

Summary and Future Works

Summary

- ❑ Propose a unified framework for food recommendation
- ❑ Explore GCN-based feature extraction and AP-oriented optimization solution for food retrieval

Retrieval & recommendation

Multimodal recipe analysis

- ❑ Explore multi-modal recipes with various attributes to enable various food computing tasks
- ❑ Release several multimodal recipe datasets, such as Yummly-28K, Yummly-66K

- ❑ Develop an ingredient-guided cascaded attention network
- ❑ The first time to propose the few-shot food recognition method
- ❑ Contribute several food recognition datasets, such as Geolocation-food, ISIA Food-200/500

Food recognition

Cooking action understanding

- ❑ The first to introduce both intuition and analysis to imitate humans for egocentric action anticipation
- ❑ Propose one Intuition-Analysis Integrated (IAI) framework

Food computing

- ❑ Systematically proposed one food computing framework
- ❑ Contribute a new taxonomy of food computing

Future Works

→ Large-scale food recognition benchmark dataset

→ Multimodal food knowledge graph

→ Multi-sensor information fusion for food analysis

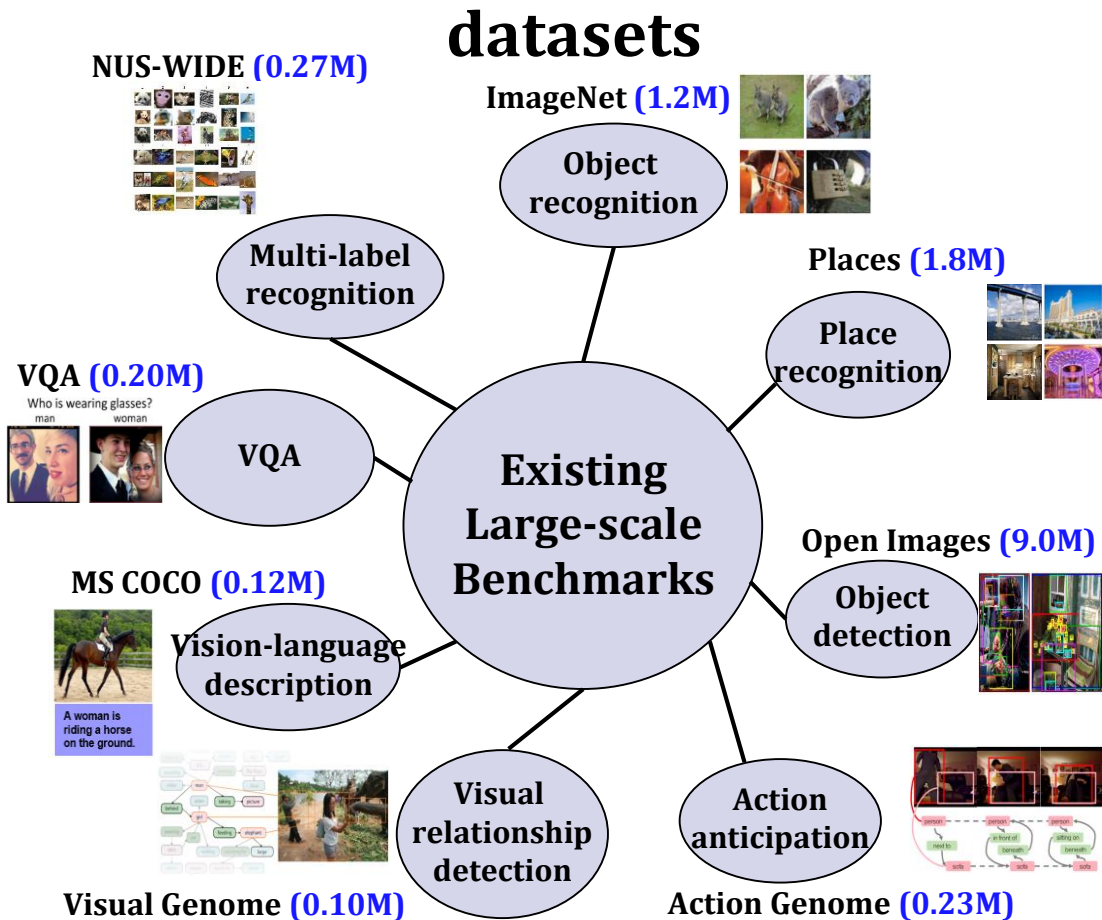
→ Multimodal food analysis for health management

→ Towards robot chef via cooking video understanding

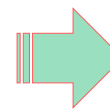
Large-scale food recognition benchmark dataset

Many recent advancements are attributed to released large-scale datasets

A large-scale ontology of ImageNet-level food images is also a critical resource to enable advanced food computing tasks



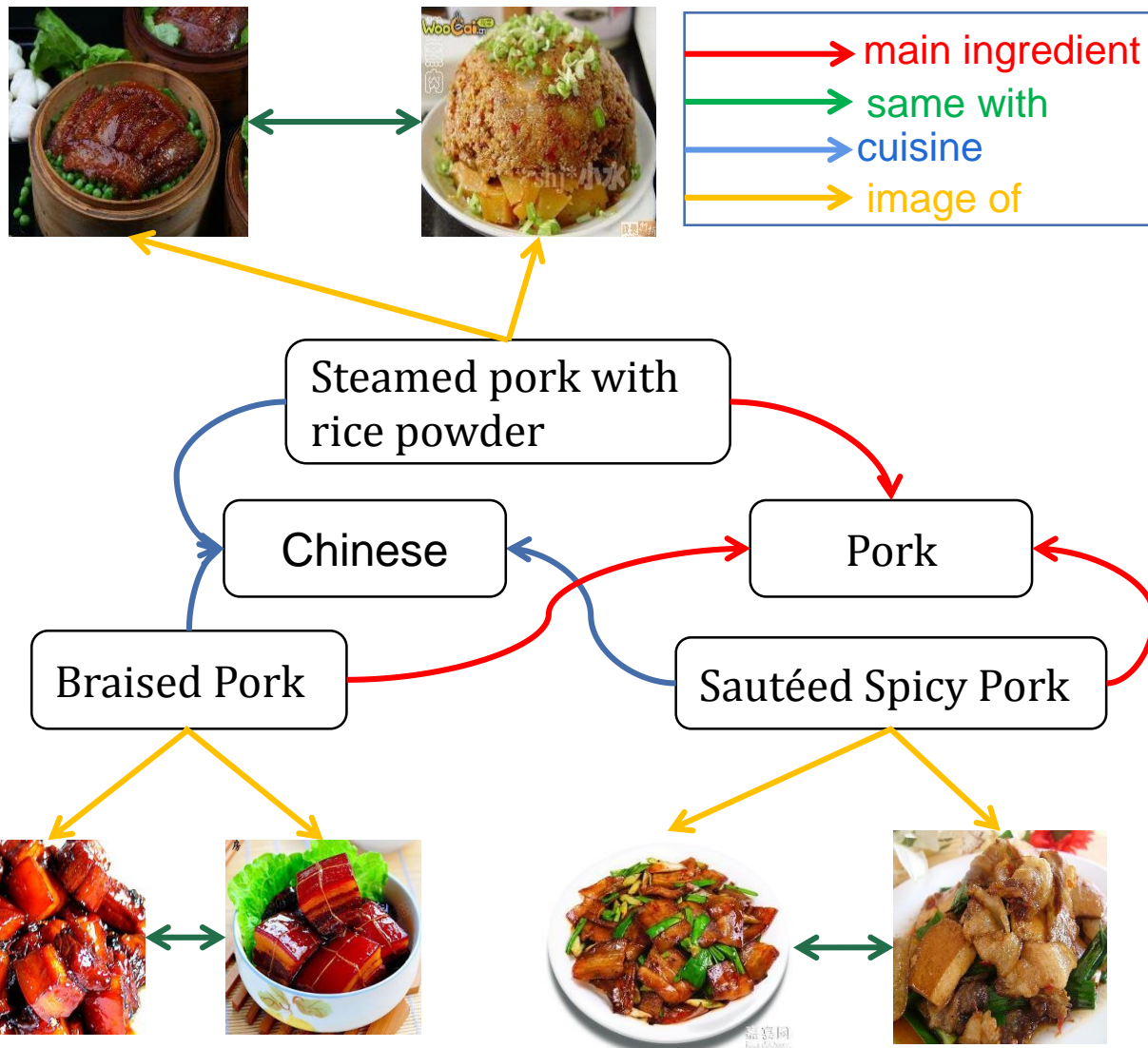
Food-500



Food-2000
(2,000 classes
>1million)

(In progress)

Multimodal food knowledge graph



Applications

- Semantic/Visual food search
- Multimodal food QA and dialogue
- Food recommendation
- Food analysis and visualization
- Visual food recognition
-

Multi-sensor information fusion for food analysis

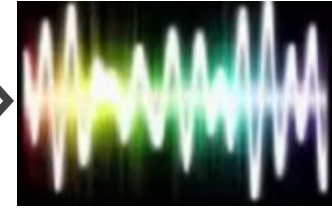


Visual

Ingredients

"1 cup ketchup",
"1 tablespoon Worcestershire
sauce", "2 teaspoons chili
powder",__

Text



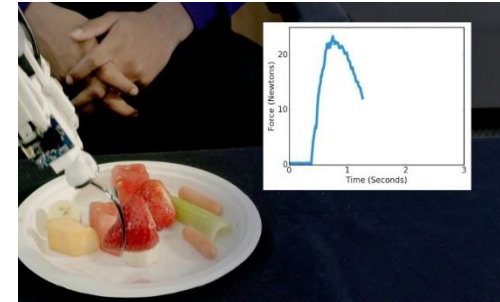
Auditory



Odor



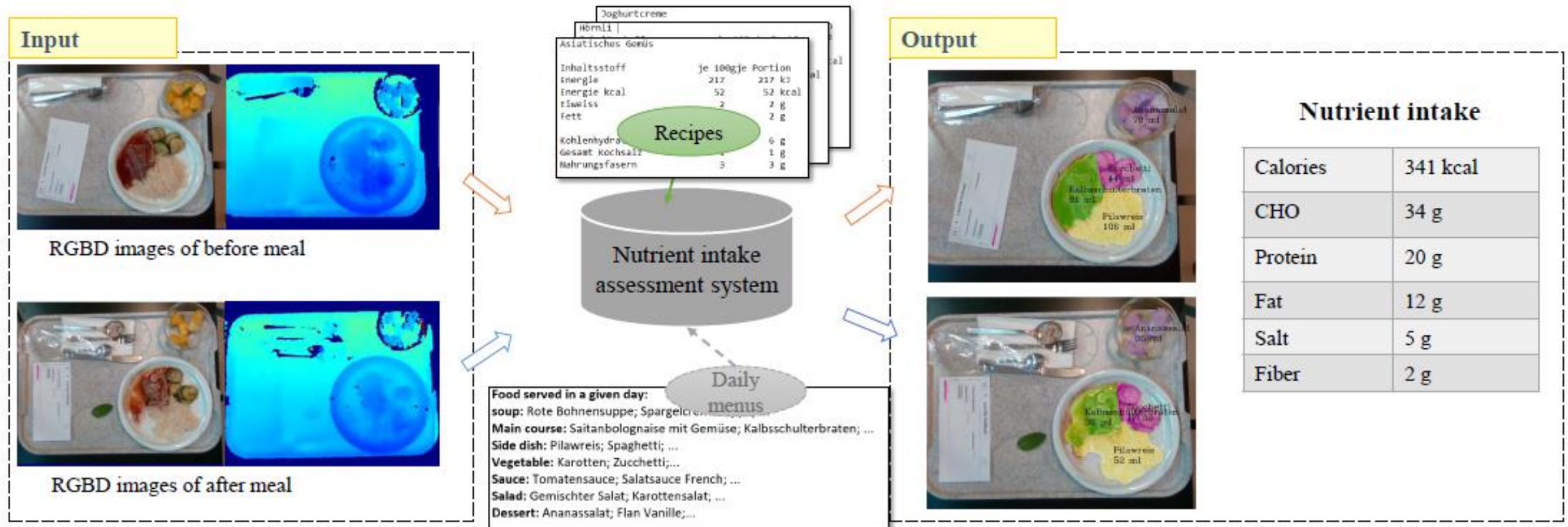
Taste/ Flavor



Haptics

- ❑ Some modalities such as Odor are harder to quantify
- ❑ Multi-modal fusion with different data statistics is difficult

Multimodal food analysis for health management



+ Food Knowledge graph

+

Towards robot chef via cooking video understanding

Start time: 00:21 00:54 01:06 01:56 02:41 03:08 03:16 03:25
End time: 00:51 01:03 01:54 02:40 03:00 03:15 03:25 03:28

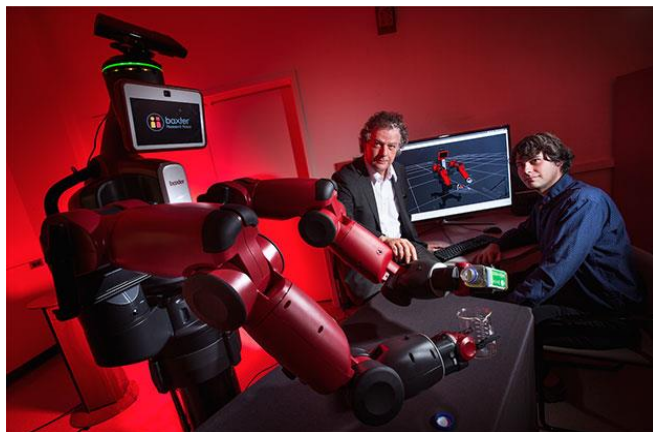


cooking videos

Introducing more food-relevant information from cooking domain, such as ingredients and food attributes will be useful



spread it over the bread.



Cooking video-oriented
Action localization
Action recognition
Action anticipation
.....



Robots Learning to Cook by Watching YouTube Videos (AAAI2015)

Future Works

Reimagine Food

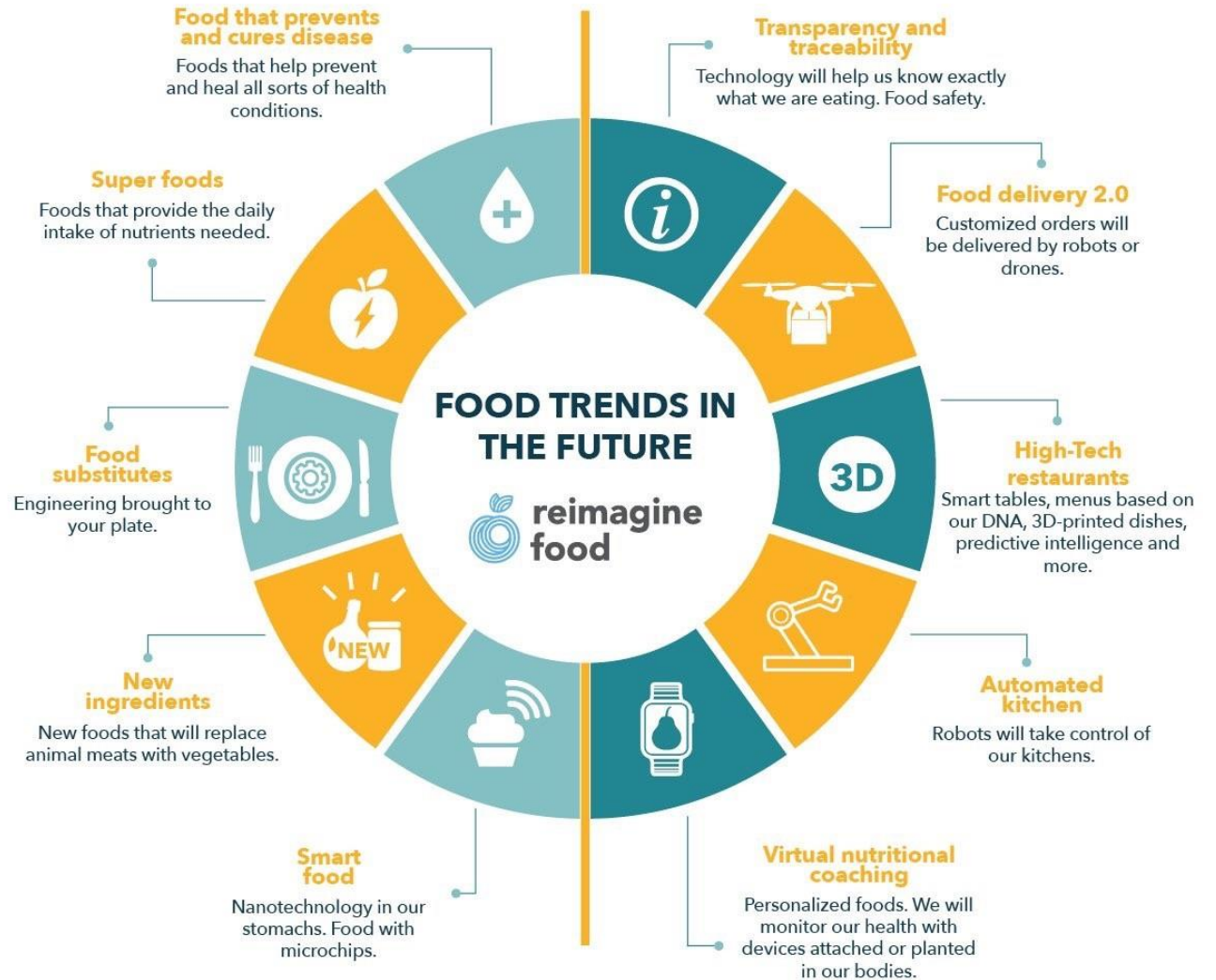
the world's first disruption center focusing on anticipating the future of food



CEO Marius Robles

WHAT WILL WE EAT IN THE FUTURE?

HOW WILL WE EAT IN THE FUTURE?



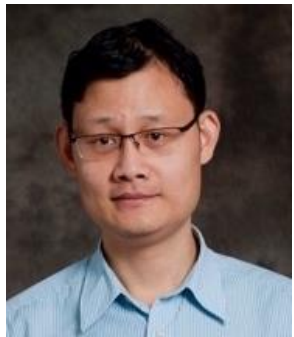
Reference

1. Weiqing Min, Shuqiang Jiang, Linhu Liu, Yong Rui and Ramesh Jain. A Survey on Food Computing. ACM Computing Surveys (CSUR) 52(2): 92:1–92:36, 2019
2. Shuqiang Jiang, Weiqing Min, Yongqiang Lyu, Linhu Liu. Few-Shot Food Recognition via Multi-View Representation Learning. ACM Trans. on Multimedia Computing, Communications, and Applications, 16, 3, Article 87, 20 pages (2020)
3. Weiqing Min, Shuqiang Jiang, Ramesh C. Jain. Food Recommendation: Framework, Existing Solutions and Challenges. IEEE Trans. on Multimedia, vol. 22, no. 10, pp. 2659-2671, 2020.
4. Weiqing Min, Bing-Kun Bao, Shuhuan Mei, Yaohui Zhu, Yong Rui, Shuqiang Jiang. You Are What You Eat: Exploring Multi-modal and Multi-attribute Information from Recipes for Cross-Region Food Analysis. IEEE Trans. on Multimedia 20(4):950-964 (2018)
5. Weiqing Min, Shuqiang Jiang, Jitao Sang, Huayang Wang, Xinda Liu, Luis Herranz. Being a Super Cook: Joint Food Attributes and Multi-Modal Content Modeling for Recipe Retrieval and Exploration. IEEE Trans. on Multimedia 19(5): 1100-1113 (2017)
6. Luis Herranz, Shuqiang Jiang, Ruihan Xu. Modeling Restaurant Context for Food Recognition. IEEE Trans. Multimedia 19(2): 430-440 (2017)

Reference

7. Ruihan Xu, Luis Herranz, Shuqiang Jiang, Shuang Wang, Xinhang Song, Ramesh Jain. Geolocalized Modeling for Dish Recognition. IEEE Trans. Multimedia 17(8): 1187-1199 (2015)
8. Shuqiang Jiang, Weiqing Min, Linhu Liu, Zhengdong Luo. Multi-Scale Multi-View Deep Feature Aggregation for Food Recognition. IEEE Trans. on Image Processing 29(1): 265-276, 2020
9. Weiqing Min, Linhu Liu, Zhiling Wang, Zhengdong Luo, Xiaoming Wei, Xiaolin Wei, Shuqiang Jiang. ISIA Food-500: A Dataset for Large-Scale Food Recognition via Stacked Global-Local Attention Network. ACM Multimedia 2020 (Accepted, Oral)
10. Weiqing Min, Linhu Liu, Zhengdong Luo, Shuqiang Jiang. Ingredient-Guided Cascaded Multi-Attention Network for Food Recognition. ACM Multimedia 2019: 1331-1339
11. Weiqing Min, Shuqiang Jiang, Shuhui Wang, Jitao Sang, Shuhuan Mei. A Delicious Recipe Analysis Framework for Exploring Multi-Modal Recipes with Various Attributes. ACM Multimedia 2017: 402-410
12. Tianyu Zhang, Weiqing Min, Ying Zhu, Yong Rui, Shuqiang Jiang. An Egocentric Action Anticipation Framework via Fusing Intuition and Analysis. ACM Multimedia 2020 (Accepted, Oral)

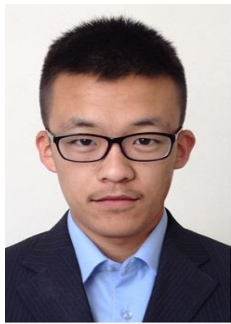
Food Computing Team



Shuqiang Jiang
Professor



Zhuo Li
Grad. student



Zhiling Wang
Grad. student



Chunlin Liu
Grad. student



Mengjiang Wang
Grad. student



Pengfei Zhou
Grad. student



Linhu Liu
Postgrad. student



Shuhuan Mei
Postgrad. student



Weiqing Min
Associate Professor



Jiahao Yang
Grad. student



Tianyu Zhang
Grad. student



Yuxin Liu
Grad. student



Jiajun Song
Grad. student



Tao Liu
Grad. student

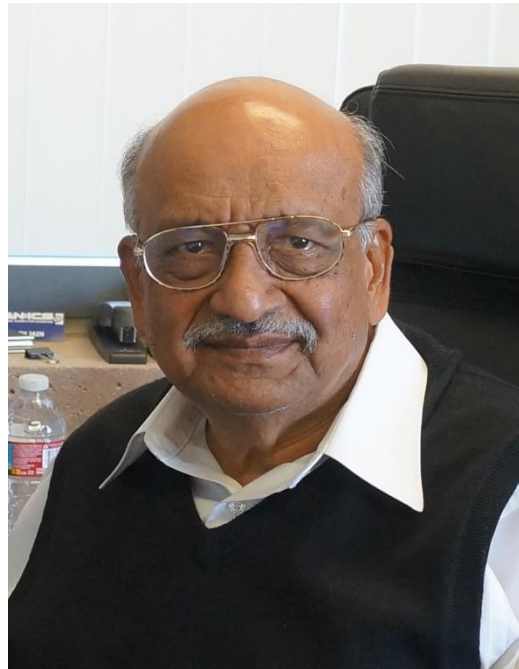


Zhengdong Luo
Postgrad. student

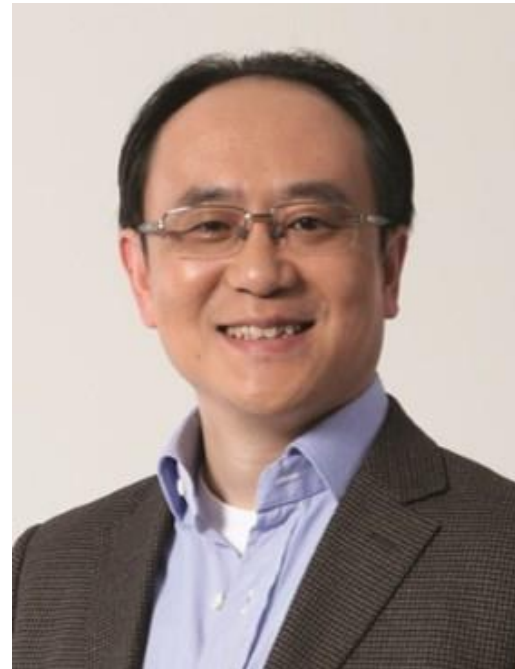


Yongqiang LYU
Postgrad. student

Give Great Thanks to Our Collaborators



Prof. Ramesh Jain



Dr. Yong Rui

Thanks

Relevant datasets, codes and models can be found at:

http://123.57.42.89/FoodComputing_Home.html

