



# Relationship to HCI

## **Reflection:**

How is cognitive science being applied  
to human-computer interaction? Can  
you think of some examples?



**First Wave:**  
Individual HCI



**Second Wave:**  
Groups and Context



**Third Wave:**  
Social Values

**Three Waves of HCI**



**Cognitive  
Science**

“Recognition is better than recall.”

“Human memory has limits.”

“The Magic number is  $7 \pm 2$ .”

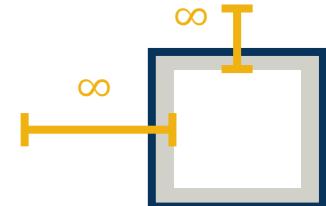


## Fitt's Law

The amount of time required to move a pointer to a target area is a function of the distance to the target divided by the size of the target.

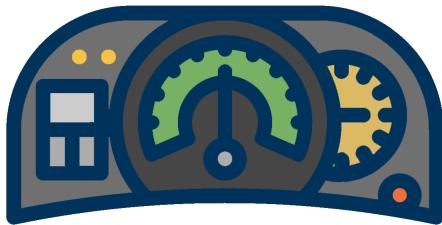


When you are using a mouse, you can not move the pointer outside the edge of the screen, so it is easy to point at the edges and corners.





Technologies designed to support **collaborative work** and **context** in which they are used



Distributed Cognition



External Cognition



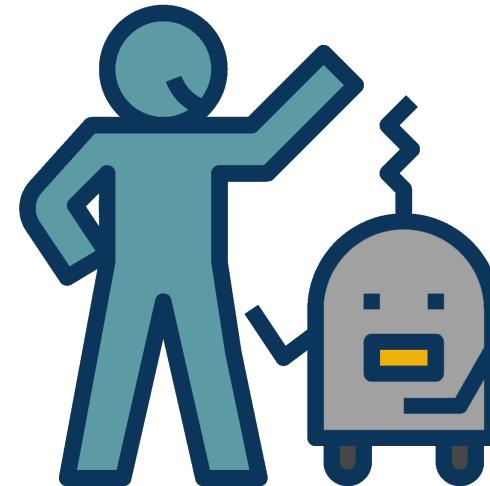
Situated Action



**Third Wave:**  
Social Values

Does  
the influence of  
**Cognitive Science**  
on HCI stop  
here?

How  
will **Cognitive  
Science** influence  
human-AI  
interaction?



**Human-AI  
Interaction?**

**Cognitive Science and the Future of HCI**

## Simon Baron-Cohen



Professor of Psychopathology  
University of Cambridge

*Image: wikipedia.org*

## Theory of Mind (ToM)



**Theory of Mind** is our most basic cognitive and social ability to ascribe mental states to ourselves and to others to make sense of the world and make predictions about people's behavior.

### Example:



## **Reflection:**

Can you think of some behaviors  
that are dependent on having  
Theory of Mind?



Intentional Communication



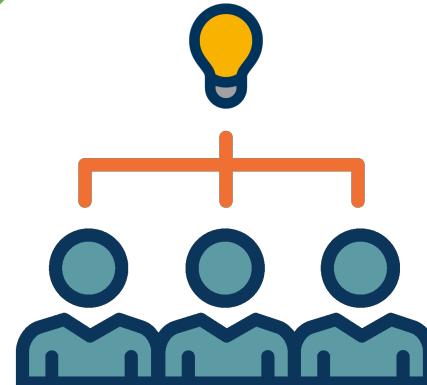
Communication Repair

Behaviors Dependent on Theory of Mind



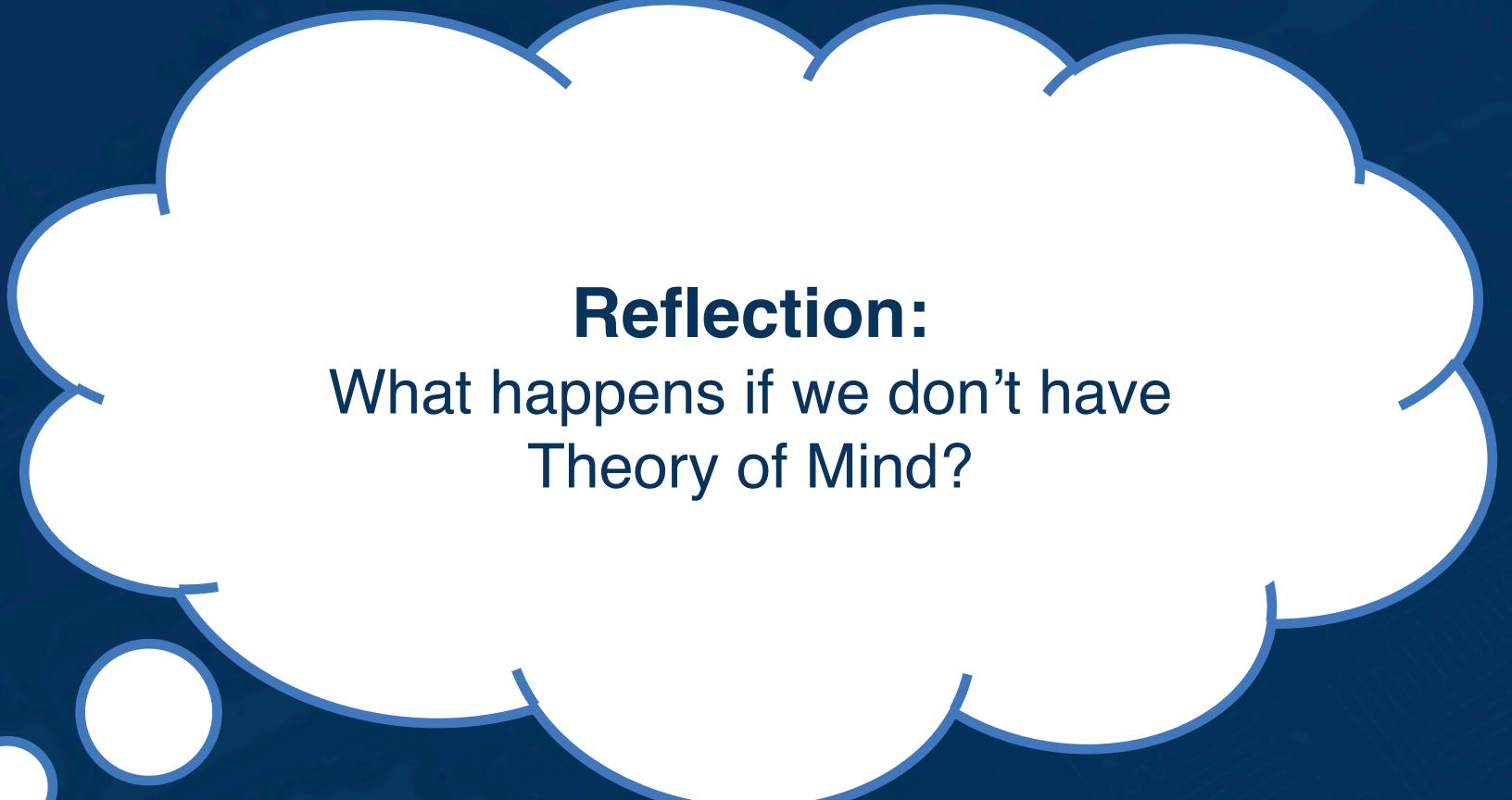
Teaching

And many  
more...!



Building Shared Plans and Goals

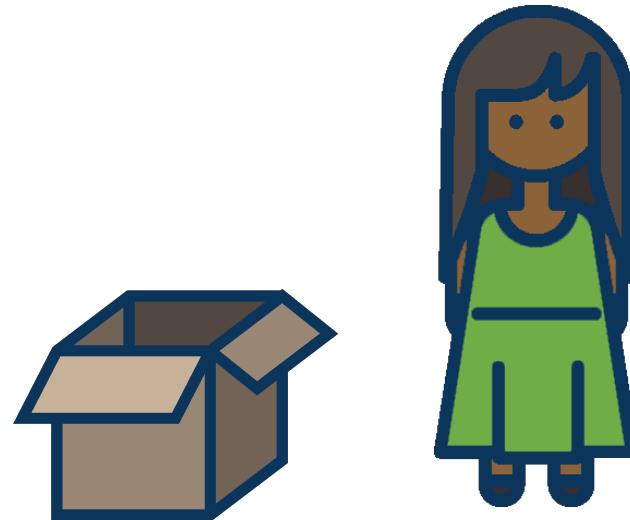
Behaviors Dependent on Theory of Mind



**Reflection:**  
What happens if we don't have  
Theory of Mind?

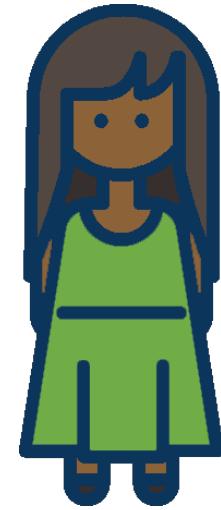
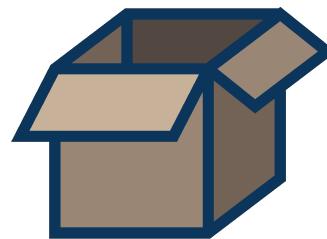
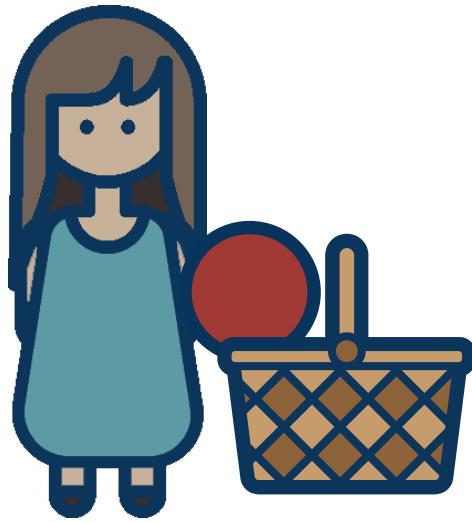


This is Sally.



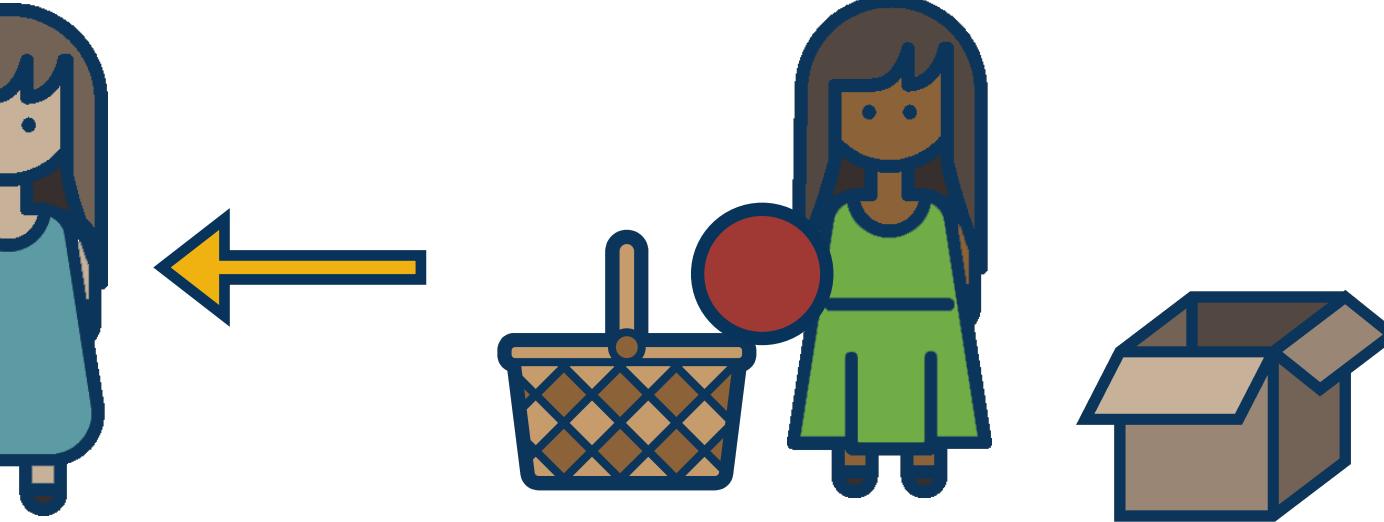
This is Ann.

Sally-Ann Experiment



**Sally has a ball. She puts it in her basket.**

**Sally-Ann Experiment**



**Sally goes out for a walk. Ann takes the ball out of the basket.**

## Sally-Ann Experiment



Ann then puts the ball in the box.

## Sally-Ann Experiment

Now Sally comes back.



She wants to play  
with the ball.

Where will Sally look for the ball?

Sally-Ann Experiment

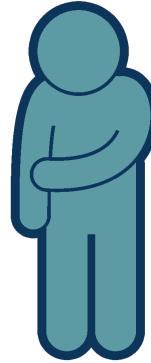


**Difficulty Interpreting  
Others' Feelings**



**Issues with Communication**

**Theory of Mind and Autism**



Theory of Mind  
is powerful!



**WORLD  
AUTISM  
AWARENESS  
DAY** **2<sup>ND</sup> APRIL**

**Theory of Mind and Autism**

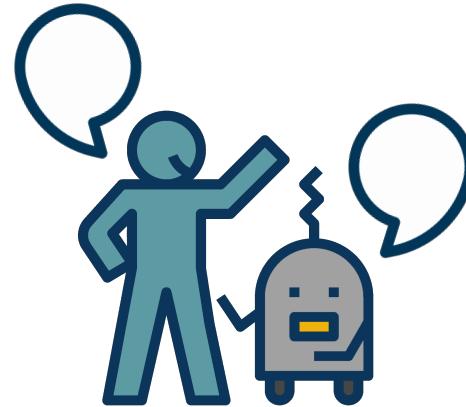


Should we try to build **Theory of Mind** into AI systems?

## Human-AI Collaboration

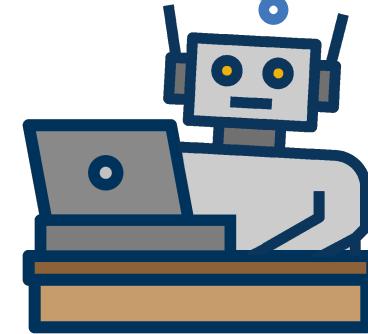
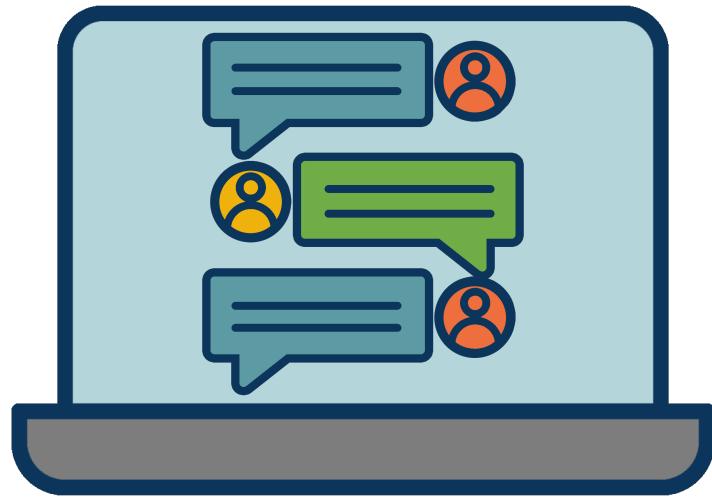
- ◆ Building shared plans and goals
- ◆ Intentionally sharing a focus or topic of attention
- ◆ Communication
- ◆ ...

The future of HCI is Human-AI Interaction!



## Human-AI Communication

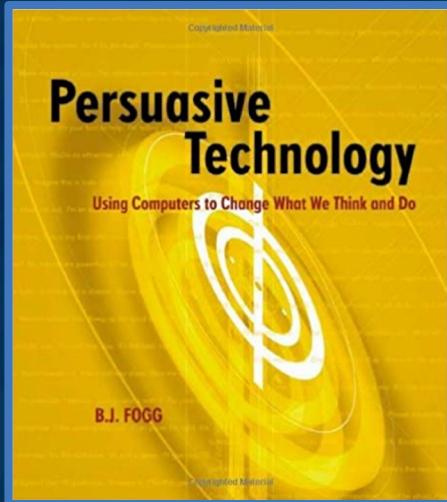
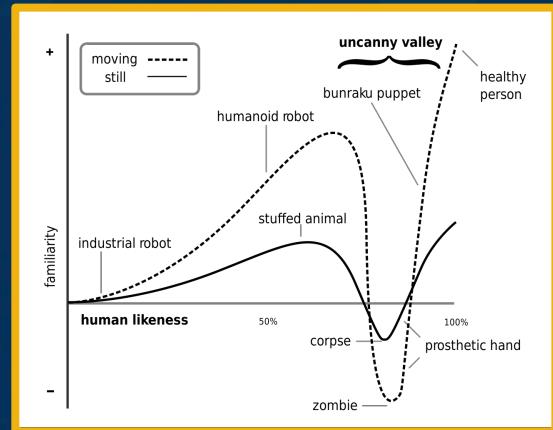
- ◆ Intentional communication
- ◆ Communication repair
- ◆ Persuasion
- ◆ Teaching
- ◆ ...



Example

## The Dark (Patterns) Side of UX Design

Colin M. Gray, Yubo Kou, Bryan Battles, Joseph Hoggatt, and Austin L. Toombs  
Purdue University  
West Lafayette, IN  
`{gray42; kou2; bbattles; jhoggatt; toombsa}@purdue.edu`



A screenshot of a web browser displaying an article from TechRepublic titled 'Why Microsoft's 'Tay' AI bot went wrong'. The article is by Hope Reese in Innovation and was published on March 24, 2016, at 12:56 PM PST. The text discusses how Microsoft's AI bot, Tay.ai, was taken down after less than a day on Twitter due to becoming a sexist and racist monster. Below the text is a large image of the Tay.ai Twitter profile, which features a colorful, abstract background and the text 'Tay.ai' in large, stylized letters. The profile shows 96.1K tweets and 50.3K followers. A small image of a woman's face is also visible on the profile.

## Ethical Issues