Tracking Laptop user Preference using an Explainable Fuzzy Neural Network

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Abstract

A key limitation in existing new product development studies is the assumption of static user preferences. This perspective overlooks the evolving nature of user expectations, which can render a well-designed product obsolete upon release. It is therefore critical to not only acknowledge this dynamism but also to develop models capable of forecasting the trajectory of user preferences to enhance product-market fit. To address these limitations, this study proposes an approach that integrates a chaos-driven multi-objective optimizer with a fuzzy neural network. This hybrid model leverages sentiment analysis on online reviews to derive datasets of evolving user preferences for modeling. Also, the interpretability limitations inherent in standard fuzzy neural networks are mitigated by generating explicit nonlinear inputs. The proposed approach is evaluated through a case study on laptops. We analyze user preferences regarding laptop performance and track its evolving trend. For validation, our method is compared to traditional fuzzy neural networks and a K-means-based fuzzy neural network. The results demonstrate that the proposed approach achieves superior performance over these two benchmark models in terms of mean relative error and error variance.

Keywords

Explainable fuzzy neural network, chaos-driven multi-objective optimizer, evolving user preferences, new product development.