NC STATE UNIVERSITY

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CARDIOVASCULAR DYNAMICS GROUP

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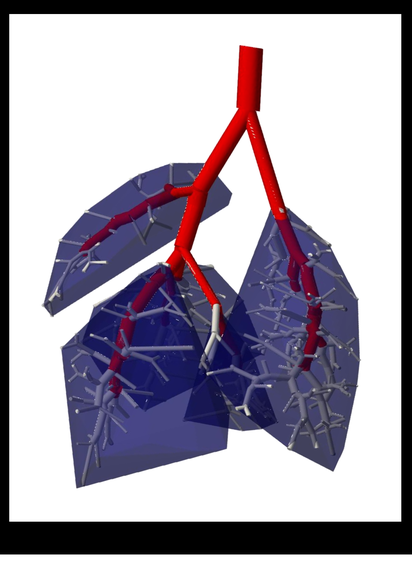

Geometric Features of Murine Pulmonary Networks

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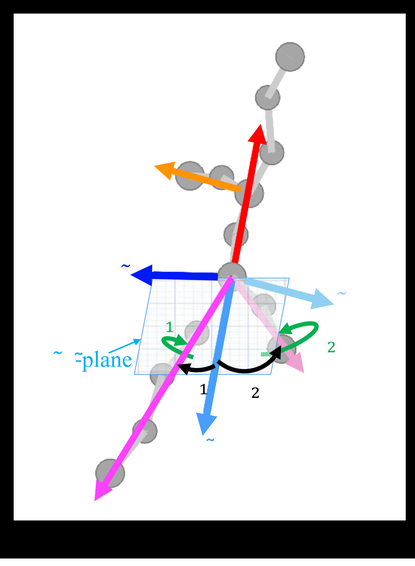
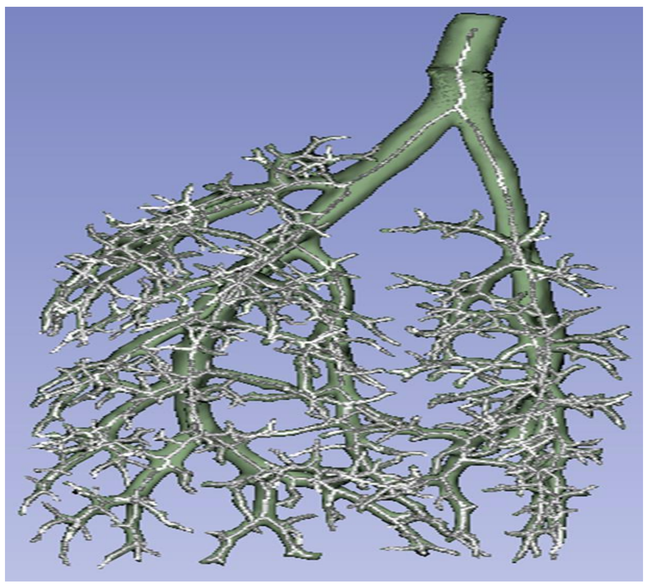
[1]North Carolina State University, [2]Virginia Military Institute



1. Research Focus:

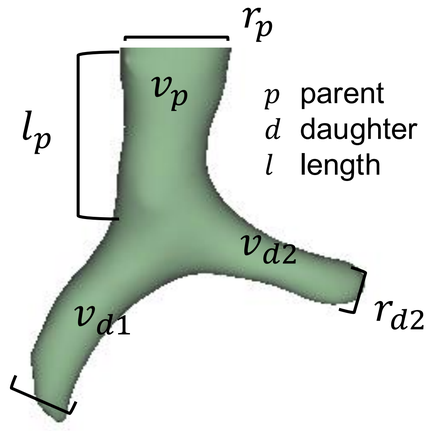
Vascular disease in both humans and animals is one of the leading causes of death. Vascular disease is associated with the vascular network structure, which impacts the hemodynamics. We aim to gain more insight into how disease impacts the vascular network geometry. Our team utilizes mathematical and statistical methodologies to characterize effects of remodeling.

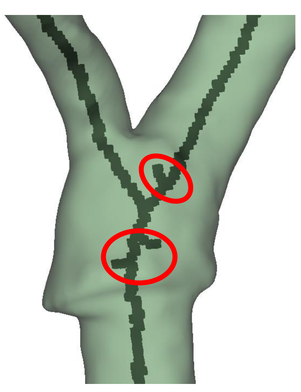


2. Research Methodology:

Our methodology characterizes the following features:

a) Geometric (branching features, network size, volume)
b) Statistical shape (coordinates of landmarks)
c) Topological (Persistent homology, loops, holes)
d) Fluid dynamics models predicting blood flow and pressure



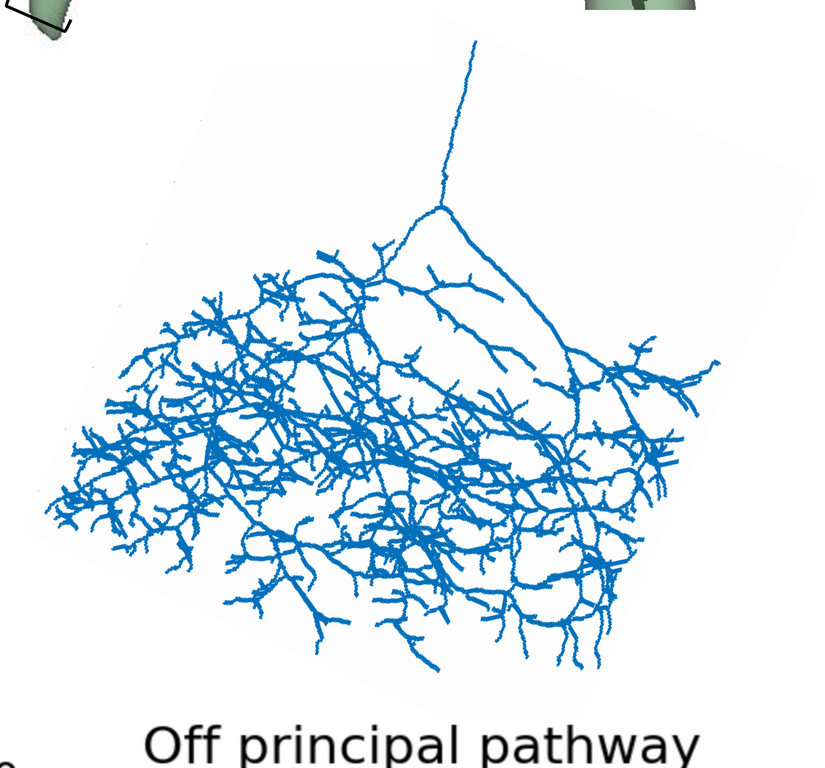


3. Examples of recent results:

Shape of hypertensive mice arterial networks show that only the length-to-radius ratio is modulated by disease.

MJ Chambers (2020). *Proc Inst Mech Eng, H: J Eng Med*, 234:1312-1329

M Miller (2023) *Math Biosci*. 364:109056



4. Interested in Collaborations Focused on:

- Experimentalists interested in vascular remodeling w/disease
- Anyone interested in 3D imaging, especially with MicroCT data
- Statistical comparison between mice can be done with more samples
- Anyone with skills in Topological Data Analysis, knowledge of network-based statistics, and geometric features