The research project aims to breast cancer diagnosis through the design and development of an elastic scattering spectroscopy (ESS)-based probe. Elastic scattering spectroscopy is a noninvasive optical technique that provides valuable structural or morphological changes in tissue. The proposed probe improves the sensitivity, specificity, and accuracy of breast cancer diagnosis by leveraging the unique capabilities of ESS.

The project begins with a comprehensive review of breast cancer, existing diagnostic techniques, and their limitations in detecting early-stage breast cancer. The project then delves into the principles of elastic scattering spectroscopy and its potential as a diagnostic tool. Through systematic experimentation and optimization, a custom-designed probe is developed to maximize the sensitivity and specificity of ESS for breast tissue diagnosis.

The research involves the diagnosis of breast cancer, the characterization of the probe's performance using phantom models, and optical properties measurements from ex-vivo tissue samples. The collected data is analyzed using algorithms to extract relevant information about tissue and identify potential biomarkers associated with breast cancer. A dedicated printed circuit board (PCB) has been meticulously designed for efficient data acquisition. The integration of this PCB facilitates seamless communication between the ESS probe and a custom-built graphical user interface (GUI) using Python. The GUI serves as a user-friendly platform for real-time data acquisition, providing pathologists/clinicians with a streamlined interface to monitor and analyze the obtained sample points