

Human AI Collaboration: A Dynamic Frontier Partnerships Between Human and Artificial Intelligence

mediaX at Stanford University Conference

November 1, 2017

Mackenzie Room (3rd fl. Jen-Hsun Huang Engineering Center)

Welcome: *Martha Russell, Executive Director, mediaX at Stanford University*

Artificial Intelligence: Augmentation, Competition and Wealth

Neil Jacobstein, mediaX Distinguished Visiting Scholar and Singularity University

1. AI augments and competes with human intellect
2. Businesses will be forced to automate for cost competition
3. Getting “beyond jobs” with esteem requires wealth
4. Technology will create massive wealth-need distribution experiments
5. Harvesting the many benefits and controlling the downside risks of AI won’t come for free
6. Like all powerful technologies, AI needs to be managed proactively

Frontiers of AI in Medical Imaging for Clinical Decision Making

Daniel Rubin, Associate Professor of Biomedical Data Science, Radiology, Medicine (Biomedical Informatics Research), and Ophthalmology (courtesy), Stanford University

1. There is much variability in people and their diseases, necessitating “precision medicine” and “precision health.”
2. There are enormous amounts of data that can be leveraged to improve clinical decision-making.
3. Integrating various types of data (e.g., images + clinical notes) and handling longitudinal data is needed.
4. AI methods that leverage integrated data can provide clinical decision support in several types of clinical decision scenarios.

Panel: Human Learning, After Machine Learning

Moderator: *Keith Devlin, Executive Director, H-STAR Institute*

Identities at the Interface

John Perry, Henry Waldgrave Stuart Professor of Philosophy, Emeritus, Stanford University

1. AI and Philosophy: personal recollections of a troubled relationship
2. Computers as persons: the issue of personal identity
3. Computer as persons: the issue of consciousness
4. A Proposed Constitutional Amendment

Human Learning Before Machine Learning

Pat Langley, Director, Institute for the Study of Learning and Expertise

1. Many key ideas in AI and machine learning had their origin in theories of human cognition and learning
2. People can collaborate more effectively with AI systems that:
 - Adopt human-like representations and knowledge
 - Follow social norms of interaction and dialogue
 - Reason about the beliefs and goals of those they aid
3. This “cognitive systems” approach differs from recent AI bandwagons, but it has a long and successful history.

Human AI Perspectives on Learning and Understanding

John Willinsky, Khosla Family Professor of Education, Stanford Graduate School of Education

1. Elon Musk warns about “something seriously dangerous happening” with AI. The danger I see with machine learning is that it gives rise to the qualified back-formation “human learning,” for which machine learning does not bode particularly well, even as it is always about to surpass it.
2. Machine learning’s success brings renewed attention to training-as-learning with the emphasis on efficient and speedy pattern recognition; this is considered an educationally reduced form of learning (“drill and kill”) compared to fostering understanding, inquiry, questioning, and imagination.

3. More seriously, the achievement of deep learning enable reduced programming, supervision, and training data, while doing even less, despite being modeled on our neurophysiology, to inform our understanding of learning processes.
4. If machine learning proceeds without a greater concern for our learning, the combination of proprietary and untraceable learning suggests (a) less of a human-AI collaboration and more parallel play; (b) areas of the human experience that will be left to machine learning to direct; and (c) gains in learning at the expense of knowledge, apart from that machine learning.

Self-Optimizing Tutoring Systems

Emma Brunskill, Assistant Professor, Computer Science, Stanford University

1. Human in the loop reinforcement learning is about making algorithms and automated agents that assist people and can leverage human expert input
2. Having a person in the loop introduces new technical challenges
3. Could impact education, health, consumer marketing and many others

The Quest for Transparent AI

Ajay Chander, Director, Digital Life Lab, Fujitsu Labs of America

1. We are now living in the Augmented Age, where the default mindset is to seek to enhance human output with machine (AI) assistance.
2. AI modules are currently being crafted as “black boxes” by engineers in a process that has inherent data and modeling biases, rendering such “Dark AI” unsuitable for interactive co-creation with humans.
3. Transparent AI encompasses AI accessibility, explainability, and tune-ability, making AI a more welcome partner for many human workflows and explorations.

Confidence, Trust and Certainty For Collaboration between Humans and Automated Systems

*Peter Norvig, Director of Research, Google
mediaX Distinguished Visiting Scholar*

1. What does an automated system need to do to show it is trustworthy to take on a task on an ongoing basis?
2. What does it have to do when one of its decisions is questioned?
3. How do humans and automated systems partner to deliver the best results?

Getting Financial Predictions Right

David H. Bailey, Leading Figure, High-performance Scientific Computing and Computational Mathematics, Berkeley Lawrence Livermore Lab

1. AI and other software tools are being utilized extensively in the world of finance.
2. However, “backtest overfitting” (statistical overfitting of market data) remains a challenge.
3. We illustrate the dangers of backtest overfitting in the design of stock funds and in market forecasting
4. Considerable care must be taken when using AI methods, for finance or anything else, to ensure they are based on sound statistics.

Human 2.0: How to Build a Centaur & Why It's Going to Change the World

Amy Kruse, Chief Scientific Officer, Platypus Institute

1. The Centaur vision blends the analytical powers of the human brain with those of a computer to create a novel, super-powered system.
2. The most exciting uses of artificial intelligence technology will not be performing “black box” analytics, but rather bringing to life J.C.R. Licklider’s dream of “Human Computer Symbiosis.”
3. We understand the architecture, key components and data flows needed to actually build a Centaur.
4. The centaur approach will have an impact on many domains and exciting application areas.

Panel:
Creating Conversations Between Humans & AIs

Moderator: *Elizabeth Arredondo, Robot Personality Designer,
Catalia Health*

Communication with AI: Interactions of Autonomous Vehicles and Other Road Users

Erik Vinkhuyzen, Sr. Researcher, Nissan Research Center Silicon Valley

1. Autonomous Vehicles must communicate through movement
2. AVs must be able to read the behavior of other people as intentional actions, and understand how its behavior communicates
3. Interactions on the road is based on vast amounts of background knowledge, including a shared perception of the environment, the rules of the road, and local norms

The Poetics of Voice Conversation

Mariana Lin, AI Writer, former Creative at Apple

1. Each AI personality should have a distinctive voice. It's important to consider word choice in writing for AI dialogue. There are a hundred ways to express the sentiment of a positive state. "I'm quite all right," "Everything's peachy," "All's good in the neighborhood" all present a different nuance of tone.
2. Consistency of tone over hundreds of thousands of spoken lines are what creates a strong character and identity. It's easy to choose a crowd-pleasing response in the moment, harder to create a more cohesive bigger-picture portrait of a character and its speech. But this is what people will respond to over time. Hire writers who focus on economy of language and word choice.
3. AI is combination of product and character design. We need designers and engineers, but we also need writers and creatives. People don't just care about functionality, they care about relationships. We have relationships with brands, and we will certainly have relationships with AI. Writers and creatives understand what's entailed in crafting deep, positive relationships. Character voice is different from brand voice. They might be related, but they should not be the same.

Conversation Design

Cathy Pearl, VP of User Experience at Sensely

1. Design for how people actually talk, not how you want them to talk
2. You can still design great conversations without strong AI/machine learning
3. Designing for speech is different than designing GUIs

Daniel Padgett, Conversation Design Lead, Google

Priors and Probabilistic Influences on Perception

Poppy Crum, Director of Research, Dolby and Stanford Adjunct Professor, CCRMA

1. Our perceived experience of sensory information in the world is malleable, contextually and experientially dependent, probabilistic in approximate description, and predictable with some uncertainty.
2. Our priors differentiate each of our perceptual experiences across a constant input to our sensory systems. In this way, bias from our priors is one component influencing how we collectively most often end up with a heterogeneous experience of homogeneous sensory input.
3. For technology to optimally engage and enhance each of our individual human systems it must be: personalized to our sensory/biological baselines, learning and integrating semantic and contextual information of our surroundings and internal state, and interfacing effective dimensionally reduced data to the user.
4. Closing the technology/physiology loop and allowing always on sensors to objectify our internal states has great possibilities, but it means the age of the poker face may come to an end. How will this change our social behaviors? How can we use this to enhance the qualities that make us most human?

In a few decades, we've gone from machines that can execute a plan to machines that can plan. We've gone from computers as servants to computers as collaborators and team members.

The expanding capabilities and applications of intelligent machines call for a more sophisticated understanding of the relationships between people and AI. AI began by understanding actions as humans performed them. Programmers captured the “how” of human behavior in rules that machines could follow. Automated machines could do it faster, with fewer errors, without fatigue. Humans can explain this type of AI.

Enter machine learning – the capacity of computers to leverage massive amounts of data to act without specific human instruction. By looking at examples, extracting the patterns, turning them into rules, and applying those rules, machine learning now captures the “what” of human behavior to provide artificially intelligent answers for complex tasks - such as visual perception, speech recognition, translation and even decision-making. AI now does things that humans find difficult to explain.

We hope you enjoyed today's great presentations from Thought Leaders who have helped guide our exploration of issues and opportunities in human interdependencies on artificial intelligence and addressed these three important questions:

1. *On which tasks will machines with AI be able to out-perform humans?*
2. *What do we know about people and technology that will help us establish confidence, certainty and collaboration in the new partnerships between human and artificial intelligence?*

And, most importantly:

3. *How can intelligent machines truly enhance the human experience?*

mediaX at Stanford University is a forum, an incubator of ideas, and a programmatic framework to encourage and support multi-disciplinary research initiatives. Our initiatives explore how understanding people can improve the design of technologies – in the areas of learning, mobility, collaboration, entertainment and commerce.

As the affiliate program to Stanford's H-STAR Institute (Human Science and Technology Advanced Research) in the Graduate School of Education at Stanford University, mediaX programs are grounded on respect for different approaches to discovery and centered on our belief in the power of collaboration – between business and academic researchers, on campus and around the world.

In trusted relationships, aligned on questions that are important for the future, mediaX collaborations seed campus-wide research and coordinate industry interest. Through dialogue and collaboration, university and industry researchers challenge what we know now and stretch intellectual resources to gain new insights relevant to academic and business collaborators.

Together, we pursue new insights on how information technology affects people's lives, how to better design products and services to make them more usable, and the innovative use of communication technologies to improve the human experience.

To become a member of the mediaX Community, please talk to or email Martha Russell martha.russell@stanford.edu

Thank you for attending the **Human AI Collaboration: A Dynamic Frontier Conference**. All of us at mediaX look forward to seeing you at the mediaX **Innovation Ecosystems for AI-Based Education, Training and Learning Conference** on November 13th.