

DOCTORAL PROGRAMME

ESSAYS ON NEXT BEST ACTION IN DIGITAL MARKETING USING
REINFORCEMENT LEARNING

By

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REINFORCEMENT LEARNING**

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Abstract

Companies make numerous sequential marketing decisions to optimise varied economic and expansion goals. With deep penetration and growing acceptance of digital channels, many companies use digital interventions to accomplish these goals. The use of digital channels is further reinvigorated by the ease of data collection at various touch points, inexpensive storage of that data and improved analytical know-how to derive insights from this data. Companies realise that digital data can be used to design and fine-tune marketing strategies and determine the optimal marketing mix. This has drawn researchers and practitioners to take keen interest in determining the ‘best’ marketing action for every customer at different touch-points through the purchase journey. This is known as Next-Best Action (NBA) modelling, which forms the basis for this thesis. From the methodological standpoint, the thesis utilises reinforcement learning technique of Multi Armed Bandits (MAB) in Essay 1 and Essay 2 and Bagging and Boosting meta-algorithms in Essay 3 for designing the models.

In this dissertation, we study three independent digital marketing utilisations of customer- level data based on appropriate NBA-based analytical models. The first essay designs an attribute-based MAB model to determine the next best content action for a B2B customer. The results show that action features such as placement and format, individual user-level features such as last touch channel and firmographic features such as size of the customer firm have a significant impact on the choice of marketing action. The second essay utilises NBA modelling to predict forgetfulness, particularly in the online grocery use-case. The proposed model is a two-stage personalisation mechanism, which uses the likelihood of purchase of an item and a Bayesian bandit model to determine the list of forgotten items as the next- best recommendations. To the best of our knowledge, this is the first study in data-driven decision modelling which is predicting forgetfulness using click-stream data. The integration of social media, email and the Internet has led to a rising interest in Direct Sales research, especially in the context of omni-

channel marketing. In the third essay, we have studied how customer-level online information can be used to re-design personal selling strategy for a firm and determine the next best marketing action for each customer.

To verify the proposed research work with existing state-of-the-art algorithms, we have used real-time data from context-specific firms to validate the models. The experimentation evaluation frameworks are in line with existing frameworks proposed in related literature and industry norms. Due to the growing focus on digital channels for selling and marketing, this thesis converses with various marketing literature streams such as customer engagement, customer experience, adaptive personalisation, recommendation systems, retargeting, and data-driven decision models.

In the presence of technology, traditional marketing strategies are transforming in order to determine latent customer preferences, improve targeting, increase engagement, enhance customer lifetime value and grow company profits. While there is much that is yet to be explored in the domain of NBA modelling, this thesis provides some promising directions and contributions to the contemporary literature in this area. All the essays focus on delivering replicable and interpretable models which can be utilised across industries and domains. Along with these models, each essay uncovers nuanced and important aspects of data-intensive NBA modelling and discusses on how to deal with them.