Madima 2020

EVENT MINING DRIVEN *CONTEXT-AWARE* PERSONAL FOOD PREFERENCE MODELLING

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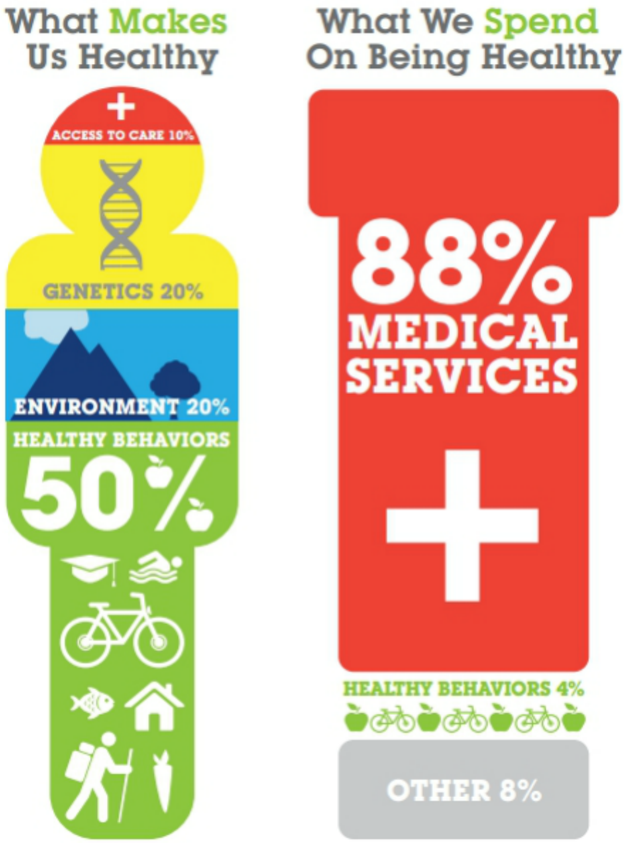
MOTIVATION

Promote healthy habits



Diseases

Cardiovascular diseases account for most non-communicable deaths, followed by cancers, respiratory diseases, and diabetes.

Unhealthy Diet

An unhealthy diet is one of the major causes of NCD deaths.

Technology: a solution

It is possible to guide users towards a healthier lifestyle by understanding their underlying taste profile and their daily lifestyles to provide healthier recommendations that still appeal to the user's tastes

PERSONAL FOOD MODEL

A model which represents the food-related characteristics of an individual.

Preferential

Personal Food Model

Models how the user's taste preference profile changes in different contexts.

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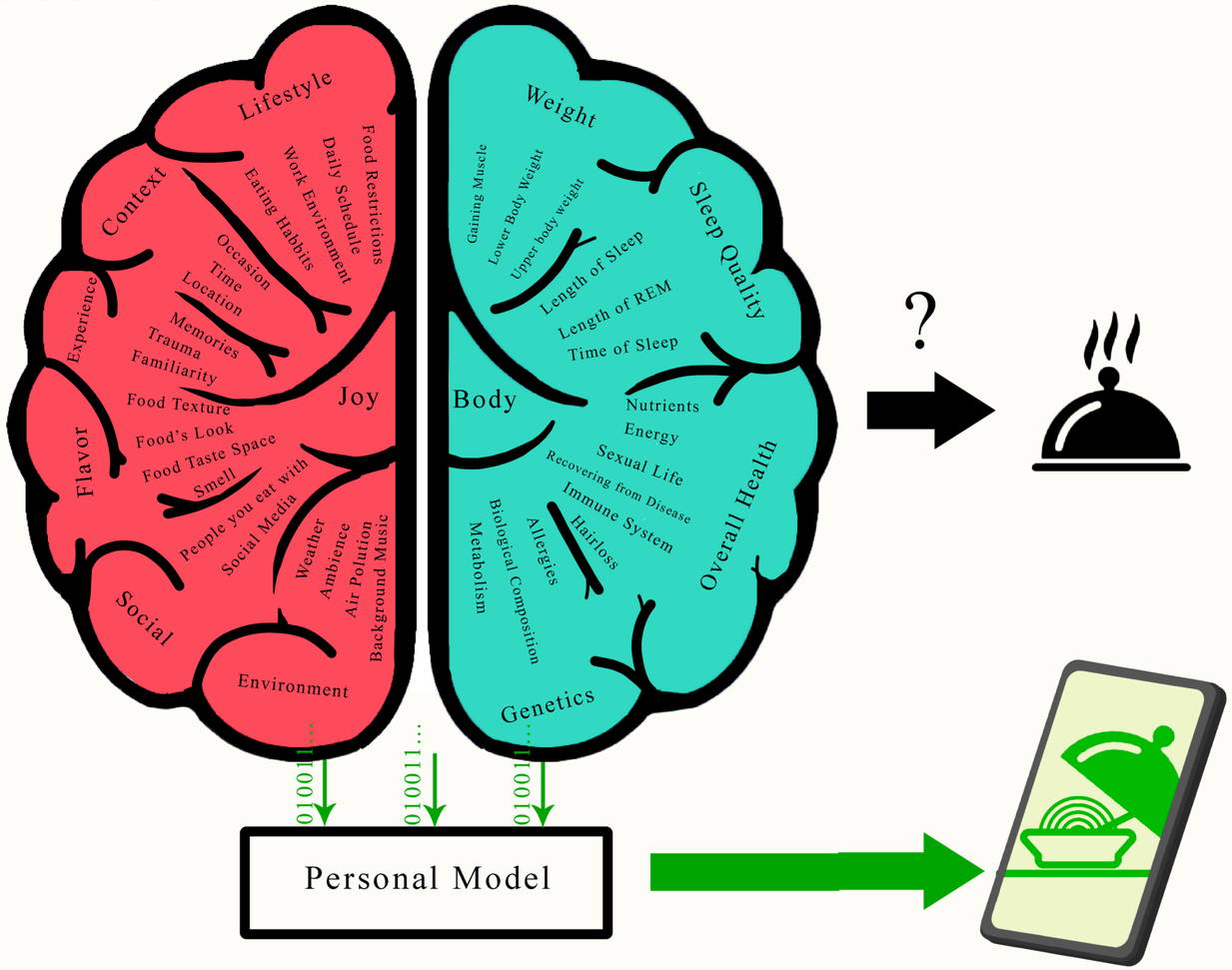
Biological

Personal Food Model

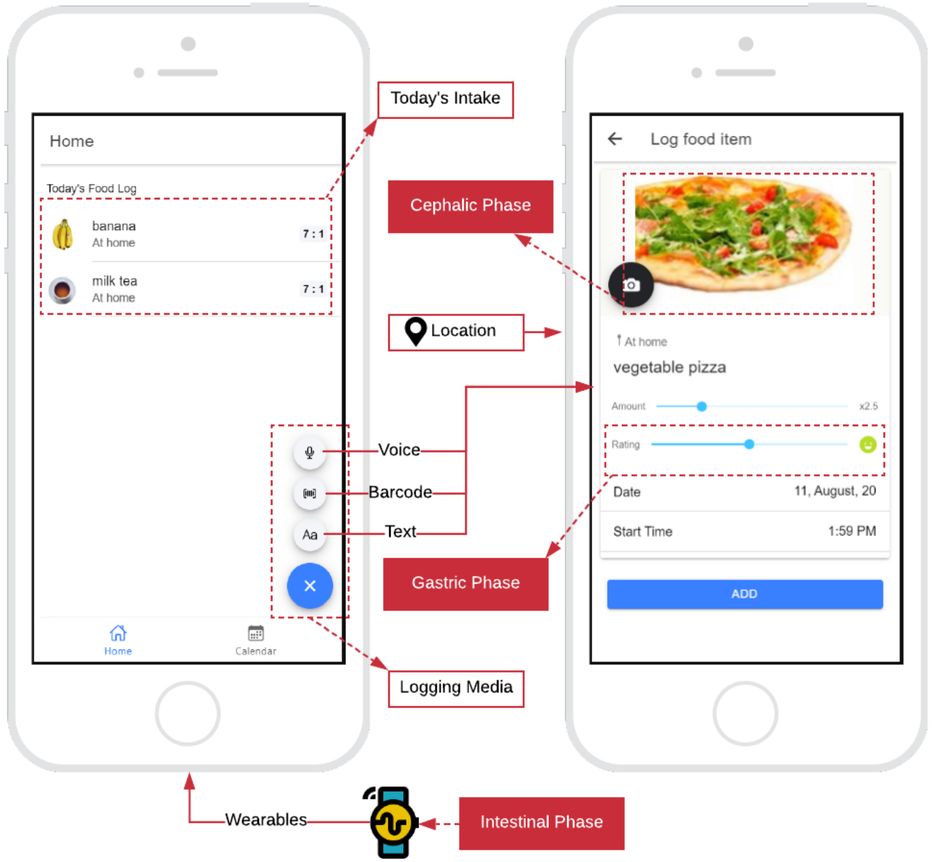
Models how different food affect the body of the individual, chronic disease, sleep, overall health, ...



*Personal Food Model, ACM Multimedia 2020

MULTIMODAL FOOD LOGGING

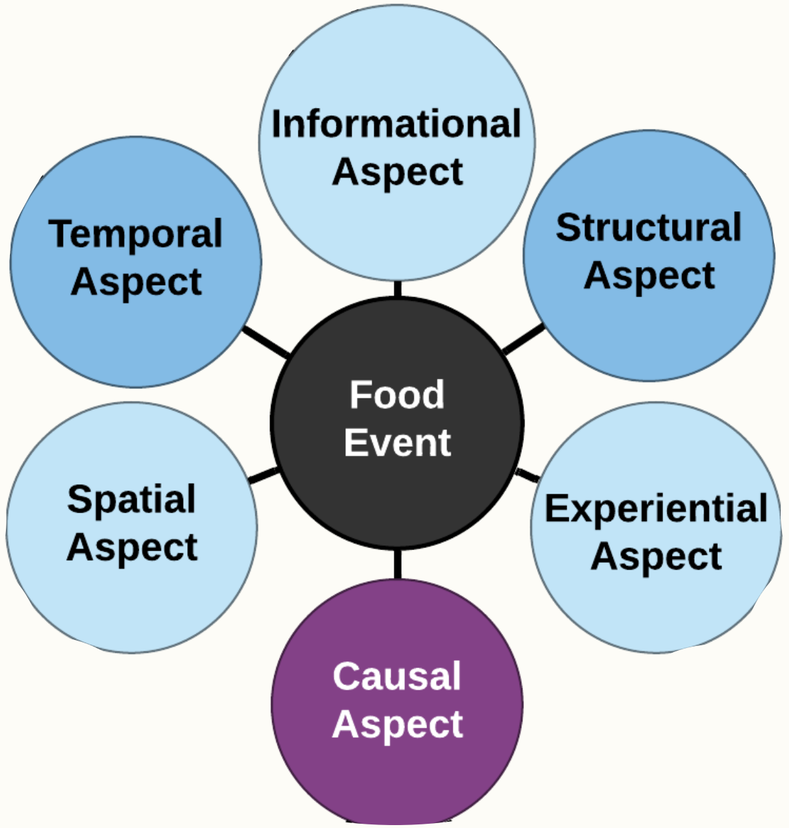
Multiple logging modalities



Food item
Nutritional values
Preference/Rating

*Multimedia Food Logger, ACM Multimedia 2020

CORE ASPECTS OF A FOOD EVENT



A STANDARD
FOOD EVENT STRUCTURE

A STANDARD
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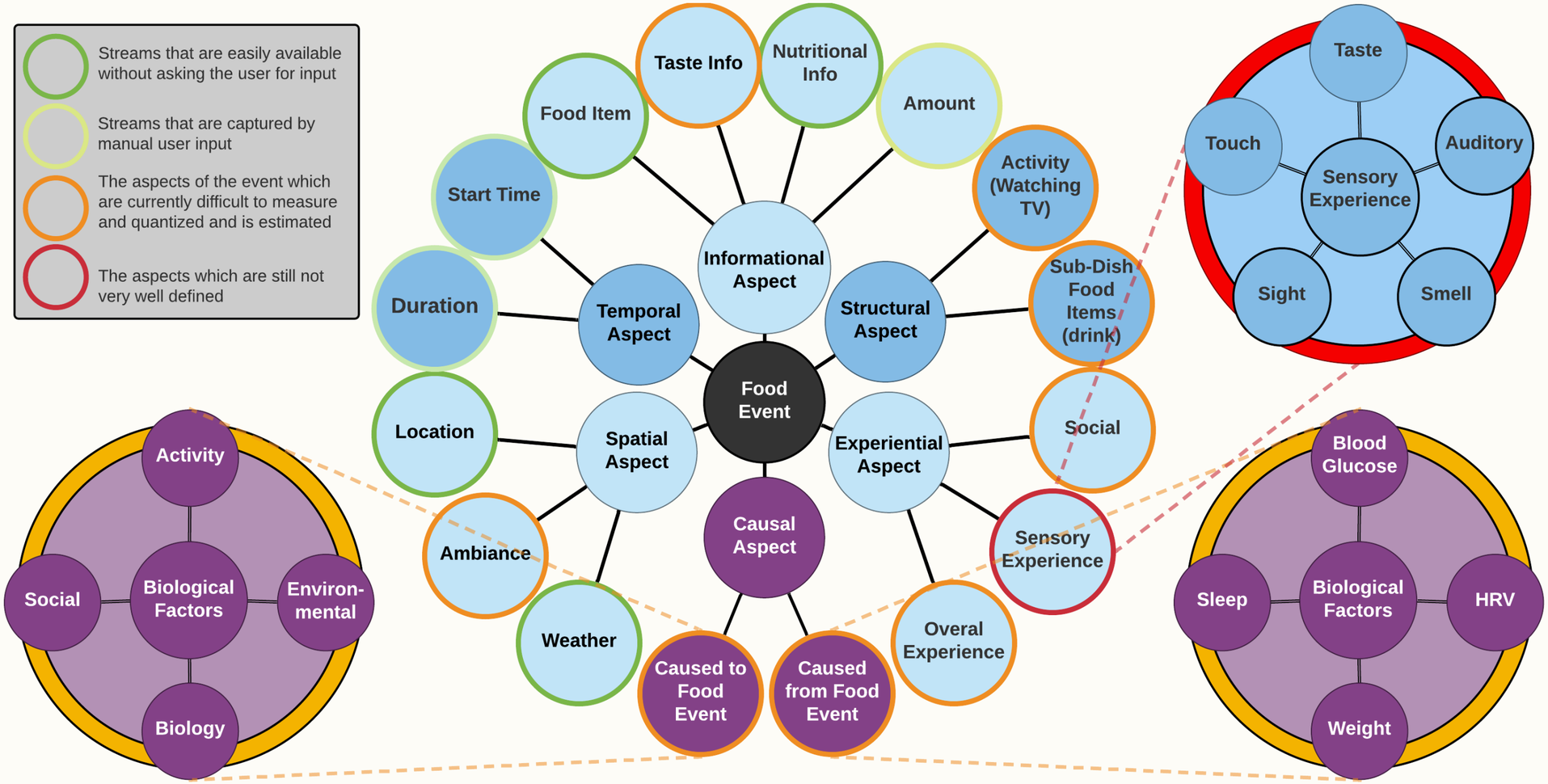
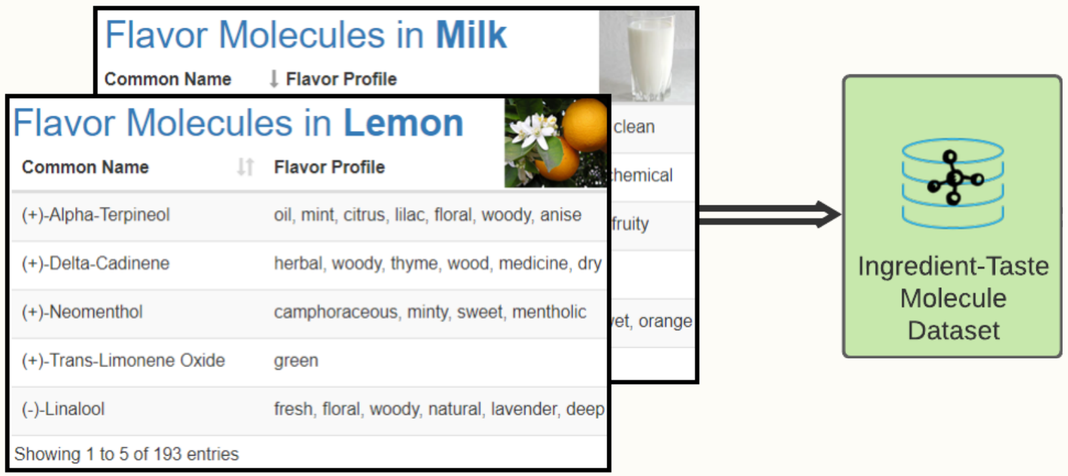


THE US4B TASTE SPACE

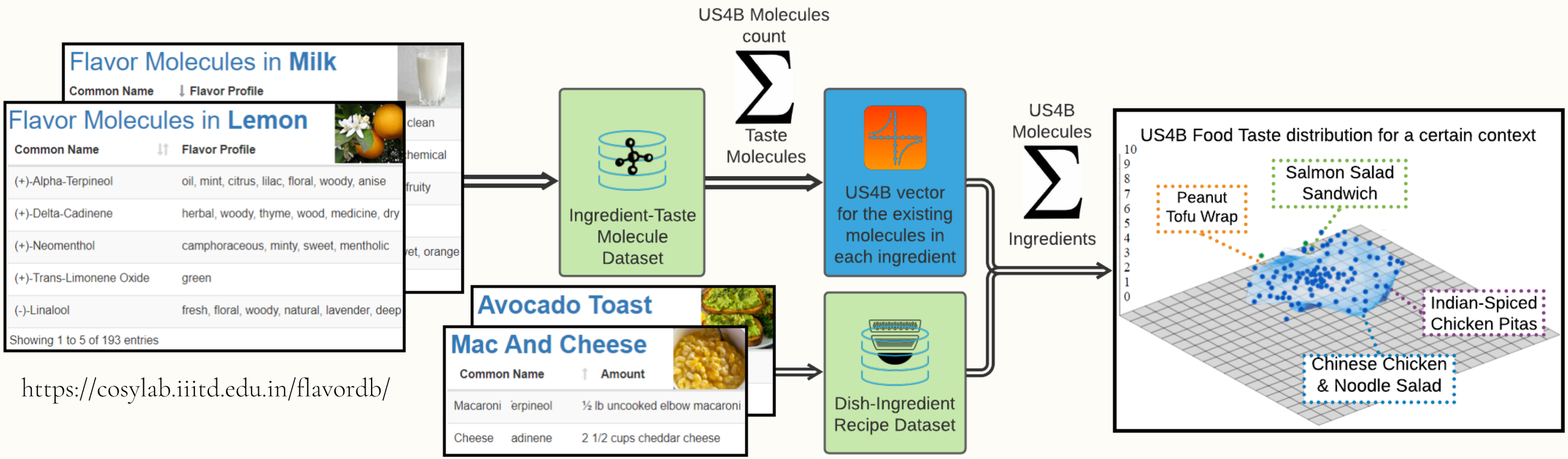
_____ from taste molecules



https://cosylab.iiitd.edu.in/flavordb/

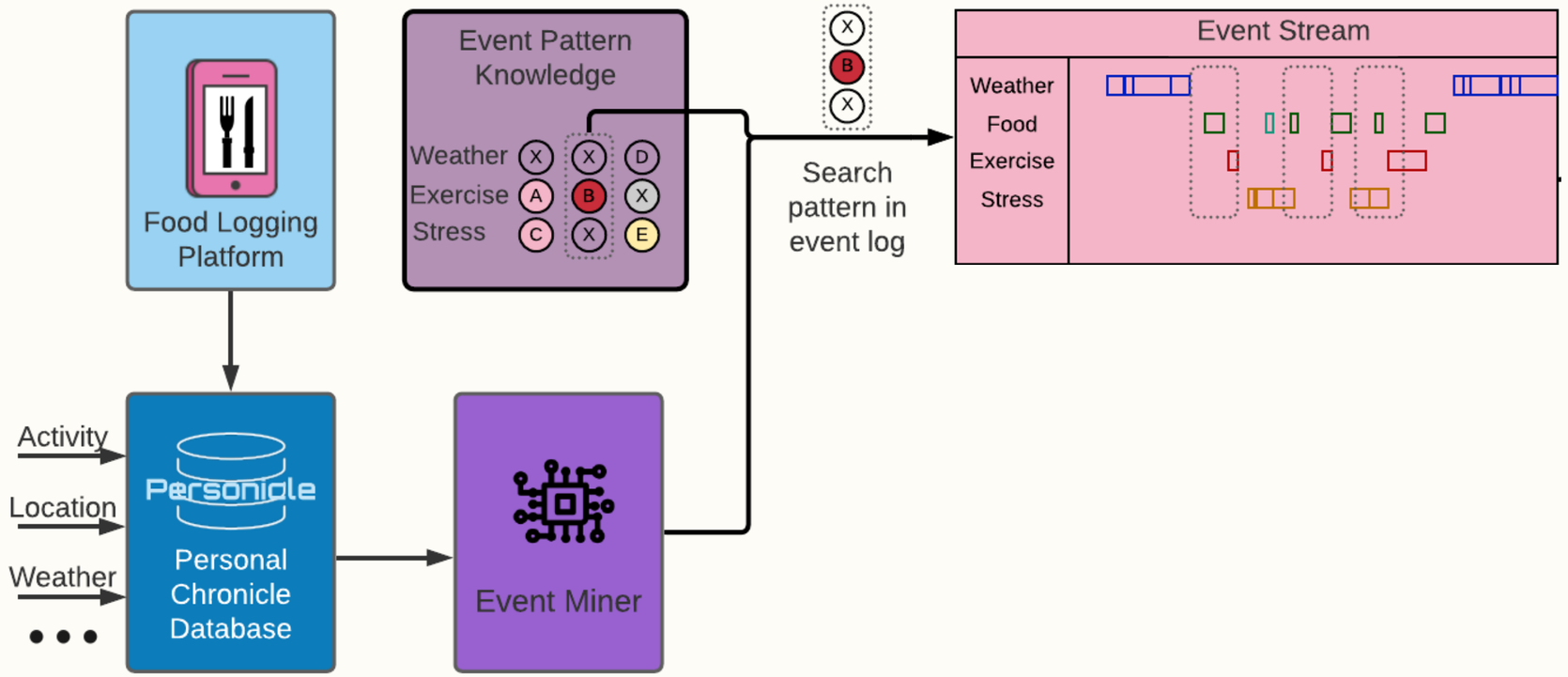
THE US4B TASTE SPACE

_____ from taste molecules



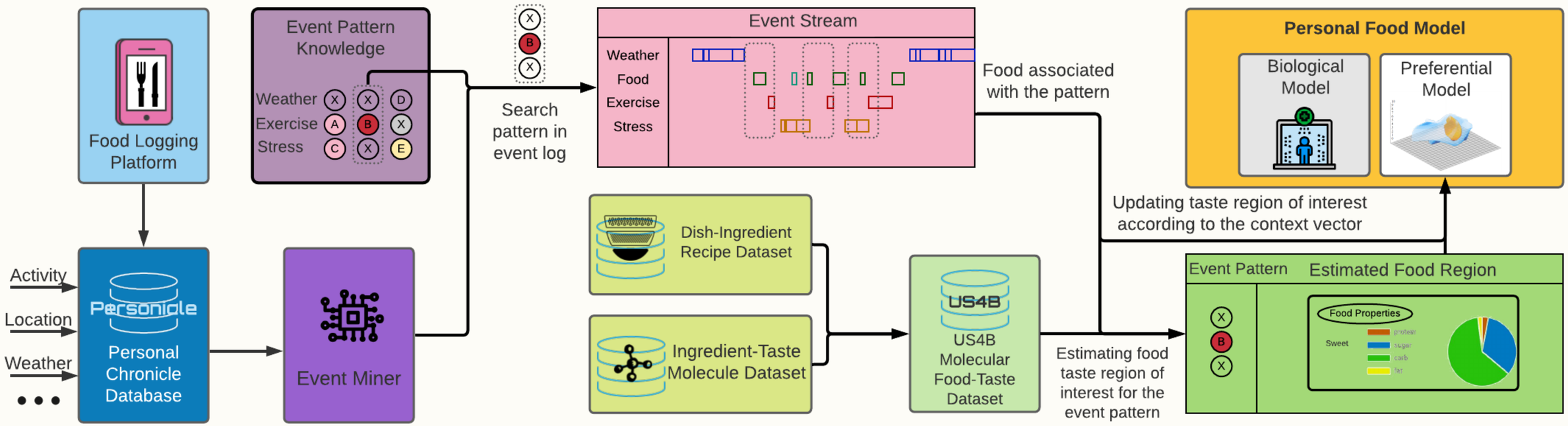
Event Mining for Food Preferences

Finding patterns in events



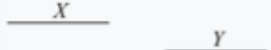
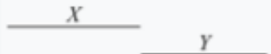
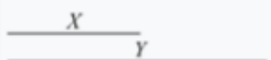
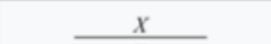
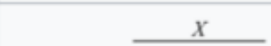
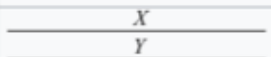
CAUSAL PREFERENTIAL MODEL

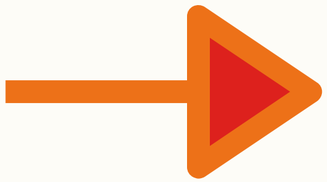
Architecture



Event Pattern Language

Specifying event patterns

Relation	Illustration	Interpretation
$X < Y$ $Y > X$		X takes place before Y
$X \mathbf{m} Y$ $Y \mathbf{mi} X$		X meets Y (*i* stands for *inverse*)
$X \mathbf{o} Y$ $Y \mathbf{oi} X$		X overlaps with Y
$X \mathbf{s} Y$ $Y \mathbf{si} X$		X starts Y
$X \mathbf{d} Y$ $Y \mathbf{di} X$		X during Y
$X \mathbf{f} Y$ $Y \mathbf{fi} X$		X finishes Y
$X = Y$		X is equal to Y



$$PollutionExposure \rightarrow DifficultyBreathing$$

$$High\ Humidity \perp SleepInterruptions$$

$$Alcohol\ \delta_{[3,4\ hrs]} SleepInterruptions$$

$$Exercise\ ::= Run \mid Walk \mid Cycling \mid Swimming$$

USING SYNTHESISED DATA

To Illustrate The Context-Aware Preferencial Personal Food Model

Ground Truth

We opted to utilize synthesized data for the experiments because we can use the ground truth of contextual factors' impact on taste to validate the model.

Resembling Live Data

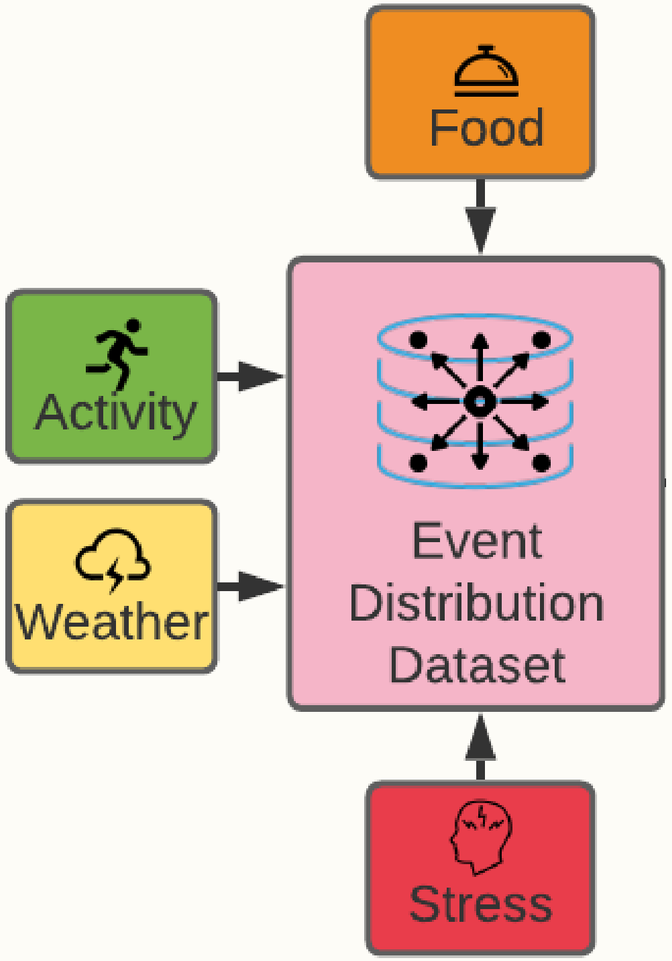
The synthesised data must somewhat resemble the original data statistically to ensure realism and keep problems engaging for data scientists.

Original Data Structure

Also, the synthesised data must formally and structurally resemble the original data so that any software written on top of it can be reused.

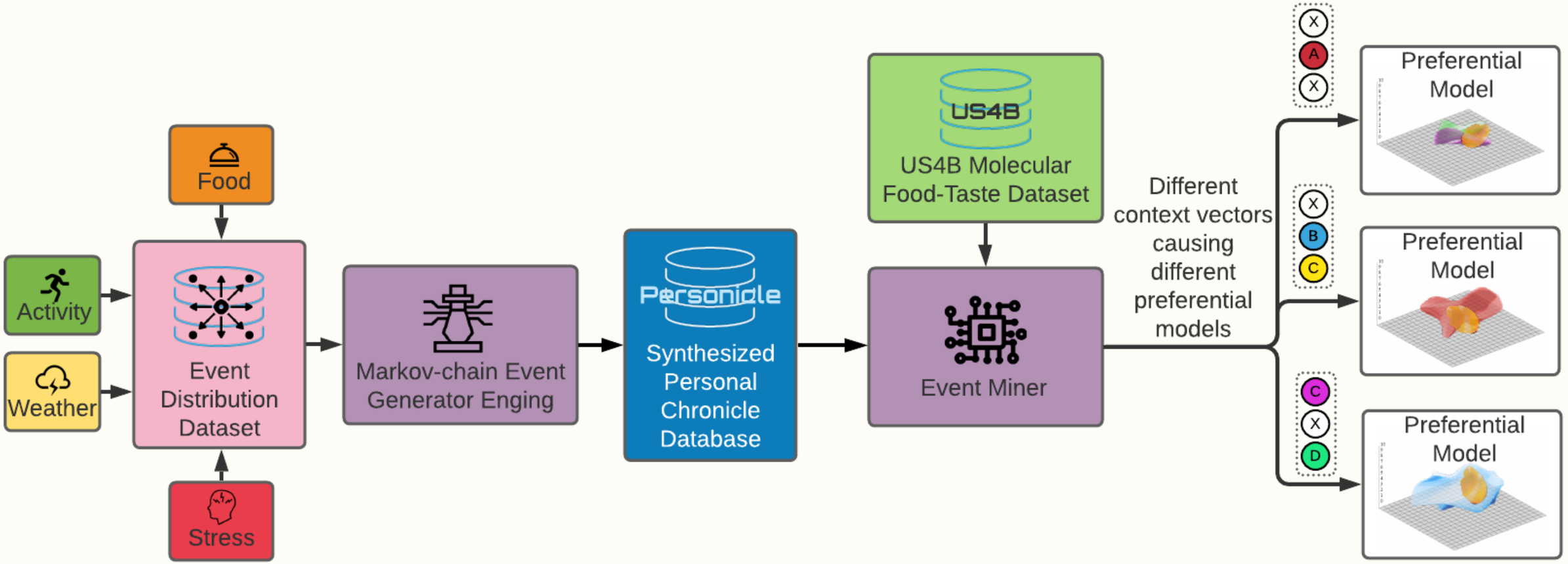
SYNTHETIC DATA GENERATION

Carefully Designed Markov-Chain Parameters set in the config file.



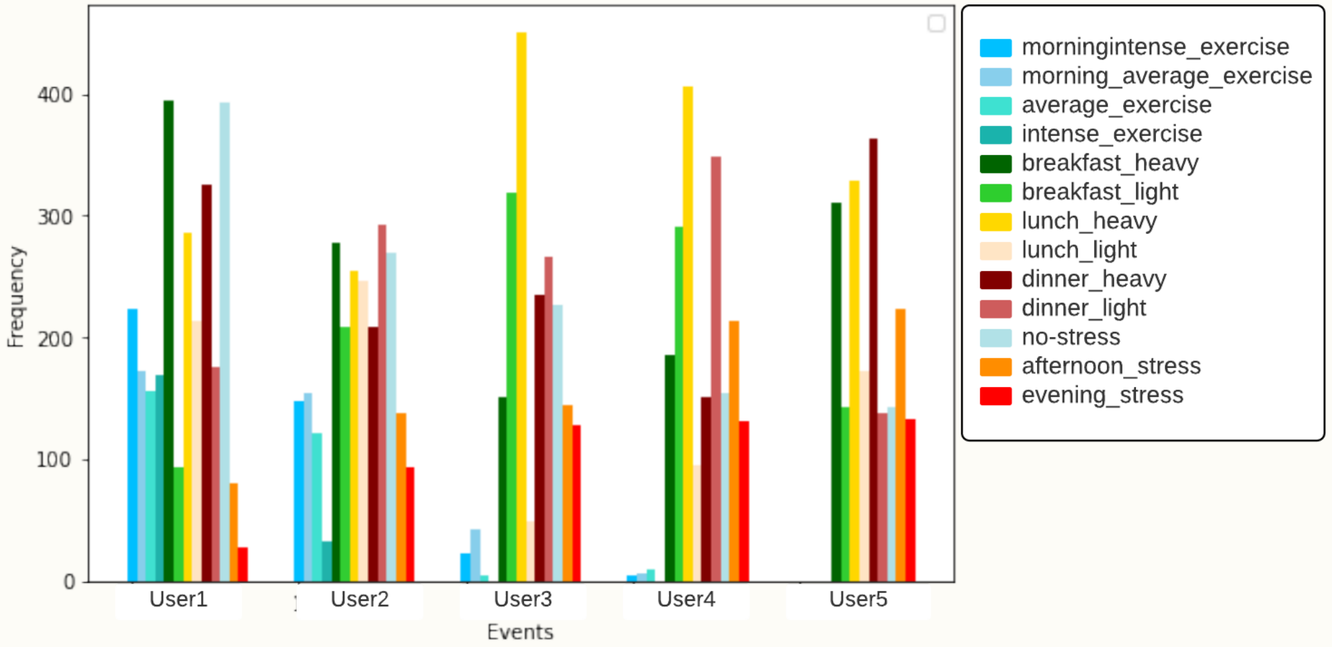
EXPERIMENTAL SETUP

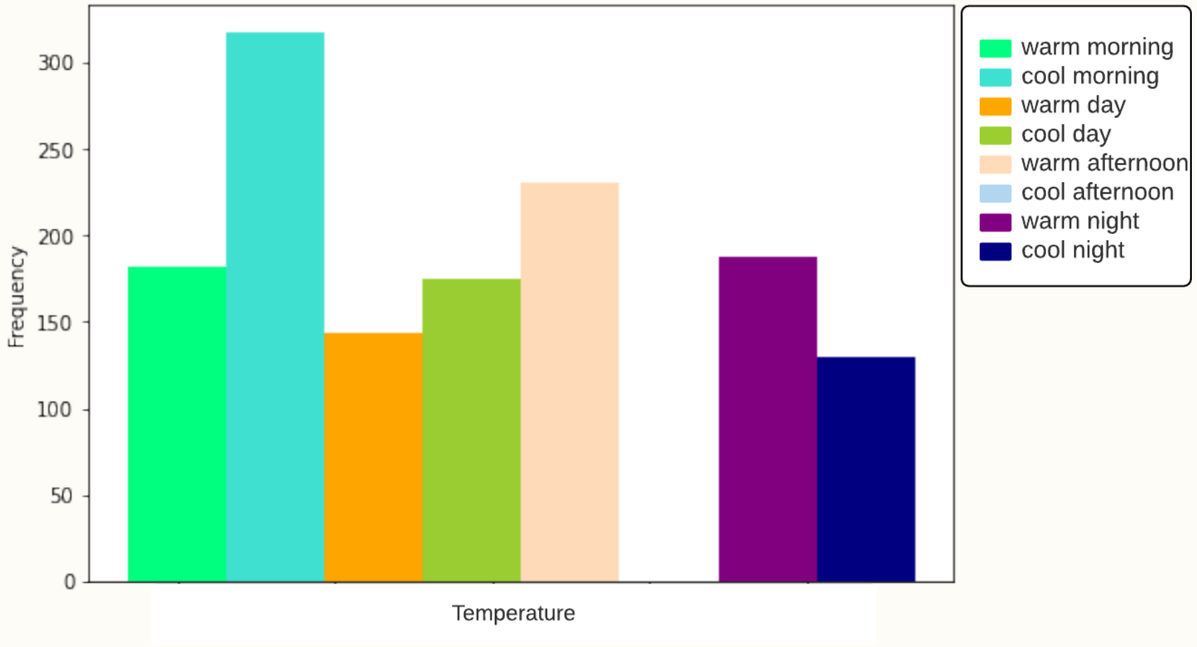
Preference Model: Contextual taste preference vector



DATA DISTRIBUTION HISTOGRAM

Synthetic data generation





EXPERIMENT

A. Contextual taste preferences

1. Identify changing taste preferences in different contextual situations
2. Demonstrate prediction improvement with contextual features

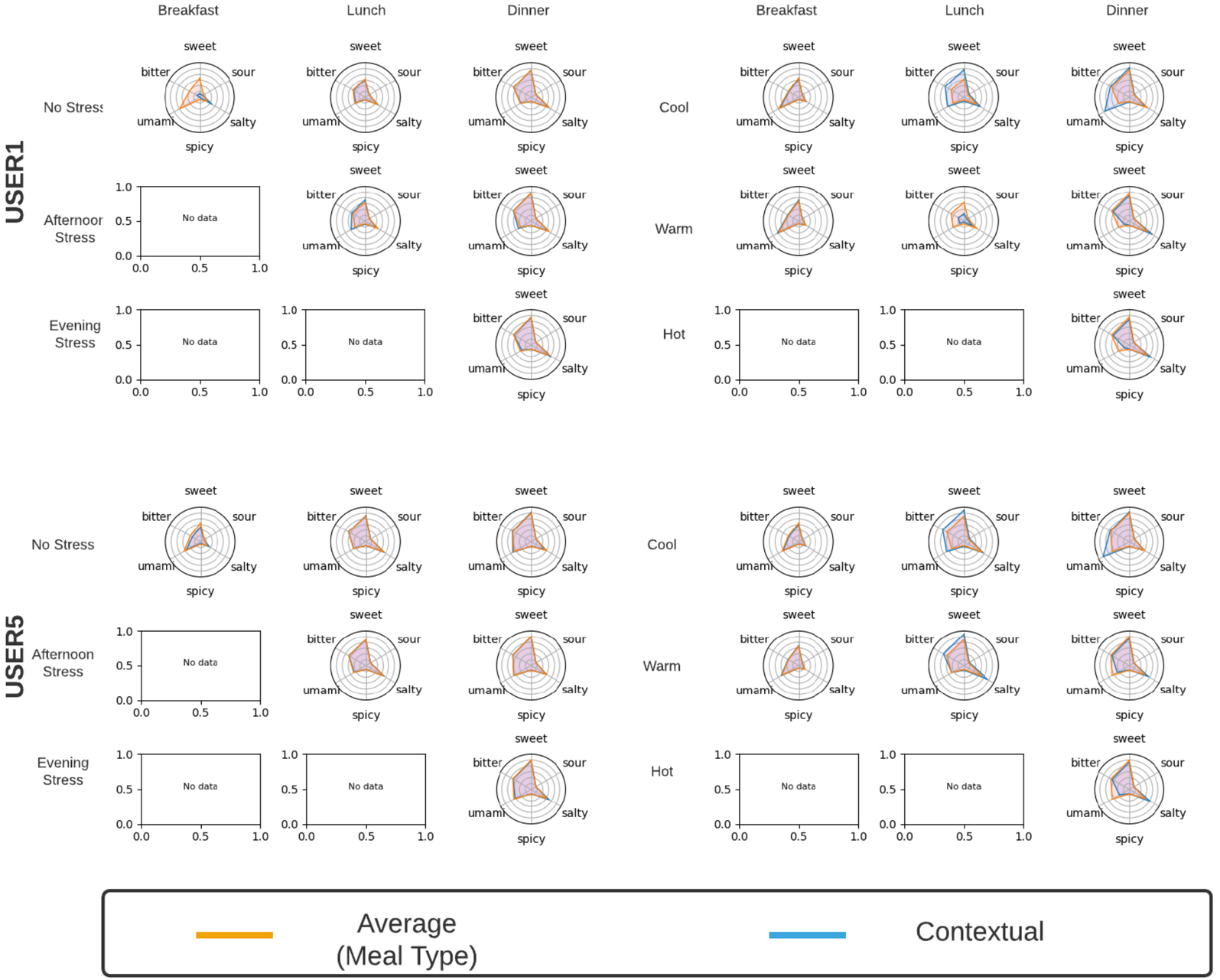
B. Longitudinal prediction model

Demonstrate improvement in contextual prediction performance over time

RESULTS

Contextual Taste Profile

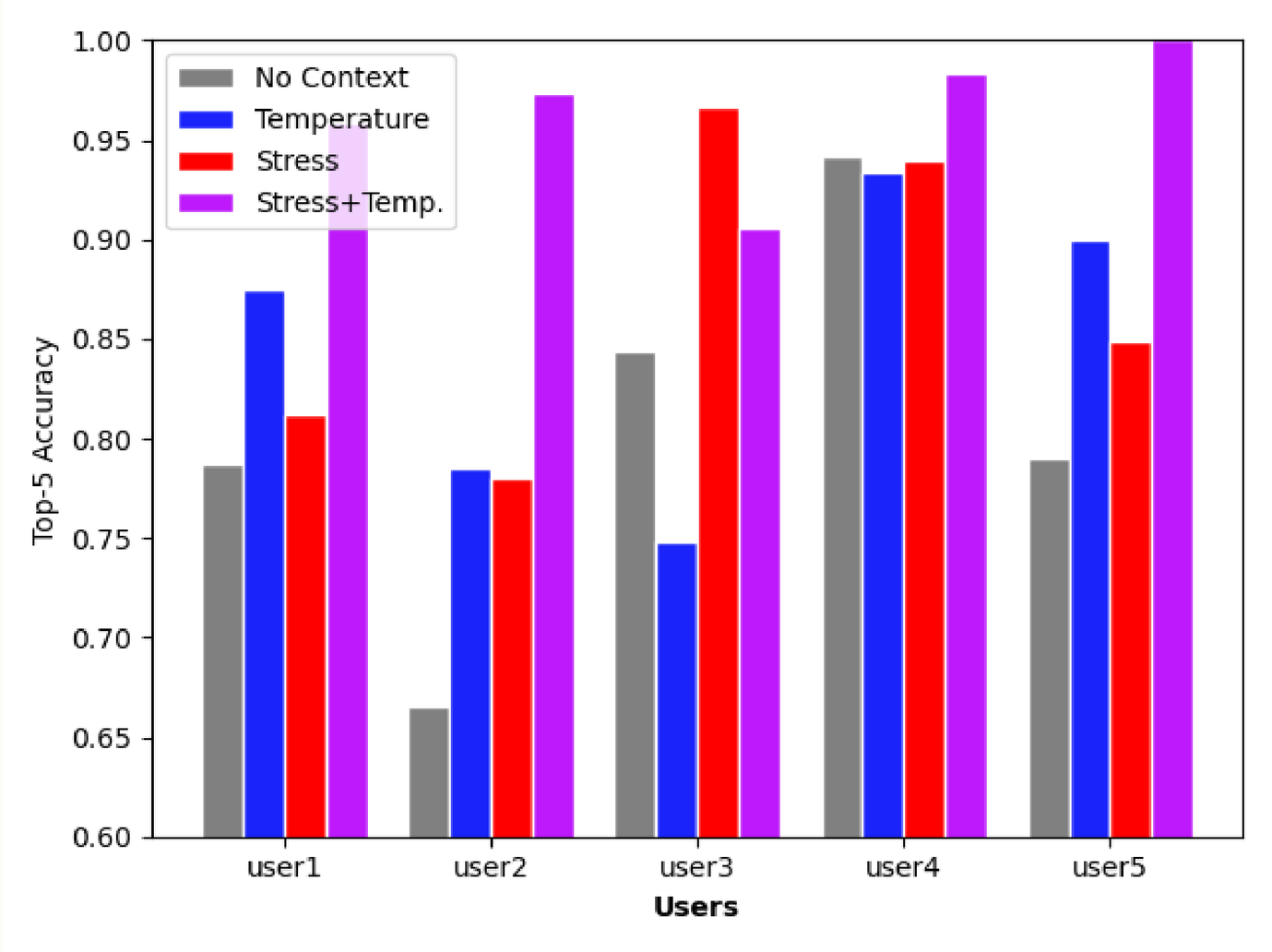
- Changing user preferences in different contexts
- Context is defined by temperature and stress in these experiments



RESULTS

Prediction: Contextual vs Average taste vectors

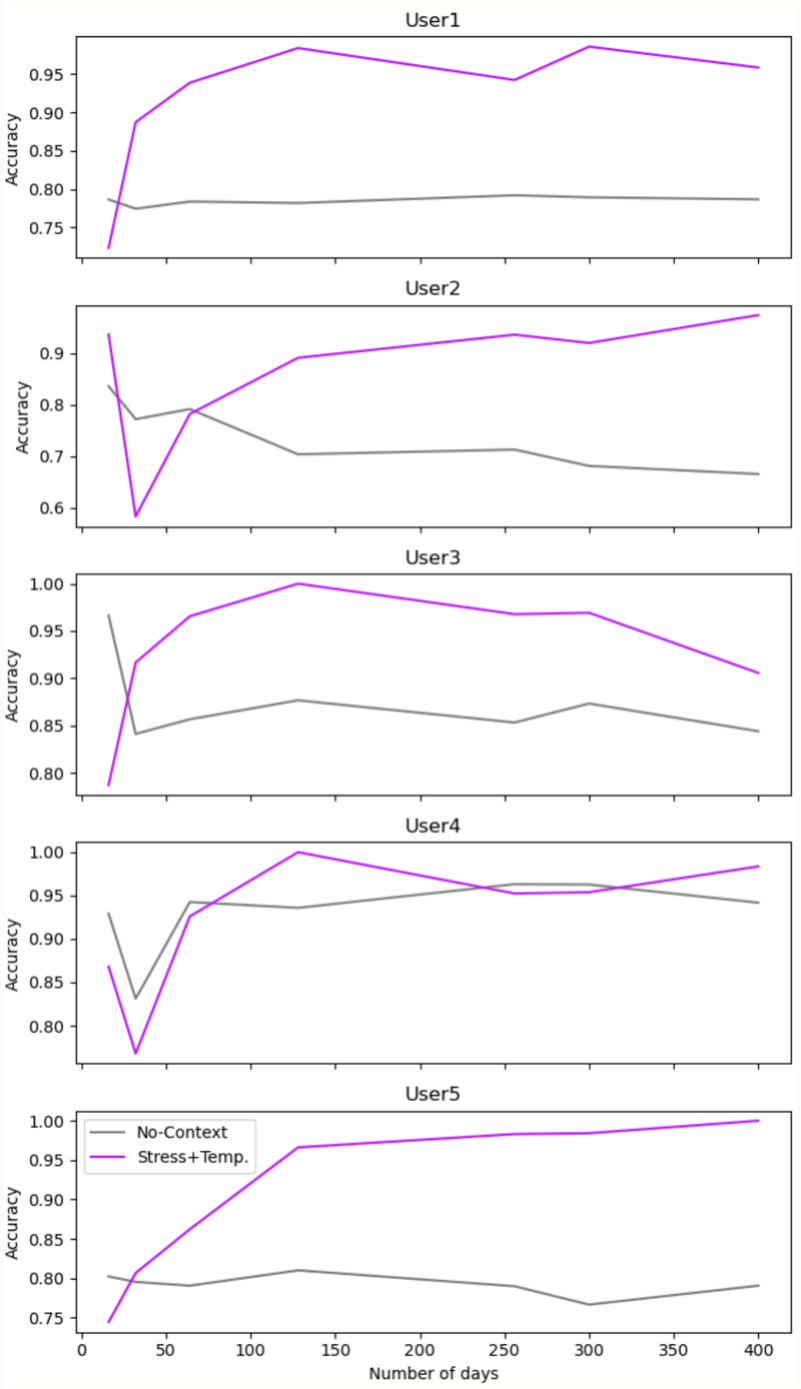
- Nearest neighbor model for predicting meal items
- Compared performance for average vs contextual vectors using top-5 accuracy metric.



RESULTS

Longitudinal Performance: Cold Start Problem

- Initially, the average models outperform the contextual models
- This can be explained by a lack of data in certain contextual situations
- After collecting sufficient data, the contextual models consistently outperform the average models



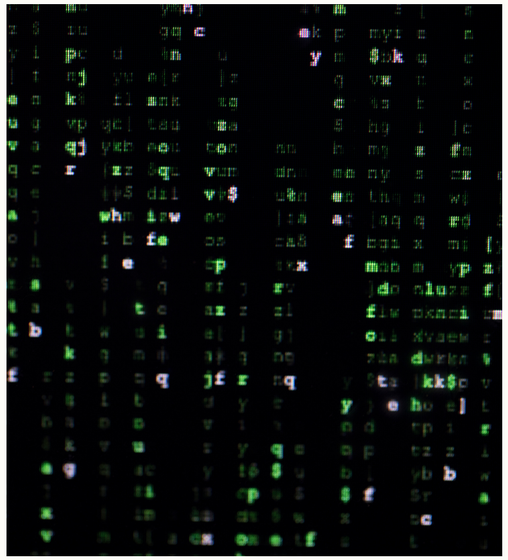
GOING FORWARD

Food Events

As discussed in the paper, many aspects of a food event is currently difficult to capture and the future research needs to fill the gap in food event capturing.

Personal Food Modeling

State of the art research in Personal Food Modeling has a lot to accomplish. Different biological and preferential factors need to be modeled in a practical manner.



Event Mining

Event mining research allows us to effectively leverage multiple data streams. Discovering behavioral patterns and identifying causal impact on our health is critical for effective health estimation and navigation.

Behavioural Change

The research community has a lot to achieve to create future contextual recommendation systems which promote effective behaviour change in our personal diet and lifestyle.

THANK YOU

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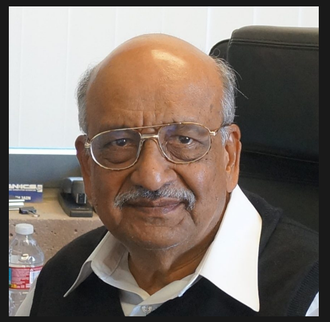

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