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► **To cite this version:**

Wendy E. Mackay. Parasitic or Symbiotic? Redefining our Relationship with Intelligent Systems. UIST 2024 - The 37th Annual ACM Symposium on User Interface Software and Technology, ACM, Oct 2024, Pittsburgh, PA, United States. pp.1 - 2, 10.1145/3672539.3695752 . hal-04842802

HAL Id: hal-04842802

<https://hal.science/hal-04842802v1>

Submitted on 17 Dec 2024

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Parasitic or Symbiotic? Redefining our Relationship with Intelligent Systems

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Abstract

My “**UIST vision**” is to fundamentally change our approach to designing intelligent interactive systems. Rather than creating parasitic systems, our goal should be to create “human-computer partnerships” that establish symbiotic relationships between artificial intelligence (AI) and human users. This requires assessing the impact of users interacting with intelligent systems over the short, medium and long term. We also need to ensure that users control their level of agency, ranging from delegation to retaining full control. Finally, we need to understand how users and AI systems affect each other’s behavior over time. This implies we need to explicitly support “reciprocal co-adaptation” where users both learn from and appropriate (adapt and adapt to) intelligent systems, and those systems in turn both learn from and affect users over time.

CCS Concepts

• **Human-centered computing** → **HCI theory, concepts and models.**

Keywords

Co-adaptation; Evolutionary Biology; Generative Theory of Interaction; Human-Computer Partnerships; Reciprocal Co-Adaptation

ACM Reference Format:

Wendy E. Mackay. 2024. Parasitic or Symbiotic? Redefining our Relationship with Intelligent Systems. In *The 37th Annual ACM Symposium on User Interface Software and Technology (UIST Adjunct '24)*, October 13–16, 2024, Pittsburgh, PA, USA. ACM, New York, NY, USA, 2 pages. <https://doi.org/10.1145/3672539.3695752>

1 Introduction

How can UIST deal with the elephant in the room — the extremely rapid adoption of artificial intelligence (AI) by the general public? AI is no longer solely a back-end tool that batch-processes data, such as detecting faces in photos, and has become an interactive front-end that supports real-time generation of text, images and video. This has upended both our research funding and the research questions we ask.

As members of the Human-Computer Interaction (HCI) community, we need to play to our strengths and shift the typical AI research emphasis from algorithms back to the user. I argue that human-centered AI research should focus on “upskilling” rather

than deskilling or replacing users, improving both the user and the system while helping them to perform more complex tasks than either could alone. We should take advantage of our unique research perspective, which measures success not solely according to an algorithm’s performance but also how the systems we build can improve users’ lives and the surrounding environment.

So how do we improve interaction with AI? Let me use a transportation metaphor: Imagine you need to get home from a party, but had a bit too much to drink. Instead of driving, you can call a cab, delegating the driving to someone else. Now imagine that you enjoy performing tricks with your motorcycle. If you are an expert, you will definitely prefer driving yourself, but of course should not drive your motorcycle home if you are a bit drunk.

Now consider an alternative form of transportation. Horses are intelligent, although not in the same way as humans. Your horse will let you delegate the responsibility for taking you home if you are intoxicated, but also let you maintain control as you perform tricks. When you buy a horse, you and the horse learn about each other over time. You each develop expertise, both individually and with respect to each other, and can accomplish more together than either of you alone.

We can apply this metaphor to creating intelligent systems that act as our partners, with strengths and weaknesses that are different but complementary to us. Ideally, both humans and intelligent systems should learn from and teach each other, improving each others’ skills over different time scales. Accomplishing this requires an explicit focus on the details of the interaction. We need to design interactive systems that are incrementally learnable and find an optimal balance between simplicity of interaction and power of expression. This in turn requires novel approaches for generating and measuring interaction.

We can learn from scientific disciplines that explicitly study interaction. For example, I was inspired by the concept of *co-adaptation* from evolutionary biology. Charles Darwin [2] observed that: “*Co-adaptation emphasizes th[e] on-going, potentially asymmetrical process of mutual influence between organisms and the environment, where survival of the fittest is not simply a matter of an organism adapting to a changing environment, but also of it physically changing that environment to ensure its survival.*” I found a similar phenomenon in my study of how computer users reacted to new technology [3]. Everyone adapted their behavior to accommodate the details of the system, but many also adapted or modified the system to meet their individual needs. Users both learned the system and appropriated it in ways big and small. Moreover, their innovations inspired new ways of thinking about the technology.

We can also learn from how evolutionary biologists define co-adaptive, inter-species relationships (see Figure 1), which may result

UIST'24, October 13–16, 2024, Pittsburgh, PA

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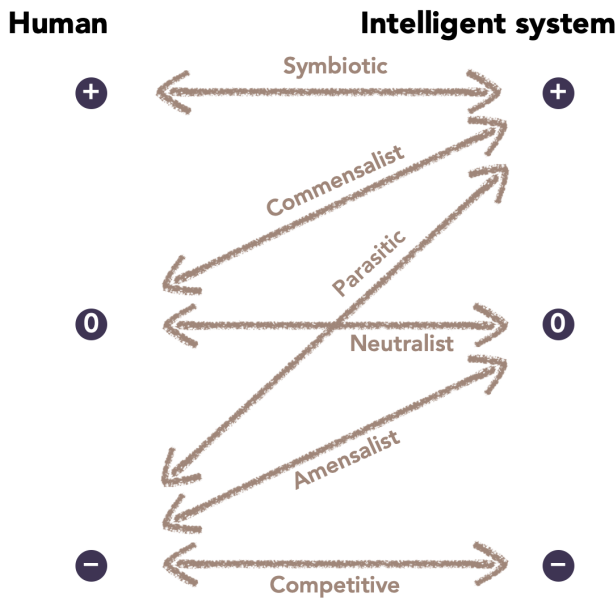


Figure 1: Evolutionary biology provides a metaphor for positive, neutral and negative relationships between users and intelligent systems. Explicitly measuring and designing for these relationships can help avoid deskilling or replacing users and instead empower them to create effective, long-term symbiotic relationships.

in positive, neutral or negative effects on each party. For example, a *symbiotic* relationship benefits both parties, whereas a *parasitic* one benefits one party at the expense of another. These relationships operate over time so that the culmination of individual interactions affect future behavior. Similar relationships obtain when humans interact with intelligent systems over different time periods. For example, the “like” button provides a tiny, short-term reward, but can lead to a user’s longer term addictive behavior.

The arrival of generative AI is creating longer term co-adaptive relationships. Some intelligent agents are designed to learn from the

user and adjust their behavior accordingly. Others “adapt” or modify the user’s behavior, shaping it over time. This can be positive, as when helping a user learn something new, or more questionable, as when persuading users to buy something they do not need. I use the term “reciprocal co-adaptation” [1] to describe these four adaptive relationships – where both users and intelligent systems *adapt* and *adapt to* each other’s behavior – as well as how these four relationships interact with each other.

This perspective offers a novel research approach for designing and measuring the impact of intelligent systems, both users and the environment, at different time scales. To the extent that researchers study the impact of AI on users, most focus on only one or at most two of these relationships. Thus an AI system designed to teach math will measure the students’ learning outcomes, but rarely consider how the system can learn from the individual student or how that student can adapt the system for other purposes.

My vision for creating truly human-centered AI is to explicitly design for all four relationships together, such that users learn from and adapt interactive systems, and those systems learn from and positively change user behavior in turn. The ideal is to create systems that combine power of expression with simplicity of interaction, where users share agency, but remain in control.

My talk will describe how we can create these “human-computer partnerships” [3, 4] such that humans and intelligent agents perform better together than either individually. Our design challenge is to develop intelligent systems that improve *human* capabilities – “upskilling” rather than deskilling or replacing humans – thus taking advantage of the best characteristics of both humans and AI.

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