

Hackathon 2024: Personal Reflective Report

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Introduction

For the purpose of this report and providing important contextual information, the topic of my group's Emerging Trends topic was *Enhancing Battlefield Awareness to mitigate friendly fire*. Our solution to this problem was called *SquadScope*. A groundbreaking system that seamlessly integrates cutting-edge AR (Augmented Reality) and AI (Artificial Intelligence) technologies, designed to enhance situational awareness and mitigate the risk of friendly fire incidents on the battlefield.

Friendly fire, also known as fratricide, is an all-too-common and tragic occurrence in military operations, where soldiers unintentionally engage and harm their own forces due to misidentification or miscommunication. The consequences of such incidents are devastating, resulting in the loss of precious lives, inflicting injuries, and leaving long-lasting emotional scars on those involved. These incidents not only undermine the effectiveness of military operations but also erode the trust and morale of soldiers, who rely on clear communication and accurate identification of friendly and enemy forces to operate effectively.

SquadScope aims to address this critical issue by harnessing the power of AR and AI to provide real-time, accurate information to soldiers on the ground. The system utilises advanced AR glasses, equipped with cameras (should the state of current and emerging technology allow us to), sensors, and microphones, to capture and analyse the surrounding environment. This data is then processed by sophisticated AI algorithms, which can identify and label objects, distinguish between friendly and enemy forces, and provide tactical recommendations to soldiers in real-time.

By seamlessly overlaying this critical information onto the soldier's field of view, *SquadScope* enhances their situational awareness, enabling them to make more informed

decisions and significantly reducing the risk of misidentification and friendly fire incidents. The integration of AI algorithms ensures that the system can adapt to rapidly changing battlefield conditions, providing soldiers with the most up-to-date and accurate information possible, ensuring they remain one step ahead.

The importance of mitigating friendly fire incidents cannot be overstated. Beyond the tragic loss of life and emotional toll, these incidents can have far-reaching consequences, including compromising mission objectives, damaging international relations, and undermining public support for military operations. By addressing this critical issue head-on, *SquadScope* has the potential to save countless lives, improve operational effectiveness, and ultimately contribute to the success of military missions, safeguarding the lives of those who selflessly serve their nations.

Reflections on Collaborative Efforts

The collaborative process for this project was a mixed experience, with both positive and negative aspects. My group consisted of Connor Humphreys, Ava Kennedy, Sameeran Raveenthiran and myself. Initially, our four-member team brought unique perspectives and skills. However, as we progressed, we faced obstacles that tested our ability to work together effectively. In the end, the remaining members within the group were Connor Humphreys and myself.

The largest hurdle our team faced was before the project even began. There was a discrepancy between the project requirements and our actual team composition. The brief stipulated groups of five to six members, but we started with only four. When two members subsequently withdrew, only two of us were left to shoulder three times the workload. Despite assurances from lecturers that accommodations would be made, no tangible adjustments alleviated the additional burden on the remaining members. We navigated these challenges independently, adding complexity to an already demanding project. This experience highlighted the importance of clear communication, contingency plans, and support mechanisms for unforeseen circumstances in collaborative projects. Nevertheless, our team persevered, demonstrating resilience and adaptability in the face of adversity.

One significant challenge was the unexpected departure of Ava Kennedy due to mental health concerns. While I supported their decision, their absence burdened the remaining members. This highlighted the importance of open communication and understanding in collaborative environments. Another hurdle arose when Sameeran failed to contribute meaningfully and submitted plagiarised work, jeopardising the whole project's integrity. This

underscored the need for clear expectations, accountability measures, and a shared commitment to academic integrity from the beginning.

Despite these challenges, I was fortunate to have Connor Humphreys as a dedicated team member who consistently contributed to half the work. Their professionalism was invaluable. However, their severe social anxiety prevented them from participating in the final presentation, leaving me solely responsible. This experience emphasised the need for open communication about individual strengths, weaknesses, and limitations within teams. It also highlighted the importance of flexibility and adaptability, as members may need to support one another unexpectedly to ensure project completion.

Throughout this process, I learned valuable lessons about the challenges and rewards of collaborative work. While the obstacles were significant, they provided opportunities for personal growth, resilience, and a deeper understanding of team dynamics. Moving forward, I will carry these lessons, recognising the importance of clear communication, accountability, empathy, and a willingness to adapt to changing circumstances. Successful collaboration requires not only individual contributions but also a shared commitment to supporting one another, overcoming challenges, and working towards a common goal.

Quantifying Individual Performances

While I firmly believe in upholding ethical principles and avoiding practices that could be demeaning or harmful, I acknowledge the necessity of providing individual assessments for this report. It is important to note that these evaluations are not a reflection of my personal opinions but rather a required component of the assignment.

Regarding Ava, who prioritised their mental health, their decision to step away from the project was a responsible choice, and they communicated their situation transparently before the second presentation's deadline. Considering their circumstances, a fair assessment would be to acknowledge their positive efforts while understanding the limitations imposed by their situation. Their initial contributions and proper citation of sources deserve recognition, and I would rate their performance a 3 out of 5 prior to their departure. As for Sameeran who plagiarised work, their actions not only endangered their own academic integrity but also put the entire team at risk. Such behaviour is unacceptable and cannot be condoned. Beyond the ethical breach, their lack of contribution and communication, exemplified by reaching out merely two nights before the final presentation to request access to the work done by others, demonstrates a complete disregard for the collaborative nature of the project and the efforts of the team members involved. Regrettably, I must assign a rating of 0 for their performance.

On a more positive note, Connor Humphreys, who contributed approximately half of the work deserves high praise. Their dedication and professionalism were invaluable assets to the project. Despite facing challenges with social anxiety during the presentation, their willingness to collaborate with me and support me is commendable. I would rate their performance a 5 out of 5.

It is worth noting that the burden of presenting for an extended period and addressing questions from lecturers should not fall solely on one individual. Whilst I was able to

compensate for this situation due to my strengths in public speaking, it highlights the importance of fostering a supportive and collaborative team environment where members can rely on each other's strengths and mitigate individual weaknesses.

In conclusion, it is my hope that future collaborations will prioritise ethical conduct, mutual respect, and a commitment to upholding academic integrity above all else.

Analysis of the Design

The proposed *SquadScope* design was a collaborative effort between Connor Humphreys and I, it seamlessly integrates innovative features to enhance functionality and user experience for soldiers. The durable polycarbonate frame incorporates a groove along the top edge for the ingenious two-axis hinge mechanism, allowing each impact-resistant lens to flip up to 90 degrees and securely lock in place when flipped down.

The lenses, crafted from materials like polycarbonate or *Trivex*, ensure durability and can be tinted or coated for UV protection and glare reduction, enhancing visibility. The design incorporates a microphone, bone conduction speakers, and a medical alert button for seamless communication and rapid injury notification.

The unobstructed peripheral frame design ensures an unimpeded field of view, crucial for situational awareness. Additionally, the inclusion of a signal transmitter allows for real-time data transmission and integration with the *SquadScope's* augmented reality and artificial intelligence systems, providing soldiers with critical information and recommendations.

Ergonomic features like rubber grips and adjustable nose pads ensure a comfortable and secure fit, allowing soldiers to focus on their mission. Overall, the proposed design reflects a thoughtful balance of advanced technology, durability, and user-centric considerations, demonstrating a commitment to equipping soldiers with a cutting-edge tool that enhances their capabilities whilst prioritising their safety and comfort on the battlefield.

Identifying Limitations and Evaluating Associated Risks

The proposed *SquadScope* design prioritises durability and capability integration but overlooks critical limitations like battery constraints for extended operations, lack of environmental resilience that could compromise electronics, unspecified compatibility

with existing systems limiting effectiveness, and an undefined user interface risking usability issues.

Incorporating a signal transmitter introduces cybersecurity vulnerabilities, while overreliance on technology may erode traditional skills and decision-making abilities. Technical failures could disrupt operations and endanger soldiers, and integrating AR/AI systems risks cognitive overload from excessive information. Privacy and ethical concerns regarding data collection and potential misuse also arise.

To mitigate these risks, extensive operational testing, robust cybersecurity, comprehensive training, and clear guidelines for responsible use are imperative. Ongoing research should focus on improving battery life, environmental resilience, system compatibility, and intuitive interfaces. By addressing these concerns proactively, *SquadScope* can leverage advanced technologies whilst prioritising soldier safety, decision-making capabilities, and ethical considerations.

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