Using Machine Learning for Optimal Targeting of Interventions in Charitable Giving: Evidence from a Nationwide Experiment in Japan

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Abstract

In this study, we use a machine learning method and empirically investigate optimal targeting strategy of charitable interventions, where we individually consider a donor's welfare and increase their donation amount. We first conduct an incentivized online experiment toward Japan's nationwide sample (N=8,520). In this experiment, a subject is randomly assigned to one out of control and five charitable intervention groups (50% matching, 100% matching, social comparison, 50% matching & social comparison, and 100% matching & social comparison), and they are asked to decide how much they give respectively toward afforestation and disaster support. Using the large-scale experimental data and a machine learning method of causal forest, which is proposed by Wager and Athey (2018), we predict for each subject how much their donation amount will change when the five interventions are respectively given compared to the control, and obtain their conditional average treatment effect (CATE) for each intervention and each recipient activity. Finally, we implement optimal targeting of the interventions. We there compare the CATEs within each subject, select the intervention which maximizes their donation amount without impeding their intention of future donation, and assign the selected intervention to them. We find from the analysis that the optimal targeting could improve the performance of fundraising activities, while the proportions of the selected interventions largely differ between the two cases, where a recipient activity is afforestation or disaster support.

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We conduct this study as a part of the project entrusted by the Ministry of Environment. We obtained online experimental data used in this study to develop an algorithm for personalization of nudge-based interventions and to evaluate its performance by simulation. In this study, as the first step of the project, we use machine learning, estimate the conditional average treatment effects for some charitable interventions, and clarify their distributions. Before conducting the experiment, we obtained an approval from the experimental ethics committee in the Inter-Graduate School Program for Sustainable Development and Survivable Societies at Kyoto University.