Partial Differential Equations (PDEs) are a formidable tool for describing real life problems. Unfortunately, they can be solved explicitly only under many simplifying assumptions. In many applications, a numerical approximation procedure is required for a quantitative analysis of the problem at hand.

This course will provide a practical introduction to the numerical approximation of PDEs. As reference problem we will mainly refer to the manipulation of medical images and the simulation of blood flow and cardiovascular diseases.

Numerical analysis of cardiovascular problems is becoming an important tool supporting the decision making process of medical doctors. The course will cover:

1. Medical image processing,
2. Numerical simulations with open source software developed by the instructors.

Instructors

A. Veneziani, PhD (Math&CS - Coordinator) - Numerical approximation of PDEs, Computational Fluid Dynamics
T. Passerini, PhD (Math&CS) - Numerical Modeling, High Performance Computing, C++ Scientific Computing Software
M. Piccinelli, PhD (Radiology) - Medical Imaging, Knowledge extraction, C++/Python Image Processing Software

Collaborators

Ernie Garcia, PhD (Radiology) - Medical Imaging - SPECT
John Oshinski, PhD (Radiology) - Medical Imaging - MRI
Habib Samady, MD (Emory Clinic) - Interventional Cardiology
Frank Tong, MD (EUH) - Radiology & Neurosurgery

Activities

Intense, all-day course
- Lectures: 3hrs per day
- Hands-on Lab: 4 hrs per day
- 2 Lectures by medical doctors
- Two visits to Radiology labs

Number of credits: 4

Evaluation

Daily Assignments
Weekly team projects

Software

FreeFem,
VMTK (C++, Python),
NetGen, LifeV (C++)

Prerequisites

Multivariable Calculus,
Linear Algebra
PDEs
Basics of Computer programming
Numerical analysis

Questions:
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http://college.emory.edu/home/academic/summer/maymester/