Advancing myocardial perfusion PET imaging toward improved reversible defect detection

The Oakland University and School of Engineering and Computer Science communities are invited to attend Xinhui Wang's defense of his Ph.D. dissertation. Seating is limited. RSVP with Katie Loodeen at loodeen@oakland.edu.

Advancing myocardial perfusion PET imaging toward improved reversible defect detection

Committee: Jing Tang, Ph.D. (Chair), Jia Li, Ph.D., Bradley J. Roth, Ph.D., Nicolas A. Karakatsanis, Ph.D.

Time: **10:00 a.m. – 12:00 p.m.**
Date: **Wednesday, May 22, 2019**
Location: **347 EC**

Myocardial perfusion (MP) PET imaging plays an important role in risk assessment and stratification of patients with coronary artery disease. However, PET imaging faces limitations in identifying and characterizing MP defects due to limited resolution and inherent noise. The maximum *a posteriori* (MAP) algorithm can improve image reconstruction by incorporating a regularization prior, which results in smoothed PET images. Using the MR image with anatomical information, we develop an anatomy-assisted MAP reconstruction algorithm with a prior based on the joint entropy between PET and MR image features derived from wavelet analysis. This algorithm outperforms the filtered ML and the conventional MAP methods on quantification and MP defect detection. We further develop another MAP reconstruction algorithm to incorporate a prior based on the dictionary learning (DL) depended sparse representation. With the dictionary learned from a self-created hollow-sphere image, the DL-MAP algorithm demonstrate an improvement of the MP defect detection over filtered ML without needing anatomical information. To take advantage of different noise level and spatial resolution in the ML and the filtered ML reconstruction, we propose an artificial neural network (ANN) enhancement scheme to integrate information from the ML and the filtered ML reconstruction. The developed ANN model improves MP defect detection and shows robustness in simulation and patient data with different count levels.