Abstract

Websites that match the preferences and information needs of visitors are efficient, but information needs may change as visitors browse a website. When consumers visit online stores during their purchase decision process they are exposed to information about products that may help them move through decisions stages, make a purchase, or bounce and leave the website. Stages are not directly observed, so learning from the outcome of a visit is a major challenge for multi-armed bandit models used in website design and online advertising. We develop a novel dynamic program to explicitly model the within-visit trade-off between nudging a consumer through the unobserved dynamic purchase stages, and risking having her terminate the website visit. We use a Hidden Markov Model to dynamically assess the consumers stages based on clickstream, and couple it with a website-morphing multi-armed bandit model to learn the optimality of each design-stage combination using a dynamic allocation index. We provide a proof-of-concept based on adapting the international MBA website of a major European university. In this application, a team designed morphs based on categorization theory, which provides us with substantive support for the choice of morph content and language tailored for early and late stages of the funnel. Our algorithm is able to identify the optimal time to change morphs within a person. We find that matching concrete and abstract morphs to dynamic stages using our algorithm outperforms current methods (fixed design) and alternative policies.