THE UNIVERSITY OF CHICAGO

Department of Statistics
MASTER'S THESIS PRESENTATION

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An Application of a Two-stage Mixed-Effects Location-Scale Model with Machine Learning

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ABSTRACT

Ecological momentary assessment (EMA) is often used to study subjective experiences within a period of time, during which up to 30 or 40 observations are usually obtained for each subject. Such repeated measurements allow for characterizing the subject's mean and variance simultaneously. In this project, we focus on an EMA study of dual-users of cigarettes and electronic cigarettes. Our interest is to understand the difference between the use of two tobacco products on people's smoking experiences and how those experiences will influence their smoking rate. We apply a two-stage modeling framework: at the first stage, a mixed-effects location-scale (MELS) model is built to estimate random effects both on the mean (location effect) and the variance (scale effect). Then at the second stage, those estimates at shared as regressors to predict the subject-level outcome, smoking rate. To model this subject-level outcome, we employ several Machine Learning (ML)-based methods and compare their performance with traditional parametric regressions (ordinal logistic regression for the ordinal outcome, smoking rate). Finally, we look at the variables selected by ML importance scoring as well as the estimations in regression models to illustrate the association between the subject-level smoking experiences and smoking rate.