



# UNIVERSITY OF LOUISVILLE CVIP LABORATORY



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## **From Images to Models and Hypothesis Testing – Examples of the State-of-the-Art in Multimodality Medical Imaging Analysis**

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The role of engineers and computer scientists in medical imaging analysis has been most explicit in segmentation, registration and visualization of multimodality images. This talk will focus on some recent advances in these methods as applied to structural model building and investigating hypothesis in computer-assisted diagnosis (CAD) and image-guided interventions. The talk will touch on three topics: 1) construction of a comprehensive 3D model of the human brain from CT, MRI, MRV, MRA and Laser scanning; 2) using low-dose CT scans for early detection of lung cancer; and 3) construction of a CT-based system for virtual colonoscopy.

The binding thread between the three topics is the use of verifiable mathematical models on images, in order to build the anatomical models and test specific biomedical hypothesis. We will show in details some of our methodologies for vascular segmentation, shape-based registration, finite element modeling of soft tissues – these are essential ingredients for image-guided interventions. We will also present two model-based image analysis systems developed at the CVIP Lab; the first is for detection of lung nodules in chest CT scans based on a novel stochastic model of the lung tissue, and the second for virtual colonoscopy based on a level set framework.

From the information technology perspective, medical imaging stands at the forefront of innovations and applications. This talk will highlight emerging themes in this exciting field.

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