

Topic 3:
Computational Intelligence and its Applications to Medical Diagnosis Aided Systems

Abstract

Computational intelligence (CI) comprises three kernel techniques: neural networks (NNs), fuzzy systems (FSs), and evolutionary computation. In this talk, I will first briefly introduce the basic concept of CI. Then, I will introduce our recent works towards applying CI techniques to medical diagnosis aided systems based on medical images or easily available measurements. For medical image-based diagnosis, the application of deep learning to the automatic transformation of renal pathology image stains and glomerulus detection will be introduced. The basic concept of deep convolutional neural networks (CNNs) and Generative Adversarial Network (GAN) will be introduced. Then, I will introduce how to apply these deep learning techniques to the glomerulus stain transformation and detection task. For easily available measurements, FSs that shows the advantage of interpretability in its inference fuzzy rules may provide a possible solution to the problem of explainable diagnosis. In this context, we have applied FSs to estimate the severity of obstructive sleep apnea (OSA) by using three easily available measurements. In this application, the technique of fuzzy neural networks that automatically builds interpretable fuzzy rules from training data will be introduced followed by its application to distinguish the OSA level of normal-mild from moderate-severe.