



Graphs in Medicine: Working with Blood Vessel Networks

An open problem in the field of medicine is taking images of blood vessels and generating a mathematical object that can be used for downstream tasks. Such a task is to measure the tortuosity of blood vessels, which can be used as a medical sign.

In this project, we want to take 3D images of blood vessels and generate a weighted graph representation. This involves constructing a 3D view of the blood vessels, finding the center-lines and junctures/bifurcations, constructing the graph, and determining the edge weights (tortuosity).

The important aspects of this task are accurate locations of the junctures/bifurcations, and accurate values of the edge weights.

The exact scope of the project is not yet fixed and is up for discussion; we are looking for motivated students who are excited to work on blood vessels through the eye of geometric graphs.

Requirements: Programming skills (Python, C/C++, ...) and knowledge of machine learning. Prior experience on working with graphs, image segmentation, computer graphics, or fluid dynamics is an advantage.

We will have weekly meetings to address questions together, discuss progress, and think about future ideas.



Contact

In a few short sentences, please tell us why you are interested in the project and about your coding and machine learning background (i.e., your own projects or courses).

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