

OFFER PERSONALISATION IN RETAIL USING DEEP NEURAL NETWORK AND OPTIMISATION

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ABSTRACT

Sales promotions are important in the fast-moving consumer goods (FMCG) industry due to the significant spending on promotions and the fact that a large proportion of FMCG products are sold on promotion. This paper considers the problem of planning sales promotions for an FMCG product in a grocery retail setting. The category manager has to solve the promotion optimization problem (POP) for each product, i.e., how to select a posted price for each period in a finite horizon so as to maximize the retailer's profit. Through our collaboration with Oracle Retail, we developed an optimization formulation for the POP that can be used by category managers in a grocery environment. Our formulation incorporates business rules that are relevant, in practice. We propose general classes of demand functions (including multiplicative and additive), which incorporate the post-promotion dip effect, and can be estimated from sales data. In general, the POP formulation has a nonlinear objective and is NP-hard. We then propose a linear integer programming (IP) approximation of the POP. We show that the IP has an integral feasible region, and hence can be solved efficiently as a linear program (LP). We develop performance guarantees for the profit of the LP solution relative to the optimal profit. Using sales data from a grocery retailer, we first show that our demand models can be estimated with high accuracy, and then demonstrate that using the LP promotion schedule could potentially increase the profit by 3

1 METHODOLOGY

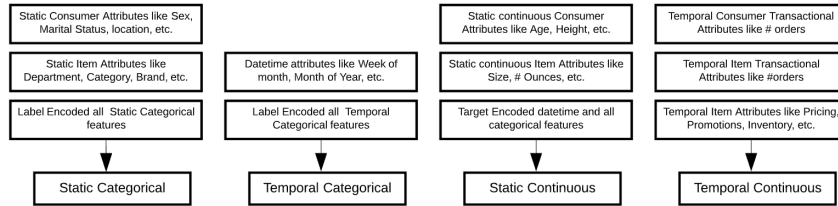


Figure 1: Data classification for DNN Architectures

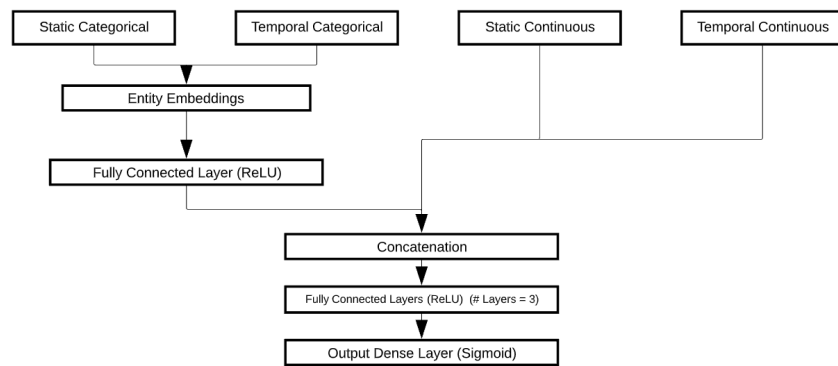


Figure 2: Multi Layer Perceptron Architecture