

# Visual Food: Interactive Preference Explorer

Exploring Nutritional Trade-offs via an Infovis System

Author: Lorenzo Pizzi, 2187091

GitHub:

<https://github.com/lpizzi13/VisualFood>



# MOTIVATION: WHY FOOD CHOICES ARE HARD

## THE PROBLEM: Subjectivity & Hidden Trade-offs

Nutrition Facts	
2 servings per container	
Serving size	1 product (40g)
Amount per serving	
Calories	160
% Daily Values*	
Total Fat 2g	10%
Saturated Fat 0g	10%
Trans Fat 0g	
Cholesterol 0mg	0%
Sodium 100mg	20%
Total Carbohydrates 37g	12%
Dietary Fiber 5g	6%
Total Sugars 4g	
Protein 2g	
Vitamin D 0mg	0%
Calcium 50mg	5%
Iron 6mg	5%
Potassium 0mg	0%

\*Percent Daily Values are based on a diet of other people's secrets.

Static labels involve conflicting dimensions whereby 'healthy' is subjective to user needs.



**ATHLETE VIEW:**  
Focus on High Protein



**DIABETIC VIEW:**  
Avoids High Sugar



**HYPERTENSIVE VIEW:**  
Avoids High Sodium



## THE GOAL: Visual Analytics for Informed Choices

Shift from universal metrics to user-defined parameters, enabling holistic comparisons through interactive Visual Analytics.

# Users & Tasks

## Target Users



- Health-conscious consumers



- Nutrition-aware users



- Dietitians exploring food data



## Main Tasks



- Compare foods across multiple nutrients



- Identify healthier alternatives



- Explore nutritional trade-offs interactively

# Food Nutrition Dataset



**Source:** USDA FoodData Central  
(Standardized per 100g)



**Items:** 5431 cleaned items across 6 macro categories



**Attributes:** 15 numerical values ( Macro & Micro-nutrients)

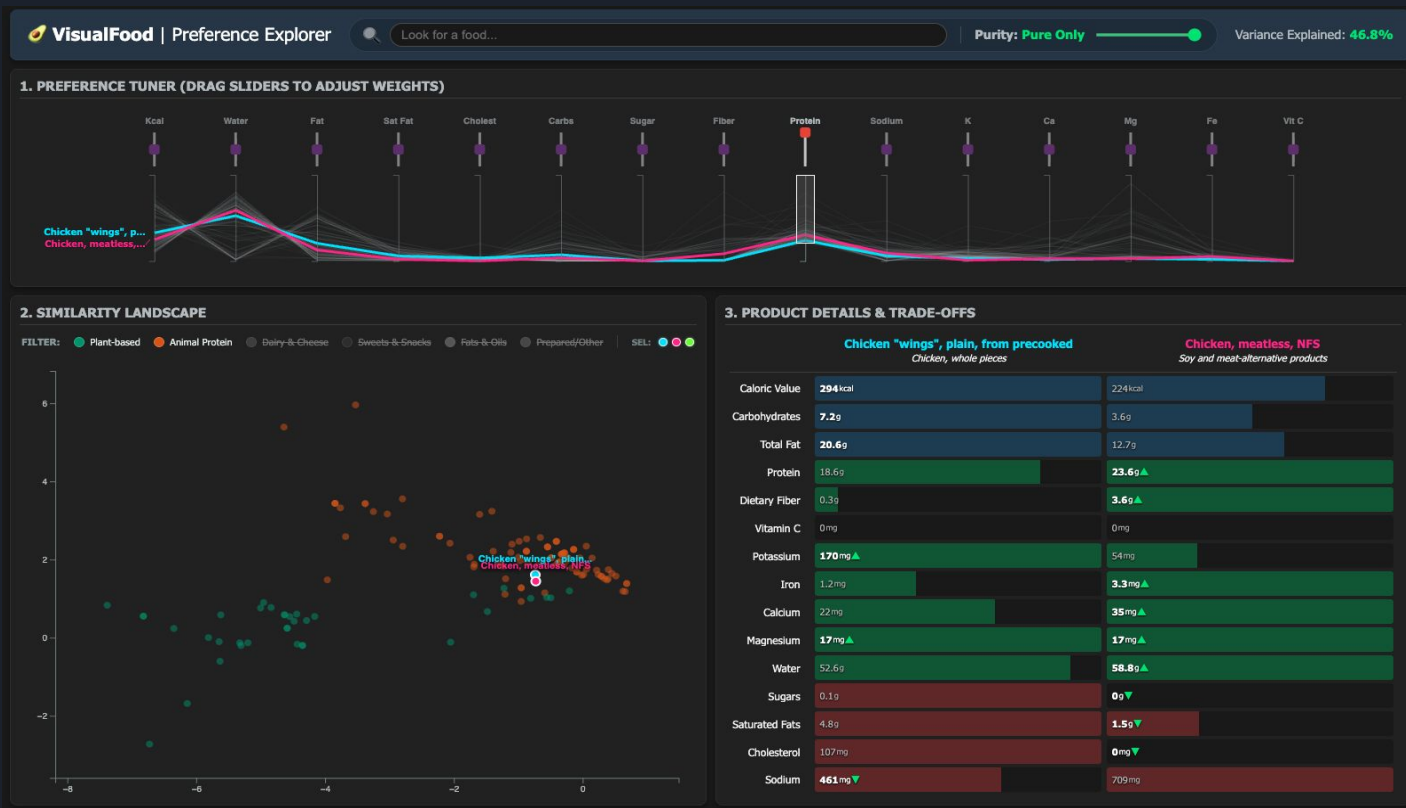


**Preprocessing:** starting from the relational USDA database, the data were extracted, merged across relevant tables, cleaned of duplicates and inconsistencies and standardized using z-normalization to produce the final analysis-ready dataset.



All the ETL process is available in the backend/data.py

# System Overview



# Parallel Coordinates (Preference Tuner)



Each line represents a food item across multiple nutrient dimensions



Semantically ordered axes make nutritional trade-offs easy to read

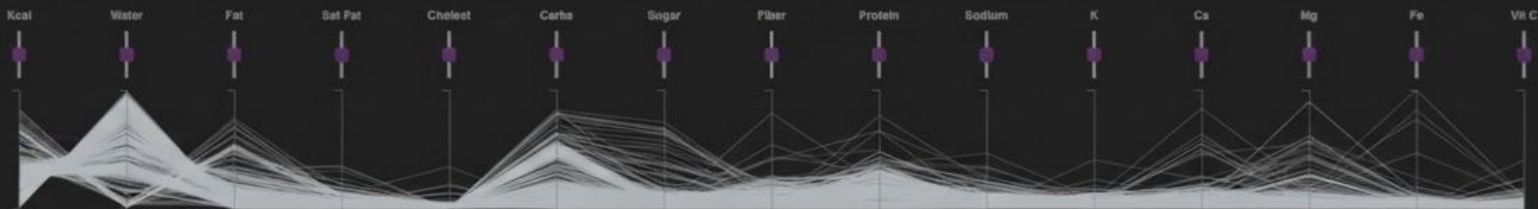


Brushing defines nutritional constraints and filters all linked views



Per-axis weight steer the **weighted PCA** enabling interactive preference-driven analysis

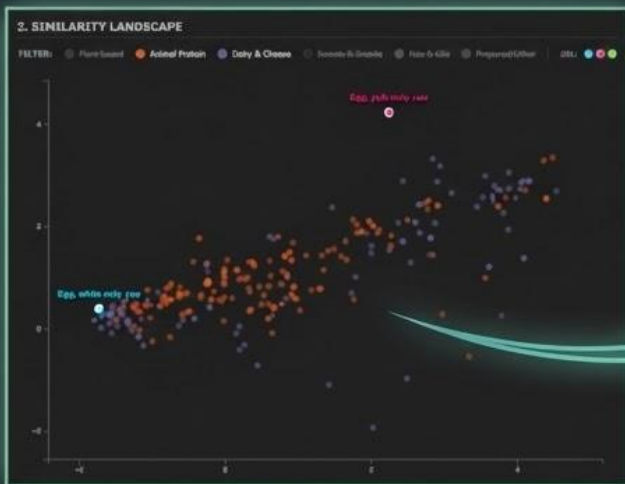
## 1. PREFERENCE TUNER (DRAG SLIDERS TO ADJUST WEIGHTS)



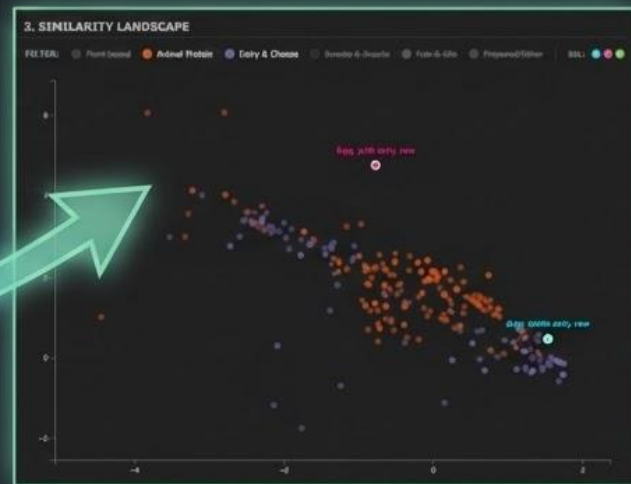
# Weighted PCA Scatterplot (Similarity Landscape)

- 2D projection of nutritional similarity
- Distance reflects overall nutritional differences
- User-defined weights steer the PCA projection
- Points are color-encoded by high-level food macro-categories
- Clusters and outliers emerge under different priorities
- Possibility of filtering according to the categories
- Selection is coordinated with all other views

PCA giving  
the highest  
weight to  
fats and  
saturated  
fats



PCA giving  
the highest  
weight to  
protein and  
fiber



# Detail Panel: Nutritional Comparator



Side by side comparison of up to 3 selected foods (detail-on-demand)



Juxtaposed micro-bars + numeric labels for quick ratios and precise reading



Row-wise normalization to handle heterogeneous nutrient scales



Semantic color logic (green: good nutrients, red: caution, blue: neutral) to avoid cognitive conflicts



Adaptive layout: responsive row height, scrolling only when needed for legibility

## 3. PRODUCT DETAILS & TRADE-OFFS

	Milk, whole <i>Milk, whole</i>	Milk, reduced fat (2%) <i>Milk, reduced fat</i>	Milk, fat free (skim) <i>Milk, nonfat</i>
Caloric Value	61 kcal	50 kcal	34 kcal
Carbohydrates	4.6g	4.9g	4.9g
Total Fat	3.2g	1.9g	0.1g
Protein	3.3g	3.4g	3.4g ▲
Dietary Fiber	0g	0g	0g
Vitamin C	0mg	0.2mg ▲	0mg
Potassium	150mg	159mg	167mg ▲
Iron	0mg	0mg	0mg
Calcium	123mg	126mg	132mg ▲
Magnesium	12mg ▲	12mg ▲	12mg ▲
Water	88.1g	89.1g	90.8g ▲
Sugars	4.8g ▼	4.9g	5.1g
Saturated Fats	1.9g	1.1g	0g ▼
Cholesterol	12mg	8mg	3mg ▼
Sodium	38mg ▼	39mg	41mg

# Insight Enabled & Live Demo

## Insight enabled by VisualFood



Identify nutritionally similar foods with healthier trade-offs



Reveal explicit nutritional trade-offs



Support goal-driven analysis through user-defined nutrient priorities

## Live Demo



Adjust nutrient weights to reflect personal goals



Select foods to trigger details-on-demand comparison



Observe coordinated updates across all views

# Conclusions



## **Integrated Visual Analytics Workflow**

VisualFood integrates data analytics, visualization, and interaction into a single visual analytics workflow.



## **Multi-Criteria & Trade-off Balancing**

Supports multi-criteria exploration of nutritional data, balancing similarity and health-related trade-offs.



## **User-Steerable & Goal-Driven Insights**

Demonstrate how user-steerable analytics enable more interpretable and goal-driven insight.



# THANK YOU FOR THE ATTENTION

VisualFood: Interactive Nutritional Data Analytics

<https://github.com/lpizzi13/VisualFood>