**Alex Le’s UTRA Application**

**Why are you interested in this position and why is the opportunity important for you? How will this opportunity enable you to explore a new or interesting professional pathway? (1-2 paragraphs)**

My fascination with x-rays began at an early age, as my TaeKwonDo dojo used discarded x-ray films to help perfect our kicks. Sensei would hold a chest x-ray above my head, challenging me to kick high, resulting in a distinctive crackling snap as my foot made swift contact with the faded image. As I strove to perfect my tornado kicks, I also developed interest in the magic of x-rays, since they revealed invisible secrets hidden deep inside the body. During my freshman year at Brown, I conducted research with Dr. Vikas Srivastava’s laboratory, where I utilized machine learning and ultrasound data to detect luminal deformities real time using Matlab and TensorFlow. Last summer, I immersed myself in SARS-CoV-2 vaccine and virology research at U.C. Davis and gained an appreciation for how thoracic CT scans played a pivotal role in differentiating Covid lung disease from other pneumonias due to its characteristic radiologic patterns. With artificial intelligence, patterns of distinctive radiographic findings could alert physicians to the emergence of such novel diseases. This year, I have taken classes in computer vision, software engineering, biomaterials and physiology to further my interests in computational biology.

With the aim of exploring the intersection of technology and biology, I am seeking a research experience where I can contribute to advancements in diagnostic accuracy and health care access. Therefore, I am particularly intrigued by Dr. Harrison Bai’s research to develop a multi-modal thoracic diagnostic artificial intelligence program. While current AI programs exist for single-task, limited scenarios, the development of a multi-task and multi-modal program would allow physicians to more efficiently and accurately evaluate a broader differential diagnosis when assessing patients. AI also has the potential to both improve access to care, especially in resource-poor areas, while helping physicians improve medical triage and diagnostic accuracy. While some investments in AI health care applications have fallen short, promising innovations exist in radiology due to robust image-recognition software. I would be excited to be at the forefront of these discoveries. In this way, my childhood goal of aiming high to reach an x-ray image has inspired me to improve and refine medical assessments with computer vision.

**Write about the skills and knowledge that you hope to develop in this position, and how this opportunity relates to your overall learning goals and/or helps you reach your current and/or future professional, personal or academic goals. For example, how does this project utilize your current research skills? What new skills or knowledge are you hoping to acquire? (1-2 paragraphs)**

In Dr. Harrison Bai’s research laboratory, I hope to improve my quantitative skills in developing machine learning and computer vision techniques. Building upon my prior research experience and coursework, I am excited to expand my knowledge in artificial intelligence to real world applications. I plan on concentrating in computational biology with the goal of entering the biomedical engineering industry. Hoping to ultimately pursue an MD-PhD in interventional radiology and computer science, I would gain invaluable exposure to this discipline. Thus, this unique experience with Dr. Bai would allow me to gain an unparalleled hands-on introduction to medical imaging and novel biomedical applications of computer science not covered in a classroom setting. Experience working with Dr. Bai also complements my classes in computer vision, physiology, software engineering, biomaterials, linear algebra and statistical inference. Furthermore, this research opportunity would adeptly enhance my experience in deep learning and bioinformatics in preparation for future studies.

Through this UTRA, I would learn how to interpret CT scans while also building a software program that uses machine learning to analyze these images. It would allow me to think like a software engineer and implement skills gained in class by specifically designing multi-task and multi-modality capabilities that distinctly differs from pre-existing single function AI medical image analysis. Thus, I would be able to combine software engineering and computer vision skills to learn how to develop an extensible neural network structure that contains functionality to support more conditions. This experience would not only further my skills as a computer scientist, but also expose me to various applications and diagnostic capabilities of CT technology. Research in this area can also lead to a Senior Capstone project as part of my Computational Biology concentration as well as continual research throughout the school year. Dr. Bai’s research focuses on an exciting, dynamic field with broad applications that can improve efficiency, access, accuracy and even disparities in medical care. This UTRA opportunity would provide a perfect learning experience in this intersection of biology and technology to further my goals of pursuing an MD-PhD. I look forward to learning from experts in this field like Dr. Bai and furthering my education in machine learning as it applies to medical diagnostics and biomedical informatics. With my coursework, past research experience and interest in computer science and biology, I hope to contribute as much as I can learn.