

## Weekly Seminar

12pm - 1pm, Friday, September 20, 2019  
UWM EMS E 237

### 3D Computer Vision: Modeling and Analysis in Biomedicine

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#### **Abstract:**

Knowing 3D anatomical structures and surface geometries is critical for planning patient treatment and conducting scientific research. While images have been widely used in clinical and research labs, imaging devices are often equipped with cameras capturing only 2D views of the underlying objects. In this talk, I shall begin with an overview of computer vision and then introduce a couple of techniques that reconstruct 3D models from a series of 2D images. In particular, I will elaborate on two types of 3D reconstruction: surface geometries with reflective rays and volumetric structures with transmissive rays. I will then discuss about 3D image and shape analysis with both traditional (knowledge-based) and machine learning (data-driven) approaches. Several applications will be demonstrated to show the efficiency and effectiveness of 3D modeling and analysis in biomedicine: 3D microscopic models through 2D scanning electron microscopy (SEM) images, high-resolution 3D modeling of teeth by active projector/camera systems, and 3D reconstruction of macromolecular structures through cryo-electron microscopy.