

Graph Neural Networks for Food Recommendation Systems

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Several industries adopted the automatic recommendation of products, specifically large e-commerce websites. These algorithms allow organisations to engage with users by suggesting interesting content and building a stronger relationship with them. These recommendations can be naturally represented by using graphs, and therefore the latest state-of-the-art is based on a novel set of algorithms called Graph Neural Networks (GNN). More specifically, recipes can be represented as a heterogenous graph with edges between users, recipes and ingredients (see Figure 1). Food preferences are very personal choices, usually based on objective criteria (such as vegetarianism) and subjective ones (such as spiciness). While filtering on objective criteria is a trivial task, recommending recipes on subjective criteria is not so trivial.

In this work, we describe a holistic approach to creating GNN recommendation system for food recommendation. We have experimented with a traditional algorithm, a neural network algorithm and a GNN algorithm created explicitly for food recommendation based on a user-recipe-ingredient structure [1]. We propose a simplified version of this algorithm. Furthermore, we explore the other components that are left out of studies: popularity bias, computation time and explainability. Often, these factors are left out of studies but have a high impact on any industry. The work is validated on a public food.com dataset and private industry datasets.

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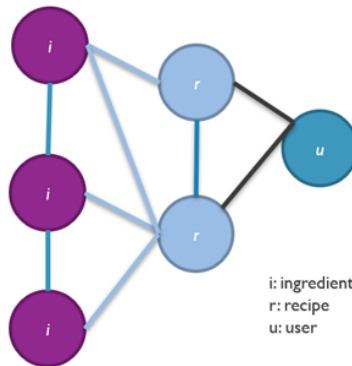


Figure 1: General structure of the user-recipe-ingredient graph. All the node types are interconnected. The ingredients connect to recipes, and recipes connect to users.

[1] Y. Tian, C. Zhang, Z. Guo, C. Huang, R. Metoyer, and N. Chawla, “Reciperec: A heterogeneous graph learning model for recipe recommendation,” in *International Joint Conference on Artificial Intelligence*, 2022.