

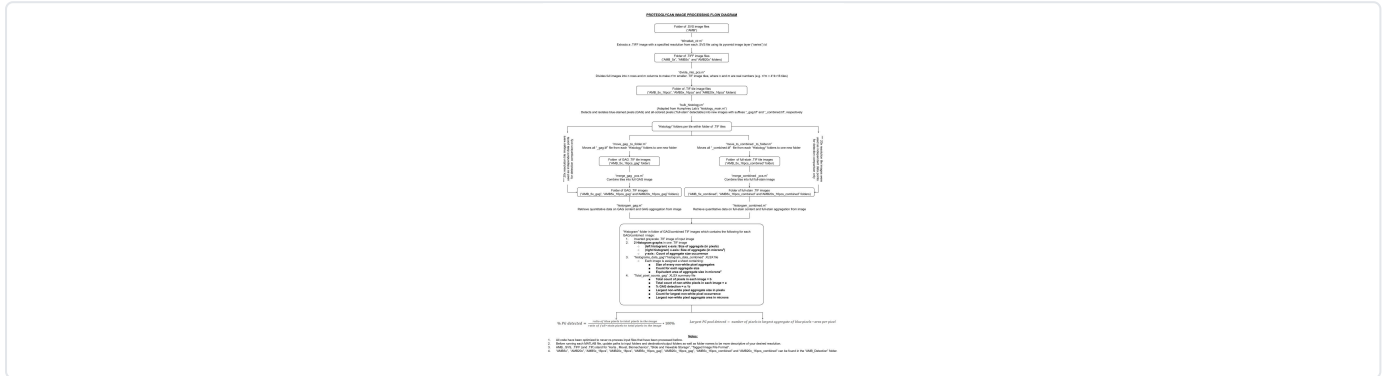
Proteoglycans and Aortic Tissue Failure

University of Toronto, MIE498 Undergraduate Thesis · Simmons Lab, Bioengineering minor

Solo thesis

A MATLAB image-analysis pipeline relating proteoglycan content to aortic-wall failure.

For my undergraduate thesis I studied how proteoglycans relate to the biomechanical failure of aneurysmal ascending aortic tissue, in Dr. Craig Simmons' lab. I wrote a MATLAB pipeline to quantify proteoglycan content and pooling from high-resolution stained-tissue scans, then related those measures to delamination strength and energy loss.



The MATLAB image-processing pipeline, from raw pathology scans to per-image proteoglycan measures.

Method

The pipeline reads whole-slide pathology scans, tiles them, isolates the stained pixels, and pulls quantitative measures per image, from proteoglycan area through aggregate and pool sizes. A preliminary study quantified the resolution trade-off: dropping from 20x to 5x cut proteoglycan detection by roughly 40%, a correction I carried into the main analysis.

Result

The main study supported the hypothesis: more proteoglycan presence and pooling went with weaker delamination strength and higher energy loss in the tissue.

SELECTED REFERENCES

- J. Humphrey, Cardiovascular Solid Mechanics, Springer, 2002.
- M. Linkert et al., "Metadata matters: access to image data in the real world," Journal of Cell Biology 189(5), 2010 (Bio-Formats).

Engineering portfolio brief. Course and team project; contribution as noted above.