# Expanded Goals Statement

My research focuses on biomedical imaging, primarily ultrasound imaging. I am particularly interested in designing computer aided diagnosis system for the detection of cancer based on ultrasound imaging. Ultrasound imaging is popular as a cost effective diagnostic tool which motivated me to explore this field. In Bangladesh where cancer treatment is still expensive and not affordable by general mass, designing a low cost ultrasound imaging based cancer detection can have a revolutionary impact.

With this vision in my mind, in undergraduate studies I started working on biomedical image processing focusing on ultrasound imaging. In my thesis, titled as *"Automatic Lesion Segmentation of Breast Ultrasound Image: An approach towards full automation"*. During my thesis, I gained knowledge regarding the basics of ultrasound imaging, inherent artifacts present in ultrasound images, different image filtering and processing techniques and segmentation methods. During my research, I designed a Computer Aided Diagnosis (CAD) system that automatically detected the cancerous lesion in the breast ultrasound image. While developing the system, I implemented an algorithm that was able to generate a seed point in the lesions and carry out segmentation of the lesion based on that automatically generated seed point. This algorithm made it easier for the physicians to perform the difficult task of structure delineation in ultrasound images within a reasonable time. I published in the proceedings of an international conference, titled "International Conference on Technological Advances in Electrical, Electronics and Computer Engineering (ICTAEECE 2015)".

Currently, I am collaborating with Dr. Kaiser Alam, adjunct Professor at Rutgers University) for further investigation of ultrasound imaging. We are designing a breast ultrasound image segmentation method based on edge and region-based active contour models and quantitative ultrasound parameters. We are focusing on building a machine learning framework using the statistical and spectral parameters from the image as the input features which is going to provide the initial contours for the active contour models.

We are also focusing on the quantitative assessment of tissue mechanical property and establishing a correlation between the unique quantified tissue-based parameters and the elastography. My focus is to develop a classifier based on the trend of variation of quantitative ultrasound parameters in different frames of elastography images for malignant and benign breast tissues.

I am applying to Bioengineering Department of George Mason University because of its conglomeration of highly capable faculties and state of the art research facilities. This department is consistently producing research outcomes focused to solve most prevalent health issues of the society. The research focus of **Dr. Siddhartha Sikdar (Principal Investigator, Biomedical Imaging Laboratory)** matches well with my area of interest. Dr. Sikdar has worked on semi-automic segmentation of carotid arterial wall using ultrasound images. My expertise on ultrasound image segmentation and experience with ultrasound imaging makes me well-rounded to undergo Dr. Sikdar's project with confidence. Such a work will have significant impact on automatic detection and characterization of atherosclerotic plaques and in the prediction

of strokes. I also believe that I can incorporate the knowledge of automatically detected carotid arterial wall into the motion tracking of intra-vascular ultrasound elastography.

In the last one year as a lecturer, I tried my best to accumulate skills necessary to face the challenges of graduate studies. I have conducted courses like Computer Programming, Digital Signal Processing and Medical Electronics. This courses helped to strengthen my basic understanding of programming, signal processing and medical imaging. I also guided a group of students for “IEEE Signal Processing Contest 2016”. I delivered invited talk on “Basic Schemes of Image Processing with MATLAB Demo” in “Short Course on Currents trends in Research leading to the industrial application of Image Processing” held in IUT. I believe my skills have provided me enough confidence to take up the challenge of pursuing graduate studies in George Mason University.

I thank the admission committee for reading my essay.

Rashid-Al-Mukaddim