**759 Final Project Proposal**

**Motivation**: Elastography is a process of using Ultrasound to measure the elasticity of a material from an applied force. This has many important uses, especially in medical imaging. In our Ultrasound Lab in the Medical Physics Department, we work on calculating the elasticity for cardiac and liver applications. This done by calculating displacement from a given force in the tissue. The gradient of the displacement is then taken to give a relative strain measurement of the tissue. This strain is an important aspect for clinicians to deduce the tissue properties for assessing current treatments or ailments.

Current methods for calculating the displacement include the Multilevel using 2D Normalized Cross Correlation; the displacement estimation method developed in our lab. The Multilevel algorithm operates as a pyramid, where initial displacements are computed starting on a coarse grid using large kernels, followed by computations on finer and finer spatial grids to obtain high SNR estimates with high spatial resolution. This method is very computationally expensive and time consuming, so it currently is done post-procedure due the time constraints of procedures. We look to create a GPU implementation of this displacement estimation method in hopes of speeding up processing time, leading to a more real-time implementation.

**Problem Statement:** We look to create a GPU implementation for one grid level of the Multilevel using 2D Normalized Cross Correlation to speed up displacement estimation computational time. This single level can easily be repeated in the future for the other levels to create the pyramidal scheme that the Multilevel ensues.

**How you plan to go about it**:

**How you will demonstrate what you accomplished**: In future work the GPU implementation for the single level of the Multilevel algorithm can be repeated for other levels to create a fast, comprehensive displacement estimation algorithm. This algorithm may then replace our current slow CPU implementation to increase our post-processing time. Even further speed ups can be made after this project to the point that this method can be implemented real-time for clinicians.

**Team members:**  Explain who they are, and what their responsibilities are

**Deliverables**: what you expect to deliver come December 21.

**Participate in Rescale sponsored Final Project competition**: No.

Remarks:

* There’s a two-page limit. See if you can make your point without hitting the limit.
* Drop your PDF proposal in the Canvas dropbox Final Project Proposal 759.
* Proposal due date: Nov. 3 at 11:59 pm.
* I hope to give feedback within one week.
* The project doesn't necessarily have to be a "ground up" implementation of some large problem, but can be a new parallel implementation of some existing code with the requisite demonstration of the effects of the parallelization (e.g., scaling analysis, correctness, etc.).
* Be bold.