

Section 1 Introduction

The rapid advancements in data science and the automotive industry are driving revolutionary transportation in the sector [1]. During the pandemic, cars have become a preferred mode of transportation for people, compared to using public transport, leading to an increase in the number of prospective car buyers [2]. Every year, car manufacturers of various brands compete to create the latest innovations with technological advancements and unique features. However, many users have a limited understanding of the various technical features present in cars. Users find it easier to express their needs in terms of the functional aspects of a product rather than its technical features [3]. To address this issue, a recommender system is needed to assist users in selecting products that align with their preferred needs.

The recommender system utilizes knowledge to generate semantic representations, assisting users in selecting relevant products based on their preferences [4]. The system incorporates knowledge-based recommendations among the different types of recommendations [5]. A knowledge-based recommendation is dependent upon explicit domain knowledge regarding items, user preferences, and recommendation criteria [6]. The system is developed within a specific domain, and the accuracy of the model is assessed based on its usefulness to users [7]. For instance, Fakhri et al. [8], implemented a user-based collaborative filtering approach to recommend restaurants in the Bandung area, considering user ratings as parameters. However, this approach has its limitations due to the cold start problem [9]. Another study by Burke [10], uses a knowledge-based system to recommend complex products, creating an interactive system where user input is used to recommend products based on their preferences and needs.

A conversational recommendation system (CRS) is a knowledge-based system designed to effectively and efficiently assist users in finding the products they are looking for [11]. CRS requires knowledge design to generate the right product based on functional requirements [12]. The system will ask questions repeatedly to the user until it generates preferences that match the user's needs [12][13]. CRS is developed from a computational framework to incorporate user functional requirements. This system works by having a conversation with a sales professional who will ask about the functional requirements that users want for a product [3]. The interaction will result in product recommendations and an explanation of why the product is recommended.

CRS has two navigations: Navigation by asking (NBA) and navigation by proposing (NBP) [12]. NBA is a system that asks questions about user preferences repeatedly and ends with product recommendations. Meanwhile, NBP will show a sample of a product to find out the user's needs from the results given from the recommended product. David, et al [14], created a chatbot application based on functional requirements with the conversational recommender system method to get user preferences. Baizal, et al [15], used a conversational recommender system ontology-based to recommend tourism destinations to users. Ontology helps users to determine their desired needs. Ontology will produce application frameworks for other domains that have similar characteristics [9]. The ontology technique consists of domain and user profiles built from explicit product-level and temporal information.

Previously, car recommendations have been developed but only based on technical specifications. However, cars have complex specifications, so many users do not familiar with the e technical specification. Compared to technical specifications, users better understand the functional requirements of a product that suits user needs [16]. To address this issue, we conducted research using an ontology-based approach combined with a conversational recommender system for car recommendations [17]. This method is helpful for users who are unfamiliar with car features because the system will ask for the needs or features that users want when considering buying a car. Information will be available on knowledge design to generate

interactions based on the functional requirements of the product. The interactions include asking questions, providing product samples and providing explanations as to why each product is recommended. This research designs a detailed ontology structure and searches for information for implementation into the ontology. This is done to get car product recommendations that suit user needs.

