**Dr. Ming-Yueh Huang**

**Nonparametric Variable Selection via Sufficient Dimension Reduction for Cross-sectional Survival Data Without Follow-up**

Abstract: In this talk, I will focus on the regression analysis based on two types of survival data without survival time: prevalent data without follow-up as well as incident and prevalent covariate data. Under fully nonparametric consideration, the conditional survival function, and hence the absolute covariate effect, is not estimable due to fully right censoring. However, the central subspace can still be estimated based on these two types of data. Different from existing methods in the literature, this feature requires no parametric or semiparametric model assumptions. In addition, the basis matrix of central subspace can be interpreted as relative covariate effects and used to screen inactive covariates. According to these findings, we propose a penalized cross-validation type criterion to estimate the central subspace and select active covariates. This method requires no stringent distributional assumptions on covariates such as linearity condition or constant variance. Moreover, the proposed estimator is shown to have the oracle property of variable selection.

**Dr. Szu-Chi Chung**

**Dimension Reduction Method for Noisy High-dimensional Images and Application to Cryogenic Electron Microscopy**

Abstract: In contrast to X-ray crystallography, cryo-EM is amenable to the structural determination of proteins resistant to crystallization. Since molecules are captured in their native states, it can further analyze the conformational mixtures. With the enhancement of algorithms and GPU acceleration, cryo-EM has become the most efficient technique to solve structures of molecules at near-atomic resolution. Take a recent event, for example, after the outbreak of COVID-19 in January, the first structure of 2019-nCoV Spike trimer was published in March using cryo-EM, which has provided crucial medical insight for developing vaccines. However, the data characteristics include strong noise, huge dimension, large sample size and high heterogeneity with unknown orientations have made analysis very challenging. In the literature, dimension reduction plays an important role in overcoming the challenges above. The traditional methods utilized in the field, however, does not well suited for the scenario and they face bottleneck either in computation or performance. In this talk, I will first introduce the related background and principles of cryo-EM image processing. Second, I will discuss our proposed dimension reduction strategy called two-stage dimension reduction (2SDR) which alleviates the computation burden and improves performance over existing methods. Finally, I will demonstrate how the methods can be employed to improve the cryo-EM image processing tasks including denoising, 2D clustering and 3D volume classification.