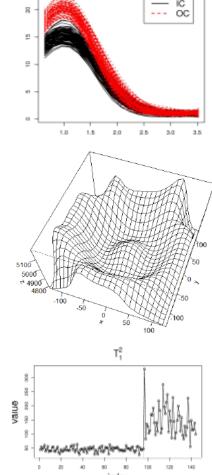# Prof. Jyh-Jen Horng Shiau / Institute of Statistics

## Industrial Statistics, Nonparametric/Semiparametric Regression, Functional Data Analysis, Random Number Generators

My primary research interests include the following two major research areas: **(a) Industrial Statistics:** In Statistical Process Control, we have developed certain process monitoring and/or fault diagnosis techniques respectively for processes with various types of quality characteristics, including univariate/multivariate random variables and in particular the random profiles. Here a profile refers to a functional relationship between a response variable and some explanatory variable(s). To have flexibility on the modeling of random profiles, we adopted the nonparametric regression approach and applied the functional principal component analysis to a set of profile data to estimate the covariance structure of the profiles. In reliability, we applied the same method to degradation data and proposed a preventive maintenance strategy by estimating the residual life during the service of an equipment or an product. In quality assurance, we have developed some process capability indices for univariate and multivariate processes as well as using process capability indices in selecting suppliers. Recently, we have been considering developing techniques for finding among many profile variables the variables that are correlated to the response variable such as yield. We are also extending the profile monitoring techniques to two-dimensional profiles, which would be useful in many industrial applications in the future. **(b) Random Number Generators:** We have proposed several classes of random number generators that have good properties of high-dimensional equi-distribution, efficiency, (extremely) long period length, and portability (HELP). Recently, we focus on constructing random number generators called "SAFE" (secure and fast encryption) generators that can be used in computer security applications by properly "mixing" baseline generators with the HELP property into a secure generator that still retains the HELP property.