Q-Chef: A User Experience Based on AI Models of Curiosity

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NSF

Personalized Models of Curiosity

How can one model curiosity?

- Curiosity is one's willingness to seek out novel stimuli

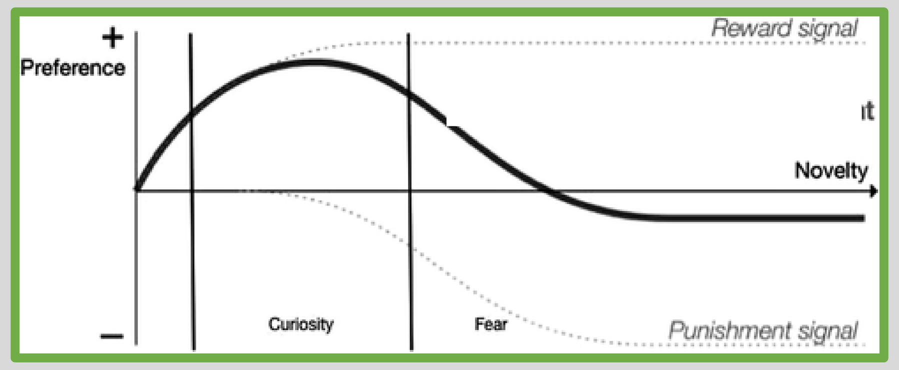

Fig 2. Wundt curve as it relates to novel stimuli

User model provides data for a personalized model of curiosity

- Highly surprising recipes will elicit a negative response to less curious people

Food Curious survey

- Part of the Q-Chef app
- Tool for further research

Survey

Advertised on Lab in the Wild

Collected data (61 people) on

- Demographics
- Familiarity with foods
- **Food Curiosity** (ex. Fig 3)

Responses to curiosity questions were assigned quadrants

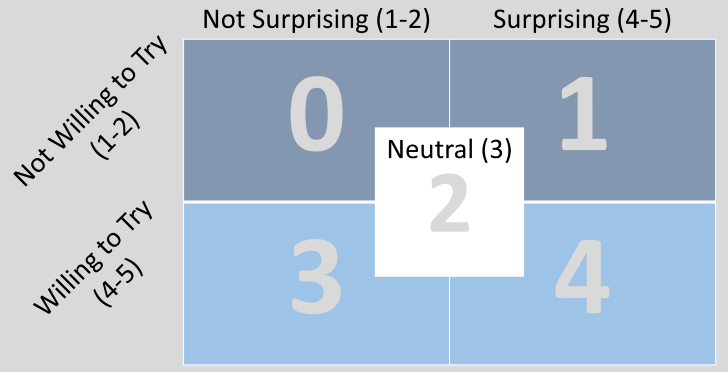

Fig 4. Encoding for curiosity quadrants using questions like in Fig 3

Fig 3. Screenshot of 10th curiosity question. Curiosity quadrant can be extracted from surprise vs willingness to try

Q-Chef Project

("*Curious Sou-chef*")

- Curiosity driven approach to dietary diversity
  - Elicit change and sustain it
- Surprise based recommender system
- Comprised of three elements

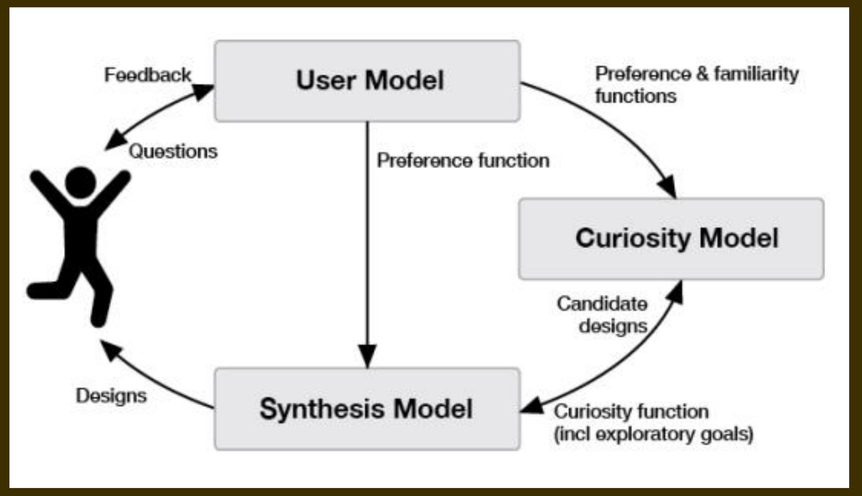

Fig 1. Model of Q-Chef's elements

Research Objectives

Cogs in the larger Q-Chef project and tools for further research to be done

- Design and develop models of personalized food curiosity using survey data
- Develop models to classify recipe data using machine learning algorithms

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Maher M.L., Grace K. (2017) Encouraging Curiosity in Case-Based Reasoning and Recommender Systems. In: Aha D., Lieber J. (eds) Case-Based Reasoning Research and Development. ICCBR 2017. Lecture Notes in Computer Science, vol 10339. Springer, Cham

Jurafsky, D., & Martin, J. H. (n.d.). Naive Bayes and Sentiment Classification. In Speech and Language Processing (3rd ed. draft). Retrieved July 21, 2017.

Food Curiosity Models

Users are represented by a 10 dimensional vector

- Values of curiosity quadrant

K-means clustering used to derive different types of user

- People have varying levels of food curiosity

Picky Kid – Not curious, except for sweets

Average Eater – Neutral or moderately curious

Foodie – Curious about all food

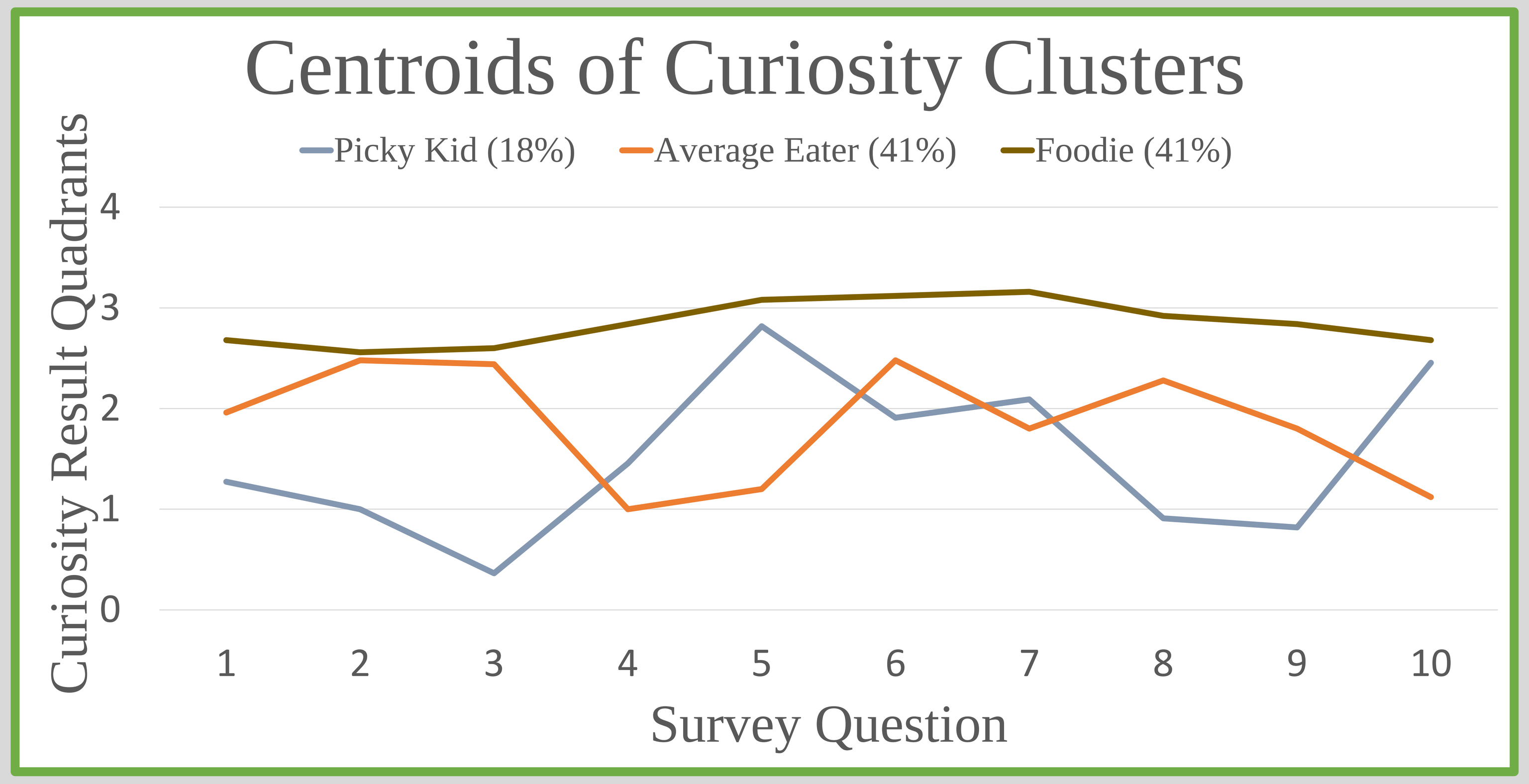

Fig 5. Centroids of each type of user. (Questions 4,5,7,10 are sweet recipes)

Classifying Recipe Data

Data was scrapped from the web

- Not consistently formatted as is

Need to know which recipes users are familiar with

- Categories solve this with less burden users

Recipe data contains

- *Title, instructions, list of categories*, *list of ingredients*

Categorizing by cuisine (fill gaps)

- Questions about cuisine in Food Curious survey

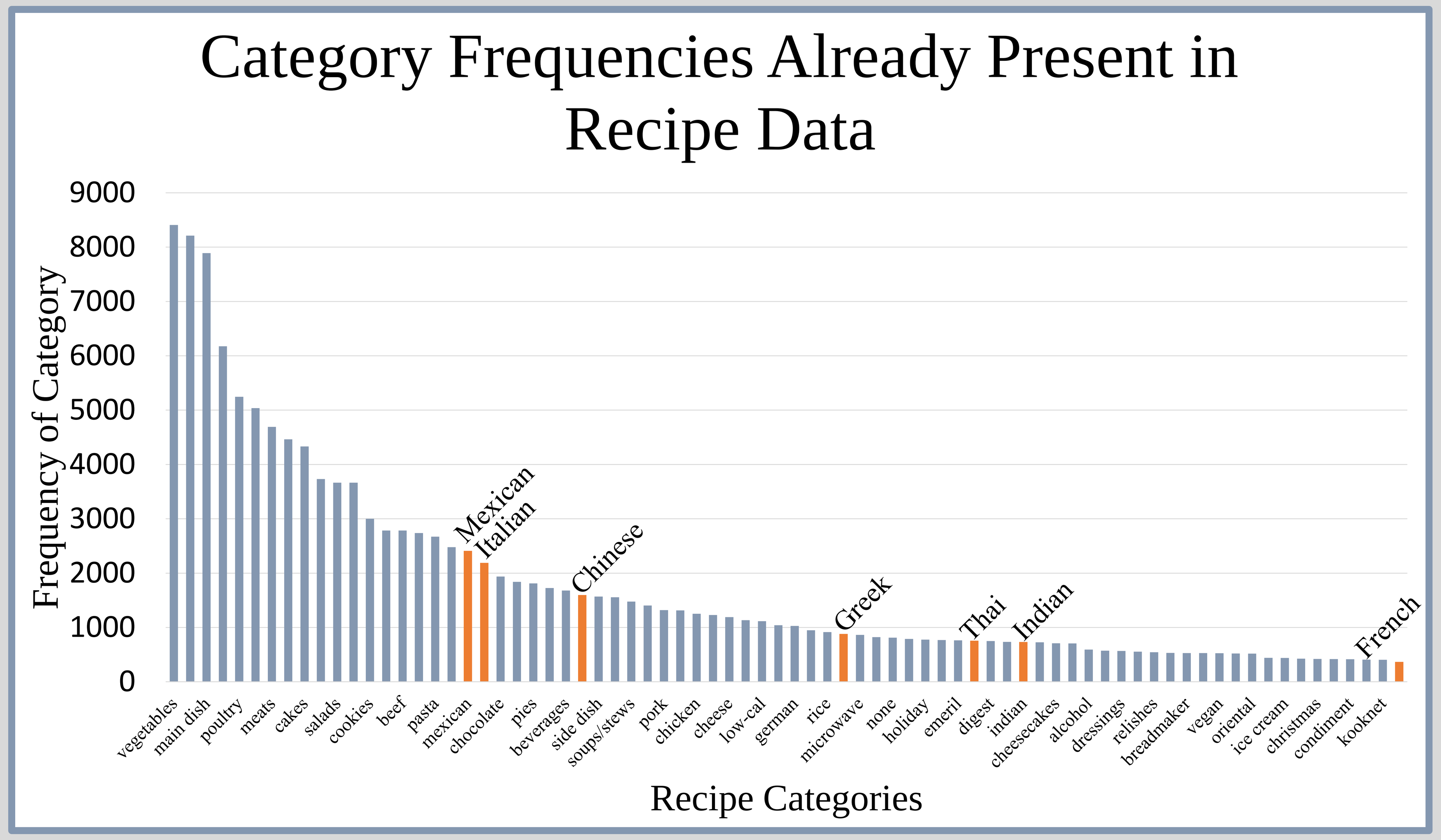

Fig 6. Distribution of categories over our data set of 86,311 recipes scrapped from the web

Machine Learning Models

Clean data of extraneous characters

- Only concerned with ingredients

Treat recipe as a sentence containing

- Title and bare list of ingredients

Naïve Bayes classification

- Pos/neg recipe for that category
- Independently classified each cuisine

Training and test data

- Independent of one another
- Contains 50%/50% recipes are/are not of that cuisine
- Size of 300-1000 depending on frequency of present tags (Fig 6)

Models assign probability to words (ingredients) present

- Give likely hood of pos/neg

Ex. Chinese model gives 56.3:1 odds to a recipe with peanut_oil

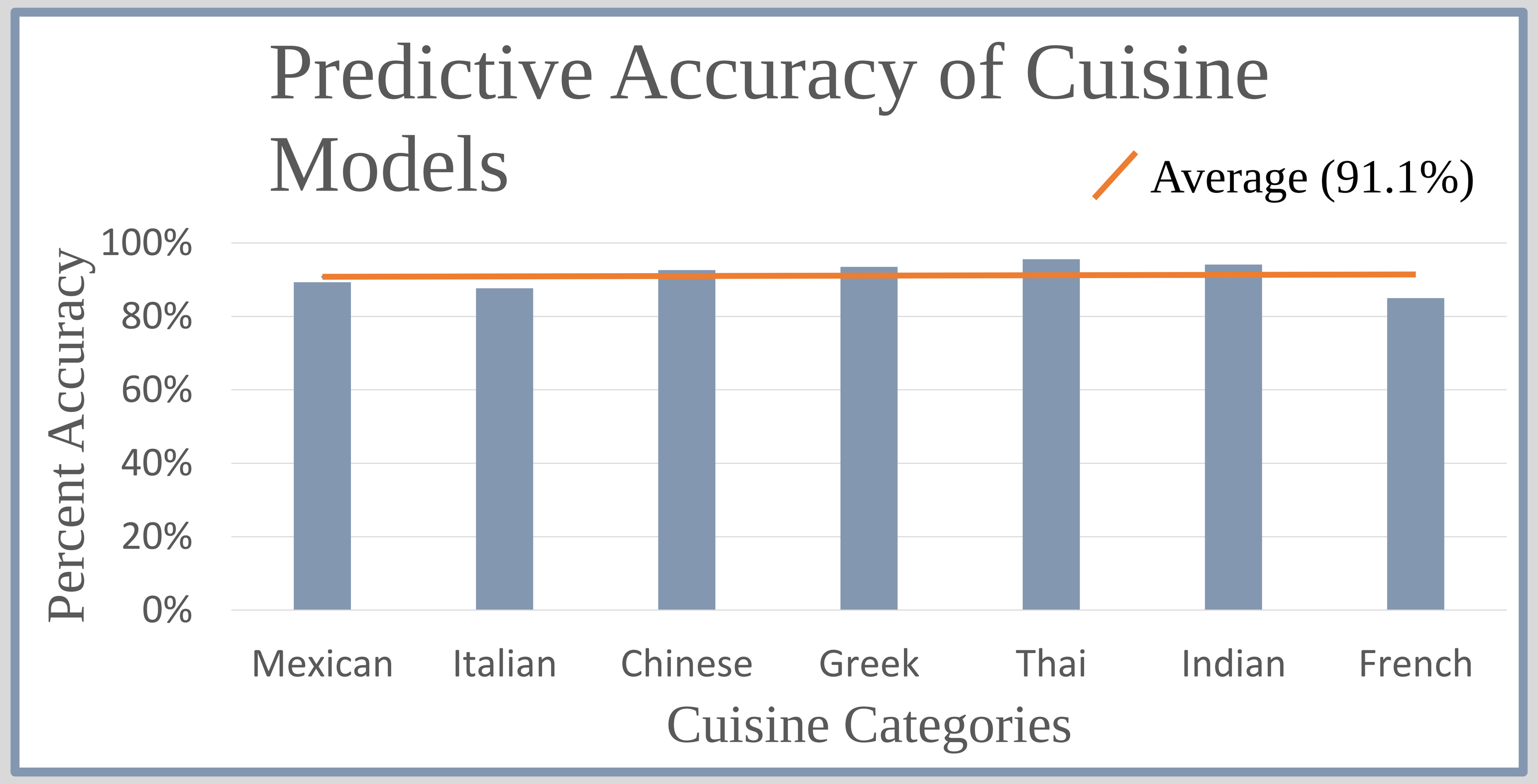

Fig 7. Percent accuracy of independent cuisine models on test data sets