

國立高雄大學統計學研究所

110 學年度書報討論題目暨摘要登記表

Stratified Experimental Designs with Multiple Treatments

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### Abstract

A good experimental design allows the experimenter in an efficient way to understand better and evaluate the factors that influence a particular system by means of statistical methods. In different fields of research, stratified design is one of the applied methods for systematically treatment allocation. This study adopts a two-stage approach to allocate the strata of stratified sampling through the random forest method when there are multiple treatments in an experiment. More specifically, obtaining the pre-observed experimental data is the first stage and the second stage is to conduct the stratified experimental design based on a predictive model that is built from the observational data and random forest algorithm. Different from other approaches such as complete randomization or classical stratification, this method creates a predictive model with the important dependent variables and aims to achieve allocate units more homogeneously in each stratum. In a simulation study, we find that the proposed method performs well on the average treatment effect (ATE), its variance and statistical power when compared with standard experimental designs including complete randomization and classic stratification.

Keywords : multiple treatments, random forest, stratified sampling

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