FoodScrap: Promoting Rich Data Capture and Reflective Food Journaling Through Speech Input

Yuhan Luo¹  Young-Ho Kim¹  Bongshin Lee²
Naeemul Hassan¹  Eun Kyoung Choe¹

¹ College of Information Studies, University of Maryland
² Microsoft Research
How do people practice food journaling?
Food journaling is not only about calorie and nutrients

- **Condiment** and **preparation methods** are important information for dietary assessment (Signorello et al., 2009)

- Capturing **eating contexts** can promote self-reflection (Luo et al., 2019; Zhang et al., 2020)

- Understanding **food decision-making** can help develop personalized diet and promote mindful eating (Sobal et al., 2009; Albers, 2012)
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- **Condiment** and **preparation methods** are important information for dietary assessment (Signorello et al., 2009)

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Why speech input?

The growing popularity

1 in 5 US adults use speech-based search on mobile devices (Global Web Index, 2016).

Nearly 50% Americans used digital voice assistant, mostly on their mobile phones (Pew Research, 2017).

50% consumers will adopt voice shopping on mobile devices by 2022 (MoffettNathanson, 2018)
How can speech input facilitate data capture?

+ Fast
Lower data capture burden
(Ruan et al., 2018)

+ Expressive
Collect rich details
(Chalfonte et al., 1991)

- Difficult to edit
Cannot edit the data on the fly
(Murad et al., 2018)

- Privacy concerns
Not appropriate in public settings
(Liao et al., 2019)

But little is known about how speech input can support capturing unstructured personal data such as food practice.
Research Question

How can speech input support collecting food practice regarding **data richness** and **data capture burden**?
FoodScrap: a speech-enabled food journaling app

Guided prompts on food details & food decisions
(Sobal et al., 2009; Bilman et al., 2017)

Created with OmniTrack Research
(Kim et al., 2017)
A one-week **remote** data collection study

**Participants**  \((N = 11)\)

- 9 females, age: 18 ~ 60
- 7 different food cultures
- Specific eating goals

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Tutorial (30-45 mins)

User Burden Scale (UBS, Suh et al., 2016)

Data Collection (1 week)

Debriefing Interview (20–45 mins)
Finding Highlights
Journal entries & time spent

- **275 journal entries**
- **200 main meals**
  - Time spent (avg.): 148.81 seconds
  - # of words (avg.): 147.61
- **47 snacks**
  - Time spent (avg.): 126.41 seconds
  - # of words (avg.): 141.61
- **28 skipped meals**
  - Time spent (avg.): 43.71 seconds
  - # of words (avg.): 48.11
Detailed components & preparation methods

Food components
- Dish names
- Ingredient items
- Spice & sauce
- Food portion
- Ingredient types
- Food characteristics

Preparation methods
- Preparation types
- Procedural methods

Additional contexts
- Weather
- Taste
- Mood and feelings
“My breakfast today is a homemade piece of *focaccia bread* that I *baked* on Saturday. It has *green olives betta cheese*, and is made with classic bread ingredients like *flour, yeast, salt water, and olive oil*. Yeah. And then there is a small cup of *ranch dressing* probably a couple of tablespoon and ice water with a splash of *grapefruit juice* in the bottle. Ever since the COVID-19 lockdown I've been trying to bake more foods. And it's been rather *enjoyable*."

(P8, Day 1, Breakfast)
Elaboration on food decisions

74% responses on food decisions were elaborated with explanations and examples

<table>
<thead>
<tr>
<th>Describing the eating moments</th>
<th>Personal status</th>
<th>Food access</th>
<th>Social environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explaining eating strategies</td>
<td>Planning ahead</td>
<td>Health belief</td>
<td>Habits</td>
</tr>
<tr>
<td>Self-assessment</td>
<td>Judgment</td>
<td>Comparison</td>
<td></td>
</tr>
</tbody>
</table>
Elaboration on food decisions

“They are my favorite candy and they were laying in front of me on my kitchen counter. So they were calling my name.” (P4, Day 3, Snack)

“I've been eating a lot of junk [food] so I thought I had to keep it a little [more] fresh for sustainability and healthy, so I thought about those veggies.” (P7, Day 5, Lunch)
Easy and fast data capture

Results from the User Burden Scale (UBS):
Less than 1 on a scale of 0 ~ 4:
Low perceived data capture burden

"I think filling it out via audio was much more easier than what I thought it would be. If I had to fill it out via text it would have been really difficult, because you had to mention cooking, whatever ingredients are there and everything. ... I think I would barely managed a sentence or two."  
(P7)
Additional Challenges

**Re-recording effort**
Redo the entire recording if losing the train of thoughts

**Mental load**
Require extra attention and concentration

**Social environmental constraints**
Feel embarrassing to talk in public settings

**Privacy concerns**
“voice is more identifiable than text”
“In-the-moment” reflection

“I feel like interacting with people, so it made me want to talk more. I feel more accountable, you know, to explain my food [decisions], to really think about it, like why am I eat this now.” (P10)

“I mostly just use it as a tool for self-reflection. I guess I overthink things all the time. I always reflect on what I said. Sometimes I thought maybe I should stop [eating].” (P9)
Implications
Effectively processing the data for healthcare use

- Extracting food details by healthcare providers’ information needs (e.g., food portion, condiment, preparation)
- Supporting efficient sorting and filtering based on providers’ information needs

Dietary assessment
Enabling reflection-on-action through feedback

Key factors influencing one's food decisions

Efficient audio searching
Supporting multimodal data capture in varying contexts

- Photo: quickly capture food items
- Touch input: public spaces
- Speech input: quiet and private settings
Thank you!

Research Contributions

- Empirical understandings of speech input’s pros and cons in capturing everyday food practice
- Design implications for process and presenting large amounts of speech input
- Recommendations of designing multiple food journaling technologies

Fundings: NSF, iSchool Research Improvement Grants (RIGs)
Appendix
## Participants’ Demographics

<table>
<thead>
<tr>
<th>ID</th>
<th>Age</th>
<th>Gender</th>
<th>Occupation</th>
<th>Household members</th>
<th>Food culture</th>
<th>Eating goals</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>27</td>
<td>F</td>
<td>Accountant</td>
<td>2 Housemates</td>
<td>African</td>
<td>Eat healthier</td>
</tr>
<tr>
<td>P2</td>
<td>30</td>
<td>F</td>
<td>Grad. student</td>
<td>A partner</td>
<td>Asian (mixed)</td>
<td>Increase food variety</td>
</tr>
<tr>
<td>P3</td>
<td>33</td>
<td>M</td>
<td>Project manager</td>
<td>A cousin</td>
<td>Asian (Indian)</td>
<td>Boost immune system</td>
</tr>
<tr>
<td>P4</td>
<td>47</td>
<td>F</td>
<td>Assistant writer</td>
<td>N/A</td>
<td>Asian (Chinese), American</td>
<td>Lose weight</td>
</tr>
<tr>
<td>P5</td>
<td>18</td>
<td>F</td>
<td>Undergrad. student</td>
<td>Parents</td>
<td>Asian (Chinese)</td>
<td>Eat healthier</td>
</tr>
<tr>
<td>P6</td>
<td>30</td>
<td>F</td>
<td>Case manager</td>
<td>A partner</td>
<td>American</td>
<td>Get healthier and fitter</td>
</tr>
<tr>
<td>P7</td>
<td>25</td>
<td>M</td>
<td>Grad. student</td>
<td>N/A</td>
<td>Asian (Indian)</td>
<td>Eat healthier</td>
</tr>
<tr>
<td>P8</td>
<td>41</td>
<td>F</td>
<td>Unemployed</td>
<td>A child</td>
<td>Western European</td>
<td>Eat healthier and lose weight</td>
</tr>
<tr>
<td>P9</td>
<td>26</td>
<td>F</td>
<td>Grad. student</td>
<td>Parents</td>
<td>Asian (Indian)</td>
<td>Eat with mindfulness and lose weight</td>
</tr>
<tr>
<td>P10</td>
<td>60</td>
<td>F</td>
<td>Personal assistant</td>
<td>A partner + 2 children</td>
<td>American</td>
<td>Reduce sweets intake</td>
</tr>
<tr>
<td>P11</td>
<td>26</td>
<td>F</td>
<td>Civil engineer</td>
<td>A partner</td>
<td>Mixed</td>
<td>Eat healthier</td>
</tr>
</tbody>
</table>