

NFM: Neural Factorization machines for Predictive Analytics

MARKET OPPORTUNITY

Factorization Machines are a popular approach to designing a machine learning model that can learn feature interaction from raw data automatically. While FM has yielded great promise in many prediction tasks, its performance can be limited by its linearity, as well as the modelling of pairwise feature interactions only since most real-world data have complex and non-linear underlying structures.

TECHNOLOGY

Neural Factorization Machines (NFMs) is a novel model for predictive analytics with sparse inputs which enhances FMs by modelling higher-order and non-linear feature interactions that are closer to real-world data. NFM achieves this by devising a new operation in neural network modelling called Bilinear Interaction (Bi-Interaction) pooling, subsuming FM under the neural network framework for the first time.

STAGE OF DEVELOPMENT

Analytical and laboratory studies to validate analytical predictions.

APPLICATIONS

NFM will be particularly effective for prediction tasks involving categorical predictor variables, such as user/item IDs, attributes, tags and categories. As an example, it can be used in the ranking engine of recommendation systems and click-through-rate (CTR) prediction of online advertising systems.

ADVANTAGES

1. In contrast to traditional deep learning methods that simply concatenate or average embedding vectors at a low level, the use of Bi-Interaction pooling encodes more informative feature interactions, greatly facilitating the following "deep" layers to learn meaningful information.
2. It allows the implementation and tuning of FM by using various techniques developed for neural networks. For example, we can use dropout and batch normalization for preventing overfitting of FM.
3. NFM can model higher-order and non-linear interactions between features in the same efficiency level as FM.

STATUS

Patent pending. Available for licensing.

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