Multicategory Choice Modeling by Recurrent Neural Nets

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Abstract

We investigate three variants of recurrent neural nets capable to reproduce dynamic effects in a flexible way. We compare these recurrent nets to non-recurrent multilayer perceptrons (MLPs) and to multivariate logit models. The latter are often used to analyze multicategory choice. Models are evaluated by binary cross-entropies for a holdout sample of households. A six hidden variable MLP turns out as best non-recurrent model. Overall, a recurrent long-short term memory net with six hidden variables outperforms the other models considered. We restrict further analyses to these two neural nets, which both include category-specific features as input variables. We compute average marginal effects of category-specific features. An evolutionary algorithm serves to determine optimal weekly category-specific features. Optimization based on the recurrent net provides an average revenue per basket higher than its observed value. As a rule, optimal category-specific features change considerably across weeks.

Subject Areas: *Market Analysis and Response, Retailing*

Track: Methods, Modelling & Marketing Analytics