

A Game-Theory-Driven Machine Learning approach for Interpretable Analysis of Online Customer Data and Product Attribute Importance

Aigin Karimzadeh

escp business school

Amir Zakery

iran university of science and technology

ali yavari

Medical University of Vienna

Cite as:

Karimzadeh Aigin, Zakery Amir, yavari ali (2025), A Game-Theory-Driven Machine Learning approach for Interpretable Analysis of Online Customer Data and Product Attribute Importance. *Proceedings of the European Marketing Academy*, (130271)

Paper from the 16th Annual Fall EMAC Conference, Istanbul, Turkey, September 17-19, 2025



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Abstract

Online customer data is valuable for product design and marketing, as it reveals customer needs. However, using artificial intelligence (AI) to analyze this data and generate valuable insights is challenging due to hidden patterns. In this study, we propose a game-theory-based machine learning (ML) method to extract deeper implications. The method first employs a genetic algorithm to select, rank, and combine product features that maximize customer satisfaction based on online ratings. Next, we apply SHAP (SHapley Additive exPlanations), a game theory approach that assigns a value to each feature based on its contribution to the prediction, providing guidelines for assessing the importance of each feature and its positive or negative influence on overall satisfaction. We validate our method using a real-world dataset of laptops from Kaggle. Our approach addresses a key challenge in multi-criteria decision-making, enabling a more efficient understanding of customer preferences.

Track: Marketing and Technology Interaction