Skin cancer is the most prevalent form of cancer, with more than 3.5 million new cases diagnosed annually in the United States alone. The gold standard method for skin cancer diagnosis is biopsy, which consists in the excision, extraction, and processing of skin samples before their final evaluation by a specialist through an optical microscope. However, conventional biopsy entails two severe drawbacks, namely its invasive nature and its time-consuming nature. Early detection is critical to achieve a positive prognosis, which strongly motivates the development of novel techniques to overcome those limitations.

Optical Coherence Tomography (OCT) is a powerful imaging modality capable of performing real-time images of living human tissues at high resolution and in three-dimensions, in an analogous way to Ultrasound Imaging but with the remarkable capacity to resolve tissue components 100 times smaller. The use of light polarization into OCT provides additional contrast mechanisms that reveal valuable information about the tissue healthy or pathological state. The Stanford Biomedical Optics group led by Audrey K. Ellerbee has recently demonstrated that polarization-sensitive Optical Coherence Tomography provides enough sensitivity and specificity so as to perform automatic skin cancer detection.

The objective of the proposed research project is to develop a handheld probe aimed to provide flexibility and ease of use of a portable polarization-sensitive OCT system for in-vivo human skin cancer detection in realistic clinical environments.