

Executive Summary

E-commerce firms utilizing explainable artificial intelligence and a multi-output deep neural network

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Online shopping has surpassed offline shopping in importance in recent years for several reasons, including its increased efficiency, convenience, and cost-effectiveness as well as its wider selection of products. Convenience drives the emergence of businesses that sell across numerous product categories and provide a range of goods at various price points. While every business strives to stay one step ahead of the competition, they must make sure to consider all factors that affect their long-term performance. Multi-category e-commerce companies should use customer lifetime value (CLV) as a crucial component of their competitive advantage. The first stage in putting a customer-specific strategy into practice is figuring out the CLV of a company's clients. A corporation might use the CLV to support continuous marketing and infrastructural improvements.

Numerous scholars have long studied CLV and have concluded that in addition to transaction data, a great deal of information about consumers' purchasing habits is necessary to compute it. In this study, web analytics and CRM data sources were utilized to train the model and estimate the CLV, the ratio of different product categories purchased, and the trends in purchase amounts for one online multi-category e-commerce company. The multi-category e-commerce retailer's website tracked and logged every action. Web analytics is the study of visitor behaviour on websites and mobile apps and covers both anonymous and identified data. For each model, the model's outputs must take on a different form (single-output, multi-output DNN models, multi-output Decision Tree, and multi-output Random Forest).

Marketing campaign selection to customer service preferences are just a few of the many applications for consumer segmentation based on CLV, DCP, and TAS. This requires creating unique strategies for varied audiences and determining whether to include customers in marketing initiatives. The multi-output DNN model outperformed the single-output DNN model as well as the multi-output DT and multi-output RF models in all evaluation criteria, based on the findings and comparisons. A single model can also be managed and maintained more easily and inexpensively than multiple models, one for each output. As a result, the multi-output DNN model may be preferable for multi-category e-commerce businesses when it comes to online purchasing.

The conclusions are based, among other sources of data, on an analysis of a dataset from a real multi-category online e-commerce site and a comparison of several CLV calculation techniques. As a follow-up to the current research, multi-category companies from other industries should be explored. Finally,



similar empirical evaluations of various multi-output DNN models are also advised as a future research topic because to their outstanding performance in this work.

Source: [Information](#)

KEYWORDS

Customer lifetime value; multi-output deep learning models; multi-category e-commerce; customer segmentation; explainable artificial intelligence (XAI)

