**Luqman’s Individual Capstone Assessment:**

From my individual academic perspective, our senior design project is a challenging project that involves different technologies to tackle an important security issue and find potential security threats. MalAI, the name of our application, is a malware analysis desktop application used to detect malware in executable applications. Many technologies will be utilized in MalAI to accomplish this goal such as Retrieval Augmented Generative (RAG) and Finetuned models. Furthermore, methods like reverse engineering will also be used to perform the analysis at the lower level. The application flow is as follows: MalAI will take an executable file as an input then the application will be reverse engineered so it will be analyzed at a lower level. Finally, by utilizing pretrained RAG and finetuned models, malware patterns will be detected, and new malware will be designed for testing purposes.

After completing four years of my bachelor’s in computer science and pursuing my last year, there are many classes I enrolled in that I believe will give me a significant advantage. For example, I have taken Web Application Programming and Hacking (EECE 4005) course in summer 2024. This course introduced me to many topics relevant to this project such as building a secure application and taught me many technical skills such as how to prevent several attacks that could target the front-end, back-end, or the database. Considering our application will be in the security sector and that we are building a desktop application, these skills will be applied by building a secure application that prevents attacks that target the machine running MalAI. Furthermore, I have taken Introduction to Computer Systems (CS 2011) in Spring 2023. This course introduced me to reverse engineering and Assembly language, and both of these technical skills will be very important in this project and will be applied in the application when implementing the reverse engineering. Finally, I took Artificial Intelligence (CS 4033) course in Spring 2025. The CS 4033 course taught me the fundamentals of artificial intelligence and laid down the foundation of AI for me to build on it. Furthermore, we also worked on a machine learning model which helped me see how machine learning models function from a mathematical perspective as well as how to implement them. The technical skills gained from CS4033 course will be very useful and will be applied when we work on RAG and Finetuned models in this project.

Alongside my education, I have also accumulated four co-ops working as a software engineer and one part-time co-op working in an operation unit providing IT support. In my four co-ops, I worked with ITG Software Engineering as a software engineer intern. In each co-op I worked on a different project which gave me the chance to develop a variety of technical skills such as web development, android mobile application development, full stack application development, and AWS cloud computing. Since we will have to build a user interface as well as a back-end for the project, many of the skills I developed at ITG will be very useful in this project and will be applied throughout project when building the desktop application. Furthermore, I worked part-time at Omantel telecommunication company in operation unit to provide IT support in the headquarters. Working in Omantel gave me the chance to develop many vital soft skills such as communication, teamwork, and leadership. I gained these skills by working with a team of approximately 10 members; therefore, I needed to have good communication and team working skills. Furthermore, I also was assigned to mentor four individuals which helped me to develop my leadership skill. I am expecting to apply these soft skills in the project by facilitating good communication between me and my team members as well as me and our advisor. Furthermore, my leadership and team working skills will both be applied throughout the project by making sure to make good decisions, completing my work in a timely manner, and providing support.

I am really looking forward to start working on this project for multiple reasons such as the fact that the project is AI-related and it requires us to utilize methods that I found very interesting like reverse engineering. However, one of the main reasons that motivate me is that this project is challenging. This project requires us to develop an application that involves many technologies and methods on a large scale; therefore, besides the technical challenges, it requires us to be disciplined, to have a clear understanding of the goal of the project, and to break down the tasks and divide them in an even way and tackle them in a timely manner. Consequently, all of these make the project viewed as challenging and that is what motivates and excites me the most. Furthermore, the preliminary approach I currently have in mind has three stages as described above. The first stage is taking an executable file as an input and then reverse engineering it to analyze the executable file at a lower level. The second stage will be utilizing Retrieval Augmented Generative and Finetuned models to analyze the reverse engineered file. Finally, the last stage will be detecting the malware and designing new malware based on the given executable file.

By the end of this two-semester project, I am expecting to have a working desktop application that will be able to detect malware and design new ones by utilizing the methods and technologies mentioned above. Furthermore, I am also expecting to have a smooth and easily navigated desktop application which will be achieved by building the application with keeping the user in mind. Another important aspect of this project is self-evaluation. Throughout this project, a task management application such as Trello will be used to divide tasks and assign them evenly between members. Therefore, I am aiming to utilize the task management application to keep track of my progress. Furthermore, by asking for clarifications from our advisor and as a team, we will make sure to not assign any task until the criteria for that task are clearly defined, so that If the criteria met that task is completed. Therefore, by following this approach, I will be able to clearly see if I am done with a certain task or not and whether the quality of the work delivered is good or not. Furthermore, to further assess the quality of work delivered, I will utilize the weekly meetings to get a second perspective on the quality of my work from my team member as well as from my advisor.