**Summer Internship Weekly Report**

| **Student Name** | Dinmukhamed Albek |
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| **Company Name** | RocketTech |
| **Work Location (Address)** | Almaty, Kalkaman 2 microdistrict, Kadyrzhanova, office 52 |
| **Supervisor’s Name and Position Title.** | Miras Nusupov, CEO |
| **Supervisor Contact Information (Corporate Email Address and Phone number)** | [nussupoff@gmail.com](mailto:nussupoff@gmail.com) 87770990300 |
| **Start/End Dates** | 12.05.2024 – 02.08.2024 |

| **Student Name** | Dinmukhamed Albek |
| --- | --- |
| **Company Name** | Institute of Smart Systems and Artificial Intelligence |
| **Work Location (Address)** | Nazarbayev University |
| **Supervisor’s Name and Position Title.** | Zhanat Makhataeva, Lead |
| **Supervisor Contact Information (Corporate Email Address and Phone number)** | zhanat.mahataeva@nu.edu.kz |
| **Start/End Dates** | 27.06.2024 – 30.08.2024 |

*Please submit an interim report at the end of each week. Then write a final report at the end of the entire internship. Each of these reports must be written within 3 days of the end of time period, except the final report, which may be submitted 7 days after the end of the internship. The course instructor will be monitoring your reports during the summer.*

**Interim Report Week 1**

**Dates: (*12.05.2024 – 09.06.2024*)**

*As part of the internship, I first had to learn the basics of linux and git, as well as python in more depth. I studied how git works and basic linux commands. I also learned the basic git commands starting with git add and ending with git switch. Then I studied more advanced python. How memory works in python, list comprehension, the difference between copy and deepcopy, decorators, generators, OOP in python, static methods, lambda functions and so on.  I also learned how to use a virtual environment, in particular poetry. I completed practical tasks on each topic I learned. In the end, I developed a script that receives a string as an argument through the terminal and outputs its graphical representation. To do this, I parsed templates with ASCII character representations and used a dictionary to store them. Then I replaced each character with its graphical representation. Overall, it was interesting, I enjoyed getting new knowledge, especially about the virtual environment. It is awesome that there is a tool thanks to which is possible to get all needed dependencies using a single command and not installing dependencies to the laptop globally which affects badly on performance.*

**Interim Report Week 2**

**Dates: (*10.06.2024 – 16.06.2024*)**

*I have been learning FastAPI this week. Fisrtly I learned WEB basics such as MVC, CRUD, and how WSGI and ASGI works. I completed mini tasks such as car mini market, book market, and so on. In these projects I used different tools such as, query parameters, HTML templates, particularly Jinja2Templates, pagination, HTTPException, JSON, Request, GET-POST forms, status codes, and so on. But since, I have little experience with SQL databases, I used classes and dictionaries as database. For sure, since I learned MVC I divided code to different directories and files. Repositories with database methods where in different directory, templates, where HTML templates with GET-POST forms and visualization where in different directory, tests where pytest with asserts used where in different directory and routes where in another one. Finally, I can say that I accomplished good understanding of CRUD and WEB development basics this week since I learned many things and had practical tasks.*

**Interim Report Week 3**

**Dates: (*17.06.2024 – 23.06.2024*)**

*This week I studied databases in particular SQL. During the study, I solved SQL-related problems in leetcode. I also studied ER models and ER diagrams and built them for Instagram for practice. After that, I studied the principles of ACID, indexes and ORM. In particular, I studied Sqlalchemy ORM, which I integrated into my projects from the previous week. I used Sqlite as a database. In general, I learned a lot of new things and as it turned out, databases are not as easy as I thought earlier.*

**Interim Report Week 4**

**Dates: (*24.06.2024 – 30.06.2024*)**

*I changed my job and now work as an RA at ISSAI. This week, since I just started my new position, there was not much work. I got acquainted with the python code and tested how the whole thing works on the python part. In particular, I studied working with GPT API, Vosk (ASR model), paper (TTS model). In general, I can't say anything about the new position yet, the only thing is that the job is very different from what it was before because I learned that every job will have significant differences despite the language and position.*

**Interim Report Week 5**

**Dates: (*01.07.2024 – 07.07.2024*)**

*This week I had some problems with Team Viewer access, so I did not work much time. The reason is that I needed to work on unreal engine, which is too heavy for my laptop. I wrote python script that checks if there is some math formula in the given text, and if it is, the formula is extracted from the text and converted to LaTeX. After what, it is converted into image that should be transferred into unreal engine. I started learning unreal engine but since I had no expertise with it before, it takes much time for me to study it.*

**Interim Report Week 6**

**Dates: (*08.07.2024 – 14.07.2024*)**

*This week, related to ISSAI job, I studied the basics of unreal engine 5. In particular, I watched tutorials related to blueprints and learned about concepts such as widgets, materials, actors, etc. To be honest, it was difficult because I had not worked with anything similar before and since I worked using teamviewer due to that characteristics of my laptop did not match the unreal engine requirements, it was very challenging due to the delay.*

*As for my work at rocket tech, I was previously given the task to create messenger, which I just finished this week. I used all the knowledge I had gained earlier. The main problem was working with sockets. Previously, I tested the endpoints using a swagger. However, it was impossible to use swagger for test goals because of sockets, so it was difficult and I had to work with templates. In general, it was an interesting experience.*

**Interim Report Week 7**

**Dates: (*15.07.2024 – 21.07.2024*)**

*Regarding ISSAI, this week I worked with the output of formulas in the unreal engine the whole week. It was extremely hard task. Initially, I wrote a script earlier that generates an image of formulas in a beautiful form and wanted to display these images in the unreal engine. But I still found no way to accomplish this. The problem was that it is impossible to dynamically change the image in the unreal engine during runtime. The only way I found was with using widgets, but the images must be imported in advance, which is impossible according to context of my task, where images are generated during runtime. Then I decided to transfer the formulas as LaTeX. However, I found ot that there is no way to render LaTeX formulas in the unreal engine. Therefore, I decided to transfer the formulas in the form in which they are generated by gpt completion and transfer the text to the unreal engine using TCP sockets. The problem is that it is not stable and it does not look good what I did. I will continue to work on this.*

*As for working at rocket tech, I was asked to write a chat bot using the API key of gpt4 for future use. I did it with the help of the Streamlit framework for the visuals and, of course, the GPT API. However, the problem is that the conversation memory is not saved and I will have to work on making gpt remember the chat earlier.*

**Interim Report Week 8**

**Dates: (*22.07.2024 – 28.07.2024*)**

*Regarding ISSAI, this week I was involved in refactoring python code and dividing python code features into classes and modules. I wrote separate module with class that is responsible for audio speech recognition using Vosk model and module that is responsible for translation. For that I used Tilmash, which is ISSAI’s own translator.*

*Regarding Rocket Tech, I continued writing chat bot and this week I worked with langchain thanks to which I integrated entity memory that helps to memorize previous messages to chatbot.*

**Interim Report Week 9**

**Dates: (*29.07.2024 – 04.08.2024*)**

*Regarding ISSAI, this week I developed speech interruption feature. I had much work with concurrency, so overall it was very interesting and useful. I developed a separate thread that waits for 'q' symbol to be pressed and when it is pressed conversation is stopped. Also I rewrote response generation function to asynchronous stream which helped to stop response generation when q is pressed. After I developed separate endpoint and the problem was that request to stop endpoint is only done after first is finished. I solved it with BackgroundTasks feature of Fast PI.*

*Regarding Rocket Tech, this was the last week and what I did is deployed chatbot and refactored code. It was very interesting to study how deploy actually works but this time I deployed it using Streamlit own cloud where it is very easy to deploy. Overall, I liked what I made, the single problem was that there did not work one feature on deployed version which worked locally. I find out that not only python dependencies but also dependencies that are installing using sudo apt should also be be mentioned on separate file.*

**Interim Report Week 10**

**Dates: (*05.08.2024 – 11.08.2024*)**

*This week I upgraded speech interruption feature. Now I integrated ASR (audio speech recognition) model with separate thread as I did with keyboard so that when user says keyword ‘stop’ LLM stops generating response. It was harder since I had to refactor ASR module so that it returns what user said asynchronous and with higher frequency. Also I had some problems with dependencies, so that it took a while to accomplish that. Also it works a bit slow, so I have to improve it next week. Overall, it was pretty interesting to do.*

**Interim Report Week 11**

**Dates: (*12.08.2024 – 18.08.2024*)**

*This week I was improving this speech interruption feature. I noticed that when the asr stop\_stream method is called, response generation stops immediately. But the problem is that the asr thread is also stopping. So I refactored the code so that the asr thread begins at the beginning of request and always finishes at the end of the request. So I reached an immediate response interruption. After that I integrated this feature to Llama 3. But for some reason the parallel request to stop endpoint was slow. I have noticed this problem through debugging and I created a threading event stop flag so that it can be changed in different modules and response generation stopped immediately in any case.*

**Final Internship Report**

*Write an overview of your internship in general. Describe what you accomplished, what you learned, whether or not you enjoyed it, and how it helped you with your educational and career goals. Would you recommend other students do a similar internship? If so, what advice would you give them?*