# *Biomedical Informatics Grand Rounds*

**Wednesday, Oct. 20, 2021, 3:00 pm – 4:00 pm**

## Deep Learning Models for Medical Image Synthesis and Segmentation

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**Remote Access**
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**Bio:** Dr. Sharon Xiaolei Huang is currently an Associate Professor in the College of Information Sciences and Technology at the Pennsylvania State University, University Park, PA, USA. She is also an affiliated faculty member of Penn State's Huck Institutes of the Life Sciences. Her research interests lie at the intersection of biomedical image analysis, machine learning, and computer vision. Dr. Huang's research is focused on developing robust medical imaging software based on computer vision and machine learning algorithms that aid medical doctors in accurate and reproducible diagnosis, and help them better understand the anatomical and physiological relationships in normal and diseased states. She also innovates in creating intelligent vision systems that are capable of learning effectively and reasoning about multiple sources of information in order to achieve functions typical of human vision.

She has over 150 publications and holds 7 patents in related research areas. She is an Associate Editor for the Medical Image Analysis journal and the Computer Vision and Image Understanding journal. She received her Bachelor's degree in computer science from Tsinghua University, and her Master's and doctoral degrees in computer science from Rutgers University. Her research has been funded by the NIH, NSF, the Howard Hughes Medical Institute, and the Pennsylvania State University.

**Abstract:** Image classification and segmentation are fundamental problems in medical image analysis. Generation of high-quality synthesized images conditioned on class labels is an effective way of data augmentation that alleviates the challenge of obtaining labeled data for supervised learning. In this talk, I'll first present several conditional generative adversarial models for synthesizing realistic histopathology images given class labels or image attributes as conditions. I'll introduce selective synthetic augmentation frameworks that learn to choose synthetic images containing reliable and informative features so as to provide quality assurance when adding synthetic images to training data. On image segmentation, I'll describe SegAN, an adversarial neural network with the multi-scale loss for object segmentation from medical images, and a 3D shape-aware organ segmentation method by predicting signed distance maps. This talk will conclude with a quick overview of other recent work on learning biomarkers from medical images for cancer diagnosis and stroke detection, machine learning for virus identification with Raman spectroscopy data, infant video analytics for general movements assessment, and neural networks with attention for clinical report generation.

**Educational Objects**: Upon completion, participants should be able to:

- Generative Adversarial Networks with attention and contrastive learning for Image Synthesis
- Data augmentation using synthetic images generated by deep generative models
- Deep neural networks for medical image segmentation
- Applications of machine learning in biomedical imaging and computer-aided diagnosis.

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