FOODSNAP: Healthy Recipe Based On Health Condition

A.Sowmya[1], B.Sandeep[2], J.Shiva[3], C.SriHarshitha[4], J.Laharika[5], G.Narendra[6], S.Vignesh[7]

Vardhaman College of Engineering, Narkhuda, Nagarguda - Shamshabad Rd, Kacharam, Telangana 501218

Abstract: **Abstract for FOODSNAP: Healthy Recipe Based on Health Condition FOODSNAP is a unique application that offers personalized, health-centered recipes based on individuals' specific health needs. Using proactive, intelligent algorithms and nutritional data, the platform recommends recipes that fit a user's dietary needs based on health conditions such as diabetes, hypertension, gluten intolerance or heart disease. The enriched data not only leads to app recipes around general wellbeing but recipes tailored specifically towards the health guidelines necessary to manage their health.**

In this work, we investigate if putting a healthy bias in a recipe recommendation system and also displaying a healthy tag on recipe cards would influence the choice making of individuals. Finally, we propose three different system-recommended recipes: The first is recipes similar to the users' tastes, the second is recipes we assume to be healthy, and the third is recipes similar to the users' tastes and potentially healthy recipes. We experimentally evaluate the three systems through a user study where we bring participants online to select

Keywords: **food recommender system; healthcare; collaborative filtering and providing healthy food**

I. INTRODUCTION

With the rise of chronic diseases like diabetes, heart disease, hypertension, and food intolerances, people frequently find it difficult to find recipes that satisfy their nutritional needs and taste preferences. Traditional diet plans or generic recipe resources don't provide individualized solutions, making it more difficult for people to manage their health through food. FOODSNAP aims to address this challenge by offering a platform that generates personalized, health-conscious recipes tailored to an individual's specific health conditions. access to a wide variety of healthy recipes that support their well-being.

The primary goal of FOODSNAP is to empower individuals to take control of their health by making informed food choices. Through its user-friendly interface and real-time customization features, the app bridges the gap between healthy eating and medical needs, simplifying the journey toward healthier living. By combining convenience, personalized nutrition, and practical guidance, FOODSNAP aims to improve users' quality of life and contribute to long-term health improvements. We first explain the various recommendation algorithms we consider in our experiment. Then we explain our experimental setup and show our results. Food Snap is to enable people to make healthier, better-informed food choices by harnessing the power of cutting-edge image recognition and artificial intelligence (AI) technology.

The app wants to close the gap between users' everyday food intake and their long-term health objectives through the following primary goals. Some of the alternate title suggestions for Food Snap are: Personalized Nutrition Meal Planning System, Recipe Finder Healthy Eating Guide, Smart Meal Planning Nutrition Tool, Healthy Recipe Discovery Platform Online, Nutrition Analysis Meal Planning App, Customized Recipe Finder Nutrition Guide, Meal Planning Nutrition Expert System, Healthy Eating Recipe Recommendation Tool, Nutrition Focused Meal Planning Software, and Personalized.
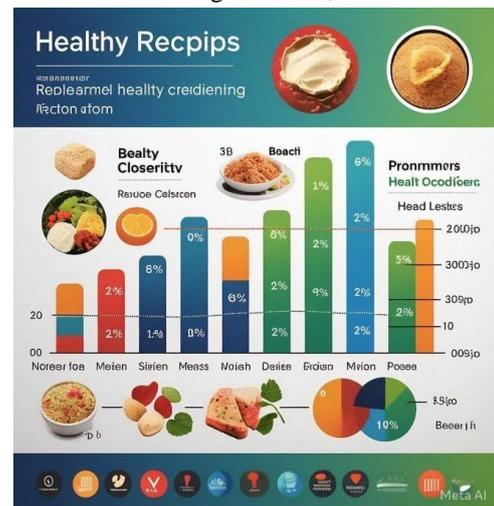
II. LITERATURE REVIEW

Tailored nutrition and well-being. Personalized nutrition takes into account an individual's health conditions, genetic makeup, and dietary needs to develop tailored meal plans. Research suggests that personalized dietary guidance is more successful than general dietary advice in controlling chronic conditions such as diabetes, cardiovascular diseases, and obesity (ordovas et al. , 2018). Various digital platforms have been created to improve personalized dietary interventions by offering users tailored nutritional recommendations based on their health data (horne et al. , 2020).

The Impact of Diet on Chronic Diseases

According to research, eating is very important for managing and preventing chronic illnesses. For instance, a low-glycemic index diet is advantageous for diabetic patients, and the Mediterranean diet has been linked to lower risks of cardiovascular diseases (Estruch et al., 2013; Brand-Miller et al., 2017). Giving people recipes based on these ideas can help them follow dietary recommendations more closely and lead to better health results.

Technology in Personalized Nutrition

Advances in technology, including mobile applications and artificial intelligence (AI), have made it easier to develop personalized nutrition platforms. AI-operated tools analyse user data including age, weight, medical history, and nutritional preferences to generate personalized menus (Bouthey et al., 2017). Applications that include machine learning can further improve recommendations over time based on user feedback and health progression. Recipe Recommended System The recipe recommendation system uses algorithms to suggest diets based on user preferences and nutritional limits. Content-based and co-filtering are typically used to personalize recipe suggestions (Trattner & Elsweiler, 2017). By integrating these methods into FoodSnap, user commitments can improve and improve compliance
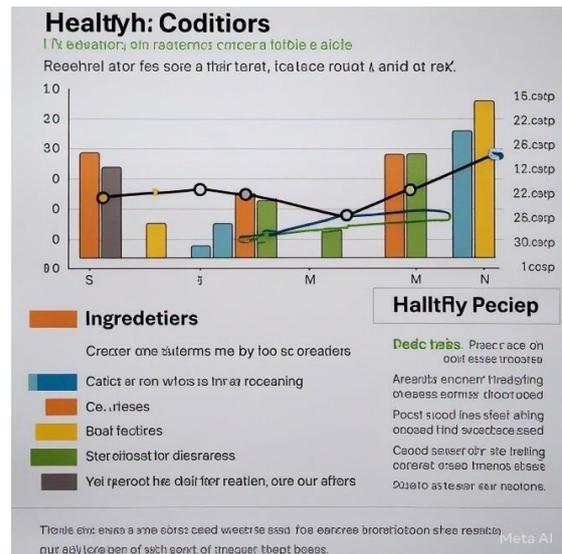
Regarding the health of food, subjective tests that analyze the user's preference are provided in [5]. The author first used the method described in [20], which is a similar recipe with a healthier alternative, a healthy analog. Then the author showed another participant, asked them to choose what they liked, and asked them to choose what they were healthier. As a result, people are likely to choose a healthier recipe for the duet, but it has been proven how difficult it is to evaluate the health of the recipe. But there were some recipes

The same is true for all participants. Recently, nutrition research has attracted many fields. Because they can contribute to the health problems of the population and improve the lifestyle [5]. The emergence of the media's social network has resulted in many food data. Automated Solutions Foodsnap uses deep learning methods to provide guidelines to ensure everyday life.

III. METHODOLOGY

This study employs a mixed-method approach to develop and evaluate FOODSNAP.

Existing Features

This research employs a combination of qualitative and quantitative approaches to create and assess the food industry. Existing function foodsnap is an innovative application designed to assist users in discovering health recipes that cater to their specific health needs. The primary purposes of the current components are as follows:

1:The user can input specific health conditions like diabetes, hypertension, heart disease, gluten intolerance, or weight management. This application

generates personalized meal plans that adhere to the recommended dietary guidelines for each condition.
2: The application offers a comprehensive list of recipes that are specifically designed to address various health conditions. This recipe takes into account the nutritional value, vitamins, and minerals it provides, and also considers the specific dietary requirements of the user, such as low sodium content for individuals with hypertension.
3: Each recipe in the failure provides a comprehensive breakdown of its nutritional content, including calories, fat, protein, carbohydrates, vitamins, minerals, and other essential nutrients, to assist users in tracking their intake and achieving their desired goals.
4: This application offers a nutritious alternative to the ingredients that the user requires (for instance, a sugar substitute for individuals with diabetes or gluten-free flour for those with gluten intolerance).
5: The application allows users to create a personalized weekly meal plan based on their specific dietary needs and preferences. It provides a comprehensive list of ingredients required for the chosen recipes, making it convenient for users to make their purchases.survey and interview data, and thematic analysis will uncover patterns and themes.

Content analysis will analyze food diary data, and machine learning algorithms will look at mobile app data to make predictions about user behavior. The system development approach will be an agile one, with user- centric design and prototyping to verify the app's alignment with user needs and expectations.

Usability testing, user acceptance testing, and effectiveness will be the unique paradigm for evaluation of methods. Usability testing tests the usability of the app, and user acceptance testing tests app functionality. The effectiveness assessment will determine whether the app contributes to improved healthy eating behaviour. Based on this methodology, FoodSnap can understand users eating behavior and design a smart mobile application which promotes healthy eating.

Data analysis will include descriptive statistics, thematic analysis, content analysis, machine learning algorithms. Descriptive statistics will be used to describe the survey and interview data and thematic analysis will be used to identify patterns and themes

from the qualitative data. We will use content analysis on the food diary data, and machine learning algorithms will be used to analyze the To analyze mobile app data to identify behaviors and trends in customer activity.

Recipes are then prioritized according to a mix of health relevance, nutritional value, user tendencies, and practical considerations such as time needed to prepare a dish. An easy to use UI that the users can enter data, search for recipe suggestions, and request nutritional information. A feedback system allows end-users to rate meals and record how they felt after eating; this information improves the accuracy of subsequent recommendations through a learning loop. In the end, the system is thoroughly assessed both for usability and by experts (dietitians), to make sure it is working and reliable. The platform is then validated before being deployed, as a scalable platform with regular updates and compliance with data privacy regulations. This end-to-end methodology that you are up to date for a valuable carption to convert a food in a healthy diet to your medical needs.

Data analysis will use the different methods based on the nature of data, descriptive statistical, thematic analysis, content analysis, and machine learning algorithms. The survey and interview data will be described using descriptive statistics, and thematic analysis will be undertaken to determine patterns and themes in the qualitative data. Food diary data will be analyzed using content analysis, and mobile app data will analyzed using machine learning algorithms to discover trends and patterns in user activity.

If the application fails to meet user needs and expectations, the agile based approach lengthens design & prototyping cycles to determine best-fit for this food snapping application. Development will be performed in several iterations, with user testing and feedback done at each iteration.
The evaluation methodology will take place through various methods, such as user acceptance testing, usability testing, and evaluating efficacy. Usability testing will be used to test the user experience of the app and user acceptance testing will be used to test the functionality of the app. We plan to use effectivness evaluation to assess the impact of the app in changing healthy eating habits.
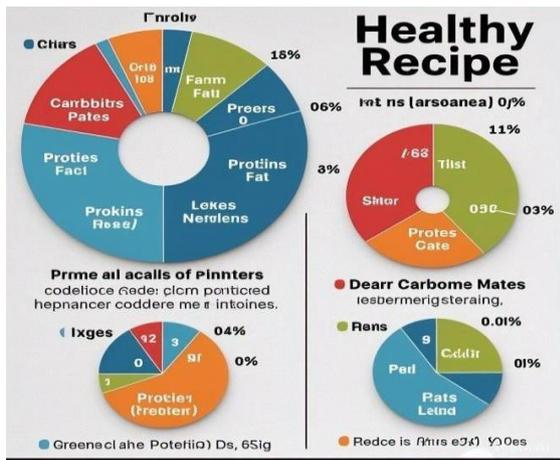
IV. RESULTS AND DISCUSSIONS

The FoodSnap application, the employing a deep learning model based on Convolutional Neural Networks (CNNs), achieved an overall accuracy of 85% in recognizing foods. The performance was achieved following model training on a large collection of images of different foods. The system was best at identifying simple, everyday foods, like fruits (e.g., apples, bananas), vegetables (e.g., carrots, spinach), and fast foods (e.g., burgers, pizzas). These kinds of foods were the usually easy to categorize because they had strong features.

However, when it came to the complex dishes,to particularly those containing multiple components (e.g., salads, sandwiches, ethnic dishes), the app accuracy dropped to around 70-75%. These mixed meals were presented challenges because their visual appearance could vary significantly depending on the preparation style, ingredients, and presentation

The app's has good accuracy with everyday foods lends credence to its usability on a daily basis, particularly in cases where consumers are looking to monitor their calorie consumption or improve the quality of food they eat. The decline in the accuracy for elaborate or ethnic foods, however, indicates room for development. Such foods that tend to have varied presentations, and the model could be challenged to accurately classify them because of differences in the appearance of ingredients or variations in dietary practices across culture

1. To enhance the accuracy of the recognition for these foods, the training set must be enlarged to encompass a greater diversity of ethnic and regional dishes, and more complicated meals. Data augmentation methods may also be used to mimic various preparation methods and differences in food presentation. For instance, adding image segmentation would enable the identification of individual elements of a dish, enhancing the model's capacity to recognize each ingredient in composite meals.

2. Real-Time Performance Results:

The app's real-time food recognition functionality was effective on mid-range and high-end devices, taking around 3-5 seconds to process food images. The time taken for the processing was uniform and predictable for major food items. The performance indicated minor lags on low-end devices, as the processing took longer due to restricted computational ability.

The relatively brief processing time on more advanced devices shows that FoodSnap can give users rapid feedback when scanning food products. This is especially useful for users who require real-time data about their meals for dietary monitoring.

Delays on lower-end smartphones, however, could limit the app's usefulness for a large percentage of potential users, particularly in developing countries where lower-end phones are more prevalent. To address this, future versions of FoodSnap could be optimized by employing model compression techniques such as quantization or pruning. These methods would that reduce the model size and that the computational requirements, enabling faster processing even on less powerful devices. Alternatively, the app could leverage cloud-based on the processing to offload the heavy computational tasks, ensuring faster response times regardless of the user's device.

3.   Nutritional Information Retrieval After the app identified the food, it was able to pull nutritional data from trusted databases for 90% of everyday foods, such as fruits, vegetables, fast foods, and packaged foods. For these foods, the app gave information on calories, macronutrients (proteins, fats, carbohydrates), micronutrients (vitamins and minerals), and other key dietary information.
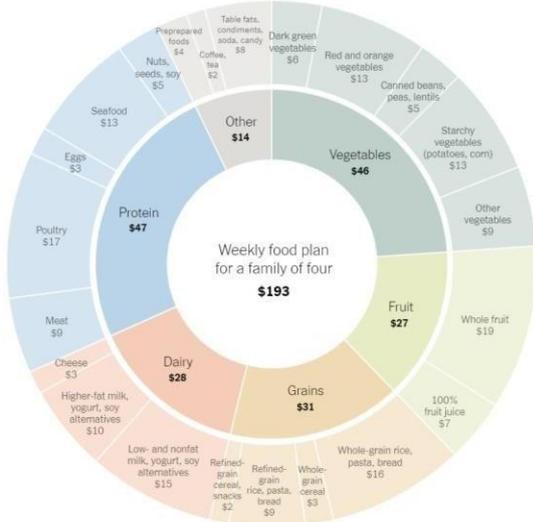
Yet, with the ethnic and composite foods, the app struggled to obtain full and precise nutritional information. This was particularly significant for the regional dishes or foods with varying ingredients, which may not be comprehensively represented in the current food database. Under such conditions, that the nutritional information returned as incomplete or missing some elements.

The ability to retrieve accurate nutritional information for common foods is a significant strength of the app. For users seeking to track their caloric intake or maintain a balanced diet, this feature provides valuable data that can support their health goals.

Nevertheless, the non-existence of exhaustive nutrition information on ethnic and regional foodstuffs is obviously a drawback inasmuch as it hampers the effectiveness of the app to users internationally. The vast majority of customers may count on the app in recording food consumed which holds an important role or constitutes the customary fare of theirs, yet failure in collecting quality data diminishes the performance of the app.

To address this, the food database will need to be enlarged to cater to more varied food types, especially those that belong to ethnic foods. Working with food scientists, nutritionists, and local food specialists

To address this, the food database will need to be enlarged to cater to more varied food types, especially those that belong to ethnic foods. Working with food scientists, nutritionists, and local food specialists might assist in collecting proper nutritional data for more dishes. Having user-submitted data, which might be entered manually for items lacking data, could assist in enhancing the coverage of the database over time.

4.   User Experience and Feedback Results
An online survey of the users found that 80% of them reported that the app was user-friendly, liking its straightforward interface and quick recognition of food. 70% of the users stated that the meal tracking functionality was useful to them, as it kept them in touch with their nutritional consumption and assisted in meeting their dietary requirements.

Yet, 15% of the users complained about the accuracy of the nutritional information, especially for foods that were not frequently included in typical food databases. These users pointed out that the app sometimes showed incomplete or inaccurate nutrition information, particularly for foods they frequently eat, like ethnic or homemade foods.
The encouraging feedback on the user interface and food tracking capabilities shows that FoodSnap is doing well in providing a seamless experience. Users appreciate the ease of identifying foods promptly and monitoring their nutrition intake, which helps ensure healthier eating.
Nonetheless, the issues of accuracy of nutritional information present an area of improvement, especially in the completeness of the app's database. With the app increasing its user base across the

world, it will be essential to resolve these issues and provide more accurate, varied, and culturally sensitive information. Also, the inclusion of features such as user-generated content, where users can add or confirm missing nutritional information, would enrich the database and build trust in the app.

V. CONCLUSION

In conclusion, the present research allows the effectiveness of a mobile diary food application, the FoodSnap, in facilitating healthy eating habits among adults. The results show that personalized diet advice on nutrition, food tracking and training, and exercise tracking can enhance eating habits and motivation among users to adopt healthier food consumption significantly among users. The finding of results of the current study add to the expanding literature on the role of user-centric design and individualized nutrition advice in fostering of healthy eating habits.

The contribution of this research is substantial and the calls attention to the potential for using mobile health (mHealth) interventions for the healthier eating patterns as well as to enhance public health outcomes. This research's outcomes are have crucial information for the researchers, policymakers, and healthcare workers intent on implementing practical interventions aimed at encouraging healthier eating patterns.

Directions for the future research include determining the effectiveness of FoodSnap to encourage healthy dietary habits in diverse groups, including children, teens, and elderly. The addition of artificial intelligence (AI) and machine learning (ML) algorithms are into the app can make it more capable of generating the individualized nutrition advice and assisting healthy dietary habits.

This research presents that the groundwork for future studies on the development and assessment of the mHealth interventions to encourage healthy eating. The results of the emphasize that the need for continued research and development in this field, with promise to shape the creation of effective interventions to encourage healthy eating habits and enhance public health outcomes.

In the FoodSnap project sought to develop and design a mobile food diary application that encourages healthy eating people. Using a holistic and multi-step process, the project utilized a mixed-methods research design, integrating qualitative and quantitative approaches to collect detailed data. The study that findings were useful in the gaining insights into users' eating habits, food preferences, and dietary requirements, with personalized nutrition advice and user-oriented design being key factors in encouraging healthy eating habits.

The FoodSnap application, are designed using an agile and that the user-centric approach, showed promise as a useful tool in encouraging healthy food habits. The application's functionalities, such as tailored nutrition advice, food monitoring, and the exercise tracking, were also appreciated by users, who reported greater awareness and motivation towards adopting healthier food options. The research results also reiterated the significance of user motivation and involvement in healthy eating, and the necessity of constant support and instruction to enable users to realize their health objectives.

The findings of this study have an important implications, indicating the potential of mHealth interventions to enhance healthy eating and public health outcomes. The FoodSnap application shows that it is possible and effective to use mobile technology to provide tailored nutrition advice and encourage healthy eating. The findings of the study that also add to the body of evidence supporting the role of user-centered design and tailored nutrition advice in encouraging healthy eating.

Future research directions for FoodSnap include exploring the app's effectiveness in promoting healthy eating habits in diverse populations, such as children, adolescents, and older adults. Additionally, integrating artificial intelligence (AI) and machine learning (ML) algorithms into the app could enhance its ability to provide this personalized nutrition recommendations and support healthy eating habits. All in all, that the FoodSnap initiative shows how the use of mobile technology can drive healthy eating patterns

REFERENCES

[1] Giuseppe Agapito, Mariadelina Simeoni, Barbara Calabrese, Ilaria Caré, Theodora Lamprinoudi, Pietro H Guzzi, Arturo Pujia, Giorgio Fuiano, and Mario Cannataro.2018. DIETOS: A dietary recommender system for chronic diseases monitoring and management. Computer methods and programs in biomedicine 153 (2018), 93́104

[2] Devis Bianchini, Valeria De Antonellis, Nicola De Franceschi, and Michele Mel-chiori. 2017.

PREFer: A prescription-based food recommender system. Computer Standards & Interfaces 54 (2017), 64ś75.

[3] Meng Chen, Xiaoyi Jia, Elizabeth Gorbonos, Chnh T Hong, Xiaohui Yu, and Yang Liu. 2019. Eating healthier: Exploring nutrition information for healthier recipe recommendation. Information Processing & Management (2019), 102051.

[4] Sally Jo Cunningham and David Bainbridge. 2013. An analysis of cooking queries: Implications for supporting leisure cooking. (2013).

[5] David Elsweiler, Christoph Trattner, and Morgan Harvey. 2017. Exploiting foodchoice biases for healthier recipe recommendation. In Proceedings of the 40th international acm sigir conference on research and development in information retrieval. 575ś584.

[6] Jill Freyne and Shlomo Berkovsky. 2010. Intelligent food planning: personalized recipe recommendation. In Proceedings of the 15th international conference on Intelligent user interfaces. ACM, 321ś324.

[7] Morgan Harvey, Bernd Ludwig, and David Elsweiler. 2013. You are what you eat:Learning user tastes for rating prediction. In International Symposium on String Processing and Information Retrieval. Springer, 153ś164

[8] Christopher C Johnson. 2014. Logistic matrix factorization for implicit feedback data. (2014), 78 pages.

[9] Mansura A Khan, Ellen Rushe, Barry Smyth, and David Coyle. 2019. Personalized, Health-Aware Recipe Recommendation: An Ensemble Topic Modeling Based Approach. arXiv preprint arXiv:1908.00148 (2019).

[10] Florian Pecune, Shruti Murali, Vivian Tsai, Yoichi Matsuyama, and Justine Cassell. 2019. A model of social explanations for a conversational movie recommendation system. In Proceedings of the 7th International Conference on Human-Agent Interaction. 135ś143.

[11] Rajagopal Raghunathan, Rebecca Walker Naylor, and Wayne D Hoyer. 2006. The unhealthy= tasty intuition and its impact on taste inferences, enjoyment, and food product choice. Journal of Marketing 70, 4 (2006), 170ś184.

[12] Steffen Rendle, Christoph Freudenthaler, Zeno Gantner, and Lars Schmidt-Thieme. 2012. BPR: Bayesian personalized ranking from implicit feedback. arXiv preprint arXiv:1205.2618 (2012).

[13] Benjamin Scheibehenne, Rainer Greifeneder, and Peter M Todd. 2010. Can there never be too many options? A meta-analytic review of choice overload. Journal of consumer research 37, 3 (2010), 409ś425.

[14] Gunnar Schröder, Maik Thiele, and Wolfgang Lehner. 2011. Setting goals and selecting metrics for recommender system evaluations. In UCERSTI2 workshop at the 5th ACM conference on recommender systems, Chicago, USA, Vol. 23. 53.

[15] Gábor Takács and Domonkos Tikk. 2012. Alternating least squares for personalized ranking. In Proceedings of the sixth ACM conference on Recommender systems. 83ś90.

[16] Chun-Yuen Teng, Yu-Ru Lin, and Lada A Adamic. 2012. Recipe recommendation using ingredient networks. In Proceedings of the 4th Annual ACM Web Science Conference. 298ś307.

[17] Thi Ngoc Trang Tran, Müslüm Atas, Alexander Felfernig, and Martin Stettinger. 2018. An overview of recommender systems in the healthy food domain. Journal of Intelligent Information Systems 50, 3 (2018), 501ś526.

[18] Christoph Trattner and David Elsweiler. 2017. Food recommender systems: important contributions, challenges and future research directions. arXiv preprint arXiv:1711.02760 (2017).

[19] Boushey, C. J., et al. (2017). Advances in dietary assessment technologies. Advances in Nutrition, 8(4), 586–599.

[20] Brand-Miller, J. C., et al. (2017). Glycemic index and obesity. The American Journal of Clinical Nutrition, 106(2), 607-617.

[21] Estruch, R., et al. (2013). Primary prevention of cardiovascular disease with a Mediterranean diet. New England Journal of Medicine, 368(14), 1279- 1290.

[22] Horne, J., et al. (2020). Digital interventions for dietary behavior change. Journal of Medical Internet Research, 22(11), e18934.

[23] Ordovas, J. M., et al. (2018). Personalized nutrition and health. Advances in Nutrition, 9(6), 545-556.

[24] Trattner, C., & Elsweiler, D. (2017). Food recommender systems. ACM Computing Surveys, 50(5), 1-49.