Keynote Title: Combining analysis of multi-parametric MR images into a convolutional neural network - Precise target delineation for vestibular schwannoma treatment planning

- by Prof. Yu-Te Wu, National Yang Ming University, Taiwan

Abstract:

Manual delineation of vestibular schwannoma (VS) by magnetic resonance (MR) imaging is required for diagnosis, radiosurgery dose planning, and follow-up tumor volume measurement. A rapid and objective automatic segmentation method is required, but problems have been encountered due to the low through-plane resolution of standard VS MR scan protocols and because some patients have non-homogeneous cystic areas within their tumors. In this talk, a two-pathway U-Net model using multiparametric MR images (T1-weighted, T2-weighted (T2W), and T1-weighted with contrast images.) with different image contrasts as input for effectively segmenting tumors will be discussed.

Keynote Speaker: Prof. Yu-Te Wu's biography

Yu-Te Wu received a B.S. degree in electrical engineering from National Cheng-Kung University, Tainan, Taiwan, R.O.C., in 1988, and M.S. and Ph.D. degrees in electrical engineering from the University of Pittsburgh, Pittsburgh, PA, in 1992 and 1997, respectively. He was a Research Associate at the Robotics Institute, Carnegie Mellon University, Pittsburgh, PA, during 1997–1998. Currently, he is the Dean, Office of Research and Development, and Distinguished Professor, Institute of Biophotonics, at National Yang-Ming University, Taipei, Taiwan, R.O.C. He has published more than 100 articles in the areas of neuroimaging, machine learning, and brain-computer interface.

Prof. Wu has long been dedicated in brain magnetic resonance (MR) imaging analysis and applications using machine learning. The image-biomarkers, such as fractal dimension (FD), gyrification index (GI), curvedness (CVD), shape index (SI), and brain network connectivity have been applied to quantify the change of cortical morphology and network properties on structural and functional MR images, respectively. He has investigated the modulation of structural and functional brain network and association between structural/functional alteration and clinical syndromes of neuropsychiatric and neurodegenerative disorders, such as major depressive disorder, bipolar disorder, spinocerebellar ataxia (SCA), and multiple system atrophy type C (MSA-C). In addition, these structural and functional image biomarkers subserve as important features for differentiating some neuropsychiatric and neurodegenerative disorders where the structural changes of the cerebrum and cerebellum are difficult to identified via visual inspection.

In recent years, Prof. Wu has collaborated with the Gamma Knife team at Taipei Veterans General Hospital (VGHTPE), Taipei, Taiwan, to develop a gamma knife treatment decision assisting system for vestibular schwannoma. The goals of this study include the development of deep-learning based method for automate tumor segmentation and application of deep-learning model to predict the VS treatment response. In addition, He also collaborated with the Department of Radiology, VGHTPE, in the application of machine learning for quantitative digital subtraction angiography for improvement of hemorrhagic risk stratification of brain arteriovenous venous malformations.