Adaptive Modeling and Dynamic Targeting for Real Time Analytics in Mobile Advertising

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ABSTRACT

Mobile marketing campaigns are now largely deployed through demand side platforms (DSPs) who provide dynamic customer targeting and a performance-intensive real-time bidding (RTB) version of predictive analytics as a service. Matching users with the campaigns they are most likely to engage with in extreme real-time environments requires adaptive model management, advanced parallel processing hardware/software, and the integration of multiple very large databases. The authors present (1) an adaptive modeling strategy to satisfy the performance thresholds of 40 to 100ms for DSPs to decide whether and how much to bid for a potential client to receive a particular advertisement via their mobile device. (2) a dynamic customer profiling technique to map mobile devices to specific lattices (geographic locations), and to track user behavior via device-histories. In this “big data” decision environment, analytic model management is automated via model feedback loops which adjust the models dynamically as real-time data streams in.

KEYWORDS


INTRODUCTION

Service-oriented computing (SOC) represents a new computing paradigm which encompasses emerging artifacts and processes including service-oriented architecture (SOA), service-oriented enterprise (SOE), service-oriented infrastructure (SOI), Web services (WS), and Service-oriented System Engineering (SOSE). SOC and SOSE differ from traditional system engineering in that they deal primarily with dynamic and adaptive real-time systems that exhibit a heavy reliance upon model analytics and feedback architecture. This adds layers of complexity above and beyond traditional system design with significant ramifications at all levels of the life cycle.

The authors present an example of such a system for mobile marketing campaigns which provides modeling and predictive analytics as a service to demand side platforms (DSPs). This system, hereafter designated as “ReCo”, is the culmination of a sustained line of decision support research into analytic modeling as a service (Kridel and Dolk, 2009, 2013; Kridel et al., 2013).

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The traditional marketing relationship between publishers and advertisers has given way to a dynamic intermediary for on-line advertising in the form of ad exchanges which establish real-time markets for connecting advertisers with customers. In this on-line world, customers are not identified until they click on a publisher website which sets in motion a request for bids from current ad campaigns to present their ad to this particular individual. This is typically done through demand side platform (DSP) intermediaries who compete for the right to present the ad by submitting real-time bids to a mediating ad exchange. Mobile marketing campaigns are now largely deployed through the intermediaries of demand side platforms (DSPs). Competition among DSPs is fierce and with Google commanding the lion’s share of the on line and mobile advertising market, the attrition rate for such companies is high. Their primary competitive advantage is to generate higher click-through response rates (CTRs); even an improvement of 1% can mean thousands more eyeballs on a single ad. Higher CTRs, in turn, depend upon the advanced analytics a DSP brings to the table meaning better algorithms, better machine learning techniques, and more efficient high-performance computing.

DSPs require a performance-intensive real-time bidding (RTB) version of predictive analytics as a service. Performance thresholds are roughly 40 to 100ms for DSPs to decide whether and how much to bid for a potential client to receive a particular advertisement via their mobile device once the client has clicked upon a particular website. This decision is a classic in extremis “big data” application which requires access to several very large databases with typically millions of rows and the ability to execute one or more large predictive models (e.g., logistic regression) to gauge a customer’s propensity to engage. Additionally, a model for bidding strategies must be developed and executed inductively using real-time bid data over the course of a campaign. In this environment, analytic modeling must be automated via model feedback loops which adjust the models dynamically as real-time data streams in. The term used for this mode of analytics is adaptive modeling.

The basic workflow cycle for a DSP service is shown in Figure 1. The constituent components of this SOA are:

Figure 1. DSP workflow architecture for mobile advertising
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