



# Serenity

DISCOVER THE CHEF IN YOU

## RECIPE RECOMMENDATION + MACHINE LEARNING

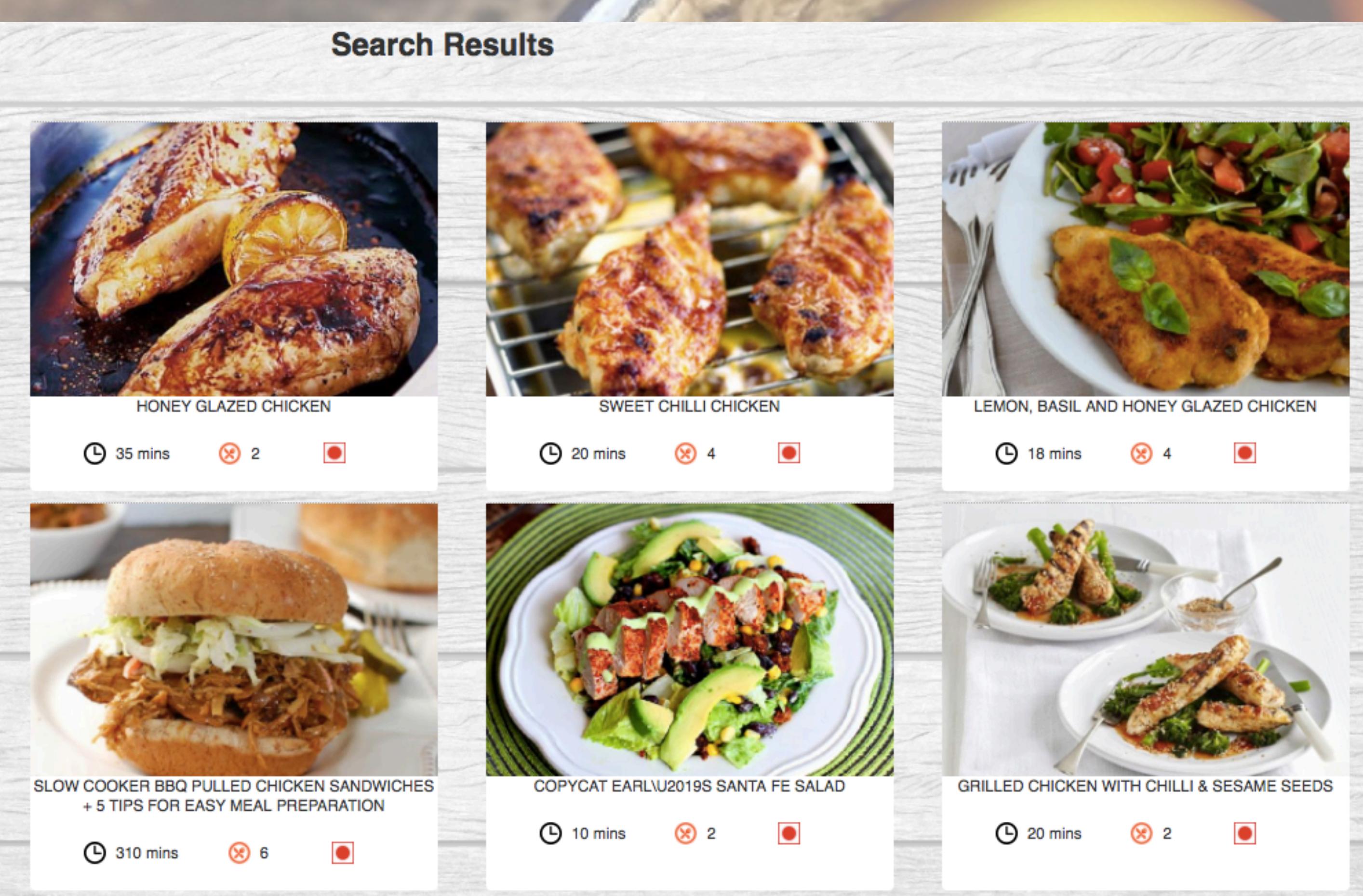
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### SUMMARY

What's for dinner tonight? Can I make something delicious with what I already have at my disposal? These are the sorts of questions Serenity intends to answer. This is not your average recipe suggestion website, however. Serenity fulfills the conventional requirement of providing recipes while incorporating **machine learning** algorithms to enhance the quality of results.

### DATA

Serenity's recipe data is sourced from Spoonacular. We connected to its API to populate the database with 20K+ recipes and 2K+ ingredients. The database takes up 202MB of storage.



**Image 1.** Serenity's user interface displaying search results for chicken breast and honey. The top results are displayed in the top-left corner, and the least at the bottom-right corner. Each tile can be clicked to bring up the full recipe details. The user can interact with the results by selecting checkboxes to filter the types of dishes being displayed or by dragging the cooking time slide-bar to only display recipes within a desired time range.

### APPROACHES

#### Proactively Adjust the Query

It is an expensive process to scan the database several times each time the user submits a query. To counteract this, Serenity uses regression learning to predict the number of results that will be returned by the database and adjusts the query if the predicted value is too low.

#### Highlight the Most Feasible Recipes

Once recipes are returned by the database, Serenity ranks them and displays those that are closest to being completed by the user. Serenity promotes recipes missing few, common ingredients and hides recipes missing many and rare ingredients.

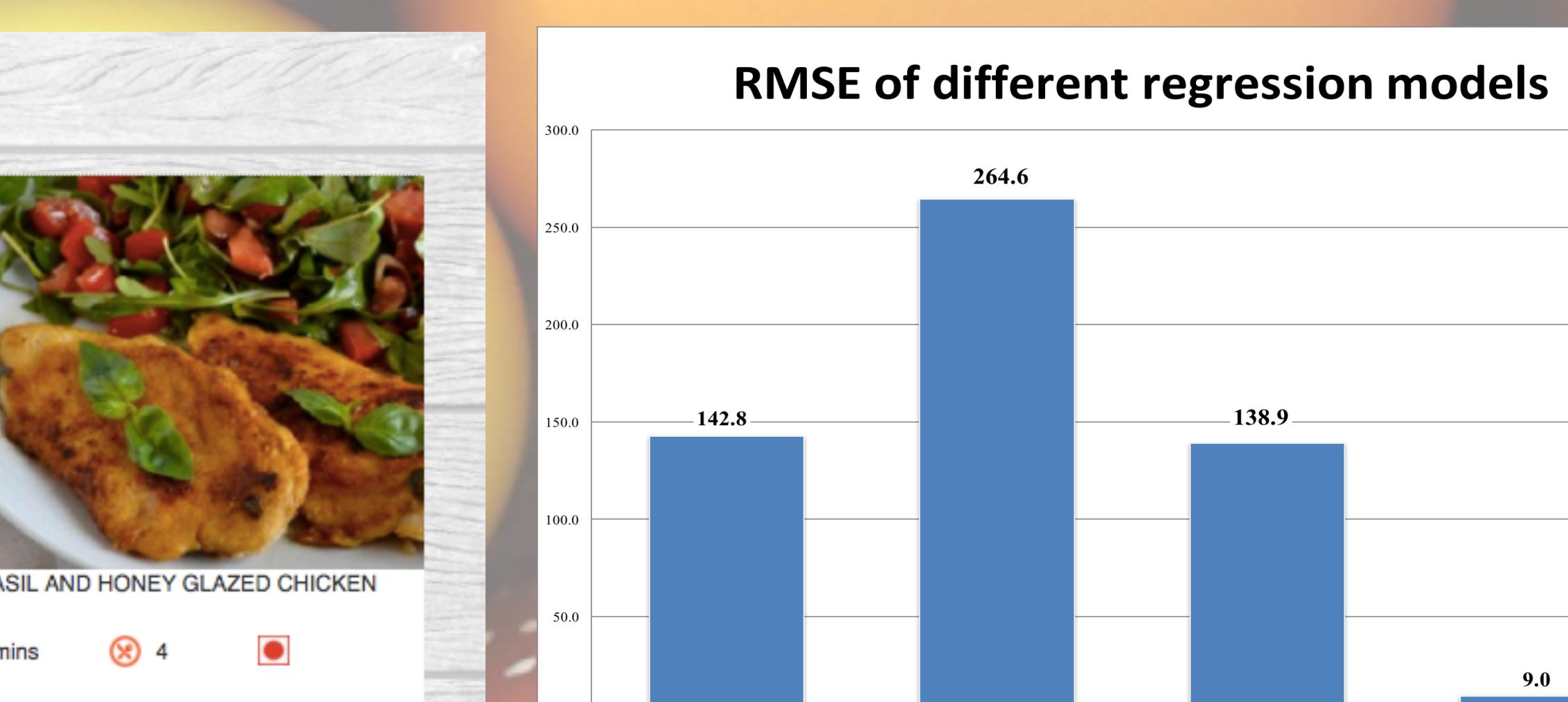
### EXPERIMENTS AND RESULTS

#### Machine Learning Model Experiments

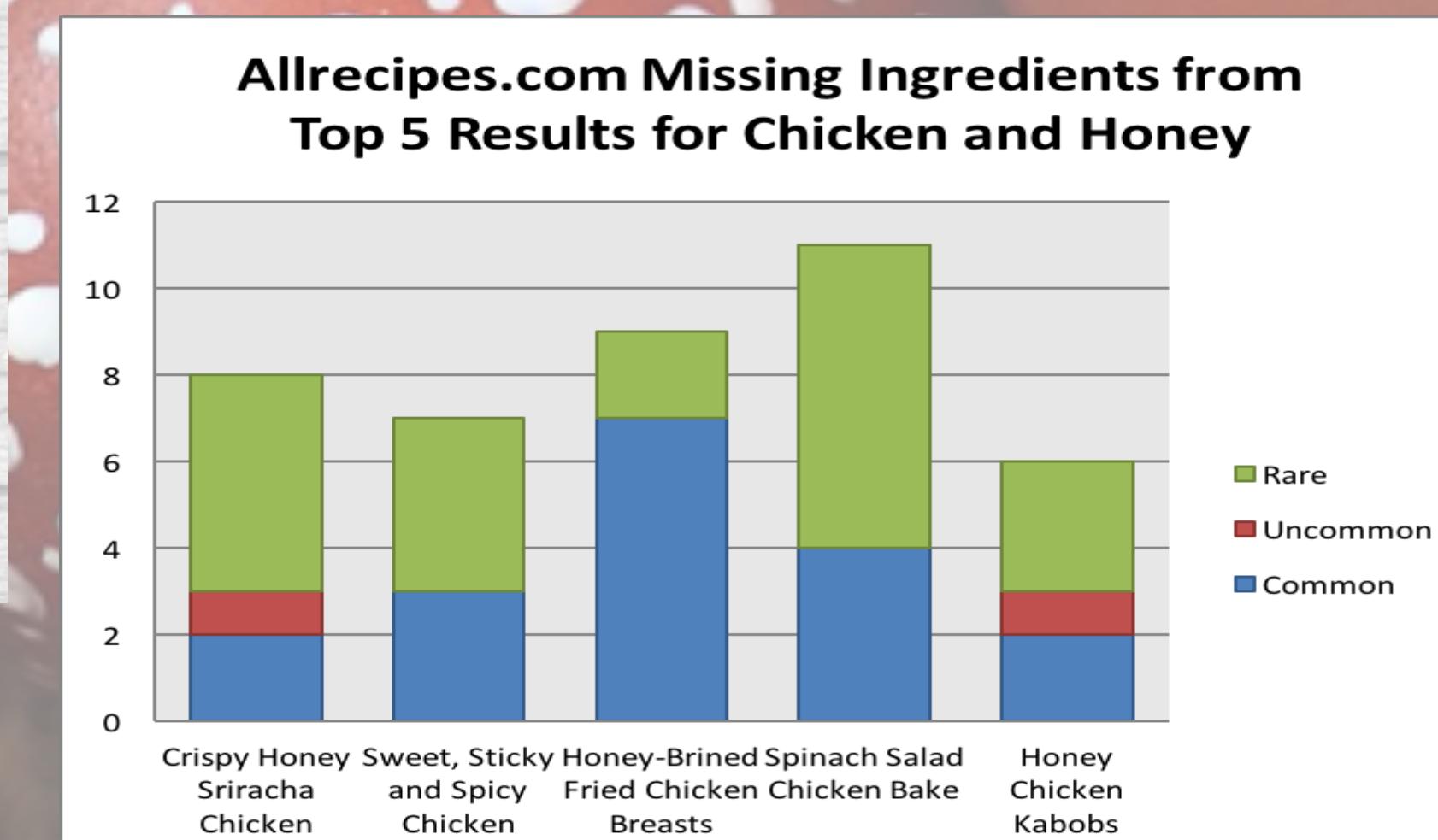
We tried several regression models and neural networks gave us the highest accuracy (see **Chart 1**).

#### Ranking Experiments

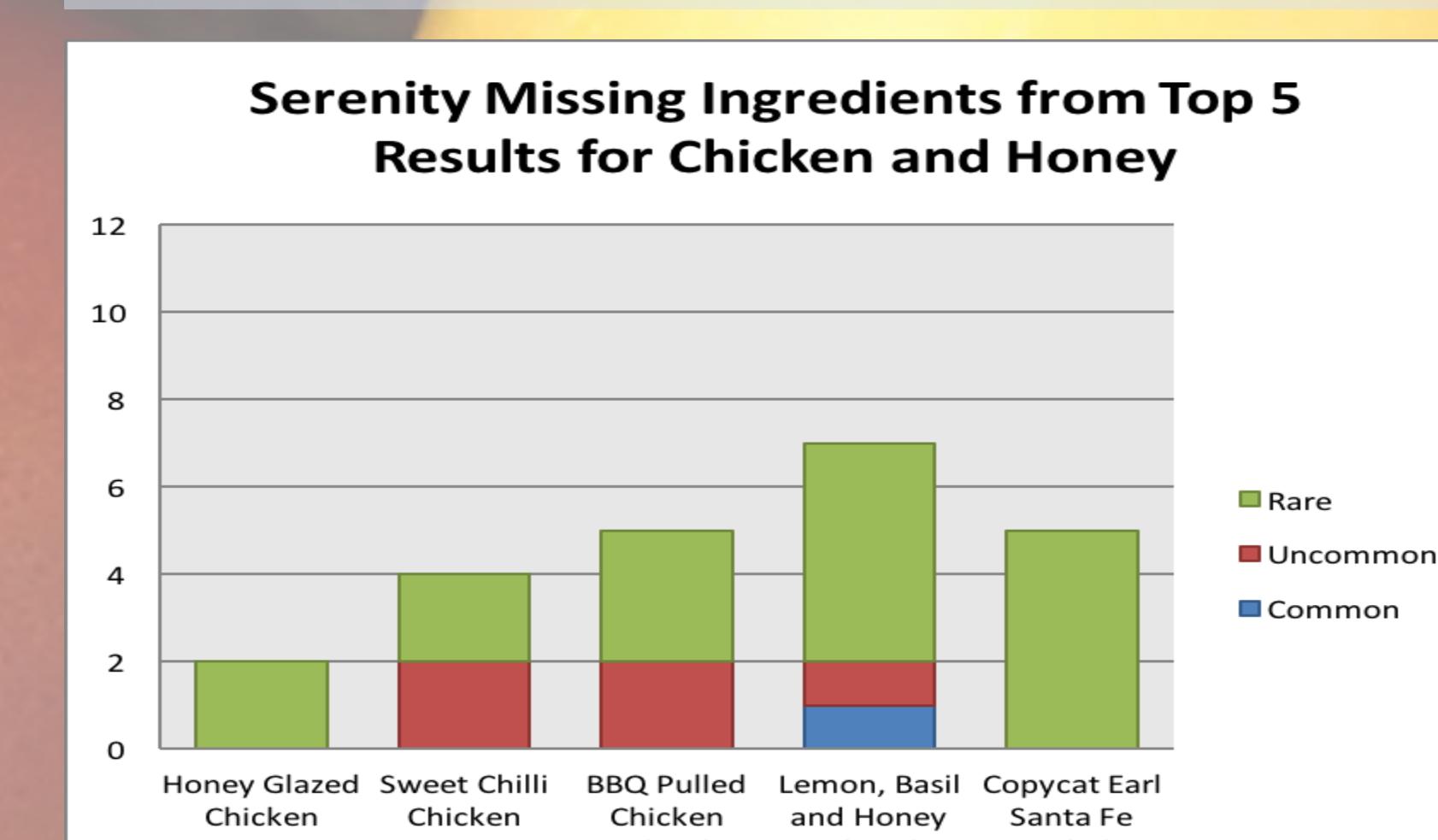
Serenity recommends recipes that require fewer additional ingredients than the State of the Art (see **Chart 2 & 3**).



**Chart 1.** RMSE of different regression models



**Chart 2.** Allrecipe.com's results.



**Chart 3.** Serenity's results.

To check the effectiveness of the quantity measure we ran 3 queries:

- Chicken, no quantity weighting
- Chicken and honey, no quantity weighting
- Chicken and honey, with quantity weighting

The first 2 queries have no overlap while the 3rd returned the top query from number 2 and the rest from number 1. This is exactly what we expected and wanted.