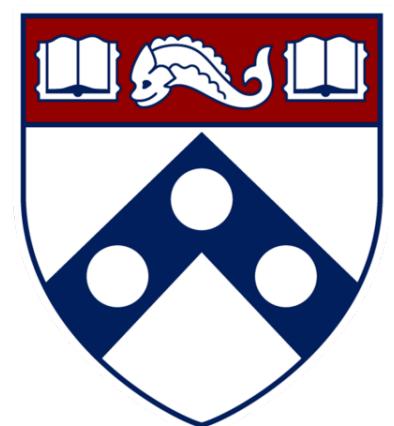


# Rewriting the Script: Adapting Text Instructions for Voice Interaction

Alyssa Hwang, Natasha Oza, Chris Callison-Burch, Andrew Head



Penn  
UNIVERSITY of PENNSYLVANIA



There are over 2 billion voice assistants worldwide, but they are mostly used for simple applications like playing music or controlling IoT devices.

Our goal was to discover  
how voice assistants can  
provide effective guidance  
for complex tasks, like  
following recipes.



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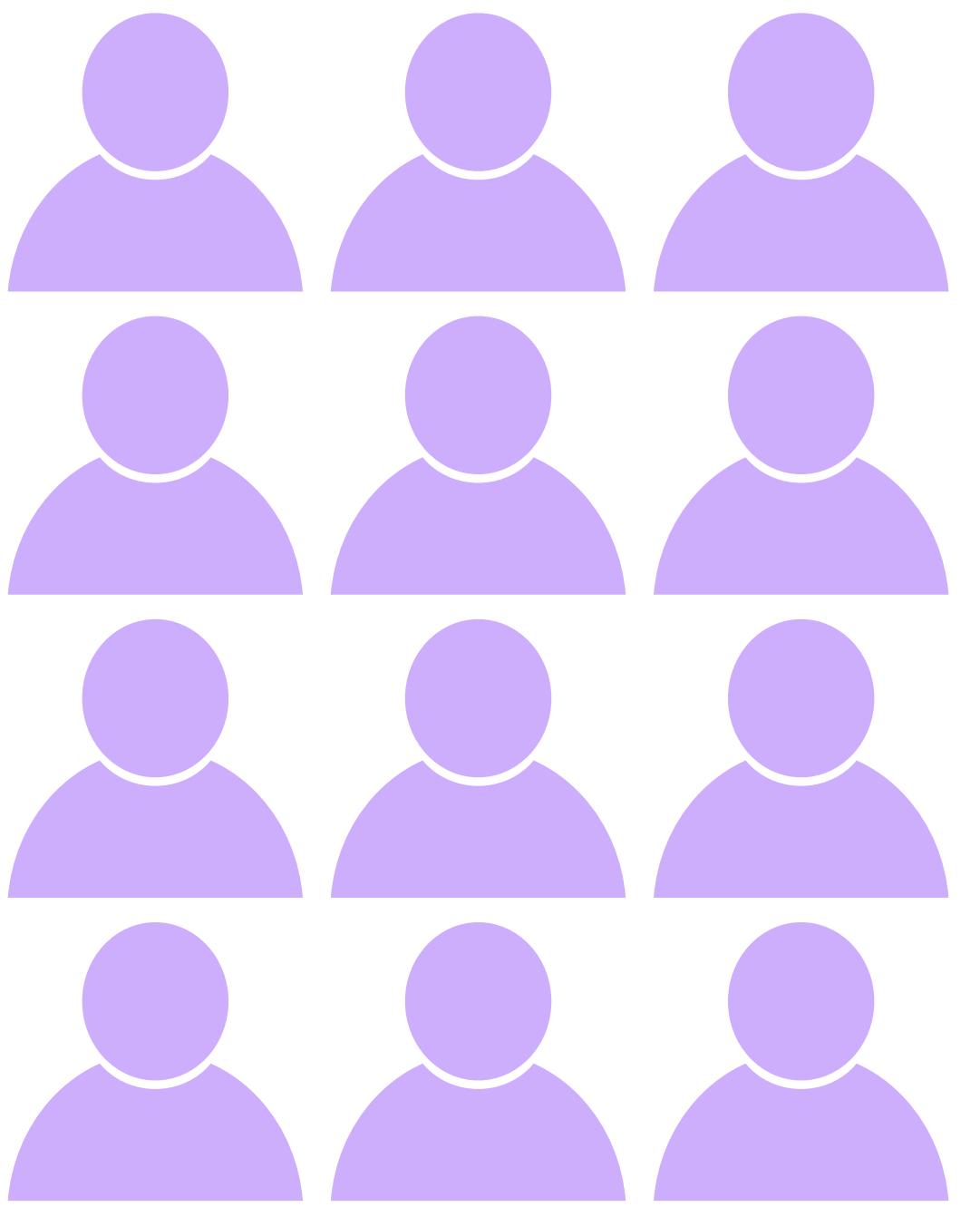
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# Research Questions

RQ1. What challenges do users face when following instructions to perform complex tasks given by a contemporary, state-of-the-art voice assistant?

RQ2. What can be done to address these challenges in future voice assistants?



# Herb-Roasted Salmon with Tomato-Avocado Salsa



Recipe courtesy of Valerie Bertinelli

Show: Valerie's Home Cooking Episode: A Heart-y Valentine's Day

Level: Easy

Total: 45 min

Active: 20 min

Yield: 6 servings

## Ingredients:

2 tablespoons olive oil, plus more for the baking sheet and salmon

1/3 cup finely chopped fresh dill

1/3 cup finely chopped fresh flat-leaf parsley

3 tablespoons finely chopped fresh chives

3 tablespoons finely chopped fresh basil

2 1/4 pounds center-cut salmon fillet, skin and bones removed

Kosher salt and freshly ground black pepper

2 large avocados

12 ounces mixed-colored cherry or grape tomatoes, halved or quartered if large

2 tablespoons fresh lemon juice

1 small shallot, minced

## Directions:

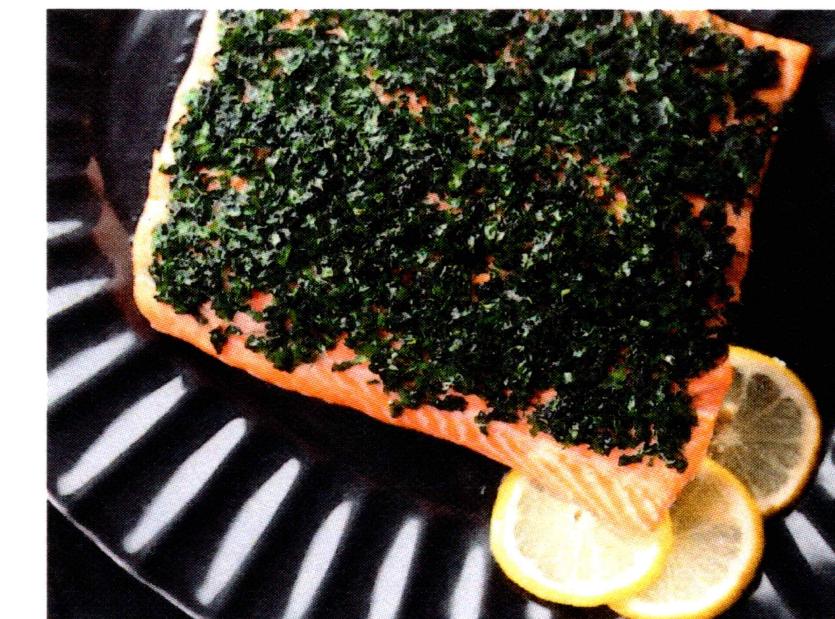
1 Preheat the oven to 350 degrees F. Line a large rimmed baking sheet with parchment paper and brush it lightly with oil.

2 Mix together the dill, parsley, chives and basil in a small bowl. Reserve 2 tablespoons of the mixture for the salsa and set aside. + Q: do you remember the quantities or do you want me to ~~say~~ repeat them? (it takes time to do this!)

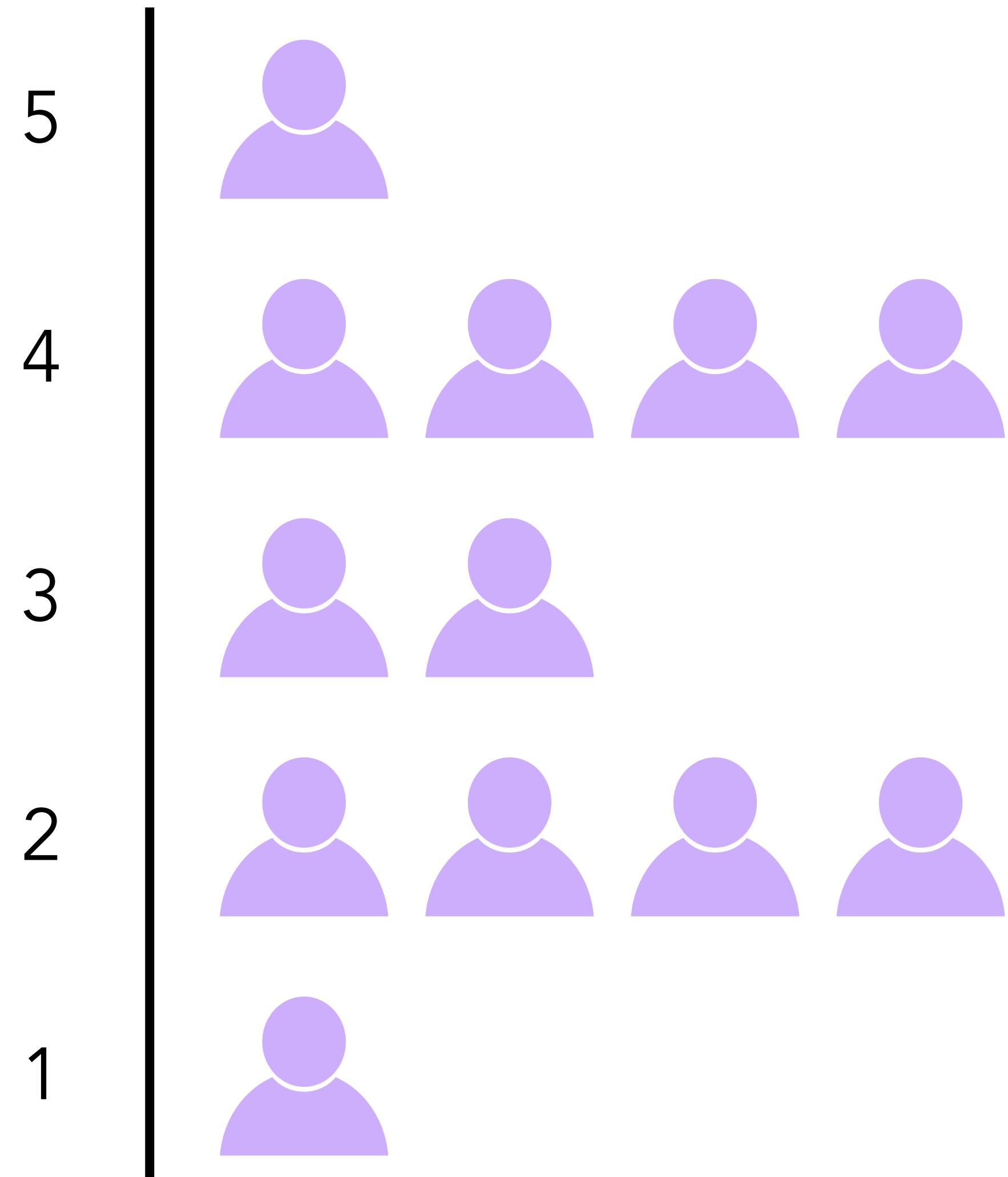
3 Put the salmon on the prepared baking sheet and sprinkle all over with salt and pepper. Drizzle the top lightly with oil, then top evenly with the herb mix. Bake until just cooked through, 20 to 25 minutes. + Do you want me to start a timer?

4 Meanwhile, halve and peel the avocados and cut them into 1/2-inch pieces. Put the avocados in a large bowl and gently toss with the tomatoes, lemon juice, shallots, 2 tablespoons oil, 1/2 teaspoon salt and the reserved herbs. Transfer to a serving bowl. + Shall we go step by step?  
1. Start with the avocados...  
2. Now time for the tomatoes...  
3.

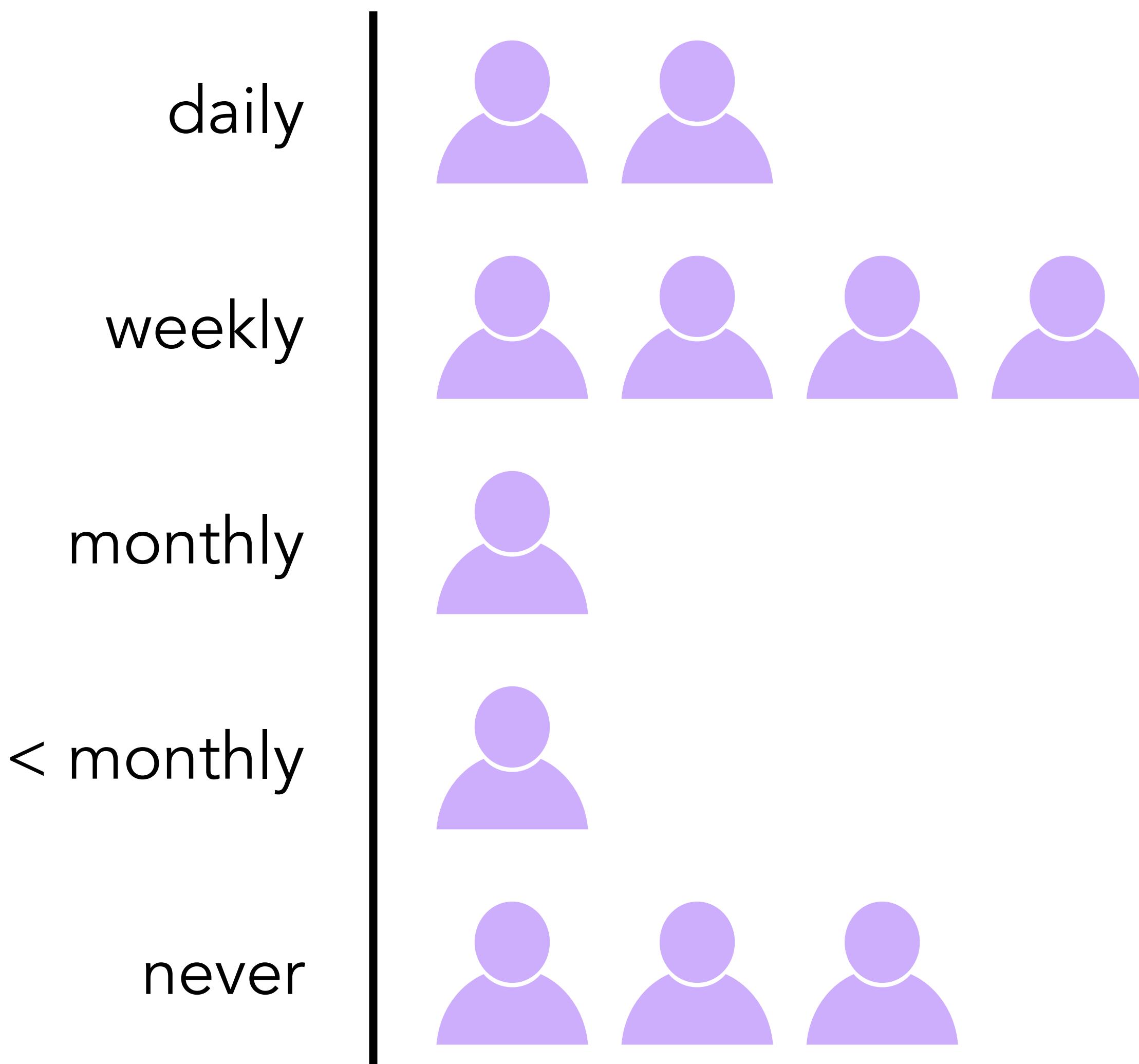
5 Serve the salmon with the salsa on the side.



# Self-Reported Cooking Skill

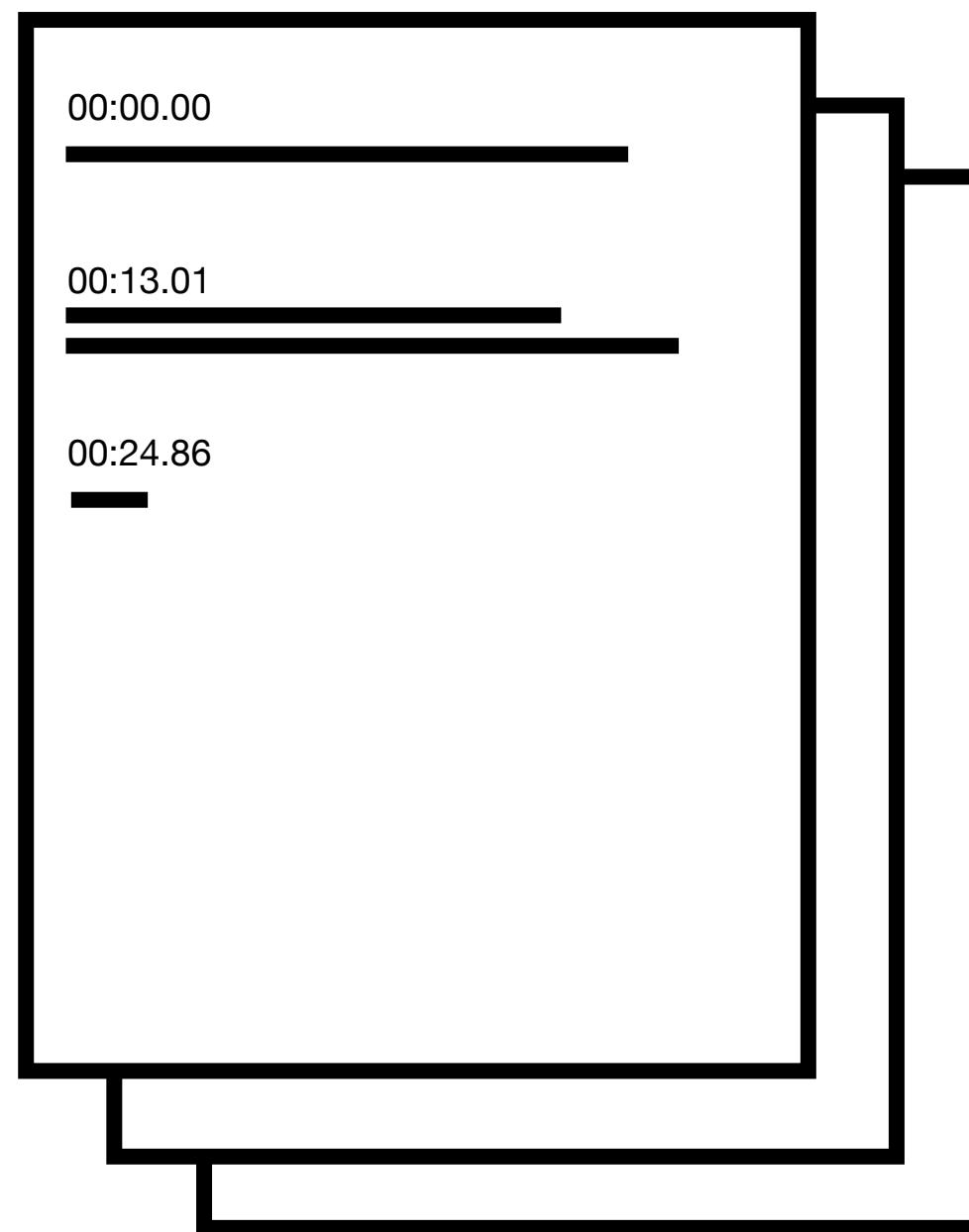


# Prior Voice Assistant Use

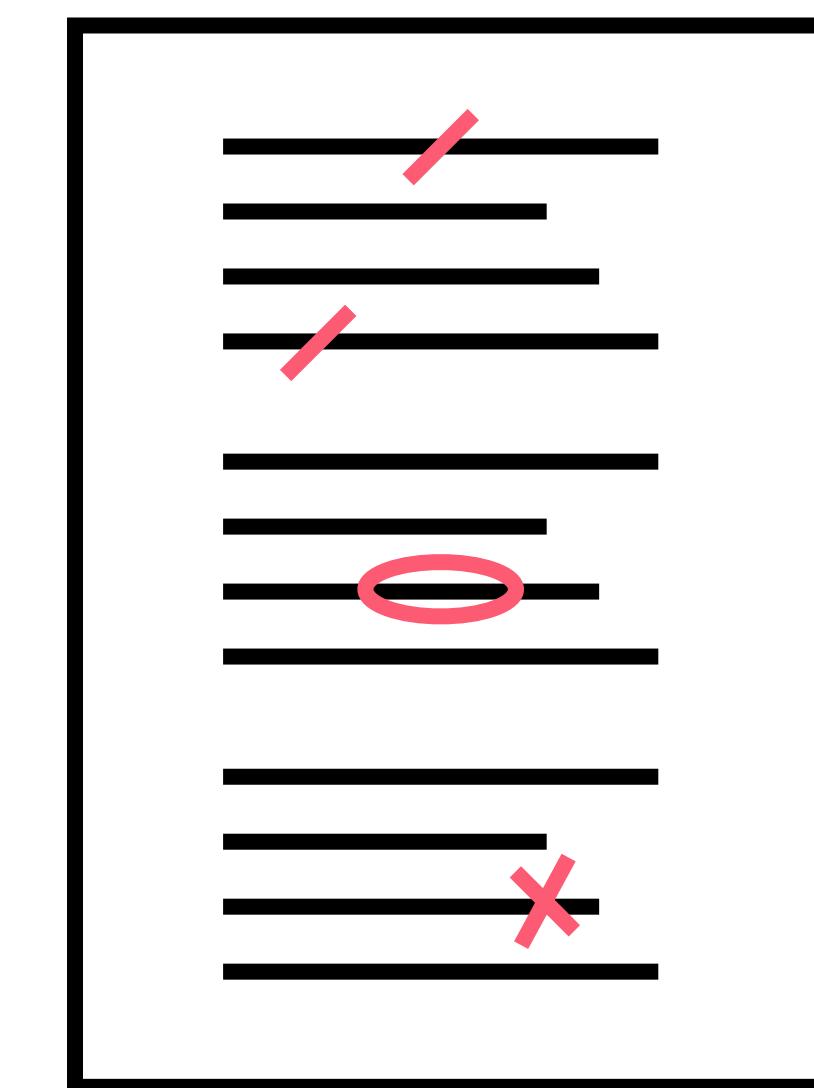




# Data from Observation Sessions

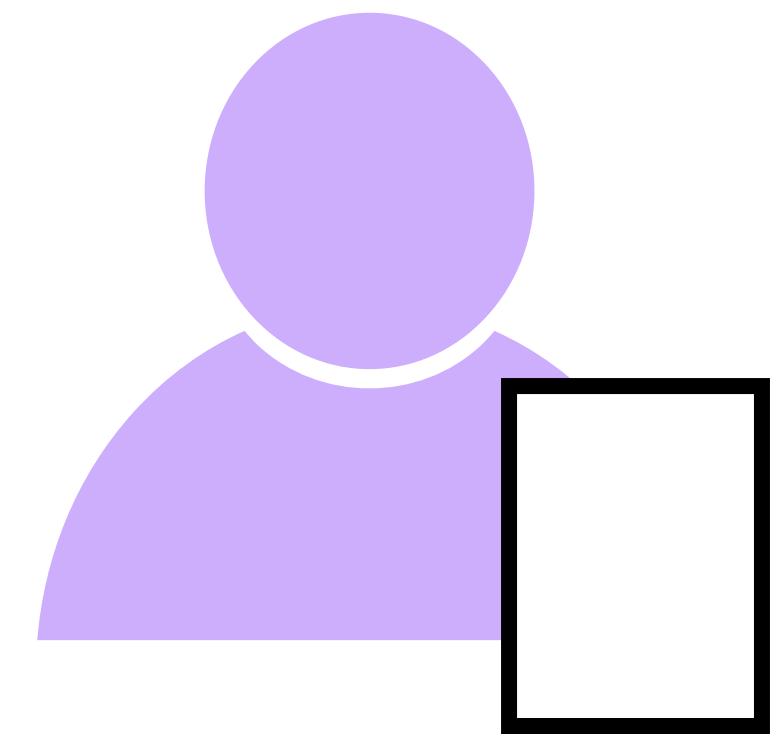


Transcripts

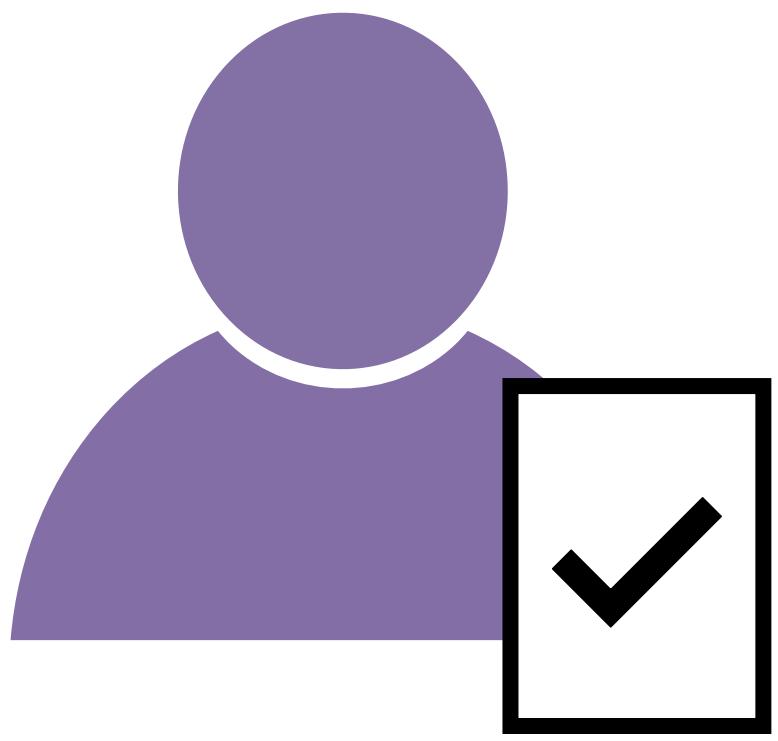


Annotations

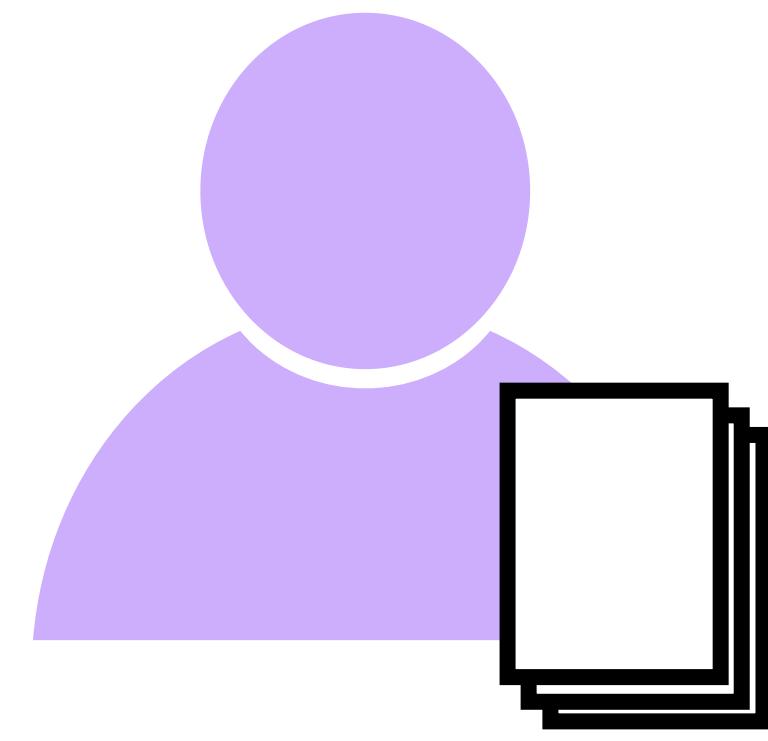
# Thematic Analysis



1. Open Coding



2. Validation

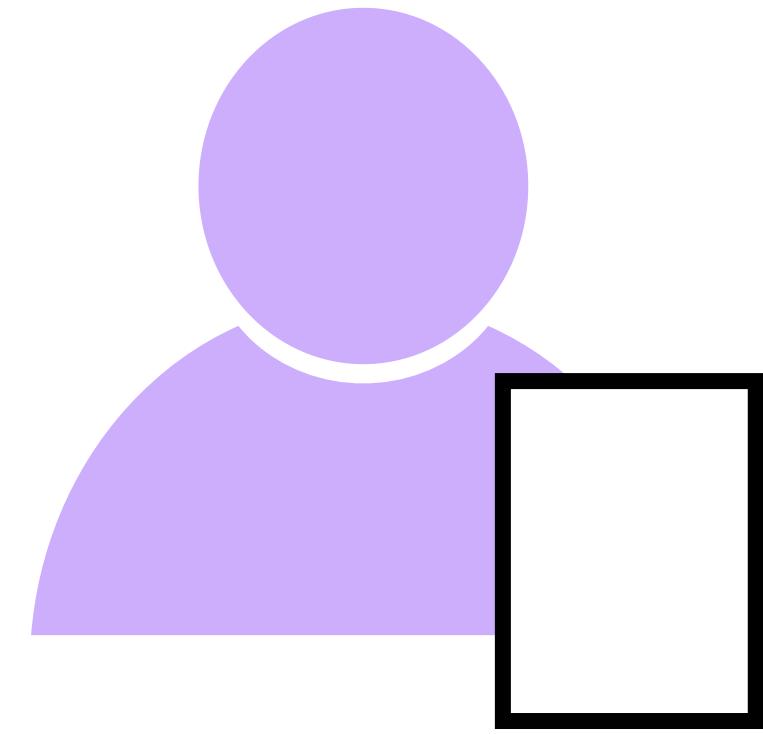


3. Axial Coding

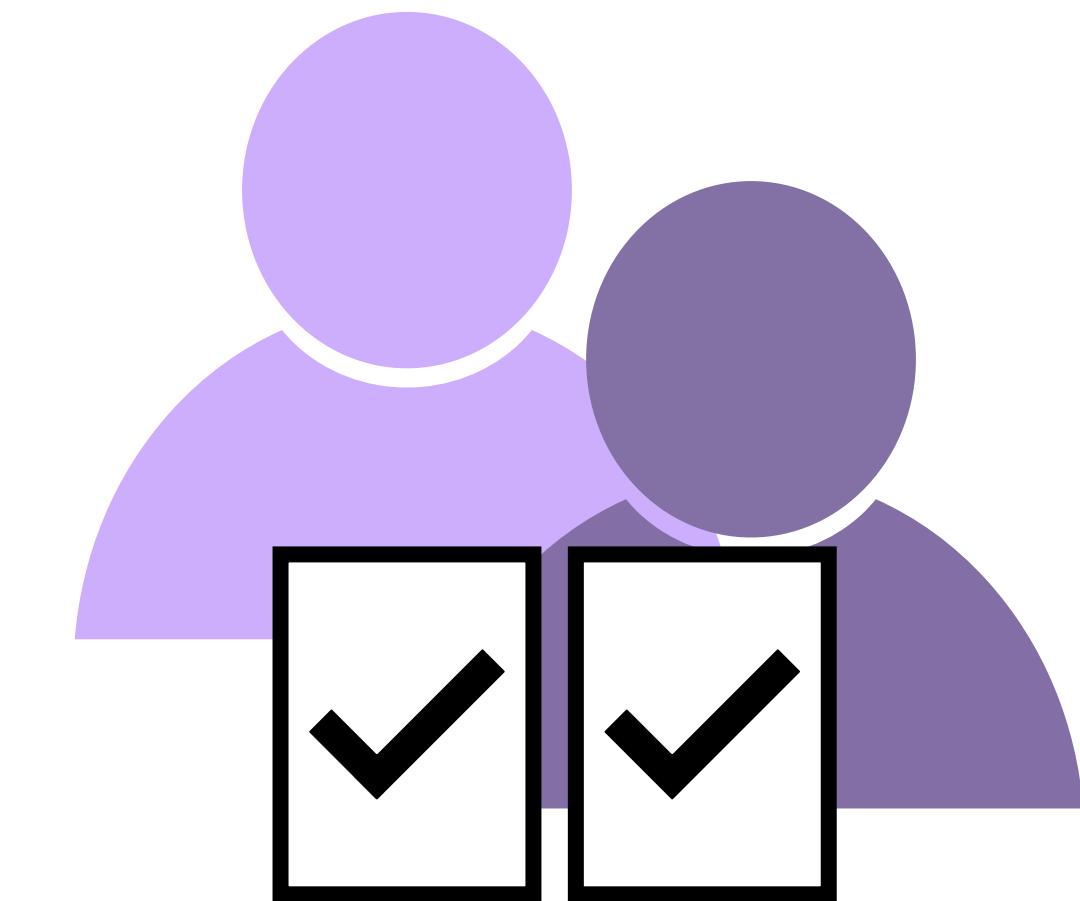


4. Validation

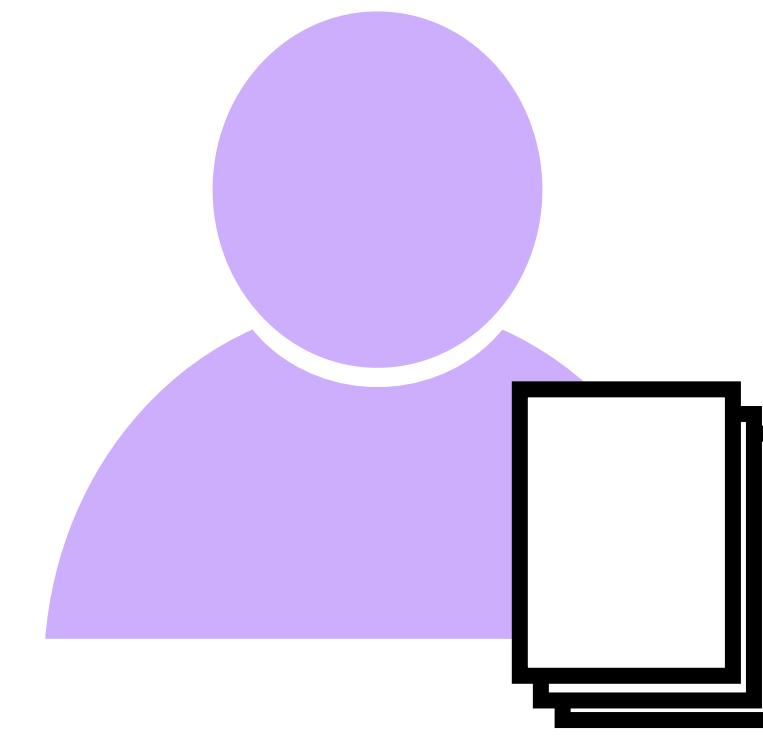
# Conversation Coding



1. Create codes



2. Code two transcripts



3. Code all transcripts

# Challenges & Solutions



Whisk the eggs, 1/2 teaspoon sesame oil, and a pinch each of salt and pepper in a second dish. If you want me to repeat this step, or list the ingredients for the step, just let me know.

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For this step, gather eggs, sesame oil, salt, and pepper. Let me know when you are ready.

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Whisk 2 eggs, 1/2 teaspoon sesame oil, and a pinch each of salt and pepper in a second dish. If you want me to repeat this step, or list the ingredients for the step, just let me know.

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Whisk **2 eggs**, 1/2 teaspoon sesame oil, and a pinch each of salt and pepper in a second dish. If you want me to repeat this step, or list the ingredients for the step, just let me know.

## Preparation

*Put in start*

- 1** Cook sausage over medium-high until lightly browned, about 5-7 minutes, being sure to break up the meat into a fine mince.
- 2** Remove cooked sausage from pan and wipe away excess fat with a paper towel.
- 3** Add onion and sauté until softened and translucent, about 2 to 3 minutes. Add mushrooms, salt, and pepper and continue to cook for an additional 2-3 minutes.
- 4** Add chopped spinach and cook until wilted and no extra liquid has accumulated in the bottom of the pan.  
*N/A I used frozen <sup>chopped</sup> spinach*
- 5** ~~NOTE: Do your best to use the excessive moisture of the spinach and mushrooms to deglaze the bottom of the pan, scraping away any browned bits from cooking the sausage earlier.~~ *Not needed*
- 6** Preheat oven to 350°F (180°C).
- 7** Once cooked, remove the spinach and mushroom mixture from the pan and combine it with the reserved cooked sausage. Stir to mix evenly.
- 8** Combine eggs and milk. Lightly whisk until just combined.

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6 de ms to

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*rewriting the script*: adapting  
written sources for spoken  
communication before  
delivering them

Put the diced avocados in a large bowl. Gently toss with halved tomatoes, lemon juice, 2 tbsp. oil, 1/2 tsp. salt, and the reserved herbs. Transfer to a large bowl.

summarize

Prepare the tomato-avocado salsa.

Put the diced avocados in a large bowl. Gently toss with halved tomatoes, lemon juice, 2 tbsp. oil, 1/2 tsp. salt, and the reserved herbs. Transfer to a large bowl.

Prepare the tomato-avocado salsa.

split

Put the diced avocados in a large bowl.

Gently toss with halved tomatoes, 2  
tbsp. lemon juice, 2 tbsp. oil, 1/2 tsp.  
salt, and the reserved herbs.

Transfer to a large bowl.

Prepare the tomato-avocado salsa.

reorder

Dice the avocados and halve the cherry tomatoes.

Put the diced avocados in a large bowl.

Gently toss with halved tomatoes, 2 tbsp. lemon juice, 2 tbsp. oil, 1/2 tsp. salt, and the reserved herbs.

Transfer to a large bowl.

Prepare the tomato-avocado salsa.

redistribute

Dice 2 avocados and halve 12 ounces of cherry tomatoes.

Put the diced avocados in a large bowl.

Gently toss with halved tomatoes, 2  
tbsp. lemon juice, 2 tbsp. oil, 1/2 tsp.  
salt, and the reserved herbs.

Transfer to a large bowl.

Prepare the tomato-avocado salsa.

Dice 2 avocados and halve 12 ounces of cherry tomatoes.

Put the diced avocados in a large bowl.

Gently toss with halved tomatoes, 2 tbsp. lemon juice, 2 tbsp. oil, 1/2 tsp. salt, and the reserved herbs from step 1.

elaborate

Transfer to a large bowl.

Prepare the tomato-avocado salsa.

visualize

Dice 2 avocados and halve 12 ounces of  
cherry tomatoes into bite-sized pieces.

Put the diced avocados in a large bowl.

Gently toss with halved tomatoes, 2  
tbsp. lemon juice, 2 tbsp. oil, 1/2 tsp.  
salt, and the reserved herbs from step 1.

Transfer to a large bowl.

Prepare the tomato-avocado salsa.

Dice 2 avocados and halve 12 ounces of cherry tomatoes into bite-sized pieces.

Put the diced avocados in a large bowl.

Gently toss with halved tomatoes, 2 tbsp. lemon juice, 2 tbsp. oil, 1/2 tsp. salt, and the reserved herbs from step 1.

volunteer

Want me to repeat that?

Transfer to a large bowl.

Prepare the tomato-avocado salsa.

Dice 2 avocados and halve 12 ounces of cherry tomatoes into bite-sized pieces.

Put the diced avocados in a large bowl.

Gently toss with halved tomatoes, 2 tbsp. lemon juice, 2 tbsp. oil, 1/2 tsp. salt, and the reserved herbs from step 1.

Want me to repeat that?

signpost

Transfer to a large bowl until the end.

summarize

Prepare the tomato-avocado salsa.

reorder

Dice 2 avocados and halve 12 ounces of redistribute  
cherry tomatoes into bite-sized pieces. visualize

Put the diced avocados in a large bowl.

split

Gently toss with halved tomatoes, 2  
tbsp. lemon juice, 2 tbsp. oil, 1/2 tsp.

salt, and the reserved herbs from step 1. elaborate

volunteer

Want me to repeat that?

Transfer to a large bowl until the end.

signpost

*rewriting the script* can  
motivate new work in  
human-centered NLP.

# Future Work: Senior Design Project

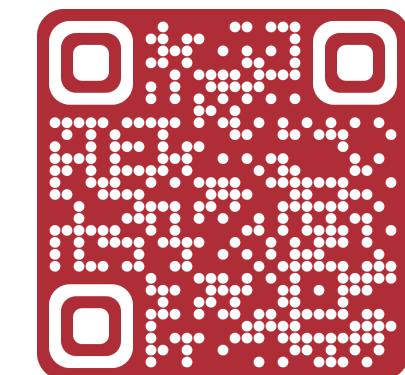


# Future Work: Kani

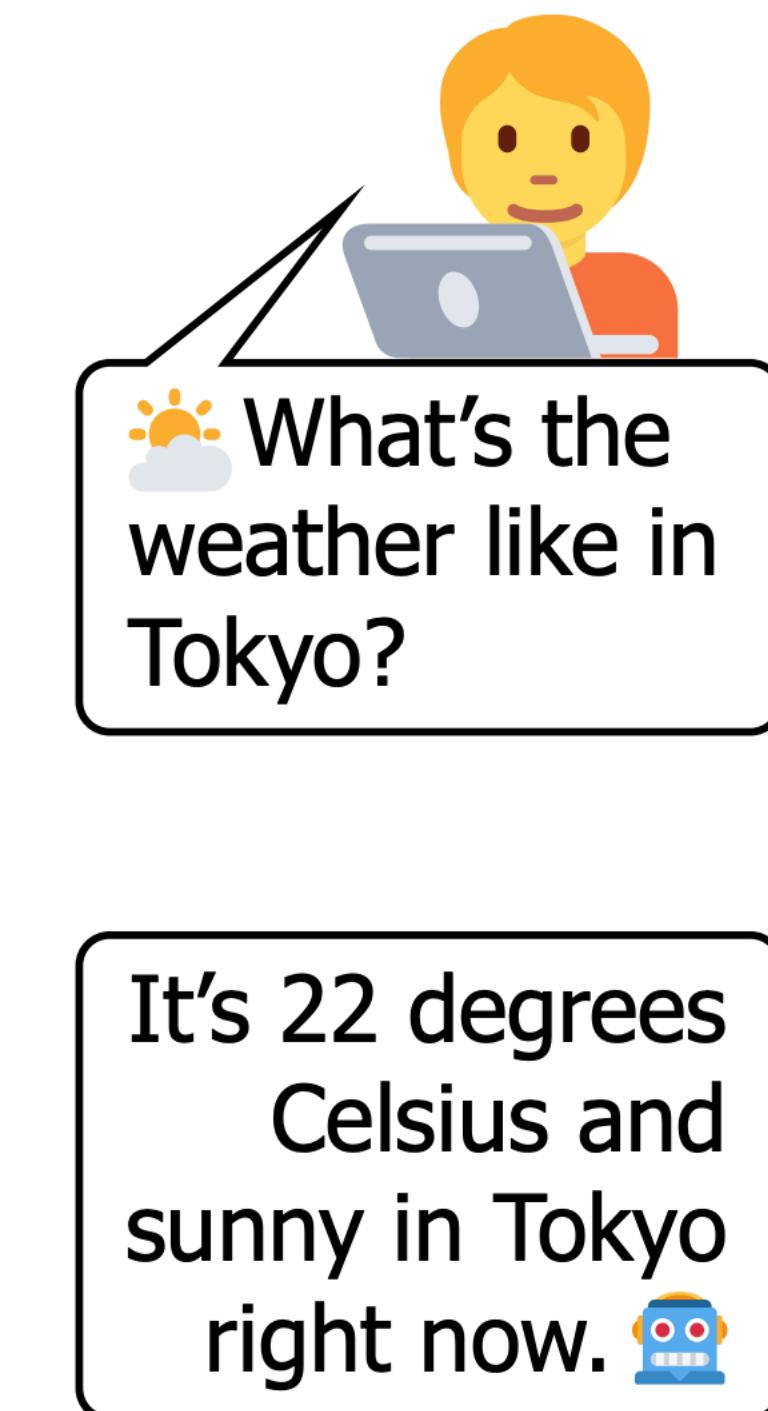
*Lightweight, flexible,  
model-agnostic **framework**  
for building language  
model **applications***



arXiv pre-print  
[arxiv.org/abs/2309.05542](https://arxiv.org/abs/2309.05542)



GitHub Repository  
[github.com/zhudotexe/kani](https://github.com/zhudotexe/kani)



The screenshot displays the Kani AI interface. At the top right is the Kani logo (a red crab icon) and the word "Kani". Below it is a "Chat History" section with a weather-related message. The "Function Context" section shows Python code for getting weather and converting Fahrenheit to Celsius. The "Engine" section features icons for different AI models or engines.

Chat History

What's the weather like in Tokyo?

It's 22 degrees Celsius and sunny in Tokyo right now. 🤖

Function Context

```
def get_weather(location: str)
def fahren_to_celsius(deg: int)
...
```

Engine

# Future Work: Audio “Skimming”

Go back to  
the last  
paragraph...



# Thank you! Questions?



Paper  
[tinyurl.com/RTS-CLunch](https://tinyurl.com/RTS-CLunch)

[ahwang16@seas.upenn.edu](mailto:ahwang16@seas.upenn.edu)  
[alyssahwang.com](http://alyssahwang.com)