# Statistics Seminar

Department of Mathematics and Statistics

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| **DATE:** | Thursday, September 28, 2023 |
| **TIME:** | 1:15pm – 2:15pm |
| **LOCATION:** | WH 100E |
| **SPEAKER:** | Yangsheng Wang, Binghamton University |
| **TITLE:** | Neural networks for clustered and longitudinal data using mixed effects models |


**Abstract**

Although most statistical methods for the analysis of longitudinal data have focused on retrospective models of association, new advances in mobile health data have presented opportunities for predicting future health status by leverag- ing an individual's behavioral history alongside data from similar patients. Meth- ods that incorporate both individual-level and sample-level effects are critical to using these data to its full predictive capacity. Neural networks are powerful tools for prediction, but many assume input observations are independent even when they are clustered or correlated in some way, such as in longitudinal data. Gener- alized linear mixed models (GLMM) provide a flexible framework for modeling longitudinal data but have poor predictive power particularly when the data are highly nonlinear. We propose a generalized neural network mixed model that replaces the linear fixed effect in a GLMM with the output of a feed-forward neural network. The model simultaneously accounts for the correlation struc- ture and complex nonlinear relationship between input variables and outcomes, and it utilizes the predictive power of neural networks. We apply this approach to predict depression and anxiety levels of schizophrenic patients using longitu- dinal data collected from passive smartphone sensor data.