A.I. & Us: Our Automated Future

CONTEMPORARY MATTERS
PPRI LUNCH SERIES

PPRI lunch series

Faculty across disciplines, from cross-cutting STEM fields, humanities, and social sciences, discuss a common topic or contemporary matter from the lens of their field. The conversation is open to all participants in the room, bringing the strength of the collective disciplines to bear on a wicked problem.

Artificial Intelligence

Artificial intelligence, automation, and the ethical concerns surrounding them have become a global topic of contention as this technology develops in a seemingly unchecked fashion. A more robust understanding of these issues is needed to develop fresh approaches and policy solutions to address these problems as they arise.

Experts

Chris Clifton
Computer Science

Bob Givan
Elec/Comp Eng

Sabine Brunswicker
Digital Innovation

Zhongming Liu
NeuroScience

Robert Proctor
Psychology

Caitlin Surakitanharn
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PURDUE POLICY RESEARCH INSTITUTE
Artificial Intelligence (AI) and automation technologies are developing on a global scale at a rapid pace and remain largely unchecked by policy, governance, or moral boundary. The definition of AI continues to be a moving target, as the concept of intelligent consciousness remains not fully defined. Questions arise from multiple areas of society and range from concerns about programming bias and discrimination to our ability to control AI once it is created, as well as how society will react and interact with AI and automation.

Artificial Intelligence - A Moving Target

Artificial intelligence is officially defined as the capacity of a computer to operations analogous to learning and decision making in humans. In other words, AI is the ability of a computer to make decisions or perform operations in a way similar to human beings. In the past, this concept has been demonstrated by computers successfully beating the best human chess players in the world or beating humans in mahjong.

However, these successes are no longer defined as forward-facing AI, as the target for what defines successful AI has moved. Today, researchers and programmers are working to develop systems that far exceed the abilities of humans in a multitude of aspects, from processing and analyzing data faster and more efficiently to teaching computers to make reasonable, correct, and ethical decisions, despite not having previous exposure to the situation or dataset.

Additionally, the next frontier of AI seems to be moving towards computers completing tasks and making decisions that humans may be incapable of doing on their own. Rudimentary versions of this kind of automaton exist in most new vehicles today (dynamic traction control). Deep learning plays a role in this kind of emerging technology, but researcher remain unclear on the exact role deep learning plays in the landscape of society.

AI researchers and developers have even been able to teach computers the ability to create abstract art. Artwork design by an AI program has been proved to be indistinguishable from those created by humans, and have often won awards in art competitions.

Consumer consumption of AI has been limited up until recently with the explosion of at-home personal assistant devices like Alexa and Google Home. By computer science standards, these devices are not advanced in their ability as AI devices. However, their market penetration and overall success do suggest that consumers are open to letting AI into their homes.
What is Deep Learning?

Deep learning is a computer science term that refers to the way an AI system interacts with its surroundings.

Traditional AI is programmed with task-specific algorithms. If the computer senses a dog, it will look for the line of programming that tells it how to behave with a dog, and execute. If a rule for dogs does not exist, it will do nothing or malfunction with an error.

Deep learning AI is programmed with data representations. If the computer senses a dog but has never interacted with a dog before, the AI will query its past experiences and data set with similar animals or objects, and make a decision how to behave with a dog.

The decision making process in deep learning is a black box. Researchers are not yet able to determine exactly how or why AI comes up with its decisions.

Bias & Discrimination

Programming Ethics and Society

Bias and discrimination have the ability to be unknowingly programmed into artificial intelligence and its tools, even in the most subtle ways.

Job ads on Facebook are an automated process, where an algorithm chooses which ads to show different people based on a variety of factors and Dr. Clifton reported that women are shown ads for lower paying jobs significantly more often than are men. He also reported that individuals with Native American names are forced to go through additional authentication processes to sign up for Facebook, where others are not. Dr. Surakibanharn reported anecdotally that upon changing her last name after marriage, she began receiving advertisements on Facebook for English lessons and ‘Learn English’ programs when those ads never appeared before the name change. These are small examples of automation programming bias and discrimination in today’s world, but their effects could propagate as AI’s influence in society grows. In the case of autonomous vehicles, concerns about bias and discrimination against age, race and/or gender, are raised, particularly in the event of a pedestrian encounter.

The German government recently released a report drafted by an ethics commission on autonomous vehicles, outlining ethical mandates for AV programming. It is the first of its kind and sets precedent for other countries. However, critics say it places restrictions on innovation that are challenging to overcome.

Creative Computers?

It was once believed that creativity was a realm that only humans could master. Rutgers University proved that wrong in 2016 when their Art and Artificial Intelligence Laboratory studied the human perception of art and found that 53% of their computer generated works of art were thought to be human-made. Pretty artsy, if you ask us!
AI & Humans: Who is in Charge?

Until recently, the concept of humans teaming with AI or living in a world where AI was prolific throughout society was the fodder for sci-fi novels and Hollywood films. Ex-Machina explored a world where AI robots are capable of cognition, consciousness, and deceit. WestWorld (HBO) gives us a peek into a world where the robots were meant to entertain, but the ambitions of one programmer and his partner allow them to revolt against humans. Are these scenarios possible or simply shock value?

Dr. Robert Givan says while current AI technology is nowhere near achieving this level of cognition and ability, the speed at which developments are made is steeply exponential. He likened the rate of growth in AI ability to that of a piece of paper being folded in half over and over again, where the first 10 or so folds make the piece of paper thicker, but at 100 folds, it would be as thick as the entire distance of the universe (93 billion light-years thick). In short - while we may not be "there" yet, the ability for machines to have cognitive awareness and deceive their human creators may not be far away. However, Dr. Chris Clifton warns that we also may never achieve the concept of "cognition" in machines. He explains that as a human society, we ultimately champion ourselves as the superior beings, and machines achieving cognition will threaten that stance. Therefore, it is likely we will continue to move the goalpost as to what it means for machines to truly be artificial intelligence.

Designing Automation with Humans in Mind

Automation and smart and connected technologies are becoming an increasing presence in society, but Dr. Robert Proctor and Dr. Caitlin Surakitbanharn warn that more developed iterations with higher levels of autonomy must be designed with human users in mind. As the functionality increases within these systems, it will become more challenging for humans to recognize and/or correct errors.

When humans divert their attention away from the routine tasks that automation is handling, the reaction time to take the task over in the event of automation error increases drastically. However, small tasks that reinforce the mode of automation or other pieces of situational information to the user at a regular interval may decrease this reaction time and result in safer systems.