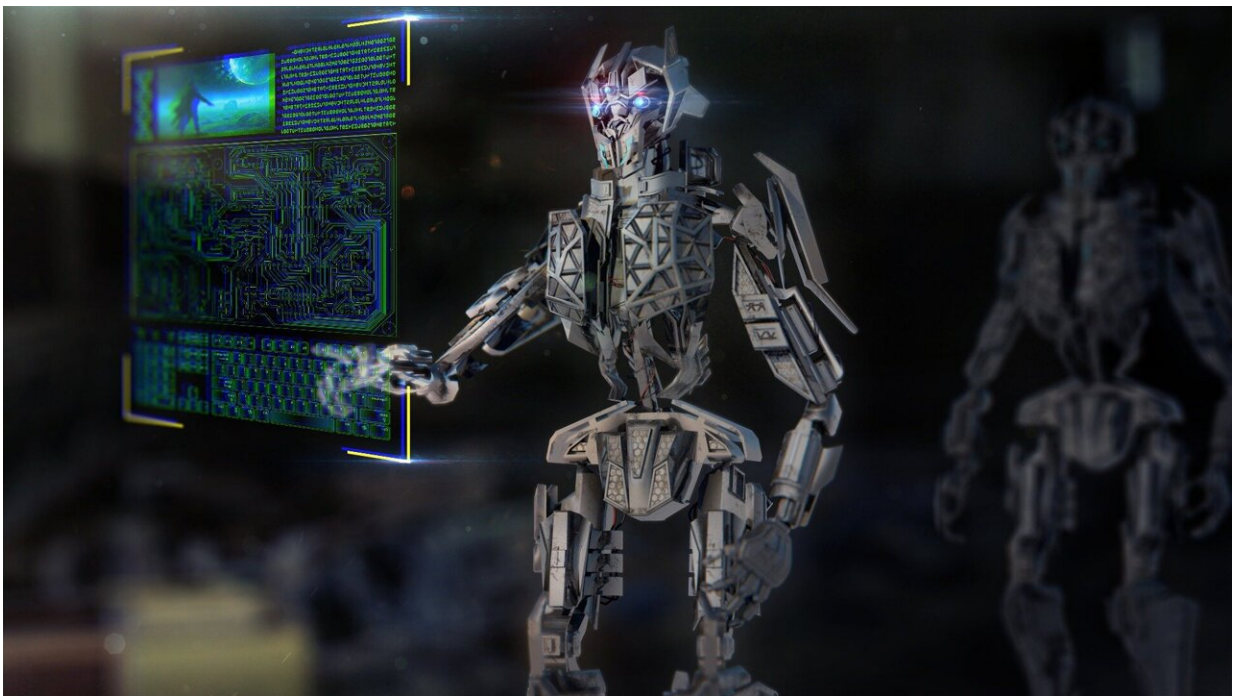


# Q&A: The future of work—how will AI and automation affect work?

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For decades, advances in technology have changed the ways people work, and now artificial intelligence could be the next big disruptor.

Three professors from the University of Cincinnati's Carl H. Lindner College of Business discuss how artificial intelligence and automation will change the way people work, what types of jobs will be lost to

artificial intelligence and the value [human workers](#) still provide.

The professors are:

- Liwei Chen, Ph.D., assistant professor of operations, business analytics and information systems
- Craig Froehle, Ph.D., professor of operations, business analytics and information systems
- Michael Fry, Ph.D., professor of operations, business analytics and information systems and academic director of the Center for Business Analytics

## **How will artificial intelligence and automation affect the future of work?**

**Chen:** In general, AI can be used in two ways. One is automation. That is, we use AI to replace some human beings for certain tasks. The other way is augmentation. We use AI to augment human beings' intelligence and ability to finish some tasks.

When we talk about augmentation, it is not to replace human beings. It is rather to complement. People and AI can collaborate together and do some tasks better. People often think these are two separate things: You can use AI either for automation or for augmentation. But in fact, when you zoom out across time and space, these two are not necessarily separated. They are actually intertwined with each other and interdependent.

**Fry:** What history suggests will happen is we'll find a new equilibrium where in general people are more productive. However, that doesn't mean it will be good for everyone. Because of automobiles, horse and buggy manufacturers, they had to find something different to do. There

certainly will be certain people, certain job classes or industries that may be obsolete. There will be others where certain parts of their jobs will be aided by AI, so you can spend more time doing something that takes more thought whereas the routine things can be done with AI.

**Froehle:** Information automation, it's a continuation of the mechanical automation that has transformed nearly every business that makes anything since the 1860s. The big difference is that we are starting to see it affect white-collar jobs, jobs that process information rather than physical goods ... so-called "knowledge-work."

**Fry:** We have a long history of disruption and automation, everything from [Johannes] Gutenberg and the printing press to the industrial revolution and the internet. What is different about this is that this does a much better job than previous attempts at generating what seems to be new content. You can ask a question that's potentially never been asked before, and it gives you an answer that seems quite reasonable.

The same with art; you can go to other places and say make a picture in this style, and it does it. I think that's what people are really caught off guard by. Now it seems like AI can create, not just automate.

## **When we talk about artificial intelligence being able to 'create,' how real is that?**

**Fry:** We could talk to some philosophers about that: What does creation mean? The algorithms it's using have been around for a while in some form but there definitely have been updates to the underlying algorithms it's using. What has changed is the availability of data. It can scrape the web and get all sorts of stuff.

If you think about what it means to create, if you're an artist, there are

certain brushstrokes and things that you have seen, and you put it together. That's basically what artificial intelligence is doing. Now does that make it intelligent like a human is intelligent? I don't know because it is based on an algorithm, but it can access so much data, and it can pull things from so many places that it starts to learn, "OK, when I put this together with this, people think that is good." That's what it is. It's all based on a scoring algorithm where it thinks through a lot of possible answers, and it has been trained to say that these types of answers people think are better than others.

The underlying approach of what it's doing is not brand new, but the ability to pull so much data, process so much data and some advances in the underlying algorithm lets it do some really cool stuff.

## **How will chatbots, like ChatGPT, affect how we work?**

**Froehle:** The concern that tools like ChatGPT, DALL-E and other generative AI are going to eliminate jobs entirely are kind of overblown, I think. What I suspect is the primary effect is that it will augment or supplement parts of people's jobs. But a lot of information-centric jobs, they're doing value-added things that don't necessarily fit the strengths of a generative AI. I also think it will reduce the time required for certain parts of our jobs, allowing us to spend more time on other parts of our jobs.

I read a story about a realtor who said she typically spent about two to three hours writing a listing for a new house. She can copy and paste some keywords and basic information into a generative AI tool, and it would spit out a first draft in about two minutes. Then she could spend 10 minutes editing it. So two to three hours goes to 15 minutes. What that does is allow her to spend a lot more time working with clients and

less time sitting in front of a computer.

**Fry:** We've been playing with it to write code. As long as you are quite specific on the code you want it to write on a small block, it does a decent job which seems amazing. But very few coders these days start from a blank screen. If I know I need to write something, I do a Google search, and it's out there. So that has already been partially automated for me. This automates it even further. And coders still have jobs; they just spend less time writing simple code and more time thinking about how to improve the efficiency and do fancier things. The job will change, but it doesn't mean the job will go away, and that's typically what we've seen when there's been a technology disruption in the past.

**Chen:** AI plays increasingly important roles instead of being passive tools waiting to be used. They can work as colleagues with human beings. To use ChatGPT as an example, it is very helpful to generate some documents like reports. I can use ChatGPT to create an initial version of the document, and then I can utilize that template and add in additional insight to make it an effective report. It saves human beings time and can free up your time to focus on more challenging pieces of work, think more strategically, think more creatively.

## **Chatbots have been used by companies, such as for customer service for a while, correct?**

**Chen:** Chatbots have existed for a long time. We talked with the chatbots, and they helped to identify the problems and direct us to the human beings as needed. ChatGPT, as a generative AI, has totally different capabilities. They can do much more challenging jobs.

**Fry:** The algorithm is simpler. What it's been trained on is much simpler. Those are like a decision tree where it's looking for keywords.

If you say, "My internet is not working," it hears certain things there and has been trained to give a verbatim response to that person. What ChatGPT can do, because it's been trained on so much more data, it has a much better chance of understanding the nuances, so it can give you a better answer based on the context.

## **When might we see these new artificial intelligence tools become as ubiquitous as the internet?**

**Froehle:** Like with most technologies, the progress isn't even. You'll go awhile then you'll have a sudden big increase in quality or effective efficacy. We could see progress really, really fast, but I don't know. But given the amount of money that's being tossed into it and the amount of activity and excitement, we should see advances at least as fast as we saw advancements in the mid-'90s in terms of the internet. Probably faster than that given the amount of people, institutions and organizations and the amount of money that's being thrown at it. I don't think anyone wants to be left behind this time. I've told several people I think this is the next World Wide Web. Ignore it at your peril.

**Fry:** It will be interesting to see how they monetize these things. Right now ChatGPT is free. You can pay for premium access. But I assume it could go behind a paywall, which could stifle a little bit of the innovation and usefulness. But Google search is an amazing tool that I think has saved all of us an amazing amount of time, and it's still free. So it's possible these could be free, and they monetize it some other way.

We're in an interesting time right now thinking who are going to be the players in this, how open are they going to make it to people using it? Because the other interesting thing with this is they actually do get better the more they're used. At least with ChatGPT, it allows you to give some feedback, and they can use that in improving the algorithm.

## How are people going to respond to their increased interactions with artificial intelligence?

**Chen:** The AI can also be your boss, your manager. We have this term called "algorithmic management." That means you work for an AI algorithm. You are monitored by an algorithm. For example, Uber drivers. When they drive, their tasks are assigned by the algorithms behind the platform. They are not assigned by human beings. So, essentially, they work for an algorithm as the boss. In that situation, how do you respond to a human being as your boss versus AI as your boss? Will that influence your interactions? Your work behaviors? Your interactions with your customers? Those social relationships will be changed because of this algorithm as your supervisor.

I have conducted research about this phenomenon. I looked at ATM service maintenance and how technicians work to fix the machines. This company implemented an AI to allocate tasks for those technicians. We noticed some very interesting tensions in this scenario. When the employees work with the AI, their motivations changed. Originally, either they were intrinsically motivated—they work because they love the job, the maintenance, their clients—or they work because they have to follow their supervisor's guidance. After implementing this kind of system, we noticed a shift of their work motivation.

They are more likely just to follow the instructions of the algorithm. They receive the message on their cell phone. The AI tells them to go to a location to fix that machine with certain tools to address pre-diagnosed problems. All of this guidance is provided by AI. Technicians just follow the instructions mechanically without even thinking about what's going on, without utilizing their expertise or experiences.

Technicians also mentioned that they missed the old days when they had

direct interactions with human being supervisors. They feel the warmth in the service process, and they enjoy the conversations with the customers when they work on site. In other words, the human intelligence and human touch pieces are decreasing after AI is introduced in the service process.

**Froehle:** Vanderbilt [University] had a situation where one of the colleges used ChatGPT to draft an email that went out to students and staff, kind of a heartfelt email about the shooting at Michigan State. And it was a pretty nice email, but then people found out that ChatGPT wrote it, and they kind of lost their minds. A majority of Americans are optimistic about the potential for AI, like the changes it's going to create are more good than bad. But the pushback and the negative reactions we've seen in certain circumstances show that there's a consistently negative reaction when it's used in empathetic roles. Transparency is going to have to be part of it. If you try to hide the fact that you're dealing with an AI from people and they find out, that's going to be worse than if you just tell them upfront.

## **Can artificial intelligence be empathetic?**

**Fry:** We've probably all faked emotions in certain circumstances. If you know in a business setting you've got to be nice to someone even though you don't think you should, you can fake the emotion. Artificial intelligence can learn that. It may not be what we consider a genuine emotion, but I'm not convinced at some point [artificial intelligence](#) can't do a decent job of replicating fake emotions. And will we be able to tell they're fake? I'm not sure.

## **What types of tasks will people be able to do better than artificial intelligence?**



**Chen:** Creativity and critical thinking are things people can do better. I demonstrated ChatGPT in my classroom for my undergraduate students. I let ChatGPT generate a paragraph of an essay and make critical comments about the paragraphs it just generated. We observed that the points it makes tend to be neutral, descriptive, informative, yet unoriginal, formulaic and not necessarily creative. If I ask my students to write a similar essay, their ideas might be more open-ended. I would expect more creative ideas with some really critical thoughts.

**Froehle:** They're not good at being spontaneous, creative, quirky, having personality and adding the richness that humans do. Now sometimes human richness is not great; it's not really what you want. But that's going to be a factor in how we deploy these things. Is the richness of human involvement worth the cost of it being so slow? Because humans are slow, at least in comparison.

The analogy I make these days is a lot of generative AI tools right now are like really fast, low-paid or unpaid interns where you have to look at the output; you just can't pass it along or stick it into a process without examining it first and adding some value for quality inspection. As we've seen, sometimes the pictures they generate aren't quite right or the facts they write aren't correct. We need someone peering over the shoulder of the AI right now to make sure that it's producing usable content. As it gets better, it may need less oversight, but it's really hard to tell how quickly it's going to get better. I suspect in some ways it's going to get pretty good really fast, but in other ways we're going to find these challenging problems continuing to plague the output. But one thing I've never lost on is betting on the progress of technology.

**What types of jobs are most likely to be replaced by artificial intelligence?**

**Fry:** I would say just like we've seen in other disruptions, automations, the things that are repetitive—and by repetitive, I mean if you can write out instructions to do it—those are things that we were pretty good at automating. I think about certain things people do in Excel spreadsheets. If I know you need to go here to get this data, click here, do this, do that, I can write a visual basic code to replace that very, very quickly. But if every day you don't know what you're going to be doing today in your job, that's harder to automate.

**Froehle:** The most easily and directly influenced are those that process or transform information in a way that is fairly procedural, that can be scripted without a lot of creativity. We're already seeing these generative AI tools creating content that is of fairly low quality but it just does it so quickly that it can make a difference.

What I suspect is going to happen is a lot of the fringe roles might have to change. For example, if a company can generate small pieces of artwork quickly and free, and low quality is adequate, then they might not need to hire an artist. But that doesn't necessarily mean that the artist is unemployable in general. It just means they might need to find a job in a different role or a different company.

## **Are there jobs that won't be affected by artificial intelligence?**

**Froehle:** There's a small percentage of jobs that aren't going to be affected very much. A lot of manual labor jobs probably aren't going to be affected very soon. Jobs that require a lot of personal, physical manipulation of things aren't going to be affected by this as fast. But for anybody who's in an information job, they're going to see this arrive on their desktops, on their watches, on their phones, if they haven't already. Even most email clients right now have AI embedded in them to detect

that, say, you received an email including some airline flight reservations, or for grammar checking.

Anytime you have a context that is purely information, the barriers to implementation, improvement and advancements are really, really low. Once you say you have to interact with the physical world, that's when things become a lot more difficult. Roombas exist, but that's about the only autonomous robot people have in their homes, and I don't think that's going to change much in the very near future.

## **Self-driving cars have received a lot of publicity. Will autonomous vehicles replace truck drivers?**

**Froehle:** Given how we've been hearing promises for a decade now and we're still in the limited on-road trials phase ... Again, you're interacting with the physical world. That's really hard. Machine vision is getting better, processing of environmental stimuli is getting faster, but it's a really hard nut to crack. It takes immense computing power to do it in real time with the level of reliability we expect of machines. What's interesting is that the public tends to expect robots to be safer than people. If self-driving vehicles were only as safe as people, they would be legislated out of existence.

**Fry:** For that particular technology, insurance is probably a bigger barrier than the technology. If there is an accident, who's at fault? Right now we say it's the driver. If there's not a driver, is it the car manufacturer, the software?

## **How can businesses use artificial intelligence to their benefit?**

**Chen:** AI can help companies reduce costs. For example, companies use

machines instead of human beings to reduce human resource costs. AI can also streamline the business process, to enhance the operational effectiveness and the efficiency. For example, in autonomous warehouses, robots can work faster and longer, and maintain the quality all the way through. The work processes will thus be standardized and streamlined; you don't see a lot of deviations.

## **If more workers are replaced by robots, will we see more companies choose to remain in the United States rather than build factories in other countries?**

**Fry:** It does open up a few things where labor costs could be less of an issue. This type of disruption certainly is not new. Since the '80s we've talked about robots, and domestic manufacturers have reduced their labor costs by investing in robots. But at the same time, a lot of people, especially in the '80s and '90s talked about the "lights out factory." That there would be no people, so you wouldn't need any lights. It would just be all robots. There's very, very few, if any, that are truly that. What we saw was this new equilibrium where a lot of routine tasks were done by robots and freed up humans to do other tasks that were not quite the same as [doing one action] every day, a million times a day. It did reduce labor costs, did reduce the labor force but also opened up some other jobs. Now we're hiring skilled workers that actually work those computer-controlled machines. The company may need fewer of these workers because the computer-controlled machine is more efficient, but the workers may be paid more due to higher skill levels. It could potentially open up more companies to be willing to [stay] if labor is less of a cost, but we'll have to see.

## **Will we see a time when a large percentage of people can't get jobs because they've been replaced by**

## artificial intelligence?

**Froehle:** I'm skeptical that it's going to cause massive unemployment, at least anytime soon. The early indication seems to be that the net effect on jobs will probably be positive.

**Fry:** History suggests that's not the most likely outcome. I would guess people have been having these same concerns, same discussions for centuries as every new technology came on. What tends to happen is efficiencies increase, new jobs are created, leisure time increases. But we do have to be careful to say that does not mean things are better for everyone. We have seen wealth inequality increase greatly. While average incomes may be up, that average income doesn't represent everyone.

**Froehle:** Whether or not a specific person is capable of handling the revised version of a role is really up to that individual. But typically, jobs don't go away as fast as they change. A classic example is most blacksmith jobs went away once we stopped riding horses, but a lot of the blacksmith-type jobs became auto mechanic jobs.

**Chen:** I believe the replacement happens at the task level. Jobs with tasks that can largely be automated will be at the high risk to be replaced by AI. Usually jobs that contain routine tasks and require a lot of repetitive work are very vulnerable to being replaced.

At this moment, I don't think the technologies are ready to take the place of many jobs. But it definitely brings in a lot of changes in the organizations and how people finish their tasks. So people need to adapt to those changes and learn how to work with those technologies. In the long term, some job titles might disappear while new titles emerge. This will require employees to acquire new skills and adapt to the changing job market.

## **Who is responsible for preparing individuals for the new reality of work that will be caused by artificial intelligence?**

**Froehle:** It's everybody. Schools, universities, trade schools, companies. Anybody who's educating the workforce of tomorrow needs to be involved in establishing in students' minds the fact that this stuff is here, it's not going away and our most effective approach is to teach them how to use it, how to collaborate with it. How to do a job doesn't end with school. There's a lot of on-the-job training and experience gathering. Those have to also be invested in. Some companies are just going to leave it up to their employees; some are going to invest heavily. But a laissez-faire approach isn't going to be nearly as competitive as one where you invest actively, develop your employees as well as invest in the technology.

We all talk about lifelong learning. That's probably a minority of Americans who have that mindset. But as technology's rate of change continues to increase, a lot more people are going to have to adopt that mindset in order to be employable.

With any technology that is increasingly ubiquitous, different roles have different responsibilities. A cab driver doesn't need to know how the combustion happens in the engine. They don't have to have a degree in mechanical engineering to drive a taxi. You shouldn't need to have a computer science degree to interact with a generative AI. One of the exciting things is companies like OpenAI have put a lot of effort into making the tools accessible to the public.

## **How do we ensure bias isn't present in artificial intelligence?**

**Froehle:** Ensuring that there isn't bias is likely impossible, the same way finding a human without bias is likely impossible. Bias exists not only in the data we choose to train the AI on but also in how the AI is constructed. We need to have as much transparency as possible so that those who are concerned about it can look at it effectively.

**Fry:** There are certain things we can do to prevent that in terms of having a diverse training set and having what's called "interpretable AI" or interpretable machine learning, so we can try to understand why it gave the output it did. It's not easy to do, but it's possible to do. But what we shouldn't forget is if it was just a person making these decisions, they have biases. It's sometimes unfair to say the AI or algorithm is less transparent than a person. I don't always know why someone is making the decisions they make. They could lie to me when I ask them. Bias is inherent in any decision making, whether it's a human or AI. But there are ways to try to make that AI potentially as transparent as a person.

**Chen:** We are still in the early stage of discussing AI bias. There are multiple ways we can potentially address this. In the development stage, we need to ensure transparency in AI. We can develop explainable AI, so AI not only provides the suggestions but also explains the rationale of how they came to this suggestion. Another way to address the potential bias is to include a more diverse set of people in the design group. If we could have developers from different ethnic groups, to represent different genders, to represent different minority groups, the algorithm might be designed and evaluated in a more diverse and neutral perspective. Since AI will not be perfect, we need to keep human beings in the loop when we maintain the algorithm. As we continually validate the performance of AI, we can check whether this is aligned with our core values. If there are any deviations, we will investigate the algorithms and fix the issues right away. Finally, government regulations and standards are necessary to make sure that AI is developed in an ethical manner. These regulations might include requirements of

transparency and accountability, as well as guidelines for testing and validating AI systems.

**Froehle:** One of the things I do worry about is: We're going to be so excited about what these tools can do for us and how fast they do it that we're going to spend more time building better tools and less time understanding how the tools actually work. Legislation will have to happen. With any technology, you can't just let it govern itself because we're going to quickly arrive at an unmanageable state.

Provided by University of Cincinnati

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