**Dhyey Patel Individual Capstone Assessment**

My senior design project, **SegLungAI**, is a machine learning initiative focused on automating the detection and segmentation of neonatal lung anomalies in MRI scans. By leveraging semantic segmentation techniques, the project aims to reduce the need for manual corrections in medical imaging analysis and improve diagnostic accuracy. From my perspective as a computer science major, this project represents the perfect opportunity to apply my technical expertise to a real-world healthcare challenge that has the potential to make a meaningful impact.

My academic experiences have thoroughly prepared me for this project. Courses like **CS2028C: Data Structures**, **CS4071: Design and Analysis of Algorithms**, and **EECE3093: Software Engineering** provided me with the theoretical and practical knowledge needed to design efficient algorithms and implement robust solutions. My understanding of machine learning principles, honed in courses like **CS4151: Artificial Intelligence**, and hands-on experience with programming tools such as **Python**, **TensorFlow**, and **PyTorch** will be instrumental in developing the model for lung segmentation. Additionally, my exposure to data visualization in **CS4092: Database Design and Development** and my proficiency in tools like **MATLAB** and **R** will aid in processing and analyzing medical imaging datasets.

My co-op experiences have been pivotal in shaping my practical skills. At **Givaudan**, I spearheaded the transformation of AI technology into a React-based web application, optimizing development workflows and boosting user engagement. These experiences taught me how to efficiently refactor and optimize code—skills I will apply when building and fine-tuning the segmentation model for SegLungAI. Furthermore, my role as a **Cyber Threat Analyst Intern at iQ4 Corporation** equipped me with a structured approach to problem-solving and collaboration, which will help me navigate the complexities of this project. These co-op roles enhanced both my technical and soft skills, preparing me to contribute effectively to the success of SegLungAI.

My motivation for this project stems from a passion for using technology to improve lives, particularly in healthcare. The ability to enhance the accuracy of neonatal lung segmentation has the potential to reduce diagnostic delays and improve patient outcomes. I am excited to contribute to a project that bridges my interest in AI and my desire to solve impactful problems. My preliminary approach involves designing a semantic segmentation model using **U-Net** or **DeepLabV3** architectures, pre-processing anonymized MRI datasets, and iteratively improving the model with performance metrics such as the Dice Similarity Coefficient (DSC). I also plan to explore data augmentation techniques and incorporate active learning to enhance the model’s robustness.

I expect the final product to be a reliable, high-accuracy segmentation tool capable of processing neonatal chest scans with minimal manual intervention. Success will be measured by the model's ability to meet or exceed performance benchmarks while maintaining generalizability to diverse datasets. To evaluate my contributions, I will track my progress against project milestones, review model performance metrics, and solicit feedback from advisors and team members. I will know I have succeeded when the tool significantly reduces manual corrections, achieves clinical-grade performance, and demonstrates its potential to address broader pediatric imaging challenges.