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## AI and the Future of Work: Opportunity or Threat?

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“The unique opportunity that AI offers humanity is to... extend the relevance, reach and value of human expertise for a larger set of workers.”

—David Autor, Economist

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People have mixed feelings about technology. They love the new opportunities for entertainment, excitement, and comfort, but they also fear how it might affect their jobs and standard of living. Fear of technological change is nothing new. In 1589, Queen Elizabeth I refused to grant the inventor of a mechanical knitting machine a patent for fear it [could put knitters out of business](#). In the early nineteenth century, English textile workers called Luddites attempted to prevent mechanization by smashing the machines, fearing the technology would displace them—which it did.

In recent decades, artificial intelligence (AI) has been cast as the villain in several popular movies. In the 1984 blockbuster *The Terminator*, Arnold Schwarzenegger plays an AI robot sent to eliminate human resistance to an AI plot to end humanity. In the 1999-2021 *The Matrix* series, AI machines have enslaved humanity, using them as an energy source. And, in 2015, *Avengers: Age of Ultron* saw several superheroes fight an epic battle against an AI that goes rogue and decides that humanity is the greatest threat to peace.

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### What Is AI?

In 2018, economists Jason Furman and Robert Seamans [characterized AI \(PDF\)](#) as “a loose term used to describe a range of advanced technologies that exhibit human-like intelligence, including machine learning, autonomous robotics and vehicles, computer vision, language processing, virtual agents and neural networks.”

AI doesn't actually think or reason like a human; [rather, it works on prediction](#). Prediction is merely the process of filling in missing information, which humans do all the time. In this context, AI takes the information you have—“data”—and uses it to generate information you don't have. You might not realize it, but you've probably seen it in several places already. Netflix predicts which movies you might enjoy, and Spotify recommends music that you might like based on your previous selections.

[Autonomous, or self-driving, cars \(PDF\)](#) provide a good example of how AI works. While we may take it for granted, driving is a very complex task; other cars, pedestrians, and traffic signals make driving difficult for humans even under perfect conditions. Engineers program this form of AI to focus on a single predication: *What would a good human driver do?* The prediction is the result of a model created

through machine learning. To train the model, humans drive cars equipped with cameras, radar, and lasers while AI collects and processes data the whole time. In effect, AI is learning how a good human driver responds to different conditions and scenarios. The more it observes, the better it becomes at predicting how to respond. At some point, AI becomes capable of driving the car without the human.

For many people, AI became reality on, or soon after, November 30, 2022, when ChatGPT was made available to the public. Ask it a question, and it responds directly and almost immediately in complete sentences with correct grammar. Upon its release, people were amazed and intimidated at the same time.

ChatGPT is in a class of AI called large language models (LLMs). Like all AI tools, LLMs are predication machines. When asked a question, LLMs predict how a human might answer based on its training. In this case, AI is trained using huge quantities of text so that it learns the patterns and properties of language, including grammar and syntax. This makes it possible for AI to predict the best response, such as when Gmail predicts what you're trying to communicate and suggests words to add to your sentences. Behind the scenes, AI selects the next word or words based on the probability that each suggestion is one the writer intends to use; statistics and mathematical models lie behind the decisionmaking, not a human brain.

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## The Economics of AI

AI has economic implications, and people are concerned about how it may affect their jobs. Will AI be a **complement** to or a **substitute** for their labor? For example, as AI improves, Uber drivers and truck drivers might be concerned that autonomous vehicles will be a substitute for their labor. However, for other jobs, AI might be a complement that allows them to produce more output than before. Think of a carpenter: Power tools do not replace the carpenter, but they do allow more work to be done in less time. Economically, this increase in **productivity** will potentially increase the carpenter's wages. Similarly, [in a recent study by Peng et al.](#), computer programmers who were given access to GitHub Copilot, a generative AI-based programming tool, completed a programming task about 56% faster than the control group without access to Copilot. Like the carpenter with power tools, computer programmers increased their productivity with AI.

It might be helpful to think of most people's jobs as a long series of tasks, all of which use different types and levels of skill. Technology might replace an entire job, but more than likely it will replace certain tasks within a larger number of jobs.

For example, the job of [radiologists](#) is to "diagnose and treat diseases and injuries using medical imaging techniques, such as x rays, magnetic resonance imaging (MRI), nuclear medicine, and ultrasounds." While radiologists are very good at their jobs, AI technology is already able to detect tumors better than humans can, due to its ability to detect patterns. Does this mean that AI will replace radiologists? Probably not. Looking for patterns in scans is just one task in a radiologist's job description; other important parts include meeting with patients to explain their medical condition, discussing treatment plans, and working with a patient's primary care doctor to ensure follow through. So, it is very likely that AI will change, not replace, the job of radiologists: They will spend less time looking at scans and more time with patients. A similar scenario will likely play out in many jobs across the economy.

## What Does the Research Say About AI?

The previous wave of technological change tended to benefit highly skilled workers. However, based on [recent evidence](#), [David Autor \(PDF\)](#) suggests that AI may produce larger benefits for less-skilled workers. [Similar results came from a 2023 study by Noy and Zhang \(PDF\)](#), in which half of a pool of office workers had access to ChatGPT for business writing tasks, while the other half used conventional tools like word processors and search engines. The authors found significant improvements in the speed and quality of writing output among those assigned to the ChatGPT group. Time spent on tasks fell by 40%, and output quality rose by 18%. So, AI increased the productivity of all the workers, but the improvements were greatest for the poorest writers. [Another 2023 study by Brynjolfsson et al. \(PDF\)](#) evaluated the use of generative AI tools that provide suggested responses to customer service agents. They found an average of 14% improvement in productivity, but the improvement for inexperienced and low-skilled workers was 34%. Again, the largest gains went to the workers with fewer skills.

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## Will AI Take our Jobs?

Although the AI economics “doomsday” narrative is alive and well, the results of these early studies tend to be generally positive for workers: Productivity is not only increased, but the productivity gap between the least- and most-skilled workers is reduced. And yet, human expertise is still needed to judge the quality of AI output. To be clear, it is too early to make judgments about how this will affect income inequality; we will know more as AI technology is adopted more widely and as more data become available.

Like all technologies, AI will likely displace some of the jobs done by humans, and it will likely change the list of tasks for many more jobs. But if the past is any guide, we’ll find that human innovation and insatiability will result in the development of new products and services that consumers want to buy. Many workers will likely be employed in jobs and fields that don’t even exist today: [Autor also found](#) that more than 60% of employment in 2018 was in job titles that did not exist in 1940. Indeed, after centuries of technological change, in most years we find the economy is long on jobs and short on workers. This time will likely be no different.

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## Glossary

**Complement (resource):** Productive inputs that are used jointly with other inputs in the production process.

**Productivity:** The ratio of output per worker per unit of time.

**Substitute (resource):** Productive inputs that can be used in place of one another.

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Name \_\_\_\_\_ Period \_\_\_\_\_

## Reading Q&A

# AI and the Future of Work: Opportunity or Threat?

After reading the article, complete the following:

1. What fear did Queen Elizabeth I have about the mechanical knitting machine in 1589?
  - a. It would be too costly to produce.
  - b. It could be dangerous to operate.
  - c. It might put knitters out of work.
  - d. It wouldn't be popular with consumers.
  
2. Who were the Luddites, and what were they known for?
  - a. English weavers who embraced new technologies
  - b. English textile workers who destroyed machines
  - c. Early American factory workers who feared AI
  - d. French artisans who promoted mechanization
  
3. How does AI make predictions, according to the text?
  - a. By mimicking human thought processes
  - b. By reasoning and analyzing like a human
  - c. By using statistics and data to predict outcomes
  - d. By reading human emotions and responding
  
4. In what classification of AI is ChatGPT?
  - a. Autonomous robotics
  - b. Machine learning tool
  - c. Large language model (LLM)
  - d. Computer vision program
  
5. How did AI affect the productivity of computer programmers using GitHub Copilot?
  - a. They worked 56% faster with no change in quality.
  - b. They made 56% fewer mistakes.
  - c. They completed tasks 56% faster and with better quality.
  - d. Their wages increased by 56%.

6. How might AI change, rather than replace, the job of a radiologist?
  - a. AI will replace all tasks a radiologist performs.
  - b. AI will handle scans while radiologists focus on patient care.
  - c. Radiologists will only work with AI on diagnosis.
  - d. AI will remove the need for human radiologists.
  
7. Which group saw the most productivity gains from using generative AI tools, according to the studies mentioned?
  - a. Highly skilled workers
  - b. Mid-level office workers
  - c. Least-skilled workers
  - d. Managers and supervisors
  
8. What point is David Autor making about AI and the future of jobs?
  - a. AI will completely eliminate most jobs that exist today, leaving few employment opportunities.
  - b. AI will create entirely new industries, but only for highly skilled workers.
  - c. AI, like past technologies, will lead to new jobs and industries that don't currently exist.
  - d. AI will cause permanent job shortages—an economy with too many workers and not enough jobs.
  
9. What is the primary concern people have about AI in relation to their jobs?
  - a. AI will create too many jobs in the economy.
  - b. AI will act as a substitute for their labor.
  - c. AI will increase the cost of doing business.
  - d. AI will not impact the workforce at all.
  
10. How does the example of AI in self-driving cars illustrate machine learning?
  - a. AI predicts how a good human driver would respond using data collected from human drivers.
  - b. AI controls all aspects of the car without requiring any human data input.
  - c. AI programs cars to follow specific routes without considering real driving conditions.
  - d. AI designs and manufactures cars but is not involved in the driving process.