

# Introduction

The rapid development of Information Technology has significantly influenced our lives today. Often, due to various daily responsibilities, consuming healthy and balanced nutrition becomes the last option for us. We tend to consume fast food where nutritional value is not prioritized, which can lead to obesity. In 2016, there were 650 million obese adults aged 18 and above, and 41 million obese children [1]. Obesity has caused various serious health problems that exist today [2]. Blocked blood vessels, stroke, diabetes mellitus, hypertension, and even cancer are some dangerous diseases caused by obesity [3]. With the increasing number of obesity cases worldwide in the past decade, issues related to nutritional value must be seriously considered [4]. It is crucial to understand a healthy lifestyle [5] to avoid the dangers of obesity. However, adopting a healthy lifestyle is not a simple task because many of us lack the necessary skills and knowledge to effectively implement it, thus making a positive impact on our lives [6].

In this research, we develop a recommender system that assists users in recommending nutritionally customized foods while also considering suitable options for users with allergies, diabetes, and cholesterol concerns. Previous studies have built food recommender systems using various approaches, including collaborative filtering [7], content-based [8], [9], knowledge-based [10], [11], and even hybrid models [2]. Vivek et al. [12] developed a recipe recommender system using a collaborative filtering approach but faced difficulties with the dataset processing, as it relied on user ratings to provide recommendations. Almeida [8] built a recommender system using a content-based approach, but encountered limitations in terms of content availability, as the dataset used was not sufficiently informative. Ahuja et al. [13] developed a recommender system by combining two approaches: collaborative filtering, which analyses food preferences suitable for users, and content-based analysis, which examines food characteristics and recommends similar items to the user's preferred choices. Meanwhile, Jung et al. [2] created a recommender system using a knowledge-based context-aware approach along with collaborative filtering. However, the nutritional standards were specifically designed for Korean food, and the recommender system targeted obesity prevention in young individuals, despite obesity being prevalent across all age groups. Therefore, there is a need for a recommender system capable of suggesting Indonesian foods based on appropriate nutritional standards for the Indonesian population. The built food recommender system should be usable by users of all age groups and aim to provide food recommendations aligned with their nutritional needs. The knowledge-based approach utilizes existing knowledge to reason about recommended products according to user needs [10]. This approach can address issues related to cold start for new users and data sparsity.