusing on getting the documentation in order and making progress on the technical specification as well as making any changes that were suggested to me by Gareth or our supervisor.
- I have also completed the video walkthrough which we will be submitting alongside the project.
- I will also be going through the code in the back end, removing any redundant code that is no longer used and commenting the code to make it easier for people who have not worked on it to understand.

Blog Entry - Gareth

Date - 19/4/2024



- This could be the final blog post of this project
- We aimed to get the project all wrapped up by today (Friday) ahead of the deadline on Sunday to make sure we had plenty of time, we did very well and have spent the last two days doing the last few adjustments
- I edited and uploaded the video walkthrough made by Jack to the repo and I also made a poster for the Expo and added it to the repo
- After I finish this post I will add our blog to the repo as well
- The last concerning point we have is that our supervisor Gareth has not replied to our last two emails since last week, we sent him our final documents to review on Tuesday and we have heard nothing since, if he does give feedback we will implement any changes
- We also had sent a reminder email last week for him to input all our meetings on the dashboard which we have been asking him to do for months now and it still hasn't been done, this is concerning but we will email Michael if he does not add them or reply to us before the deadline on Sunday
- If this is the last post, goodbye!
- Gareth