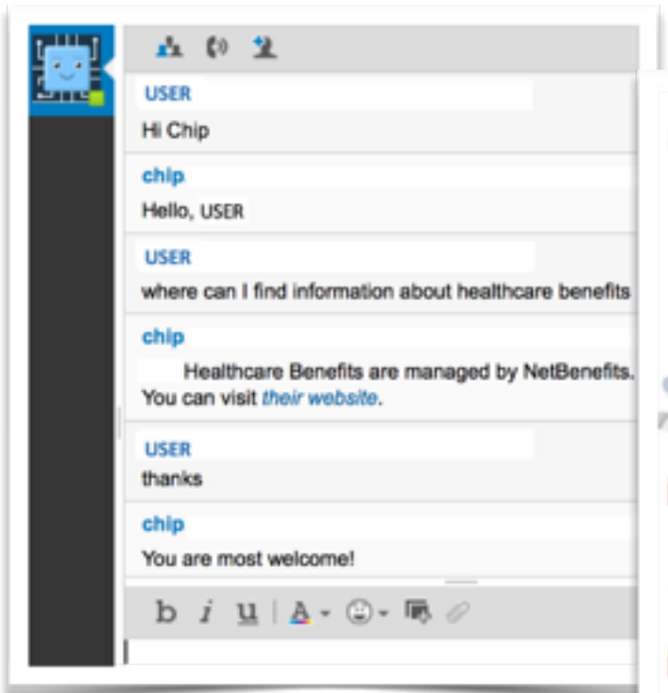
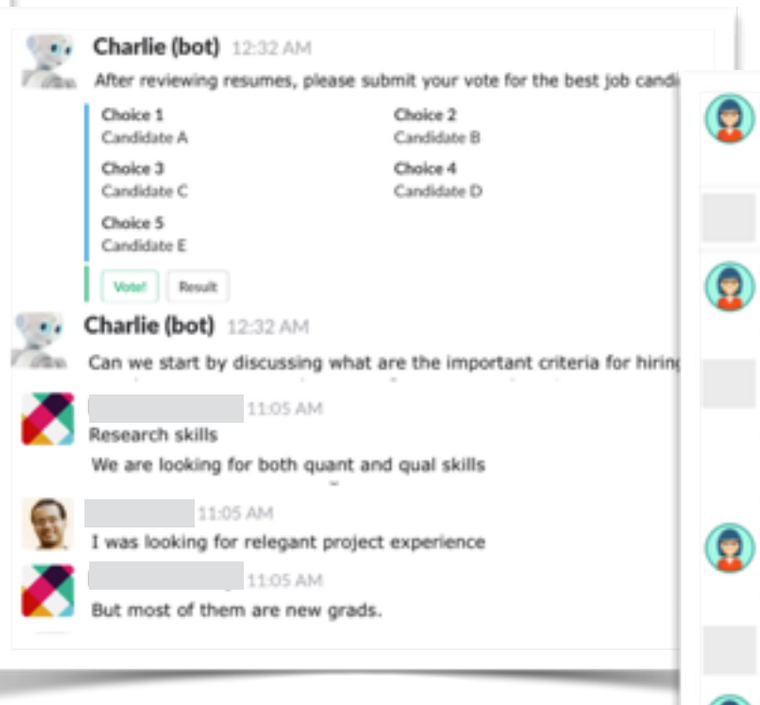
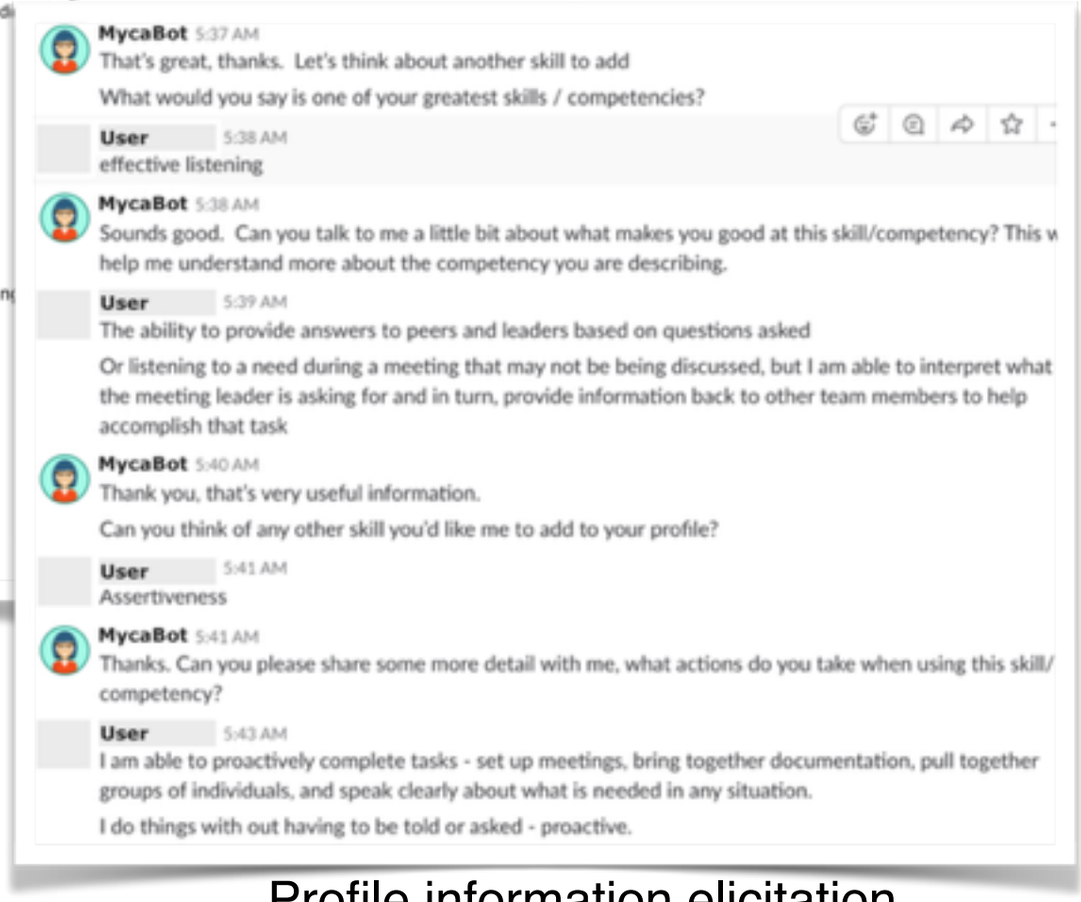
Ways of knowing for AI: (chat)bots as interfaces for machine learning

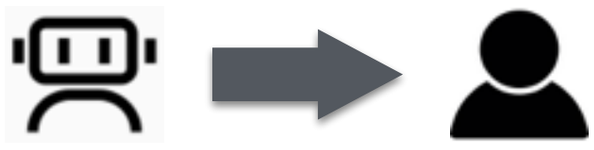
Q. Vera Liao
Michael Muller
IBM Research



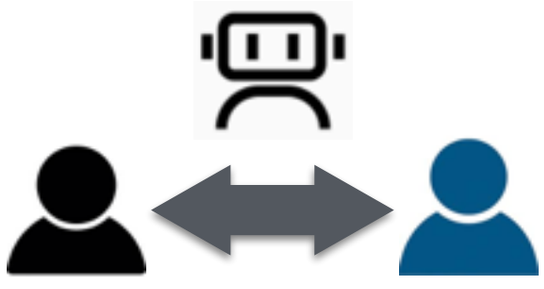




Q&A
(CHI18)



Group facilitation
(CHI18)

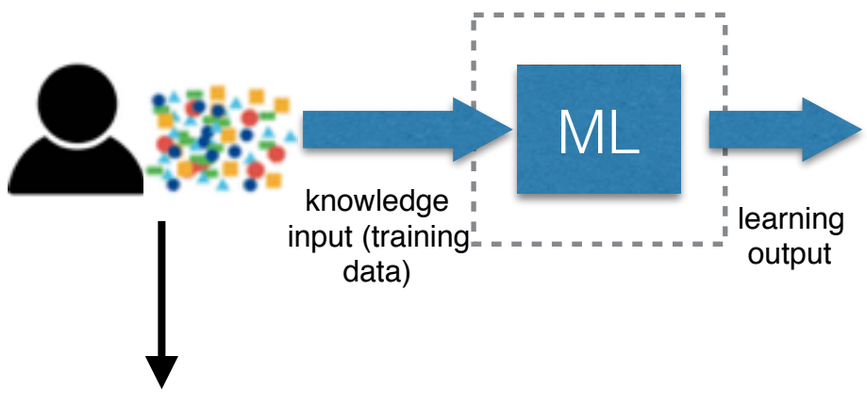


Profile information elicitation
(IUI18)

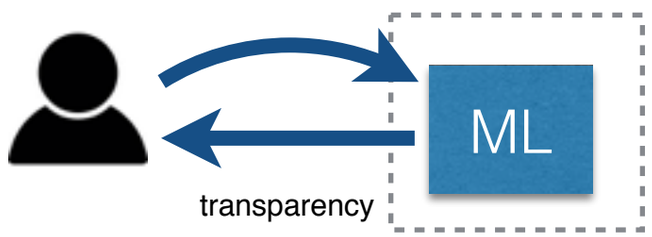
- drive down desired information paths
- dynamic and adaptive interface
- personified/anthropomorphic designs
- relatively low cost for language understanding and knowledge base

Knowledge elicitation for machine learning

Towards more **efficient** learning algorithms that **interact** with people

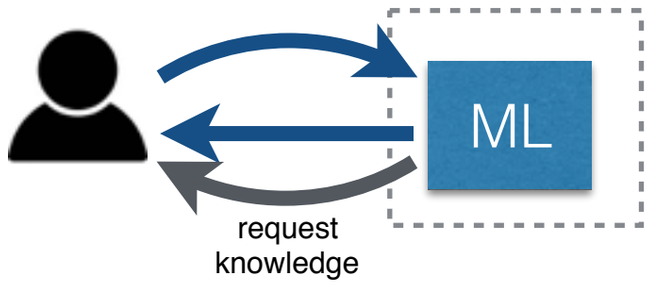


message	label
I need to see the balance of my credit	billing
I need quick assistant on pricing, as I need to finali	billing
Thanks for the reply. It doesnt look like the items I	error
Chris - Yes I do have a pay as I go account. Since Ju	billing
Hi Elias, we haven't been able to connect. And I ha	promotion
hey there Elias - I believe either you or someone fr	promotion
Hi Virgina,.Thanks for reaching me out..I was willir	billing
Can i contact u through whatsapp?	schedule
When I click on the container to set it up, there ar	billing
fyi, i was creating node.js apps in amazon in minut	error
I need help	



interactive

e.g. *interactive ML* allows domain experts to examine the model output and **incrementally update the knowledge input**



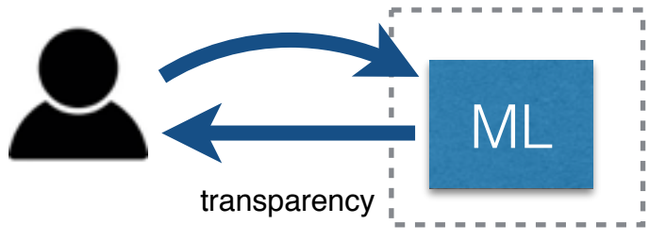
proactive

e.g. *active learning* relies on the learning algorithm to **request knowledge for selected items** (e.g. most uncertain ones)

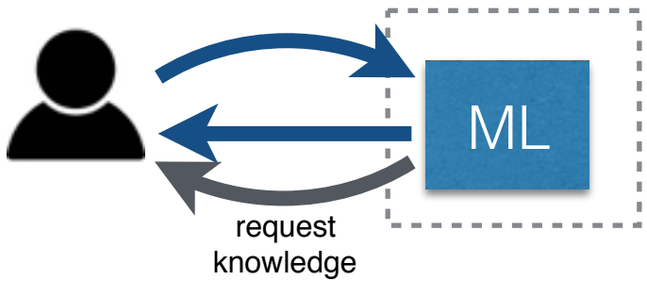
rich forms of knowledge

e.g. *weak supervision* allows **higher-level knowledge input** in rules and heuristics

Ratner, A., Bach, S. H., Ehrenberg, H., Fries, J., Wu, S., & Ré, C. (2017). Snorkel: Rapid training data creation with weak supervision. VLDB 2018



interactive



proactive

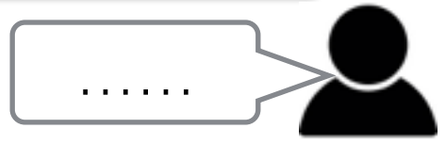
rich forms of knowledge

I have learned to classify messages with 85% accuracy. Try testing me a billing related question?

The following message is asking about billing, right?

Yes **No**

What are some common phrases people use when talking about billing?



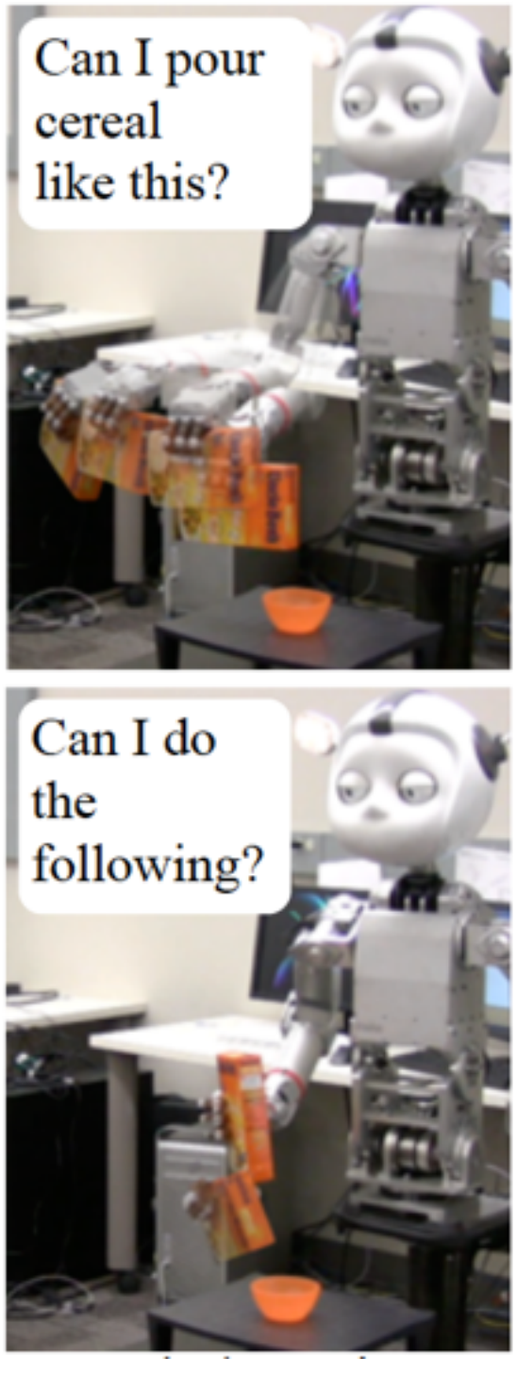
Why is this message about billing? Can you explain the pattern to me?

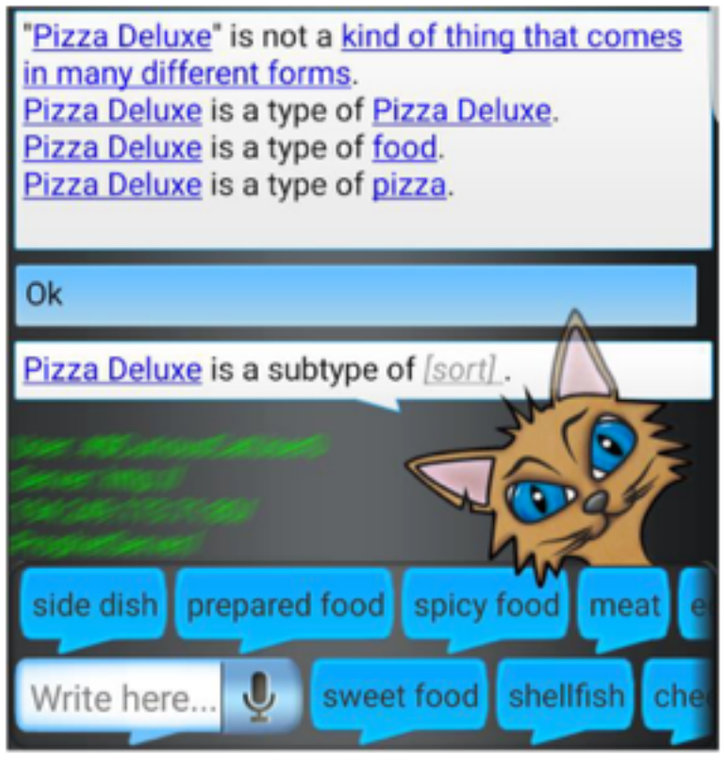
Design issues (an ongoing list)

Design goals: **articulation, efficiency, robustness, engagement**

- Knowledge elicitation techniques: “prompts”, dialogue structure, probes, etc.
- Bridging natural conversational behaviors and formal input for learning algorithms (*socially guided machine learning* Thomaz & Breazel 2008)
- Bot persona: mental model, mental model, mental model

Teacheable agent: a naive student model?





(Cakmak & Thomaz, 2012) (Bradesko et al., 2010)

- A natural fit for “learner”
- Leveraging teaching interactions and teaching/learning theories
- But, leading to behavioral biases
- May not be a common interface for diverse models and human knowledge sources

multi models and multi knowledge sources

Examples of knowledge needed for ML models

type of knowledge

tacit

value learning — values

learning to reason — knowledge structure, reasoning process

learning features and schema — domain concepts

learning instance category — instance labels

explicit

domain experts | end users | other stakeholders | crowd workers

type of human knowledge sources

individual | group

Examples of HCI methods

type of design knowledge

open-ended

speculative — design fictions

inferential — interview, verbal protocol, task analysis

descriptive — card sorting, structured interview, survey

evaluative — questionnaire, AB testing

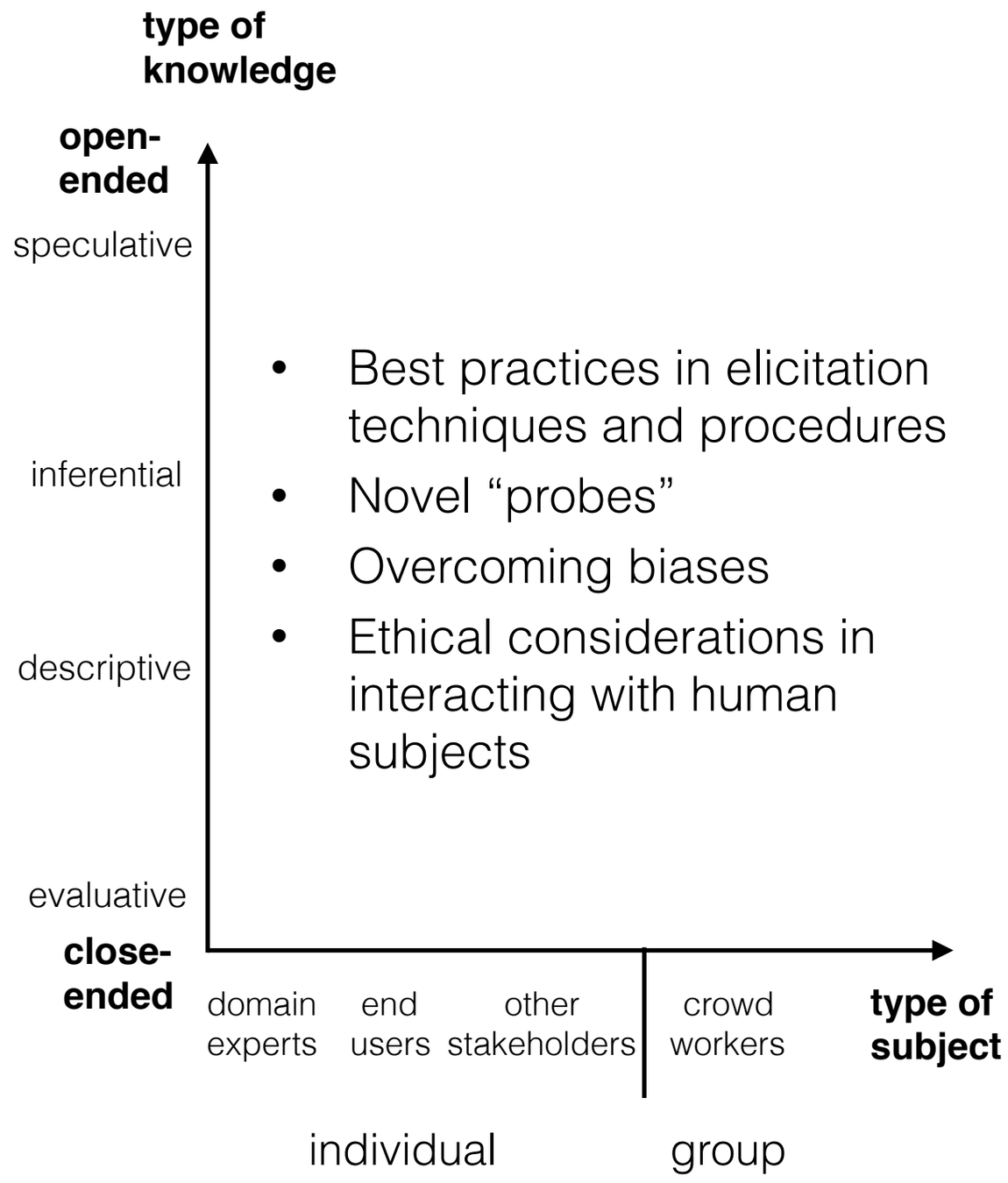
close-ended

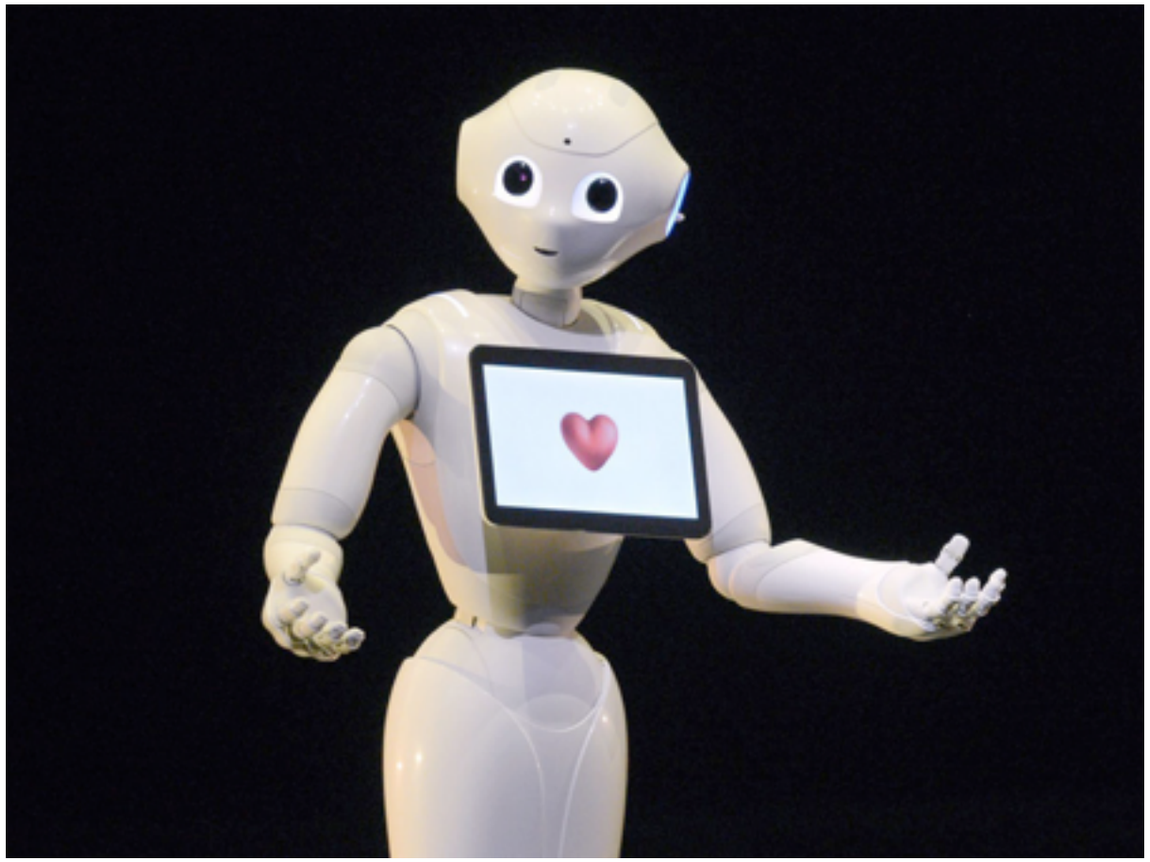
domain experts | end users | other stakeholders | crowd workers

type of subject

individual | group

A common knowledge input interface for ML:
A toolbox of knowledge elicitation methods with the goal of learning the task domain, understanding diverse stakeholders, and ultimately, optimization centered around user needs and societal benefits





HCI researcher bot?