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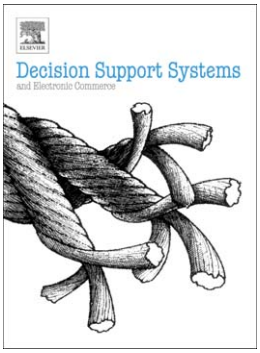

Optimal Pricing in E-Commerce Based on Sparse and Noisy Data

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Optimal Pricing in E-Commerce Based on Sparse and Noisy Data

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Abstract

In today's transparent markets, e-commerce providers often have to adjust their prices within short time intervals, e.g., to take frequently changing prices of competitors into account. Automating this task of determining an "optimal" price (e.g., in terms of profit or revenue) with a learning-based approach can however be challenging. Often, only few data points are available, making it difficult to reliably detect the relationships between a given price and the resulting revenue or profit. In this paper, we propose a novel machine-learning based framework for estimating optimal prices under such constraints. The framework is generic in terms of the optimality criterion and can be customized in different ways. At its core, it implements a novel algorithm based on Bayesian inference combined with bootstrap-based confidence estimation and kernel regression. Simulation experiments show that our method is favorable over existing dynamic pricing strategies. Furthermore, the method led to a significant increase in profit and revenue in a real-world evaluation.

Keywords: Dynamic pricing, e-commerce, machine learning, data mining

1. Introduction

Pricing is a crucial factor for companies to be competitive on today's transparent online markets. Since manual pricing strategies (e.g., based on expert heuristics) do not scale well for larger e-commerce sites and pricing based on simple rules (e.g., adding a certain profit margin per category to the purchase price) might be too coarse-grained, automated decision support systems can represent a valuable tool that help companies find "optimal" prices for their products and can thereby play

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