

# SmartEats

## Investigating the Effects of Customizable Conversational Agent in Dietary Recommendations

 Minhui Liang<sup>1</sup>, Jinping Wang<sup>2</sup>, Yuhan Luo<sup>1</sup>

<sup>1</sup> BiWell Lab, Department of Computer Science, City University of Hong Kong

<sup>2</sup> College of Journalism and Communications, University of Florida



Department of  
Computer Science  
香港城市大學  
City University of Hong Kong



College of Journalism  
and Communications  
UNIVERSITY of FLORIDA



Image from <https://www.flaticon.com/free-icons/computer>

# Personalized dietary needs matters!

In the context of daily diets, a well-balanced diet is essential, but **personalized dietary needs** should also be taken into account.

It is hard for individuals to organize personalized diets by searching on the Internet, so **dietary recommender system** can help.

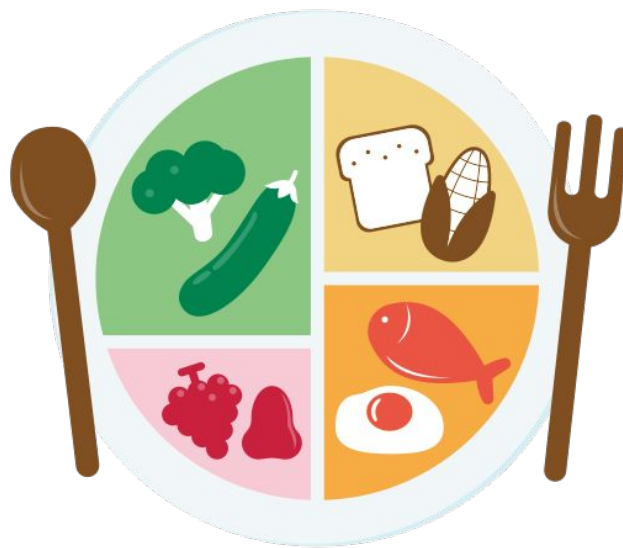


Image from <https://www.flaticon.com/free-icons/nutrition>

# Conversational Recommender system (CRS) in the era of AI

Users are no longer passive receivers of recommendations, but can **engage in multi-round conversation** to shape the recommendations.

The advancement of LLMs can facilitate efficient **user information collection** and function as **recommendation engine**.

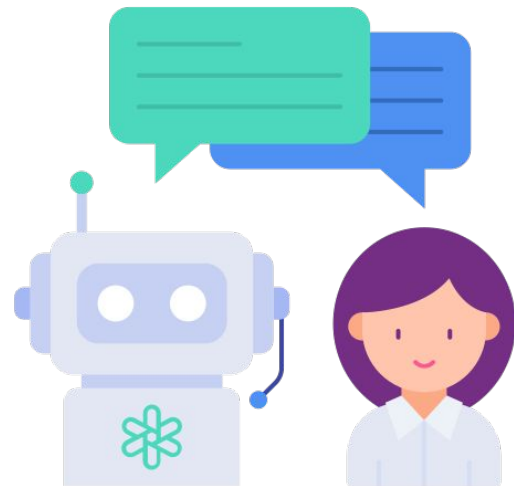


Image: <https://www.flaticon.com/free-icons/ai-application>

**How would individuals perceive the conversation experience and recommendation quality?**

# How to improve user experience in CRS?

User experience and recommendation perception can be largely shaped by agent's **conversational style** and the **personality** it exhibits.

However, it is challenging to design a **one-size-fit-all solution** to meet everyone's preferences.

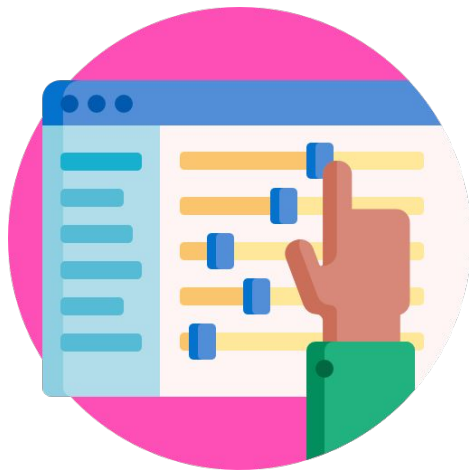


Image: <https://www.flaticon.com/free-icons/customization>

**How about letting users customize their own agent?**

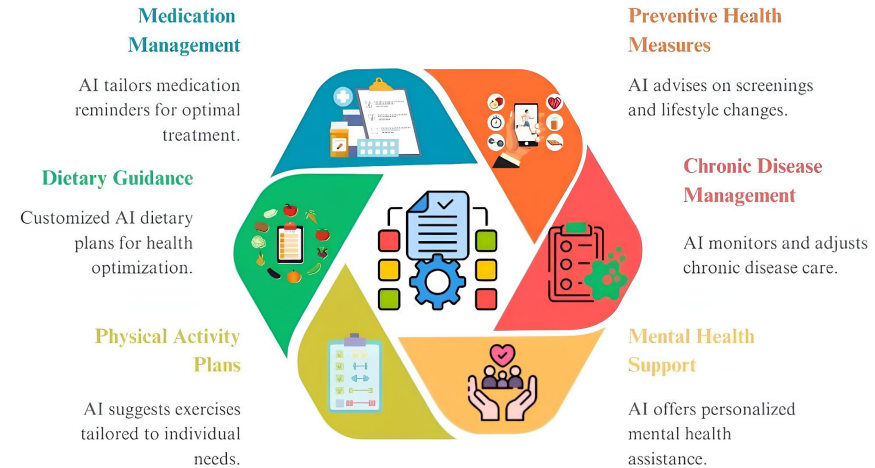
# Research Questions

**RQ1:** Whether and how does the **customizability** of the conversational agent (CA) affect individuals' **conversation experience** and **their perception of the recommendations**?

# In recommendations for health, the benefits entails more

For health promotion purpose, the recommendation quality is not just a single click of “like” or “dislike.”

But how users perceive and follow the recommendations in **real-life settings**.



# Research Questions

**RQ2:** How do individuals' **interactions with the CRS** influence their **recall of and adherence to the recommendations**, and whether these influences are related to the **customizability** of the CA?

# SmartEats: a CRS incorporating a customizable CA

I want the personality of the chatbot as a nutrition expert to be:

extroverted

introverted

I want the chatbot to speak:

casually

formally

Add additional characteristics you would like the chatbot to be. This can be anything, including:

- Specialized nutrition expertise or training background
- Tones or use of words
- Role play a specific person
- Cultural backgrounds
- ...

It is not necessary to follow the above hints. You are encouraged to be creative in terms of an idealized chatbot for your dietary recommendation. Please limit your description to 30 words (optional)

*I am a fitness and running enthusiast with nutrition expertise.*



Hey there! I'm SmartEats, here to give you personalized dietary recommendations that fit your needs. I have an extroverted personality, which helps me connect with you while keeping things clear and straightforward. As a fitness and running enthusiast, I love sharing what I know about healthy eating.

To begin, I might ask: "What's your healthy eating goal?" This helps me give you the best advice!

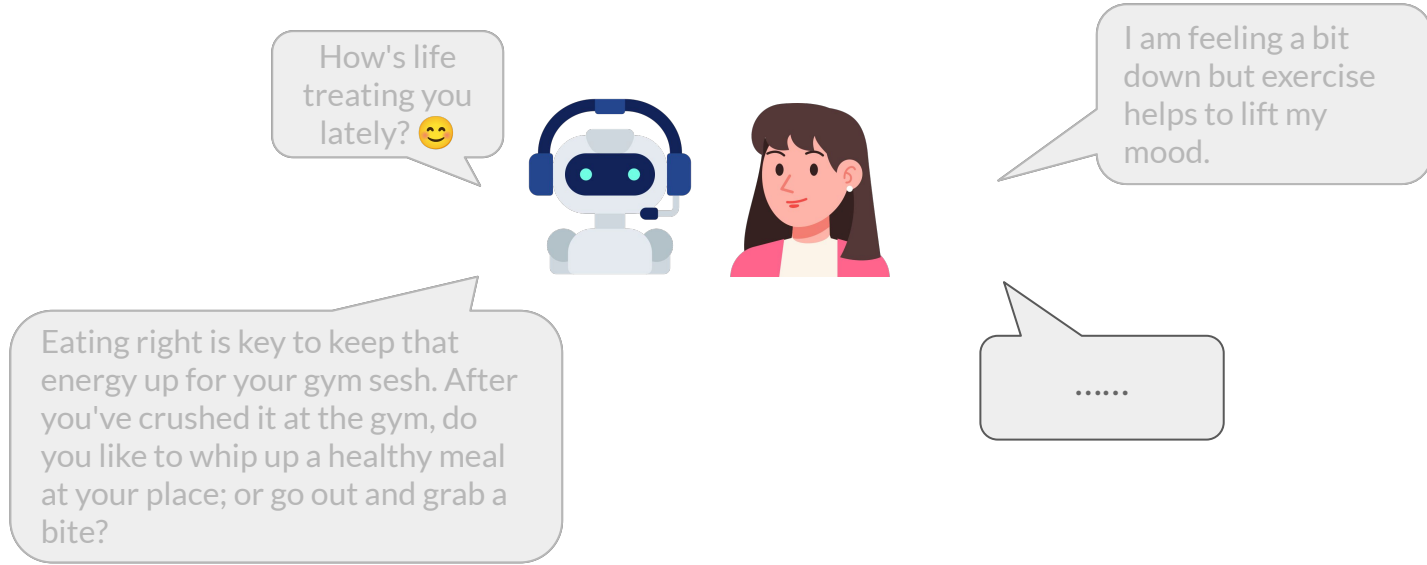
If you're happy with how I'm communicating, just press "Next" to continue. If you want to change the settings, click "Reset". Let's work together on your nutrition journey!

Reset

Next



# SmartEats: a CRS incorporating a customizable CA



# SmartEats: a CRS incorporating a customizable CA



[dish name]  
[explanations]



[dish name]  
[explanations]

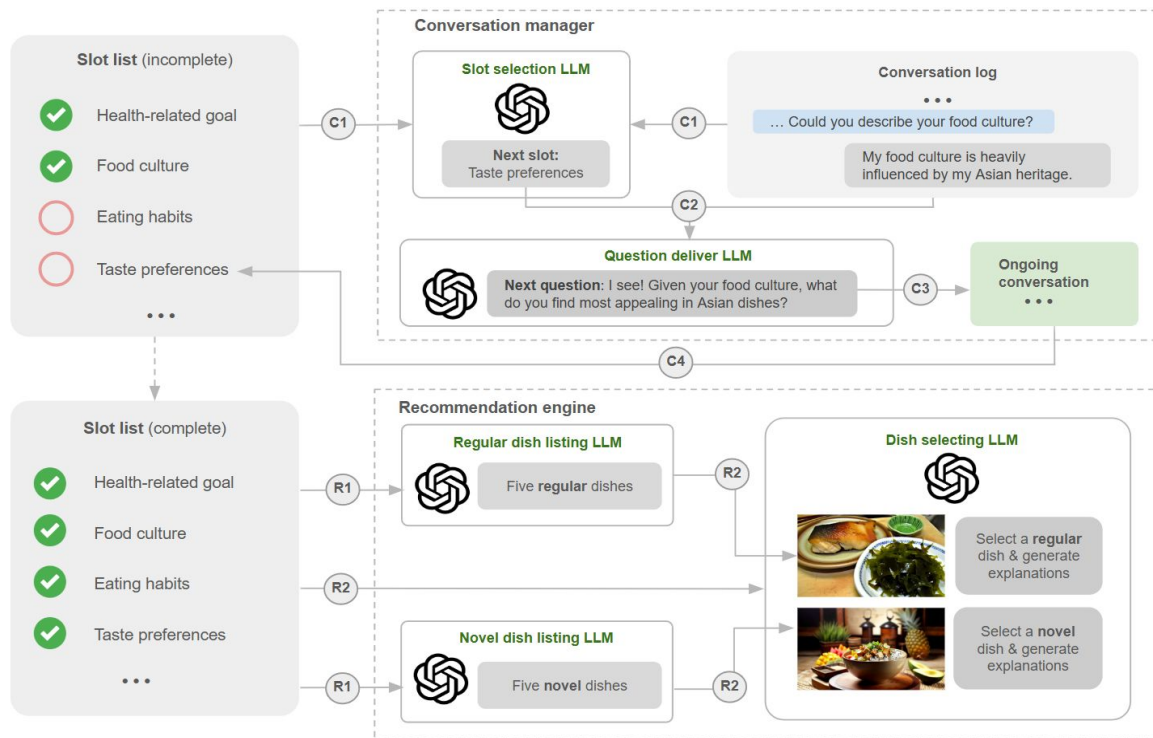
Would you like to try any of the dishes?



I prefer the second one.

For physical fitness, including lean proteins like chicken and fish, along with plenty of vegetables and whole grains will support muscle repair and provide sustained energy.  
**Keywords: lean protein, high fiber, portion control.**

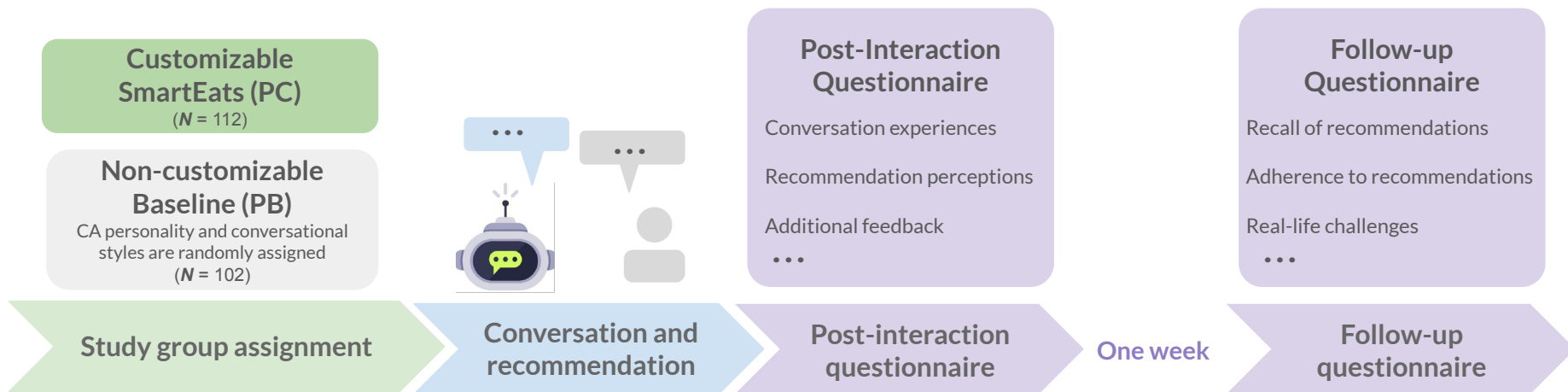
# Multi-LLM workflow of SmartEats:



Check out our poster: [Exploring Multi-LLM Collaboration to Power Conversational Recommender System: A Case Study of Dietary Recommendation](#), CUI'25 short paper for more information.

# User study:

## A two stage, between-subjects study ( $N = 214$ )



# Findings

# RQ1: Customization settings

Participants prefer the CA to be **the same personality as themselves**, especially for those who are **extroverted**. Most participants prefer the CA to talk in a **casual style**.

**Over half** participants customized **additional characteristics** of the CA, mainly covering three aspects:

## Specialized expertise

*I am a nutrition and personal fitness expert. I have specialty expertise around improving flexibility and balance as well as strength and conditioning.*  
(PC-18)



## Persona traits

*I am (a) female. I am (a) South East Asian. I am kind and encouraging. I am a good motivator.*  
(PC-85)



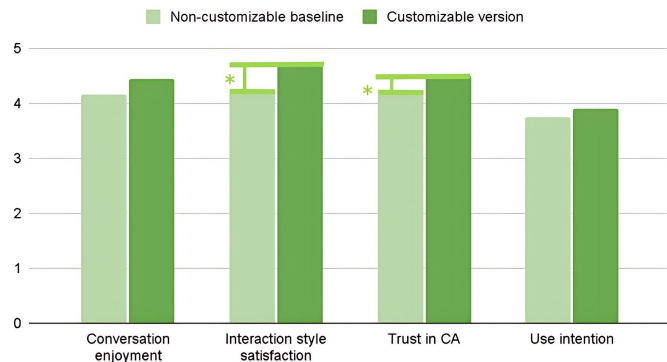
## Information delivery

*I will use simple language for explaining nutrition.*  
(PC-32)



# RQ1: Customization effect on conversation experience

Participants' conversation experience



*Do you eat at set times, or just when you're hungry?*

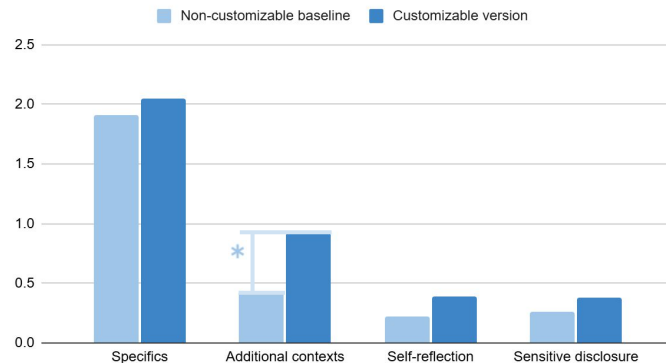
Non-customizable group

*Mostly set times. (PB-17)*

Customizable group

*I usually eat when I am hungry, and it also depends on my family members and their schedules. Sometimes I am hungry but can't eat and I can't always choose what I want. (PC-7)*

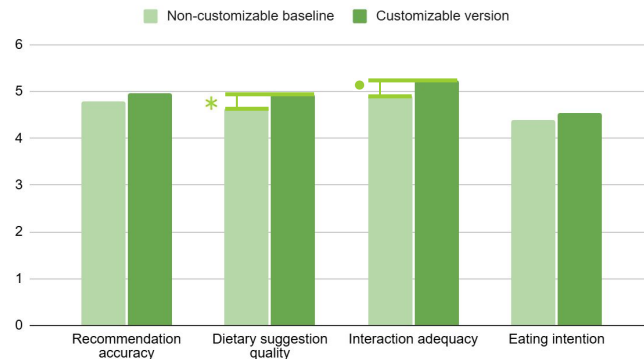
Participants' conversation engagement



# RQ1: Customization effect on recommendation perceptions

- Both groups achieve a **recommendation acceptance rate** of over **97%**, and **88%** of them directly accept the recommendation at the **first round**.
- Participants in the **customizable group** reported significantly higher **dietary suggestion quality** and marginally significant **interaction adequacy** in the CA.

Participants' recommendation perceptions



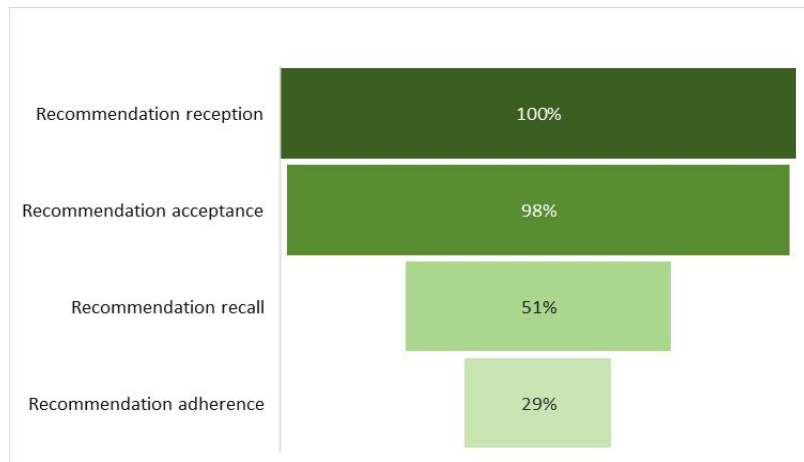
*(The CA) was clear and really understand my lifestyle choices. (PC-94)*

*I like how it would consider my messages from throughout the chat, and my location, in providing me with a recommendation. (PC-105)*



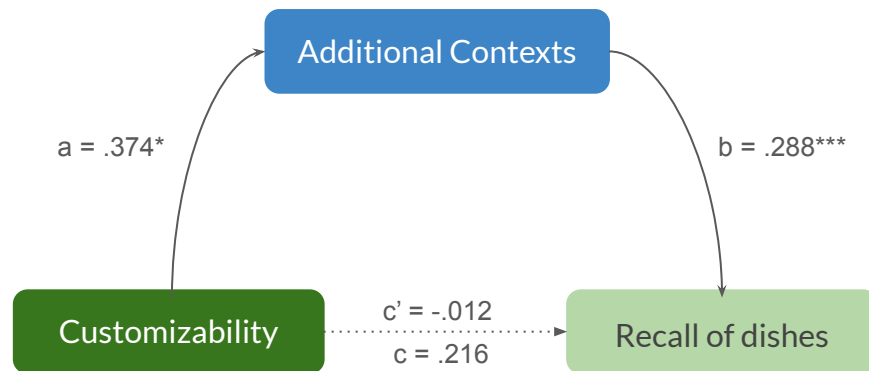
## RQ2: Customization effect on recall and adherence

The customizable group: significantly higher **dietary suggestion quality**.  
Recommendation acceptance is great, but the **intention-action gap** is huge.



### Implications

Granting flexible space for agent customizability to improve user engagement, which enhances their real-life memories.



## RQ2: Effects of interaction factors on recall and adherence

- Participants who provided **more additional context** were more likely to **recall the recommended dishes**.
- Participants who provided **more sensitive information** or reported **higher eating intention** were more likely to **adhere to recommendations**.



*How is everything going with you lately?*

Non-customizable group

*Good. (PB-3)*



Customizable group

*Not so good. I realized I was having some premature ejaculation during sexual intercourse. Could that be related to my diet? (PC-33)*



### Implications

Fostering motivation building to fill the intention-action gap.

## Future work:

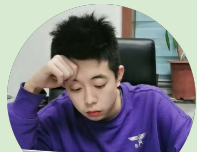
- Integrating physical data through wearable devices to support more **tailored recommendations** and **long-term dietary plan recommendations**.
- Extending the CRS design to other health support contexts, such as **fitness coaching** and **stress coping recommendation**.



Image: <https://www.flaticon.com/free-icons/idea>

# Thank You!

## Authors



Actively seeking  
intern/visiting  
opportunities

**Minhui Liang\***

PhD Student



**Jinping Wang\*\***

Assistant Professor



**Yuhan Luo\***

Assistant Professor

\*Department of Computer Science, City University of Hong Kong \*\*College of Journalism and Communications, University of Florida

## Acknowledgement

This research was supported by City University of Hong Kong (# 9610597 & #9220150).