Recipe Recommender Assignment EDA

by,

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Problem Statement

- As a Machine Learning Engineer at food.com, the objective is to design a recommendation system that elevates user engagement.
- The core purpose of this recommendation engine is to deliver personalized recipe suggestions to users, based on their choice and the current recipe they are looking at.
- In this project, the primary focus lies in the exploration of data and the crafting of features that form the foundational components for building a reliable and effective recommendation engine.

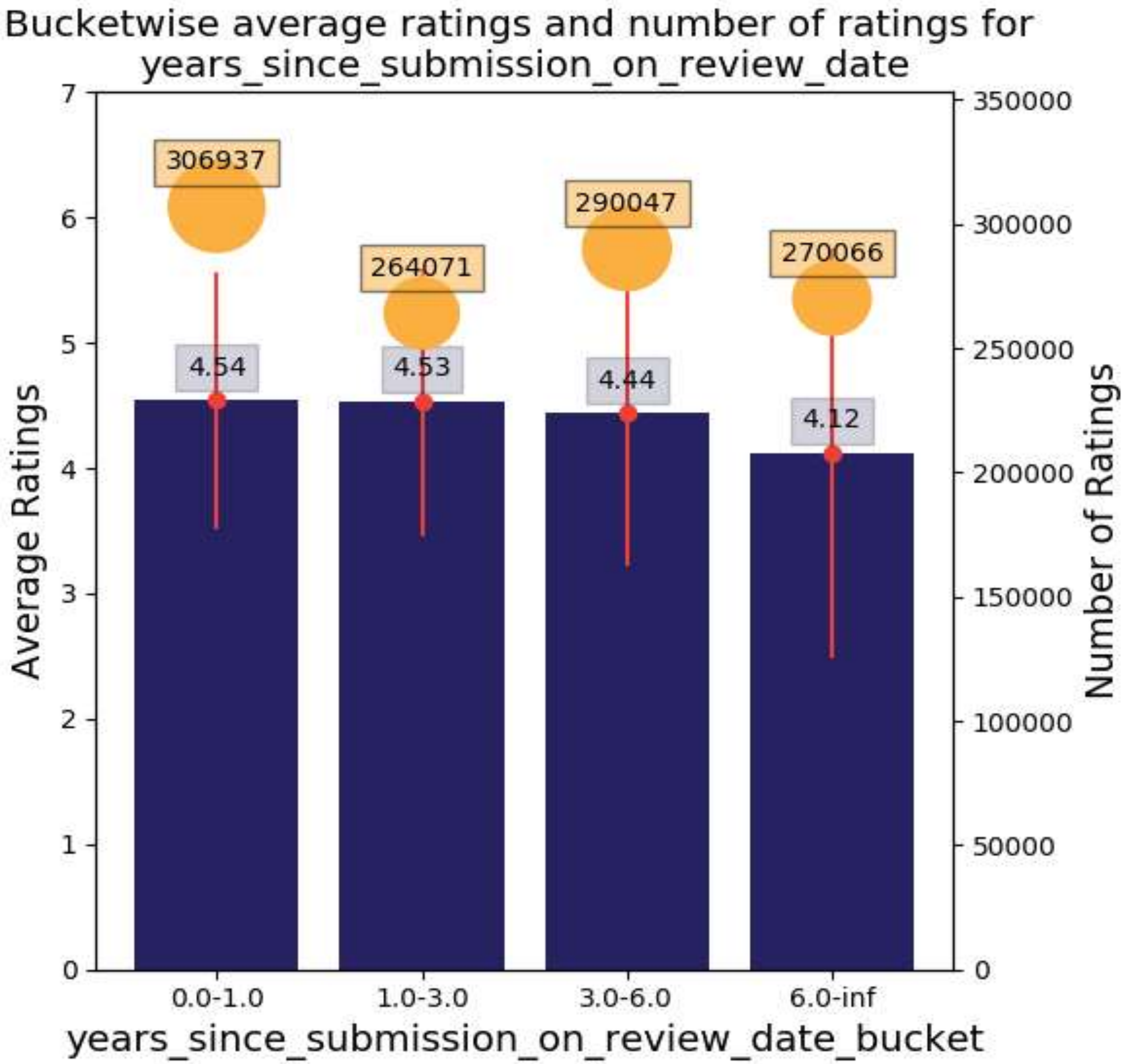
Business Objectives

- The recommendation engine is a way to increase the website's user engagement.
- If a user is shown relevant recipes, they are more likely to spend more time on the website reading about recipes. Higher user engagement will likely result in more business opportunities like collaborations, promotions, etc.
- The performance of a recommendation engine will significantly impact the revenue the recipe website can generate.
- Analysis and feature engineering is done using Spark on Elastic Map Reduce service (EMR).

Understanding Dataset

- The first file is the Raw_recipes.csv file. It contains all the recipe-related information. Each row in this file describes a recipe.
- The second file is the RAW_interactions.csv. Each row in this data file is one user reviewing one recipe. One user can review more than one recipe, and each recipe can be reviewed by more than one user.

Exploratory Data Analysis(EDA)



years_since_submission_on_review_date

(Review Time Since Submission)

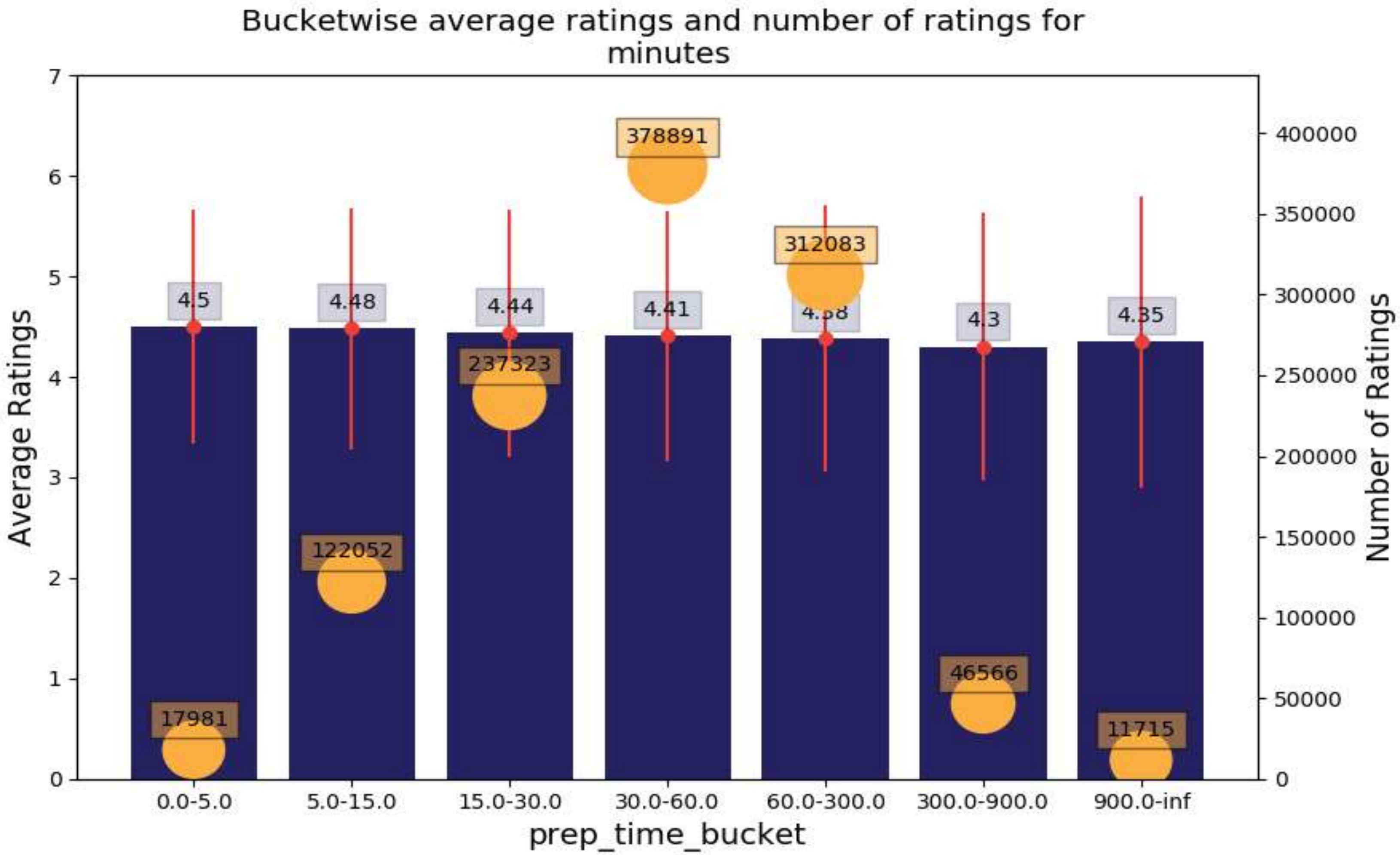
Upon analyzing the 'Review Time Since Submission' data, it becomes evident from the graphical representation that recipes older than six years tend to receive lower ratings.

Exploratory Data Analysis(EDA)

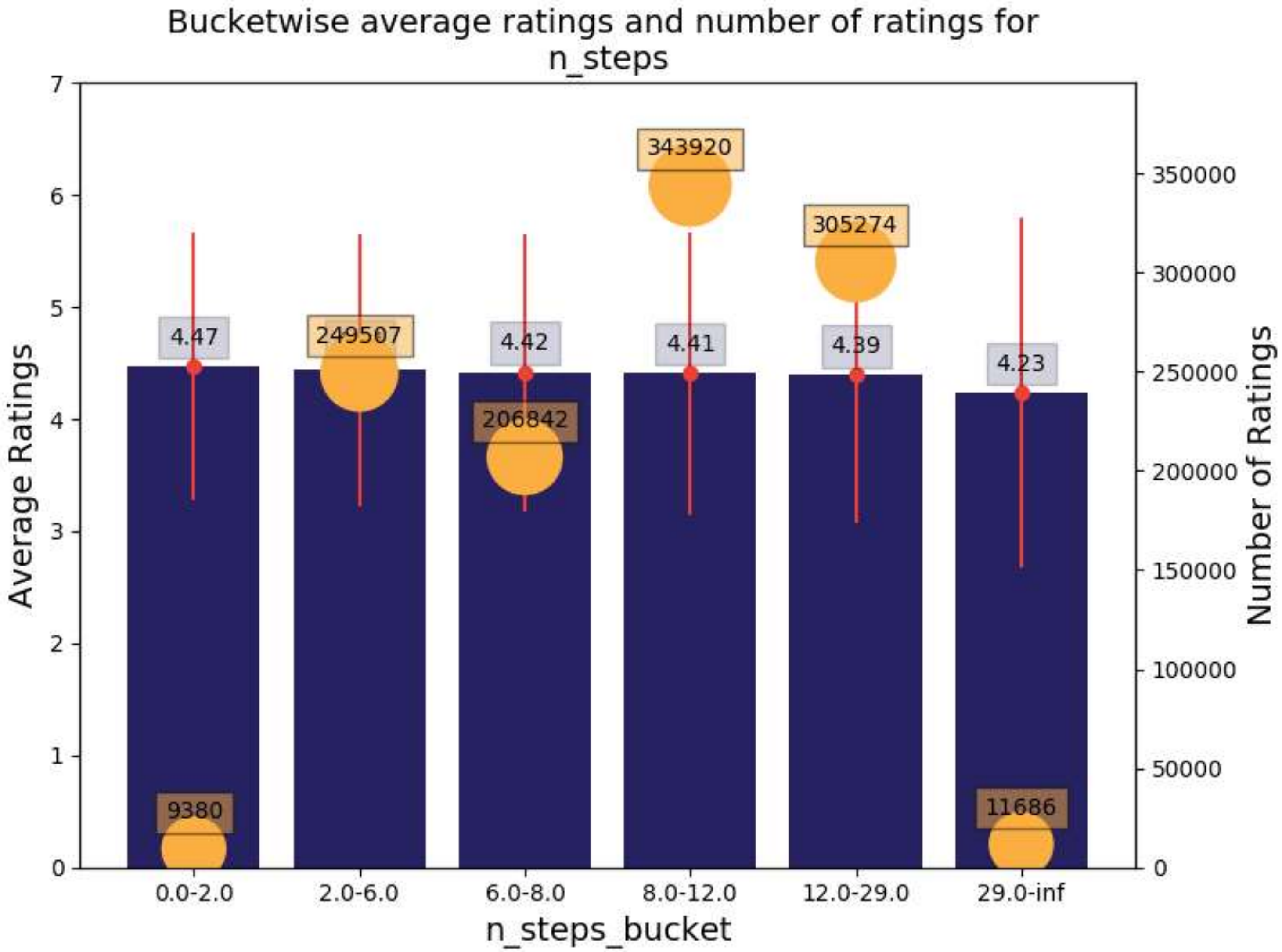
minutes

(Preparation Time)

Recipes with shorter preparation times tend to have higher average ratings compared to those with longer preparation times.



Exploratory Data Analysis(EDA)



n_steps

(Number of Steps)

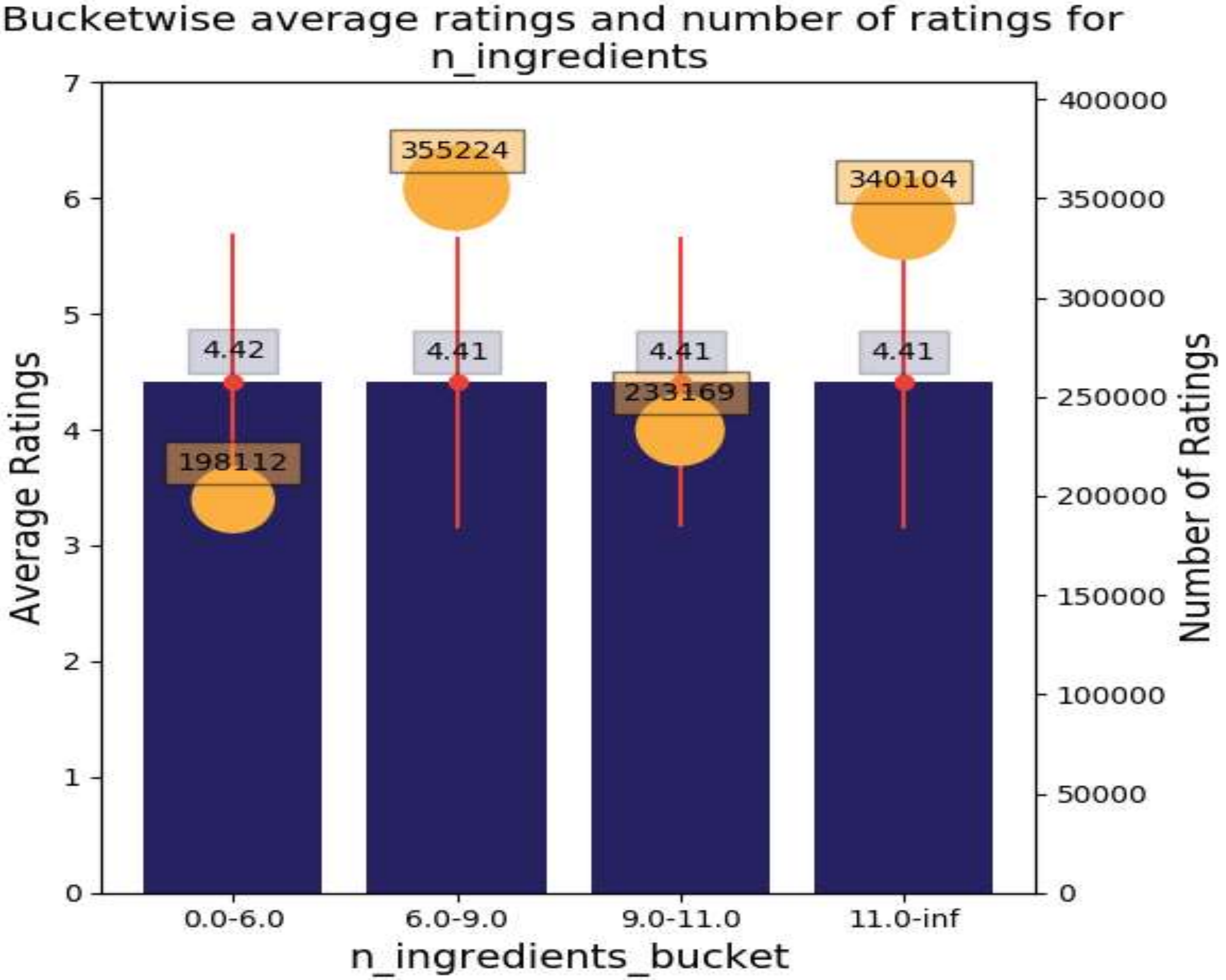
The 'n_steps' feature emerges as a clear determinant of recipe ratings. Recipes featuring fewer than 2 steps receive high ratings, while those with more than 29 steps are rated very low, indicating the strong relevance of this feature in determining average ratings.

Exploratory Data Analysis(EDA)

n_ingredients

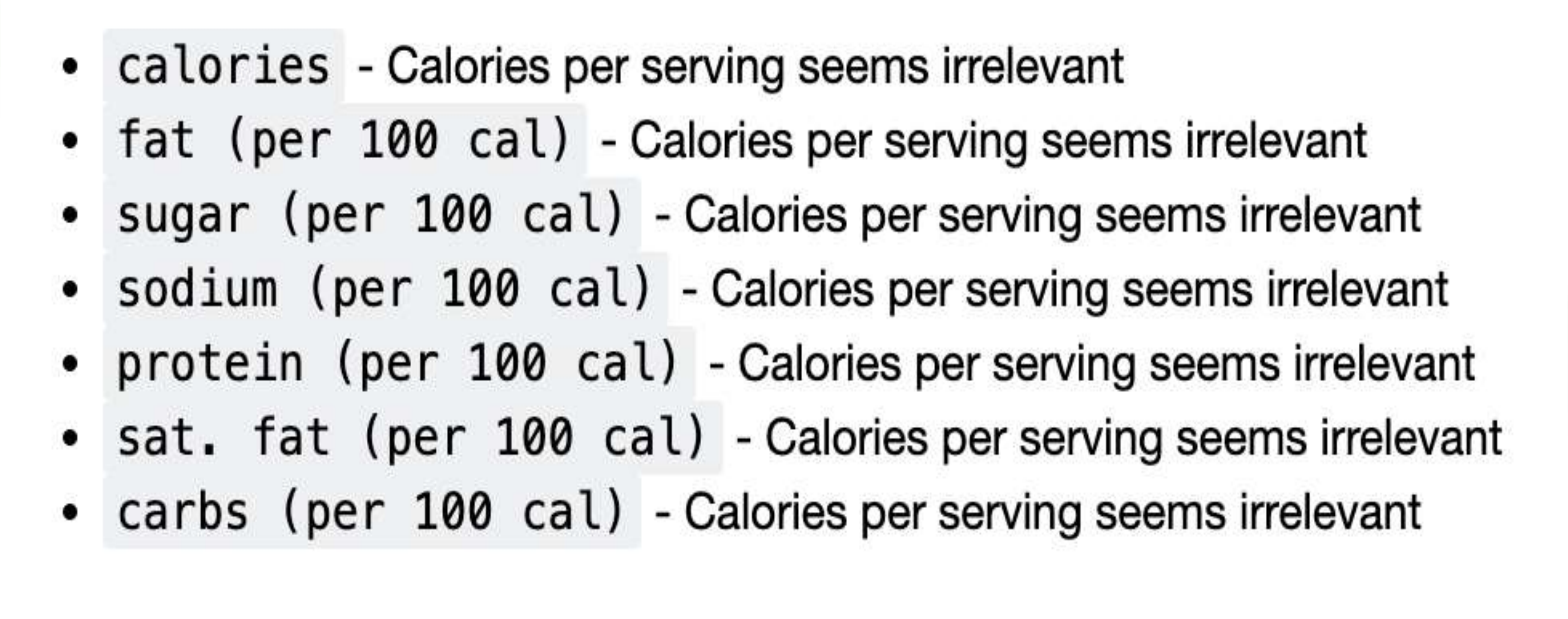
(Number of Ingredients)

The 'n_ingredients' feature, representing the number of ingredients, exhibits relatively consistent average ratings across various ranges, indicating that it may not be an influential feature in determining recipe ratings.



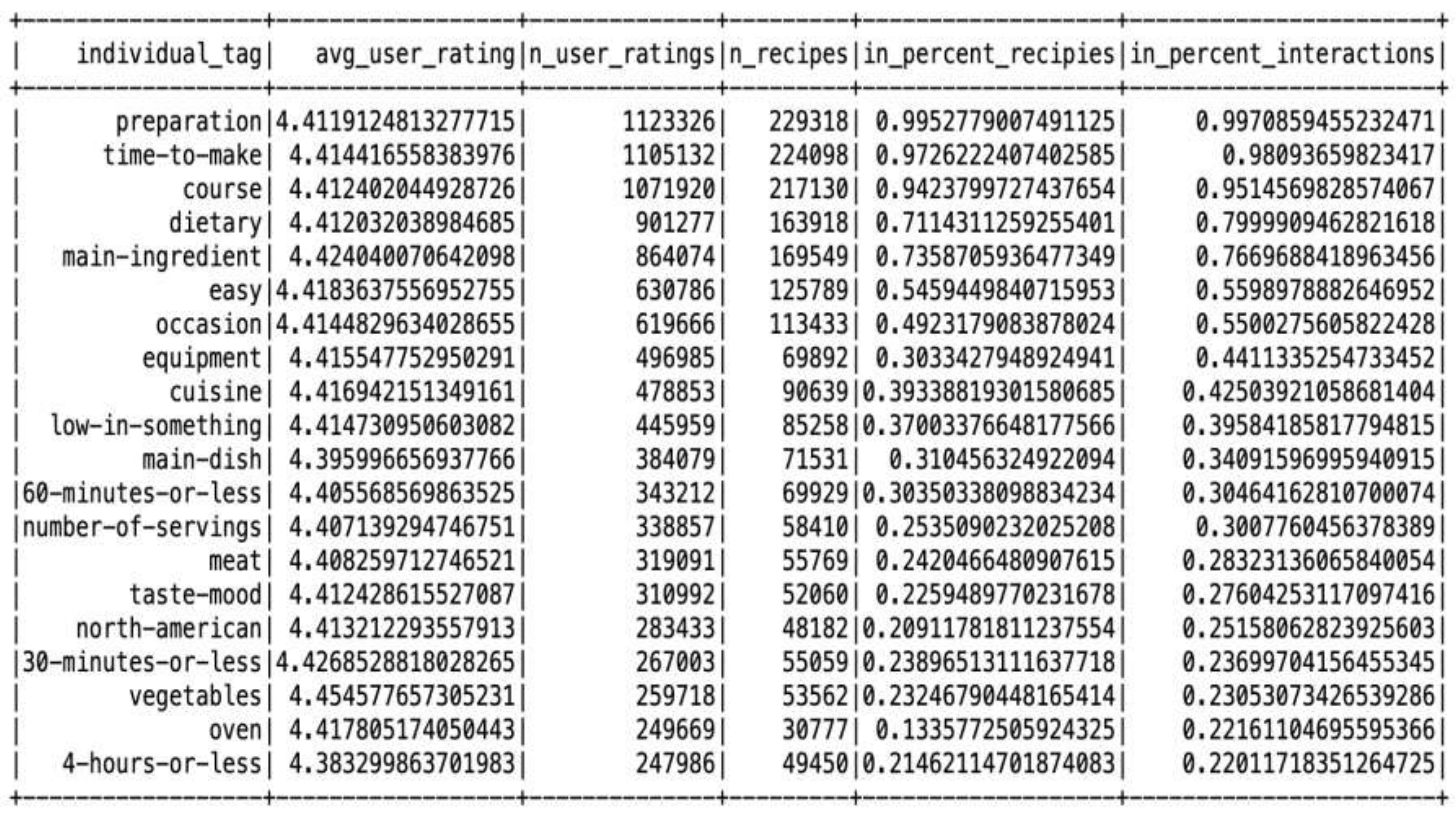
Exploratory Data Analysis(EDA)

nutrition columns



- `calories` - Calories per serving seems irrelevant
- `fat (per 100 cal)` - Calories per serving seems irrelevant
- `sugar (per 100 cal)` - Calories per serving seems irrelevant
- `sodium (per 100 cal)` - Calories per serving seems irrelevant
- `protein (per 100 cal)` - Calories per serving seems irrelevant
- `sat. fat (per 100 cal)` - Calories per serving seems irrelevant
- `carbs (per 100 cal)` - Calories per serving seems irrelevant

Exploratory Data Analysis(EDA)



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+------------------+------------------+--------------+---------+-------------------+-----------------------+
|    individual_tag|   avg_user_rating|n_user_ratings|n_recipes|in_percent_recipies|in_percent_interactions|
+------------------+------------------+--------------+---------+-------------------+-----------------------+
|       preparation|4.4119124813277715|       1123326|   229318| 0.9952779007491125|     0.9970859455232471|
|      time-to-make| 4.414416558383976|       1105132|   224098| 0.9726222407402585|       0.98093659823417|
|            course| 4.412402044928726|       1071920|   217130| 0.9423799727437654|     0.9514569828574067|
|           dietary| 4.412032038984685|        901277|   163918| 0.7114311259255401|     0.7999909462821618|
|   main-ingredient| 4.424040070642098|        864074|   169549| 0.7358705936477349|     0.7669688418963456|
|              easy|4.4183637556952755|        630786|   125789| 0.5459449840715953|     0.5598978882646952|
|          occasion|4.4144829634028655|        619666|   113433| 0.4923179083878024|     0.5500275605822428|
|         equipment| 4.415547752950291|        496985|    69892| 0.3033427948924941|     0.4411335254733452|
|           cuisine| 4.416942151349161|        478853|    90639|0.39338819301580685|    0.42503921058681404|
|  low-in-something| 4.414730950603082|        445959|    85258|0.37003376648177566|    0.39584185817794815|
|         main-dish| 4.395996656937766|        384079|    71531|  0.310456324922094|    0.34091596995940915|
|60-minutes-or-less| 4.405568569863525|        343212|    69929|0.30350338098834234|    0.30464162810700074|
|number-of-servings| 4.407139294746751|        338857|    58410| 0.2535090232025208|     0.3007760456378389|
|              meat| 4.408259712746521|        319091|    55769| 0.2420466480907615|    0.28323136065840054|
|        taste-mood| 4.412428615527087|        310992|    52060| 0.2259489770231678|    0.27604253117097416|
|    north-american| 4.413212293557913|        283433|    48182|0.20911781811237554|    0.25158062823925603|
|30-minutes-or-less|4.4268528818028265|        267003|    55059|0.23896513111637718|    0.23699704156455345|
|        vegetables| 4.454577657305231|        259718|    53562|0.23246790448165414|    0.23053073426539286|
|              oven| 4.417805174050443|        249669|    30777| 0.1335772505924325|    0.22161104695595366|
|   4-hours-or-less| 4.383299863701983|        247986|    49450|0.21462114701874083|    0.22011718351264725|
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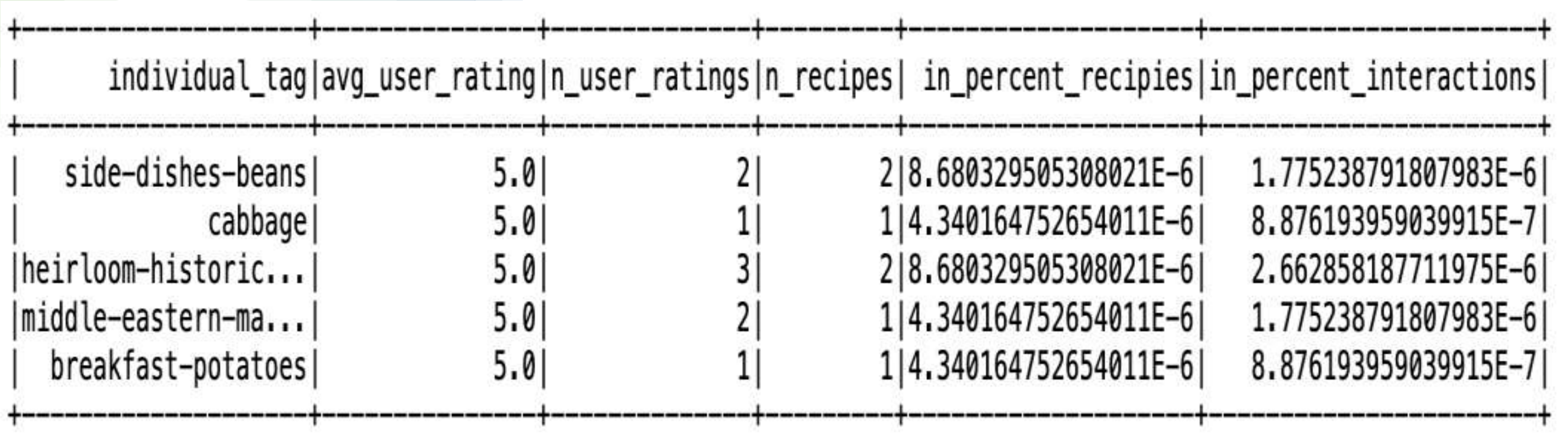
Top n most rated tags

These tags have received the highest number of user ratings, indicating their popularity and relevance among users.

Exploratory Data Analysis(EDA)

Top rated tags



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+--------------------+---------------+--------------+---------+--------------------+-----------------------+
|      individual_tag|avg_user_rating|n_user_ratings|n_recipes| in_percent_recipies|in_percent_interactions|
+--------------------+---------------+--------------+---------+--------------------+-----------------------+
|   side-dishes-beans|            5.0|             2|        2|8.680329505308021E-6|   1.775238791807983E-6|
|             cabbage|            5.0|             1|        1|4.340164752654011E-6|   8.876193959039915E-7|
|heirloom-historic...|            5.0|             3|        2|8.680329505308021E-6|   2.662858187711975E-6|
|middle-eastern-ma...|            5.0|             2|        1|4.340164752654011E-6|   1.775238791807983E-6|
|  breakfast-potatoes|            5.0|             1|        1|4.340164752654011E-6|   8.876193959039915E-7|
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Tags with the highest average user rating, which stands at a perfect score of 5, appear to have received a comparatively lower number of user ratings.

Conclusion

- Through in-depth Exploratory Data Analysis (EDA), we have gained valuable insights into the factors shaping average ratings.
- Specifically, 'Review Time Since Submission,' 'Preparation Time,' and the 'Number of Steps' have been identified as pivotal elements profoundly affecting recipe ratings.
- Conversely, our analysis indicates that the ‘Nutrition’ columns and the 'Number of Ingredients' lack significant relevance in determining the average rating.
- These insights will be instrumental in model development and will aid strategic decision-making for the business.

THANK YOU