

AFF

We affirm the resolution resolved: In the United States, the benefits of the use of generative AI in education outweigh the harms.

Contention 1: Workplace Education/Training

Workplace education and training is vital for jobs Goodman 24

Rodriguez, Christian. "Workforce Development: Reimagining and Modernizing How to Connect Workers with Good Jobs." Center for American Progress, 4 Nov. 2024,

www.americanprogress.org/article/a-progressive-vision-for-education-in-the-21st-century/workforce-development-reimagining-and-modernizing-how-to-connect-workers-with-good-jobs/. Accessed 26 Mar. 2025.

[Veronica Goodman: has graduate degrees in economics and management from Johns Hopkins University, and a bachelor's degree from The George Washington University]

The need to invest more in students and workers has been more urgent amid a few years of a tight labor market,³ despite recent signs of the labor market slowing down relative to the post-coronavirus pandemic period.⁴ **Education and training programs are a powerful tool to increase labor force participation, especially among those workers most likely to be left out of opportunities.**⁵ Until July 2024, the U.S. unemployment rate had remained at 4 percent or lower for 27 consecutive months,⁶ the longest stretch since the 1960s.⁷ **In 2024, job openings in the U.S. economy continue to outnumber the people actively seeking work.**⁸ In fact, a majority of workers' wages are outpacing inflation,⁹ and the economic recovery following the COVID-19 recession has featured historically strong real wage growth. **At the same time, however, labor force participation is still below pre-pandemic rates.**¹⁰ **Given the demographics of an aging workforce, labor force participation is expected to remain lower, meaning policymakers will have to focus on workforce development to a greater extent.**¹¹ **Existing models, such as career and technical education, registered apprenticeships, work-based learning, and sectoral training partnerships, are proven methods of preparing students and workers for the labor market.**¹² This chapter of the Center for American Progress report "A Progressive Vision for Education in the 21st Century" outlines how policymakers can invest more and look for ways to provide universal access to these opportunities.

Gen AI improves workplace education Touran 24

Kayvon Touran. "Generative A.I. Can Transform Workforce Development: The Future of Corporate Training." Observer, 4 Sept. 2024, observer.com/2024/09/how-generative-ai-is-transforming-workforce-development-corporate-training/. Accessed 25 Mar. 2025.

[Kayvon Touran: co-founder and CEO of Zal.ai, a SaaS platform that combines cutting-edge learning science and generative AI to transform workforce learning and development. Previously spent six years at Noodle, an EdTech company that partners with more than 50 top universities in the world to build and grow their online offerings, where he led the product team in launching a platform for managing lifelong learning courseware.]

According to a recent McKinsey report, generative A.I. has three significant transformative advantages and the potential to transform workforce development programs in several ways: **A.I. systems can improve knowledge retention and increase engagement via personalized learning experiences that generate content tailored to individual employees' needs and learning styles. Generative A.I. can help employees practice and develop new skills in a safe and controlled environment by simulating real-world scenarios experienced on the job.** This is useful for industries that require hands-on training, such as healthcare and manufacturing. However, it also creates an entirely new opportunity for knowledge workers to rehearse **and** refine critical human interactions with artificial intelligence acting as an external/internal stakeholder. **Natural language**

processing can **provide real-time feedback and assessment, reducing bias inherent to human intelligence and freeing instructors to focus on more strategic and creative tasks. This can help reduce the administrative burden of training and development and improve the overall efficiency of corporate learning programs.**

This allows workers to adapt to the changing job market **Morgan Stanley 23**

"Generative AI Is Set to Shake up Education | Morgan Stanley." Morgan Stanley, 2023, www.morganstanley.com/ideas/generative-ai-education-outlook. Accessed 5 Mar. 2025.

[**Morgan Stanley**: an American multinational investment bank and financial services company headquartered at 1585 Broadway in Midtown Manhattan, New York City; offices in 41 countries and more than 90,000 employees; clients include corporations, governments, institutions, and individuals; ranked No. 61 in the 2023 Fortune 500 list of the largest United States corporations by total revenue and in the same year ranked #30 in Forbes Global 2000]

Current generative AI technologies will likely affect a quarter of the occupations that exist today, rising to 44% within three years, according to Morgan Stanley Research estimates. But fears that substantial job losses and permanent displacement of workers will ensue may prove unfounded in the long term. **Education providers could find themselves in a unique position to meet the growing need for retraining workers displaced by the technology—including by helping them learn skills needed to use or develop generative AI.** Analysts estimate a \$16 billion market opportunity within the next three years from reskilling workers displaced by generative AI, assuming that around 6% of affected workers will need reskilling. "History tells us major changes in technological paradigms are often followed by periods of disruption, typified by economic growth and net job creation—an idea at odds with current concerns about job destruction in the wake of generative AI," says Duverce.

More jobs want generative AI skills **Wells 24**

Wells, Rachel. "71% of Employers Prefer AI Skills above Experience in 2024." Forbes, 5 Nov. 2024, www.forbes.com/sites/rachelwells/2024/11/05/71-of-employers-prefer-ai-skills-above-experience-in-2024/. Accessed 21 Feb. 2025.

[**Rachel Wells**: Forbes contributor and freelance writer who covers remote and flexible working, freelancing, side hustles, skill development, and AI, for Gen Z and Millennials; has been featured on Scripps News, MSN, and Business Insider; serial entrepreneur, LinkedIn Top Voice, silver winner of the London Chamber of Commerce's Young Business Person of The Year 2024 award, and is launching a tech start-up]

The next statistic states that **71% of business leaders would give preference to a candidate with less experience, as long as they had AI skills.** This signals good news for entry-level professionals. If you're seeking to break into a new industry, either as a career pivot or simply because you are just starting out in your professional life, **having AI skills will certainly give you a competitive edge when it comes to being considered for an entry-level role. The final highlight from Microsoft's study is that 77% of leaders state that with AI skills, entry-level professionals will be given greater responsibilities. This clearly evidences that AI can give you the upper hand in your career, and actually propels you forward and enables faster professional development and growth than would be the case otherwise. AI skills are indispensable in today's job market. While employers are actively seeking professionals who can bring their AI expertise to enable greater ROI, streamline processes, and remain competitive,** this is your opportunity to future-proof your career and be part of the innovation.

IMPACT: Employment **AIPRM 24**

AIPRM. "AIPRM." Aiprm.com, 11 July 2024, www.aiprm.com/ai-replacing-jobs-statistics/. Accessed 29 Mar. 2025.

[**AIPRM**: a prompt management tool and community-driven prompt library]

The National Bureau of Economic Research reported that between 50% and 70% of changes to US wages since 1980 can be attributed to the relative wage decline of blue-collar workers, whose jobs have been either degraded or replaced altogether by automation. Following this line of research, it appears likely that this pattern may increase as we enter an altogether new stage of automation. **In**

fact, in 2023, investment bank Goldman Sachs predicted that 300 million jobs across the United States and Europe could be lost or degraded as a result of AI adoption. However, these predictions rarely tell the whole story. A survey of 750 business leaders by Resume Builder reported that more than a third (37%) of companies using AI say that the technology replaced workers in their organization in 2023 because “they were no longer needed”. Moreover, in 2024, 44% who use AI or plan to by next year say that employees will “definitely” (21%) or “probably” (23%) be laid off due to artificial intelligence. Despite this, 91% of companies using or planning to use AI in 2024 will hire new employees in 2025, and 96% state that having AI skills will be beneficial for candidates to have hands-on experience working with artificial intelligence. A further 83% say demonstrating AI skills will help current employees have more job security than those who don’t. Workers willing to adapt to technology demands and sharpen up on AI tools may be able to mitigate the impact of these job loss predictions.

- **Employment saves lives Brenner 21**

Brenner, M. Harvey. “Unemployment, Bankruptcies, and Deaths from Multiple Causes in the COVID-19 Recession Compared with the 2000–2018 Great Recession Impact.” American Journal of Public Health, vol. 111, no. 11, American Public Health Association, Oct. 2021, pp. 1950–59, <https://doi.org/10.2105/ajph.2021.306490>. Accessed 21 Feb. 2025.

[M. Harvey Brenner: Professor University of N. Texas Health Science Center, Department of Behavioral and Community Health & Bloomberg School of Public Health Johns Hopkins University]

In the COVID-19 period of February to November 2020, unemployment was a significant predictor of excess deaths controlling for the number of COVID-19 cases, age, and Black and Hispanic racial/ethnic groups (Table 1). Using the same model, with identical controls, the combination of both recessional factors of unemployment and bankruptcies yielded an impact of further increased excess deaths (Table 2). In the analysis presented in Table 2, which combines unemployment and bankruptcies, the numerical effect on excess deaths related to unemployment slightly decreased because of the relationship between unemployment and bankruptcies that typically would occur in a recession. In the model that presents 10% unemployment (as currently estimated by the Federal Reserve and Department of the Treasury³⁰) as the only recessional variable, an additional 48 149 deaths were estimated (Table 1). In the recessional model that included both unemployment and bankruptcies, the estimates of 10% additional unemployment led to 35 700 excess deaths, and a 120-unit increase per 100 000 in bankruptcies led to approximately 144 483 deaths. Is this finding a unique, natural consequence of a recession related to a world pandemic or a partial reinstantiation of the effects of recessions during the 21st century, specifically 2000 to 2018? Like total mortality, all major chronic disease causes of death showed significant beneficial effects of log GDP per capita with a 5-year lag and mortality increases related to unemployment without lag (Table 3). The principal recessional variable, unemployment, showed evidence of elevated mortality during 2000 to 2018 (total mortality) and major chronic causes of death and suicide and continued to do so in the period February to November 2020 for total excess death. This indicates a continuous relationship of recession (especially indicated by unemployment rates) through the 2 research sample periods elevating mortality. The principal control variables showed strong positive relations to total mortality and mortality by major cause. However, the health care workforce with inverse relations to mortality featured as the strongest coefficient among predictive variables except GDP per capita with a 5-year lag (Table 3).

Contention 2: Pharmaceuticals

Pharmaceuticals are vital for healthcare **Fan 23**

Fan C, Song X, Li C. The Relationship between Health Insurance and Pharmaceutical Innovation: An Empirical Study Based on Meta-Analysis. Healthcare (Basel). 2023 Nov 7;11(22):2916. doi: 10.3390/healthcare11222916. PMID: 37998407; PMCID: PMC10671039.

[Chenchen Fan: Shanghai International College of Intellectual Property, Tongji University, Shanghai 200092, China]

As one of the crucial strategies for achieving social equality in the healthcare system, health insurance contributes to improving the accessibility of healthcare services and essential medicines, thus safeguarding the basic rights to life for residents and achieving universal health goals [1,2,3,4,5,6]. Health insurance exerts a direct influence on investment in the pharmaceutical industry and drives innovation by actively promoting the utilization of drugs and medical services [7,8,9,10]. Health insurance is vital for pharmaceutical innovation by ensuring access to necessary medications. Pharmaceutical innovation refers to the discovery and development of new drugs through scientific research, drug design, preclinical testing, and clinical trials [11]. It involves understanding the molecular mechanisms of diseases, identifying potential drug targets, and creating new chemical entities that can effectively treat, prevent, or manage various diseases. **Pharmaceutical innovation helps to improve the overall efficiency of health insurance systems and population health outcomes by providing patients with access to more effective and safer treatment options and enables healthcare systems to deliver personalized and cost-effective care [12,13]. It reduces financial barriers and incentivizes pharmaceutical companies to invest in research and development.** In effect, health insurance bridges the gap between affordability and medical breakthroughs, fostering a thriving market that encourages innovation.

Universities drive pharmaceuticals **Plackett 24**

Plackett, Benjamin. "The Great Pharmaceutical-Academic Merger." C&EN Global Enterprise, vol. 102, no. 31, American Chemical Society, Oct. 2024, pp. 21–24, <https://doi.org/10.1021/cen-10231-feature2>. Accessed 24 Mar. 2025.

[Benjamin Plackett: holds a master's degree in journalism from New York University]

Drug companies are increasingly looking to academics in a bid to mitigate some of these financial burdens. This often involves university researchers doing early-stage drug discovery before pharmaceutical companies take over to push a novel compound through clinical trials and get it to market. "This trend is not entirely new," says Karl-Heinz Altmann, a synthetic organic and medicinal chemist at the Swiss Federal Institute of Technology (ETH), Zurich. "But it does have momentum now."

Generative AI improves pharmaceuticals within universities **Pesheva 24**

By EKATERINA PESHEVA. "Researchers Harness AI to Repurpose Existing Drugs for Treatment of Rare Diseases." Harvard.edu, 25 Sept. 2024, hms.harvard.edu/news/researchers-harness-ai-repurpose-existing-drugs-treatment-rare-diseases. Accessed 24 Mar. 2025.

[Ekaterina Pesheva: Senior Director, Science Communications & Media Relations]

The AI model, called TxGNN, is the first one developed specifically to identify drug candidates for rare diseases and conditions with no treatments. It identified drug candidates from existing medicines for more than 17,000 diseases, many of them without any existing treatments. This represents the largest number of diseases that any single AI model can handle to date. The researchers note that the model could be applied to even more diseases beyond the 17,000 it worked on in the initial experiments. The work, described Sept. 25 in Nature Medicine, was led by scientists at Harvard Medical School. The researchers have made the tool available for free and want to encourage clinician-scientists to use it in their search for new therapies, especially for conditions with no or with limited treatment options. **"With this tool we aim to identify new therapies across the disease spectrum but when it comes to rare, ultrarare, and neglected conditions, we foresee this model could help close, or at least narrow, a gap that creates serious health disparities,"** said lead researcher Marinka Zitnik, assistant professor of biomedical informatics in the Blavatnik

Institute at HMS. **"This is precisely where we see the promise of AI in reducing the global disease burden, in finding new uses for existing drugs, which is also a faster and more cost-effective way to develop therapies than designing new drugs from scratch."** added Zitnik, who is an associate faculty member at the Kempner Institute for the Study of Natural and Artificial Intelligence at Harvard University. The new tool has two central features — one that identifies treatment candidates along with possible side effects and another one that explains the rationale for the decision. **In total, the tool identified drug candidates from nearly 8,000 medicines (both FDA-approved medicines and experimental ones now in clinical trials) for 17,080 diseases, including conditions with no available treatments. It also predicted which drugs would have side effects and contraindications for specific conditions — something that the current drug discovery approach identifies mostly by trial and error during early clinical trials focused on safety.** Compared against the leading AI models for drug repurposing, the new tool was nearly 50 percent better, on average, at identifying drug candidates. It was also 35 percent more accurate in predicting what drugs would have contraindications.

There are many more models being made for this **He 24**

He, Da, et al. "The Use of Artificial Intelligence in the Treatment of Rare Diseases: A Scoping Review." *Intractable & Rare Diseases Research*, vol. 13, no. 1, International Research and Cooperation Association for Bio & Socio-Sciences Advancement (IRCA-BSSA), Feb. 2024, pp. 12–22, <https://doi.org/10.5582/irdr.2023.01111>. Accessed 28 Mar. 2025.

[Da He: Shanghai Health Development Research Center (Shanghai Medical Information Center), Shanghai, China]

With the increasing application of artificial intelligence (AI) in medicine and healthcare, AI technologies have the potential to improve the diagnosis, treatment, and prognosis of rare diseases. Presently, existing research predominantly focuses on the areas of diagnosis and prognosis, with relatively fewer studies dedicated to the domain of treatment. **The purpose of this review is to systematically analyze the existing literature on the application of AI in the treatment of rare diseases. We searched three databases for related studies, and established criteria for the selection of retrieved articles. From the 407 unique articles identified across the three databases, 13 articles from 8 countries were selected, which investigated 10 different rare diseases.** The most frequently studied rare disease group was rare neurologic diseases (n = 5/13, 38.46%). **Among the four identified therapeutic domains, 7 articles (53.85%) focused on drug research, with 5 specifically focused on drug discovery (drug repurposing, the discovery of drug targets and small-molecule inhibitors), 1 on pre-clinical studies (drug interactions), and 1 on clinical studies (information strength assessment of clinical parameters).** **Across the selected 13 articles, we identified total 32 different algorithms,** with random forest (RF) being the most commonly used (n = 4/32, 12.50%). The predominant purpose of AI in the treatment of rare diseases in these articles was to enhance the performance of analytical tasks (53.33%). The most common data source was database data (35.29%), with 5 of these studies being in the field of drug research, utilizing classic databases such as RCSB, PDB and NCBI. Additionally, 47.37% of the articles highlighted the existing challenge of data scarcity or small sample sizes.

Islam 24

Chakraborty C, Bhattacharya M, Pal S, Islam MA. Generative AI in drug discovery and development: the next revolution of drug discovery and development would be directed by generative AI. *Ann Med Surg (Lond)*. 2024 Aug 14;86(10):6340-6343. doi: 10.1097/MS9.0000000000002438. PMID: 39359753; PMCID: PMC11444559.

[Md Aminul Islam, MSc: COVID-19 Diagnostic Lab, Department of Microbiology, Noakhali Science and Technology University, Noakhali; Advanced Molecular Lab, Department of Microbiology, President Abdul Hamid Medical College, Karimganj, Kishoreganj, Bangladesh]

Generative AI tools have indeed existed for some decades. **However, tremendous interest has recently been generated in utilizing these tools with the success of chatbots, especially with the origin of ChatGPT. Currently, ChatGPT is used for drug discovery and development, from target to small molecule discovery**⁴. **However, several generative AI models have successfully performed in small-scale laboratory settings, and some researchers have questioned their performance in real-world conditions. Nevertheless, we must recognize the capability of generative AI technologies in various application areas including the drug discovery process.**

DL-based methods are used in all stages of drug development. Deep neural networks (DNN) and deep learning networks (DLN) related

methods, part of generative AI, are currently applied in drug-related data growth. Generative AI can develop superior text, concept art, visual art, code, animation, speech, music, and video. For instance, it is possible to synthesize good-quality visual representation using diffusion models¹⁴. The generative power of these tools can modify the traditional creative process methodologies that developers employ to design and produce. To comprehend the impact of generative AI across numerous domains and initiate regulatory policies, stakeholders must focus on novel interdisciplinary approaches and investigate the interaction between creativity and technology¹⁵.

IMPACT: Lives saved **Lancet 24**

The Lancet Global Health. "The Landscape for Rare Diseases in 2024." The Lancet Global Health, vol. 12, no. 3, Elsevier BV, Mar. 2024, p. e341, [https://doi.org/10.1016/s2214-109x\(24\)00056-1](https://doi.org/10.1016/s2214-109x(24)00056-1). Accessed 24 Mar. 2025.

Lancet Global Health: The Lancet Global Health is an internationally trusted source of global health knowledge. With an Impact Factor of 19.9 (2023 Journal Citation Reports®, Clarivate 2024) and CiteScore of 44.1 (Scopus), we are the world-leading global health journal.]

By definition, rare diseases affect a small number of individuals (fewer than 1 in 2000 people in any WHO region); yet, with more than 7000 types of rare disease in existence, the burden worldwide is not insignificant. To date, approximately 300 million people live with rare diseases. Such individuals are often a neglected and marginalised group, especially those in low-income and middle-income countries. Around 80% of rare diseases have a genetic cause, almost 70% of which present in childhood; **about 95% lack approved treatments**; the average time for an accurate diagnosis is 4.8 years; and about **30% of children with a rare disease die before age 5 years. In 2021, the UN embraced the first resolution on addressing the challenges of persons living with a rare disease and their families, calling on Member States to provide access to safe and affordable health services, particularly at the primary-care level.** As we approach Rare Disease Day on Feb 29, what does the current landscape look like for people living with rare diseases?

Rebuttals:

Answer: AI will force students to develop better critical thinking skills.

Chen, Claire. "AI Will Transform Teaching and Learning. Let's Get it Right." Stanford University, March 9, 20**23**,

<https://hai.stanford.edu/news/ai-will-transform-teaching-and-learning-lets-get-it-right>. Accessed February 15, 2025. [Her research interest is in Reinforcement Learning. She regularly serves on the Program Committee in major AI venues,]

Liang suggested that students must learn about how the world works from first principles – this could be basic addition or sentence structure. However, they no longer need to be fully proficient – in other words, doing all computation by hand or writing all essays without AI support. In fact, by no longer requiring mastery of proficiency, **Demszky argued that AI may actually raise the bar. The models won't be doing the thinking for the students; rather, students will now have to edit and curate, forcing them to engage deeper than they have previously.** In Khan's view, this allows learners

to become architects who are able to pursue something more creative and ambitious. And Noah Goodman, associate professor of psychology and of computer science, questioned the analogy, saying this tool may be more like the printing press, which led to democratization of knowledge and did not eliminate the need for human writing skills.

Generative AI can increase student performance **Sun 24**

Sun, L., & Zhou, L. (2024). Does Generative Artificial Intelligence Improve the Academic Achievement of College Students? A Meta-Analysis. *Journal of Educational Computing Research*, 62(7), 1896-1933. <https://doi.org/10.1177/07356331241277937>

Lihui Sun: an associate professor in the Department of Educational Technology, School of Education, Minzu University of China. His research interests include computational thinking and programming education for children]

Using a meta-analytic approach, **this study analyses 65 independent studies on Gen-AI to enhance college students' academic achievement since 2022 to provide evidence on the effectiveness of Gen-AI to enhance college students' academic achievement.** In

addition, this study also explored the effects of different moderating variables on college students' academic achievement. These moderating variables provide more specific guidance for advancing the research and practice of Gen-AI-based teaching and learning activities in the future.

Gen-AI Can Effectively Improve College Students' Academic Achievement

The combined effect size of Gen-AI on college students' academic achievement is 0.533, indicating that Gen-AI has a moderate contribution to college students' academic achievement. This is consistent with existing research, where Baidoo-Anu

and Owusu Ansah (2023) reported a strong impact of Gen-AI on teaching and learning, where **Gen-AI significantly improved not only the cognitive level, but also the critical thinking, creative thinking, and problem-solving skills of college students**

(Vázquez-Cano et al., 2021; Chang et al., 2022). At the same time, Gen-AI also contributes to the development of non-cognitive aspects of college students, such as boosting confidence (Essel et al., 2022; Sánchez-Ruiz et al., 2023), motivation and self-efficacy (Kim & Lee, 2023). **Overall, Gen-AI is effective in improving college students' academic achievement, and this effect varies significantly depending on the moderating variables.** If the moderating variables are properly combined, Gen-AI may be highly effective in improving the academic achievement of college students. In addition, the combined effect size of the medium may be because the use of Gen-AI in teaching and learning is not yet mature and widespread. This is explained by Rudolph et al. (2023), who argued that Gen-AI has the potential to enhance the teaching and learning experience through personalized learning materials, simulated conversation partners, and automated grading, but that at present, there may be technological limitations, cost issues, and teacher and student acceptance, leading to the fact that its application in the education field is not yet widely spread.

Therefore, in the face of this situation, the education field needs more investment and efforts to promote the application of Gen-AI in teaching.

Generative AI increases critical thinking **Sardi 25**

Sardi, Juli, et al. "How Generative AI Influences Students' Self-Regulated Learning and Critical Thinking Skills? A Systematic Review." *International Journal of Engineering Pedagogy (IJEP)*, vol. 15, no. 1, International Society for Engineering Education (IGIP), Kassel University Press, Jan. 2025, pp. 94–108, <https://doi.org/10.3991/ijep.v15i1.53379>. Accessed 23 Mar. 2025.

Juli Sardi: a lecturer and researcher at the Faculty of Engineering, Universitas Negeri Padang (UNP), Sumatera Barat, Indonesia. He is a doctoral student in Educational Science at UNP. His research extensively covers Technology Vocational Education and Training (TVET), Vocational Learning Evaluation, Vocational Education Curriculum, Blended Learning, and Learning Models in TVET.]

Generative artificial intelligence (AI), particularly tools such as ChatGPT, is transforming education by enhancing self-regulated learning (SRL) and critical thinking skills, two essential competencies in the digital era. This study systematically analyzes the impact of generative AI on these skills using the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) framework to identify, evaluate, and synthesize relevant studies. **Document searches were conducted in Scopus, Web of Science, and ScienceDirect, focusing on publications from 2022 to 2024, when ChatGPT was first widely adopted. Of the 3,214 documents identified, 557 met the initial screening criteria, and 38 studies were selected for detailed analysis. The findings reveal that 71.4% of studies reported AI's positive role in SRL, mainly through personalized learning, metacognitive support, and adaptive feedback. Likewise, 62.5% of studies reported its significant role in critical thinking, supporting the process of analysis, evaluation, and reflection.** However, researchers cautioned against an overreliance on technology, which one said could take away some students' ability to think for themselves. Such findings indicate that educational institutions need to change their ways and include generative AI in a model that focuses on areas that foster learner independence. This approach will assist teachers and decision-makers in harnessing the distinctive kitsch of AI technology by creating new learning spaces that are creative and future-oriented.

AI still requires critical thinking skills

"11 Essential Skills for a Job in Artificial Intelligence." **Johns Hopkins Engineering** Online, 4 Dec. 20**24**, ep.jhu.edu/news/11-essential-skills-for-a-job-in-artificial-intelligence/.//Ivy league department//
John Hopkins Engineering:

Data Management and Processing

AI professionals must handle large volumes of data with efficiency and expertise. They, therefore, must possess exceptional data management and processing skills. These skills are used for cleaning, organizing, and preparing datasets before those sets train AI models.

Techniques like data wrangling, preprocessing, and understanding big data tools (e.g., Hadoop, Apache Spark) guarantee that AI models are built using accurate, high-quality data.

Analytical and Mathematical Skills

Mathematics forms the backbone of both artificial intelligence (AI) and machine learning (ML), as they allow for the development of sophisticated models and algorithms. **Professionals working in AI must be proficient in specific mathematical fields to** build accurate models, optimize performance, and **derive meaningful insights from data.**

Statistics and Probability

Statistics and probability form the foundations of AI, especially for tasks such as evaluating models, analyzing predictions, and making decisions. These fields help quantify uncertainty and allow AI systems to make predictions even with incomplete data.

For example, in supervised learning, statistical measures like mean squared error (MSE) are used to assess model performance. Bayesian probability is used in many AI models to update predictions as new data becomes available. Additionally, probabilistic models such as hidden Markov models rely on these principles to handle sequential data, like speech or time-series analysis.

Linear Algebra and Calculus

Both linear algebra and calculus are necessary for understanding the mechanics of machine learning models. Linear algebra provides the foundation for DL models by handling multi-dimensional datasets and operations like matrix multiplication. For example, techniques like singular value decomposition (SVD) are widely used in dimensionality reduction and recommender systems.

Calculus, particularly multivariable calculus, is foundational for optimization tasks in AI, such as gradient descent, where derivatives are calculated to minimize error functions and improve model accuracy.

Problem-Solving and Critical Thinking

While machines can process large amounts of data, AI still requires the human capacity for creative problem-solving and logical reasoning to evolve and improve. These abilities drive the development of sophisticated algorithms and optimize AI systems for accuracy and efficiency.

Creativity in Algorithm Design

Developers often need to think outside the box when crafting innovative algorithms or enhancing existing ones to solve problems. This creative process necessarily involves balancing multiple variables and constraints, envisioning new ways for AI systems to learn from data, and incorporating innovative techniques to improve outcomes. For example, AI systems that generate original art or music rely heavily on creatively designed algorithms that allow machines to mimic human creativity.

Logical Thinking and Deductive Reasoning

Logical thinking and deductive reasoning come into play when troubleshooting AI models.

debugging code, and optimizing algorithms. Developers must carefully analyze an AI system's behavior and identify issues to enhance performance as it grows.

Answer:China and the US compete for other reasons

Hass, Ryan, et al. "Advancing U.S.-China Coordination amid Strategic Competition: An Emerging Playbook." Csis.org, 20**25**,

www.csis.org/analysis/advancing-us-china-coordination-amid-strategic-competition-emerging-playbook. Accessed 5 Mar. 2025. IL[Director, John L. Thornton China Center and the Chen-Fu and Cecilia Yen Koo Chair in Taiwan Studies, Brookings Institute; and Senior Fellow, Center for Asia Policy Studies]

The present period is one of intensifying rivalry, with neither country content with the status quo. **Both the United States and China are engaged in a sprawling competition that spans military, economic, technological, diplomatic, and ideational realms, including global governance.** Currently, Washington and Beijing do not have any broadly shared purpose that could help the relationship weather shocks and generate resilience.

Answer: China has already won the AI race

Kumar, Bhaswar. "DeepSeek: Has China Won "AI War" against the US or Just the First Battle?" @Bsindia, Business Standard, 28 Jan. 20**25**, www.business-standard.com/external-affairs-defence-security/news/deepseek-has-china-won-ai-war-against-the-us-or-just-the-first-battle-125012800747_1.html. [Bhaswar Kumar has over seven years of experience in journalism. He has written on India Inc, corporate governance, government policy, and economic data. Currently, he covers defence, security and geopolitics, focusing on defence procurement policies, defence and aerospace majors, and developments in India's neighbourhood.] Accessed 5 Mar. 2025.IL

According to the SCMP, Zhou Hongyi, co-founder, chairman, and chief executive of Chinese cybersecurity firm Qihoo 360, commended DeepSeek for having "upended the world" in a recent video posted on his Weibo account. This remark followed the start-up's release of two advanced AI models, which were developed at a lower cost and with fewer computing resources compared to what major tech firms typically require for LLM development. In another widely circulated Weibo post, Feng Ji, founder and chief executive of Black Myth: Wukong developer Game Science, highlighted DeepSeek's potential to reshape China's "national fate" amid the ongoing tech rivalry with the US. Referring to the global attention garnered by DeepSeek, Zhou stated in his social media post: **"We should have confidence that China will eventually win the AI war with the US."** DeepSeek's ability to develop powerful models at a fraction of the cost incurred by larger tech companies highlights the significant strides made by Chinese AI firms, even in the face of US sanctions that restrict access to advanced semiconductors crucial for training LLMs, according to the SCMP report. LLMs are the foundational technology behind generative AI platforms like OpenAI's ChatGPT. DeepSeek's breakthrough fuels market disruption and sparks US concerns "China is the only market that pursues LLM efficiency owing to chip constraints," Jefferies equity analyst Edison Lee reportedly wrote in a research note on Monday. He highlighted that the Trump administration is likely to recognise that imposing further restrictions could "force China to innovate faster". DeepSeek's AI model breakthrough over the weekend triggered significant turbulence in the stock market on Monday, raising doubts about the US' technological dominance. Shares of major US AI and semiconductor companies plummeted amid fears that Chinese firms might surpass them in the high-stakes race for supremacy. For example, American semiconductor giant Nvidia saw its stock price plunge by as much as 25 per cent on Monday before closing at \$118.58, marking a 16.8 per cent drop and wiping out nearly \$600 billion in market value. Similarly, in Europe, tech stocks led market losses, with shares of chip equipment maker ASML Holding falling by more than 8 per cent.

Answer: AI only uses a fraction of 2% of electricity production.

Garrison, Anna. "How Much Does AI Use Water and Energy? Unpacking the Negative Impact of Chatbots." Green Matters, January 10, 20**25**, <https://www.greenmatters.com/big-impact/how-much-water-does-ai-use>. Accessed February 14, 2025. [Anna is a staff writer based in the Hudson Valley]

A research study quantifying the carbon footprint of BLOOM determined that training a Generative Pre-trained Transformer 3 (GPT-3) uses just under 1,300 megawatt hours (MWh) of electricity, which is the equivalent of energy for 130 homes, per the U.S. Energy Information Administration. Training a Generative Pre-trained Transformer 4 (GPT-4), like ChatGPT, however, uses 50 times more electricity. **Data from 2022 shows that the data center industry represents 2-3 percent of total global emissions,** per Electronics Hub. However, it's anticipated this could dramatically increase in the future — a report from January 2025 by the International Energy Agency (IEA) reveals that should demand for AI systems double in 2026, it would equal roughly the amount of electricity used by Japan.

Only a fraction of these data centers operate AI **The Week UK 24**

UK, The Week. "The Data Centres That Power the Internet." Theweek, The Week, 8 Sept. 2024, theweek.com/tech/the-data-centres-that-power-the-internet. Accessed 3 Mar. 2025.

[The Week UK: A weekly British news magazine founded in 1995 by Jolyon Connell, formerly of the right-of center Sunday Telegraph. Its main focus is news and commentary pertaining to important world events, as well as science, business and the arts]

Data centres are the backbone of the internet and of much modern IT. They store, process, send and receive the data we produce and use. Each new development in IT – such as the growth of social media, TV and music streaming, online gaming, online banking and cloud computing – **has led to the need for more data centres.**

Answer: Education is essential to prevent climate change.

"Education is key to addressing climate change. " **United Nations**, July 14,

20**20**, <https://www.un.org/en/climatechange/climate-solutions/education-key-addressing-climate-change>. Accessed February 14, 2025.

Education is a critical agent in addressing the issue of climate change. The UN Framework Convention on Climate Change (UNFCCC) assigns responsibility to Parties of the Convention to undertake educational and public awareness campaigns on climate change, and to ensure public participation in programmes and information access on the issue. **Education can encourage people to change their attitudes and behavior; it also helps them to make informed decisions.** In the classroom, **young people can be taught the impact of global warming and learn how to adapt to climate change. Education empowers all people, but especially motivates the young to take action.** Knowing the facts helps eliminate the fear of an issue which is frequently colored by doom and gloom in the public arena. In this context, UNICEF has tapped into the minds and imaginations of children around the world to capture what it means to be a child growing up in the age of rapid climate change.