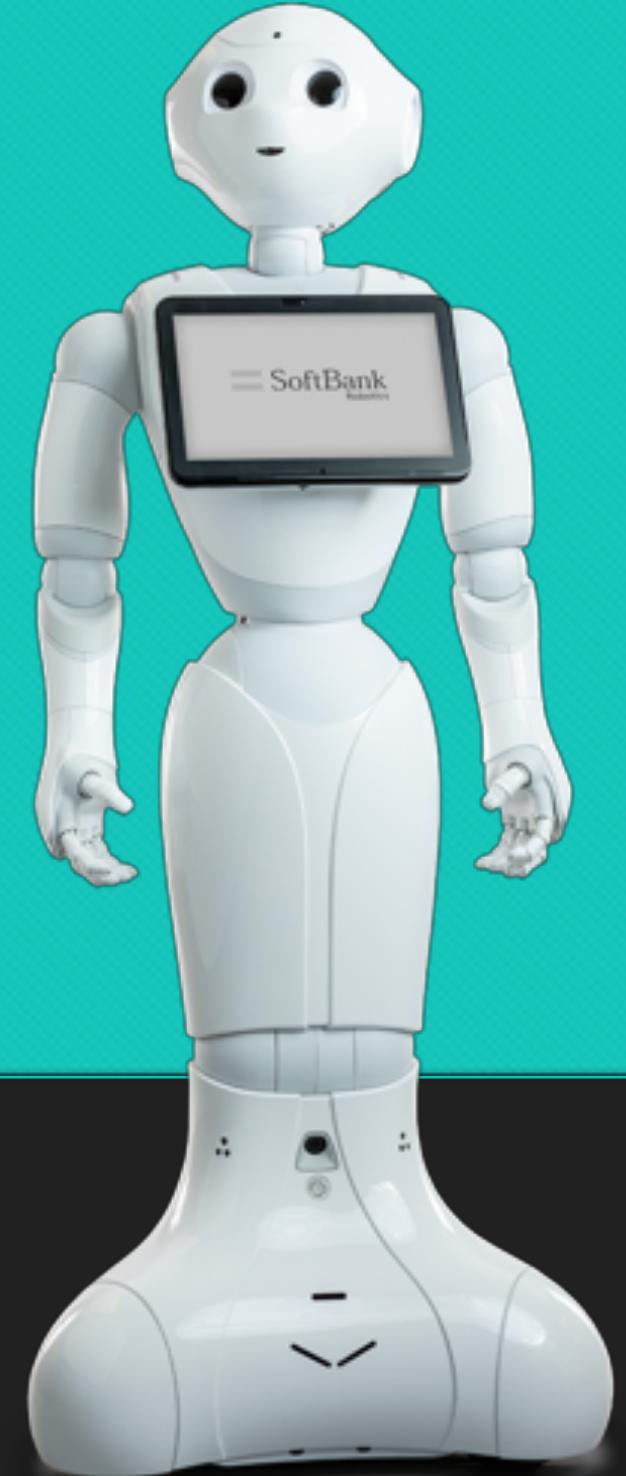


Failing gracefully

Adaptive, cooperative language design for social robots

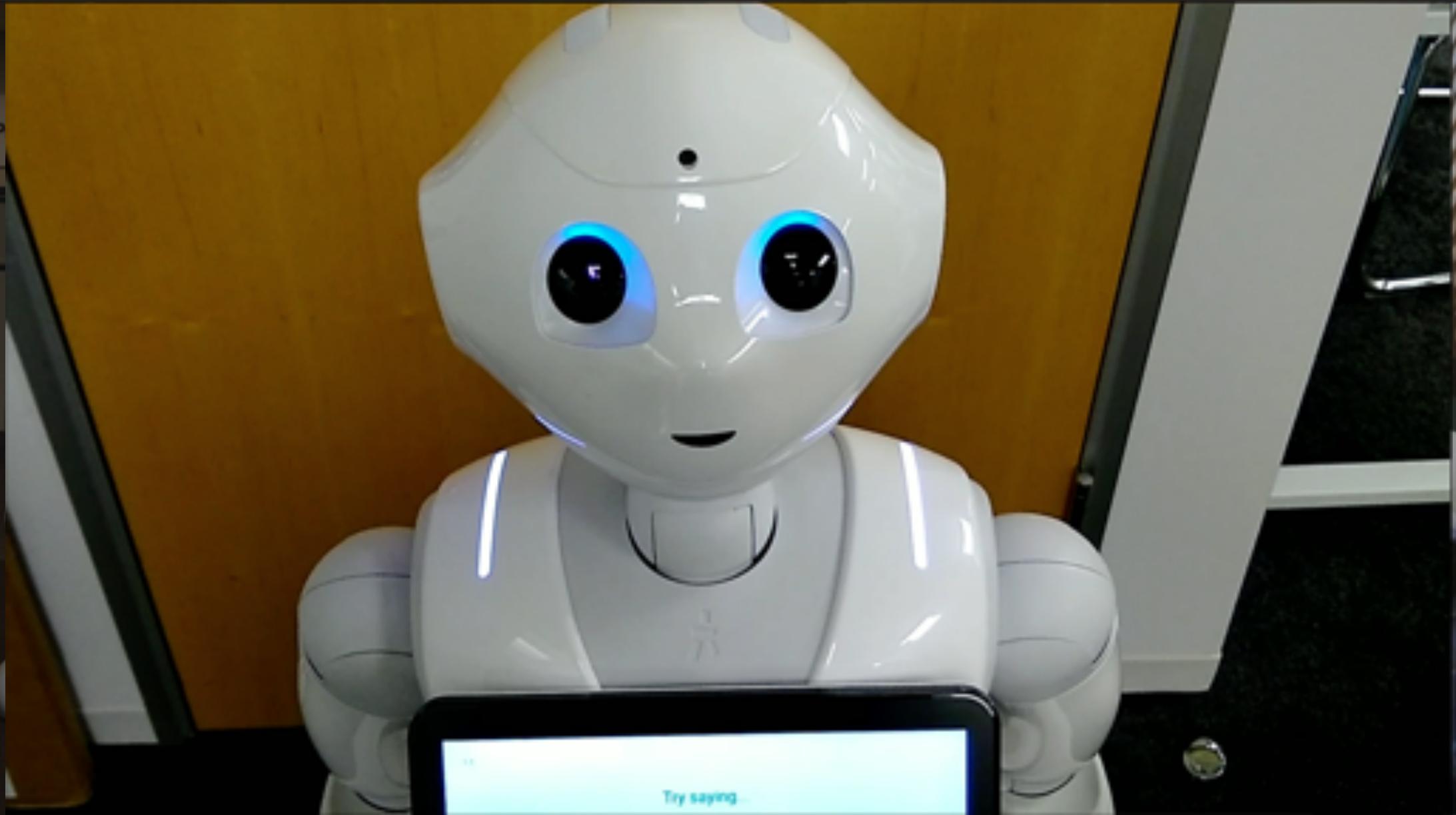
Alison Rush

Computational Linguist, SoftBank Robotics America



Pepper

A social robot.

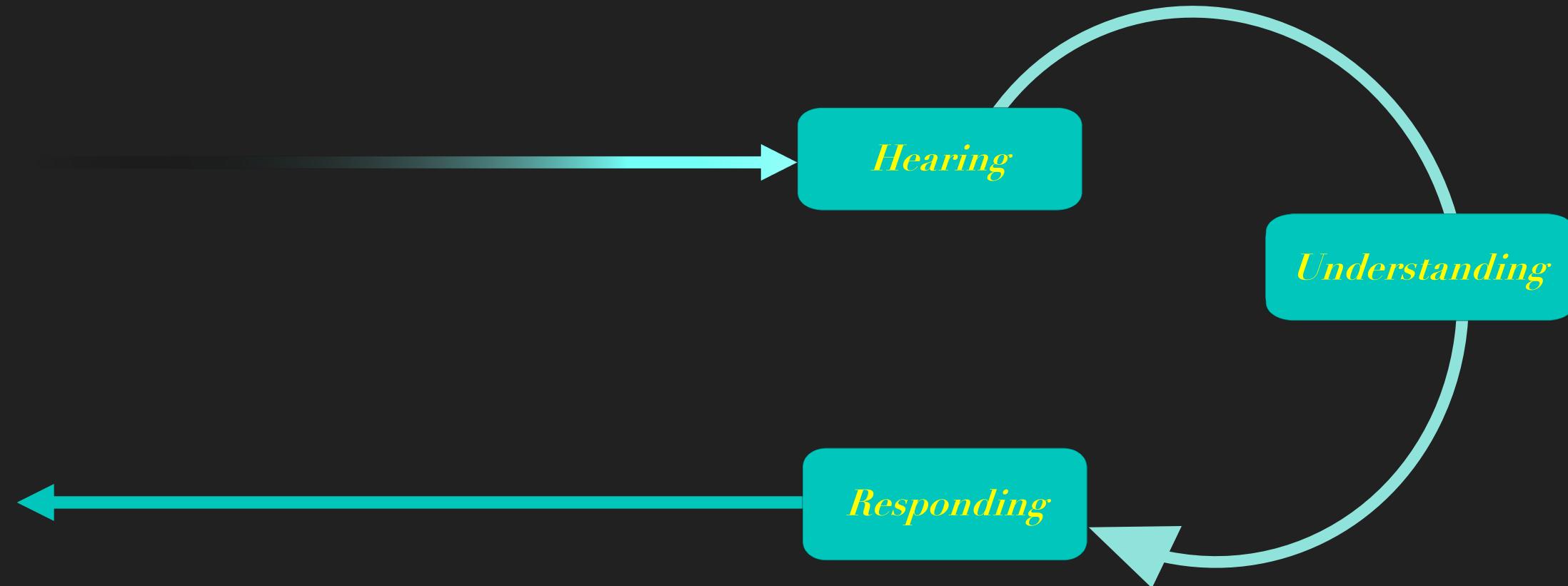


SoftBank
Robotics

**What does it mean to
“fail”, conversationally
speaking?**



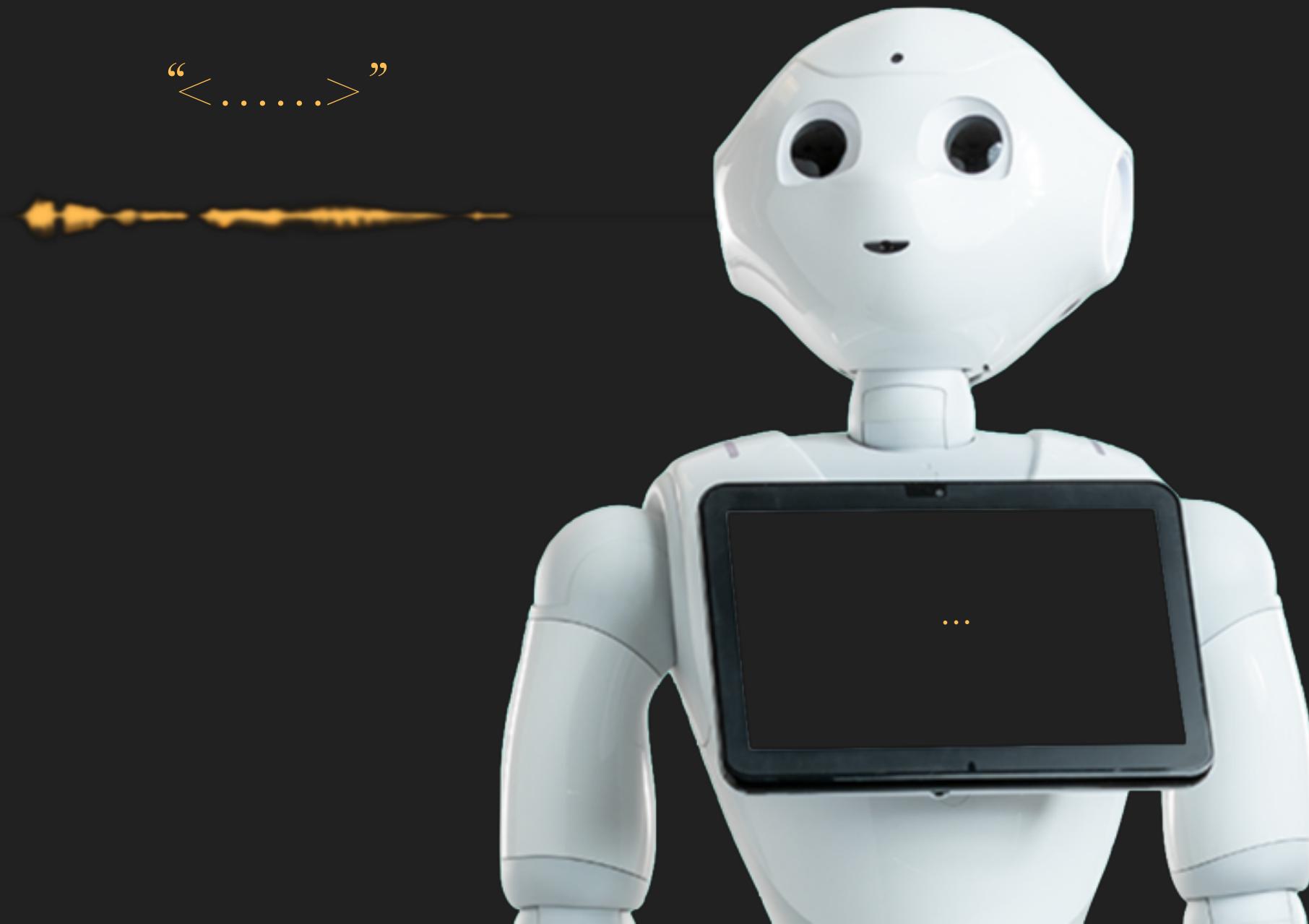
THE CONVERSATIONAL LOOP



*Humans **hear** speech and interpret the sounds as words, **understand** the meaning of the words we've heard, then **respond** accordingly.*

Robots send sounds to a **speech-to-text** engine, to be interpreted as words; these words are sent to an **intent matching** engine, to be matched to a defined response, then the response text is sent to a **text-to-speech** engine, to be spoken aloud.

⚠ HEARING

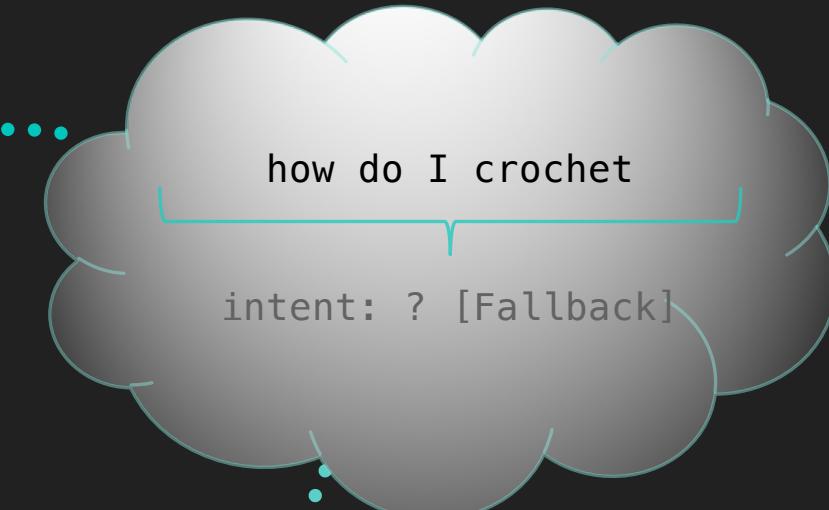


1. **Speech to text**
2. Intent matching
3. Text to speech

⚠ UNDERSTANDING

Default fallback

“How do I crochet?”



1. **Speech to text**
2. **Intent matching**
3. **Text to speech**

I'm not sure what you mean. Can you
try putting it in other words, please?

⚠ UNDERSTANDING(PARTIAL)

Contextual fallback

“I’m looking for inspiration.”



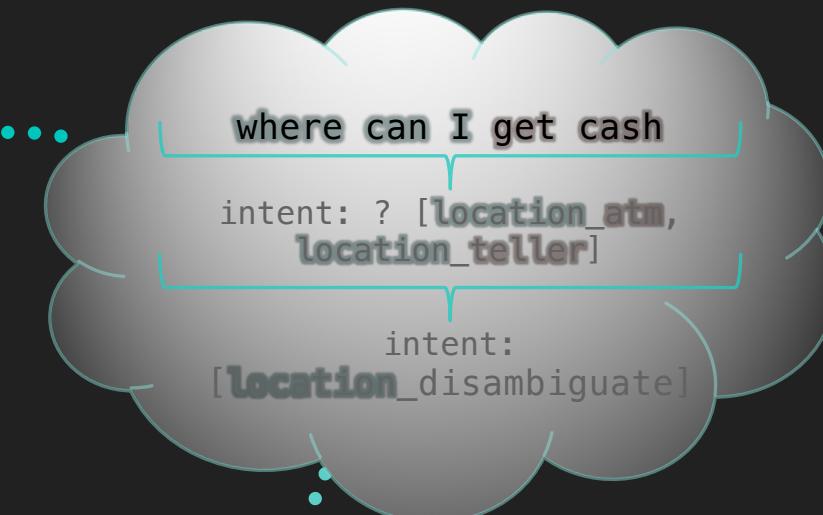
1. **Speech to text**
2. **Intent matching**
3. **Text to speech**

I couldn’t find a location for that in my
knowledge base.

⚠ UNDERSTANDING(PARTIAL)

Contextual fallback: disambiguation

“Where can I get cash?”



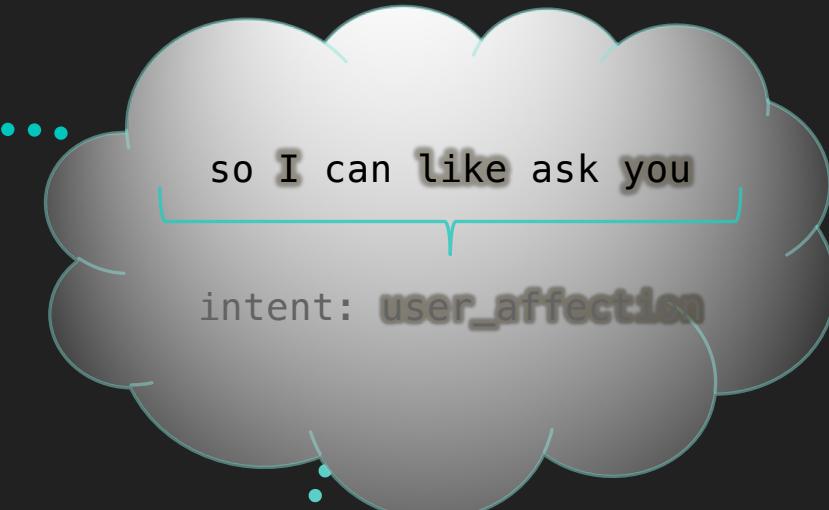
1. Speech to text
2. Intent matching
3. Text to speech

You can **get cash** in more than one place.

Which location are you interested in?

⚠ RESPONDING

“So I can, like, ask you...”



1. **Speech to text**
2. **Intent matching**
3. **Text to speech**

How very nice of you to say so!

Where can communication fail, and how can we respond?

“Just answer my question!”

Sorry, I'm trying to answer your questions as best I can. Please be patient with me!

⚠ HEARING

- Didn't hear → (no reaction)

A verbal reaction isn't always ideal.

⚠ UNDERSTANDING

- Didn't understand → default fallback
- Partially understood → contextual fallback

Give partial credit, be proactive if possible.

⚠ RESPONDING

- Misunderstood → ...

Respond politely to what human might say next.

What does it mean to be graceful in conversation?

Cooperating
Adapting

- **Quality (speak truthfully)**
 - *I expect you to respect my trust.*
- **Quantity (be succinct)**
 - *I expect you to respect my time.*
- **Relevance (make sense)**
 - *I expect you to respect my desire.*
- **Manner (sound “normal”)**
 - *I expect you to respect my comfort.*

“Gricean Maxims” (Paul Grice, 1975)

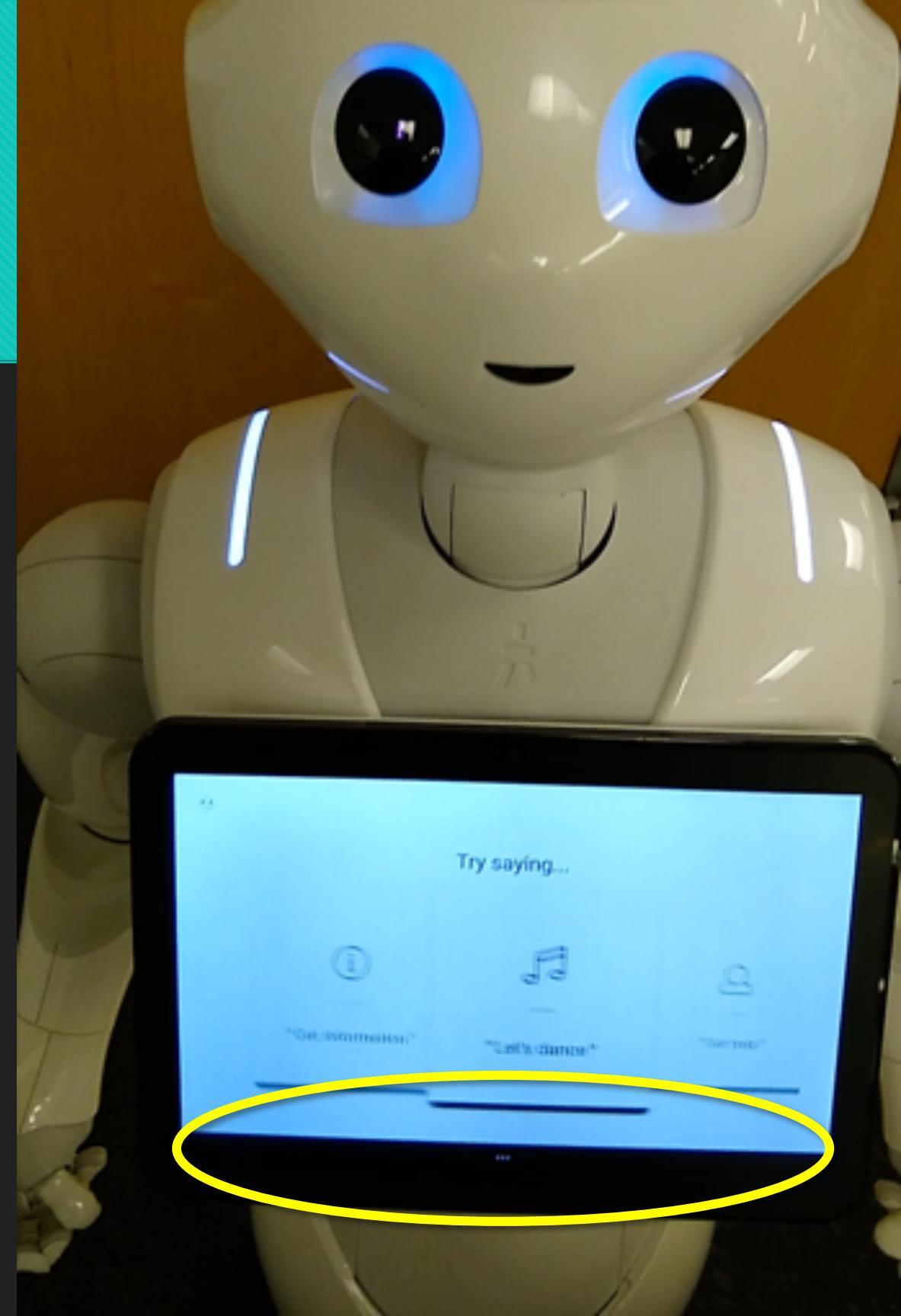
What do we expect of others in conversation?

Quality

Quantity

Relevance

Manner



Some tools and strategies.

Variety
Escalation

VARIETY

Modular structures
& randomness



[ERROR] **Description:** input not understood; **Hint:** try a different input.

1. Hmm? I'm not sure what you mean. Could you try rephrasing, please?
2. Excuse me? I don't understand. Could you try putting it in other words?
3. Pardon me? I'm afraid I don't get it. Could you try saying it another way?
4. Sorry? I'm afraid I don't understand. Can you please rephrase that?
5. Um? I don't know what you mean. Is there perhaps a different way to say it?

5 variants

1. Hmm?
2. Excuse me?
3. Pardon me?
4. Sorry?
5. Um?

1. I'm not sure what you mean.
2. I don't understand.
3. I'm afraid I don't get it.
4. I'm afraid I don't understand.
5. I don't know what you mean.

1. Can you try rephrasing, please?
2. Could you try putting it in other words?
3. Could you try saying it another way?
4. Can you please rephrase that?
5. Is there perhaps a different way to say it?

5

x

5

x

5

=

125 variants

VARIETY

Modular structures
& randomness
(a **caveat**)

Hi! How are you?

Oh, not much! What's up?

Fine, thanks!

(wellbeing inquiry)	(status update)
How are you?	Fine, thanks!
How's life?	Well, thank you.
What's up?	Oh, not much!
What are you up to?	Nothing much.

ESCALATION Three strikes

Strike 1

⚠
(huh?)

Strike 2

ℹ
(here's what I'm missing)

💡
(you can help me by...)

Strike 3

ℹ
(give up graciously)

Let's try interacting
through my tablet.

💡
(propose
alternative)

Priorities:

- Brevity
- Variety

Priorities:

- Transparency
- Courteous guidance

Priorities:

- Apology
- Redirection (or escalation)

ESCALATION Three strikes



A summary.

Robot behavior

Human behavior

Tools and strategies

Questions?



Thank you.

Alison Rush

alison.rush@softbankrobotics.com