Optimism and Anxiety

Views on the Impact of Artificial Intelligence and Higher Education's Response

Northeastern University

GALLUP®

Foreword
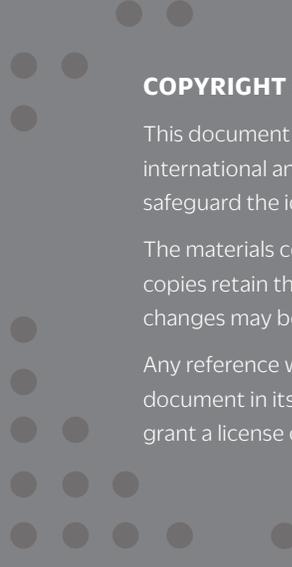
Economists across the political spectrum agree that the single biggest threat to future job growth in the United States is neither immigration nor trade — but the artificial intelligence tsunami about to sweep the economy.

Automated trucks are making deliveries, and software is picking stocks and interpreting medical tests. Smart machines are getting smarter, and many of the jobs performed by people today — up to half of all U.S. jobs, according to some forecasts — will disappear within the next 20 years.

With the release of the inaugural Northeastern-Gallup national survey on artificial intelligence (AI), we now know a majority of Americans agree that AI poses a great threat to our economy. It's a concern that is "collar-blind." Blue-collar and white-collar workers alike are deeply concerned that AI's adoption will result in a net loss of jobs.

Moreover, many Americans — including 69% of millennials — worry that the emergence of new technology will exacerbate inequality and widen the gap between rich and poor in the United States.

What's less clear is how higher education institutions — the incubators of human talent — will respond to this sea change in the future of work. Now more than ever, it is incumbent on higher education to consider how we best position students to secure the skills and knowledge necessary to succeed in the 21st-century global digital economy.

As the Northeastern-Gallup survey shows, Americans believe colleges and universities have their work cut out for them. Just 22% of those with a bachelor's degree or higher believe their own education prepared them "well" or "very well" to work with AI in the workplace.

Further, 18% of those currently employed say they are "extremely confident" they could secure the education or training they need to obtain an equivalent position at a similar salary should they lose their current position to new technology. And nearly half (49%) would prefer to get such training from an employer, as opposed to one-fifth (21%) who would seek to upskill through an in-person program at a college or university.

Taken together, these results are a wake-up call for higher education. The need for colleges and universities to adapt is clear. We must design and implement a curriculum that empowers humans to be "robot-proof" — to do the jobs only humans can do.

I am convinced that the answer to greater artificial intelligence is greater human intelligence. In times of uncertainty and disruption, our guiding star should be education. As machines continue to improve, we can too.

Armed with these new data, higher education must heed the call to innovate, to meet learners where they are, and to make the changes necessary to help all Americans adapt to new technology.

The economic stakes are high. The well-being of societies has long been tethered to vibrant systems of higher education. By rising to the challenge of artificial intelligence, universities with the audacity to change represent humanity's best chance to win the jobs of the future.

Joseph E. Aoun
President
Northeastern University

Table of Contents

Summary of Key Findings

Between Sept. 15 and Oct. 10, 2017, Gallup and Northeastern University conducted a mail survey of 3,297 U.S. adults. This survey covered a wide range of topics related to artificial intelligence (AI), including perceptions of the impact on people's lives and their work, educational choices they may make in response to this economic revolution, and potential interventions from higher education, government and private industry. Several key findings emerged from this study:

AMERICANS ARE LARGELY OPTIMISTIC ABOUT THE IMPACT THAT AI WILL HAVE ON PEOPLE'S LIVES AND WORK.

76% Seventy-six percent of Americans "agree" or "strongly agree" that AI will fundamentally change the way people work and live in the next 10 years. Additionally, among Americans who anticipate this change, a similar percentage (77%) are "mostly positive" or "very positive" about the impact AI will have on these two areas.

HOWEVER, AMERICAN WORKERS EXPECT THE INTRODUCTION OF AI WILL RESULT IN A NET LOSS OF JOBS.

73% Nearly three-quarters of adults (73%) say an increased use of AI will eliminate more jobs than it creates. Results are consistent across most demographic groups. However, those with blue-collar jobs are particularly pessimistic, with 82% saying the transition will result in a net job loss, compared with 71% of those with white-collar jobs.

RELATIVELY FEW AMERICAN WORKERS FEAR LOSING THEIR OWN JOB TO NEW TECHNOLOGY.

23% Less than a quarter of employed adults (23%) are "somewhat worried" or "very worried" they will lose their job to new technology. This concern is nearly twice as common among those with less than a four-year college degree (28%) than among those with a bachelor's degree or more education (15%).

AMERICANS ARE SPLIT ON THE SKILLS U.S. WORKERS WILL REQUIRE TO SUCCEED IN THE AI ECONOMY.

49% Nearly half of Americans (49%) say "soft" skills, such as teamwork, communication, creativity and critical thinking, are the most important for U.S. workers to cultivate to avoid losing their jobs to AI. Alternatively, 51% say learning "hard" skills, including math, science, coding and the ability to work with data, are the most important to maintain a job in the face of new technology adoption.

A SLIM MAJORITY OF AMERICAN WORKERS UNDERSTAND THEY WOULD NEED ADDITIONAL EDUCATION TO SECURE A NEW, EQUIVALENT POSITION, SHOULD THEY LOSE THEIR CURRENT JOB BECAUSE OF THE NEW TECHNOLOGY.

51% Fifty-one percent of employed U.S. adults "agree" or "strongly agree" they would need additional training to secure a new position at an equivalent salary; results are notably similar among white-collar workers (52%) and blue-collar workers (50%).

BUT FEW AMERICANS ARE CONFIDENT THEY COULD SECURE THIS ADDITIONAL EDUCATION.

18%

Eighteen percent of employed Americans say they are "extremely confident" they could secure this training, with an additional 25% saying they are "confident" in their ability to do so. Americans with white-collar jobs (51%) and those with a bachelor's degree or more (53%) are among the most likely to say they are "confident" or "extremely confident" they could secure the education they would need to find equivalent jobs.

AMERICAN WORKERS WOULD LARGELY LOOK TO EMPLOYERS TO PROVIDE THE EDUCATION THEY WOULD NEED TO FIND EQUIVALENT POSITIONS.

49%

Just under half of employed Americans (49%) say they would look for on-the-job training or other opportunities offered by an employer to secure the skills they would need to find a job similar to the one they lost. The next most common option is in-person educational programs at colleges and universities, with 21% saying they would look to these institutions for additional training. Online educational or training programs at universities and colleges are the third most popular option, at 16%.

EMPLOYERS ARE EXPECTED TO PAY FOR AMERICANS' RETRAINING PROGRAMS.

61%

When asked to choose among seven options concerning who should pay for retraining, a clear majority of U.S. adults overall (61%) say employers should fund these programs. The federal government comes in second at 50%.
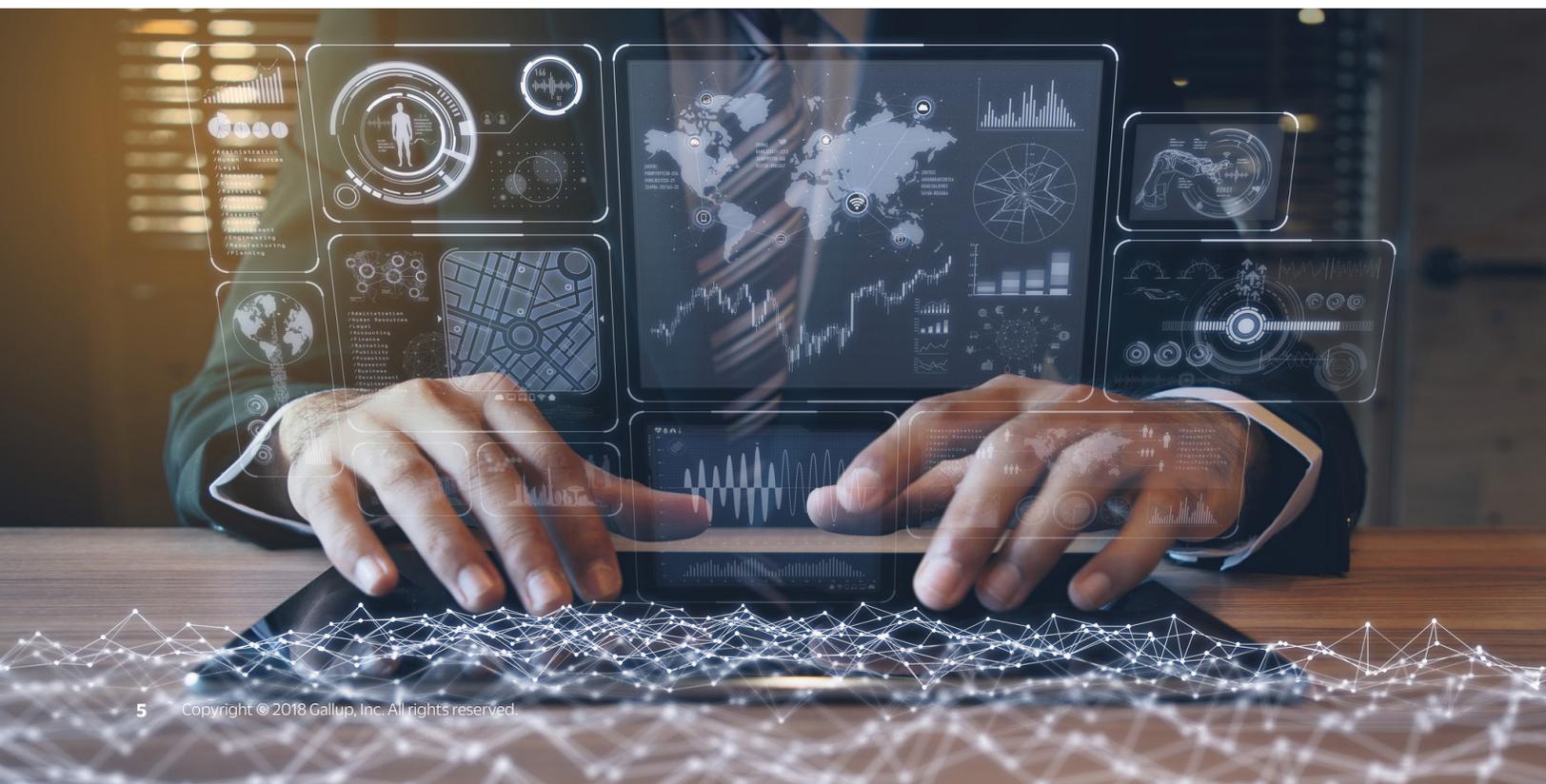
Introduction

The global economy is on the cusp of a revolution that will affect every American, regardless of age, race, education or profession. This revolution will see the adoption of artificial intelligence and robotics on a vast scale, transforming virtually all industries and creating large-scale upheaval. To succeed in the new economic environment this change will create, Americans will need to develop new skill sets and adapt to the rapidly changing needs of existing and emerging industries.

As with any revolutionary change, there will be substantial anxiety among Americans as old industries and careers are swept away and new opportunities emerge.

As many as 47% of all jobs in the U.S. are at risk of replacement by these technologies.[1]

In response to this likely sweeping change, Gallup and Northeastern University conducted a mail survey of 3,297 Americans over the age of 18, from Sept. 15 to Oct. 10, 2017. The survey featured 58 questions concerning a variety of demographic and public opinion data related to AI, defined as computers, robots or other technology that can accomplish tasks humans can do, as well as learn and complete tasks that humans may not be able to do.

The results of this survey indicate that 73% of Americans believe the increased adoption of AI will result in a net loss of jobs. However, most Americans (77%) don't believe their own job is at risk. This gap in expectations between how Americans believe AI will affect the U.S. as a whole and how they perceive it will impact them as individuals has significant policy implications. Equipping Americans with the skills to justify their optimism about their own future is a challenge that higher education can and must meet.

U.S. adults express differing attitudes about how to best mitigate the impact of these changes and position themselves to take advantage of new opportunities. Currently, 22% of Americans with at least a bachelor's degree say their education prepared them "well" or "very well" to use AI in the workplace. Additionally, 18% of currently employed Americans are "extremely confident" they could obtain the additional education they would need to find a new job, should they lose their current position because of new technology.

Americans' perception that they lack skills to work with AI, as well as their uncertainty about whether they can obtain these skills, underscores colleges and universities' obligation to provide the additional education and training necessary to prepare the country's labor force for the emerging digital economy. Understanding Americans' attitudes toward this transition and their preferences for mitigating its potentially negative impacts can help leading academics, policymakers and industry leaders develop initiatives and programs to prepare U.S. workers for success.

---

1   http://www.oxfordmartin.ox.ac.uk/downloads/academic/The_Future_of_Employment.pdf

Americans' Attitudes Toward Artificial Intelligence

Americans are generally optimistic about the impact AI will have on their lives and work. Majorities in every key demographic believe AI will likely have a positive effect, though the level of optimism varies. Additionally, most Americans say they have already adopted some products that incorporate elements of AI, including navigation programs and streaming media services. This large-scale adoption suggests Americans are comfortable with elements of AI, though they express concerns about some of its applications, such as self-driving vehicles. Americans also express mixed views on the role they expect the federal government to play in regulating AI and supporting its development.

AMERICANS OPTIMISTIC ABOUT THE IMPACT OF AI ON WORK AND LIFE

More than three in four Americans (76%) "agree" or "strongly agree" that AI will fundamentally change the way people will work and live over the next decade. This belief is consistent across all demographic groups, with majorities of Americans expressing these sentiments regardless of age, education or where they live.

U.S. adults who believe AI will fundamentally alter the way people work and live in the next 10 years are largely optimistic about its impact. Seventy-seven percent say the technology will have a "mostly positive" or "very positive" impact on how people work and live over the next decade.

This optimism is consistent across all major demographic groups, though it is more prevalent among some groups than others. For example, 82% of those with a bachelor's degree or higher level of educational attainment believe AI will have a "mostly positive" or "very positive" effect, compared with 74% of those with less education.

76%

More than three in four Americans **"agree"** or **"strongly agree"** that AI will fundamentally change the way people will work and live over the next decade.

FIGURE 1

OVERALL, DO YOU BELIEVE ARTIFICIAL INTELLIGENCE WILL HAVE A MOSTLY POSITIVE, MOSTLY NEGATIVE OR NEITHER POSITIVE NOR NEGATIVE IMPACT ON HOW PEOPLE WORK AND LIVE IN THE NEXT 10 YEARS?[2]

AMONG THOSE AMERICANS WHO SAY AI WILL FUNDAMENTALLY CHANGE PEOPLE'S LIVES AND WORK IN THE NEXT 10 YEARS

	Very/Mostly positive	Very/Mostly negative	No impact
Overall	77%	23%	*
Age			
18-35	79%	20%	1%
36-50	75%	25%	1%
Education			
Less than bachelor's degree	74%	25%	1%
Bachelor's degree or higher	82%	18%	*
Job Type			
White collar	78%	21%	1%
Blue collar	68%	31%	*

Less than 0.5%

White-collar[3] (80%) and blue-collar[4] (77%) workers in the U.S. similarly believe AI will fundamentally alter work and life in the next decade. However, among those who believe AI will be work- and life-altering, 78% of white-collar workers say that the impact will be "mostly positive" or "very positive," compared with 68% of blue-collar workers. Perhaps contributing to their higher levels of optimism, white-collar workers as a whole are also more likely to say they have an "excellent" or "good" understanding of AI at 64%, compared with 51% of blue-collar workers.

Americans' level of optimism concerning the adoption of AI also differs according to the type of community in which they live. Among those who see AI fundamentally changing work and life, 79% of those who reside in the suburbs of large cities or in small cities and towns say they are "very positive" or "mostly positive" about the likely impact of AI, compared with 69% of those who live in rural areas.

---

2 Totals may not add to 100% because of rounding.

3 For this report, white-collar workers are defined as those working in industries that are largely salaried, including the legal field, architecture, engineering, healthcare, the sciences, and financial sector, among others.

4 Blue-collar workers are defined as those working in industries that are typically considered to be composed largely of hourly wage earners, including clerical or office, construction, maintenance, service, and transportation workers, among others.

PERSONAL IMPACT OF AI ON AMERICANS' LIVES SEEN AS POSITIVE

Americans largely see the technology's current impact on their lives as positive. Nearly eight in 10 (79%) say the impact of AI on their lives so far is "very positive" or "mostly positive." This figure rises to 89% among U.S. adults with a bachelor's degree or higher level of education, but falls to 74% among those with less than a bachelor's degree. There is a similar gap in positivity between white-collar (87%) and blue-collar (73%) workers.

Additionally, the perception that AI has positively affected Americans' lives declines with age. Eighty-nine percent of U.S. adults aged 18 to 35 say the impact of the technology has been "very positive" or "mostly positive," compared with 71% of those aged 66 and older.

FIGURE 2

PERCEPTION OF AI IN AMERICANS' LIVES

	"Very positive" or "Mostly positive" current impact	"Very positive" or "Mostly positive" impact in 10 years
All Americans	79%	74%
Age		
18-35	89%	82%
36-50	83%	71%
Education		
Less than bachelor's degree	74%	69%
Bachelor's degree or higher	89%	84%
Job Type		
White collar	87%	81%
Blue collar	73%	67%

Americans are also optimistic AI will continue to have a positive impact on their lives, with nearly three-quarters (74%) saying the technology will have a "very positive" or "mostly positive" effect on them in 10 years. While slightly lower than the 79% who say AI's current impact on their lives is "very positive" or "mostly positive," this still shows a substantial majority are optimistic. As with current views on AI, optimism about the future is particularly high among Americans with a bachelors' degree or higher level of education, 84% of whom say the technology will have had a "very positive" or "mostly positive" impact in 10 years compared with 69% among Americans with less than a bachelor's degree.

AMERICANS NOT SOLD ON SELF-DRIVING VEHICLES

Americans are skeptical about some aspects of AI technology, including the emerging development of self-driving vehicles. Just one in four U.S. adults say they are "likely" or "extremely likely" to use fully self-driving cars, and a similarly low percentage, 23%, report they would be "comfortable" or "extremely comfortable" riding in a fully self-driving car on a daily basis. Slightly fewer Americans, 20%, say they would be comfortable sharing the road with fully self-driving trucks. These concerns call into question the widespread adoption of self-driving[5] vehicles, at least in the near-term. They also suggest that, while Americans are positive about the potential adoption of AI, they have concerns about how it may affect their safety.

MAJORITY OF AMERICANS FAVOR GOVERNMENT OVERSIGHT OF AI

Americans see an important role for government to play in the industry. They widely support additional regulation of industries that use new technology, but offer substantially less support for government efforts to foster additional research and development of AI.

Seventy percent of all Americans "agree" or "strongly agree" that the U.S. government should do more to regulate companies that use AI in order to protect consumers' personal information and privacy. Unsurprisingly, agreement varies along political lines, though majorities of all major political subgroups — including 76% of self-identified Democrats and 64% of Republicans — support additional regulation. Furthermore, there are differences by age group, with older Americans somewhat more likely than those younger than 50 to support increased government regulation.

While most Americans support additional regulation of companies that use AI, far fewer favor government support for the research and development of the new technology. Thirty-six percent of all Americans "agree" or "strongly agree" the federal government should provide more funding for university research on AI. This figure increases to 41% among Americans who reside in large cities, which are often home to such institutions. In contrast, 23% of rural Americans agree.

---

5   https://www.forbes.com/sites/oliviergarret/2017/03/03/10-million-self-driving-cars-will-hit-the-road-by-2020-heres-how-to-profit/#286f5ee27e50

FIGURE 3

AMERICANS WHO "AGREE" OR "STRONGLY AGREE" WITH FEDERAL GOVERNMENT ACTIONS

% AGREE/STRONGLY AGREE

Regulate companies using AI to protect consumers	70%
Fund university research on AI	36%
Provide tax breaks to businesses researching AI	26%
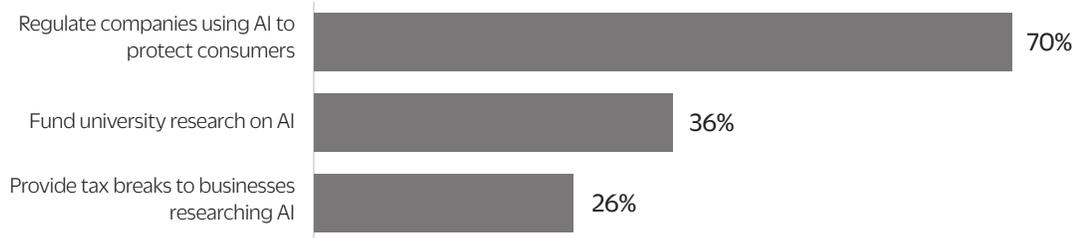
Support for federal tax breaks to companies that conduct research and development on AI is substantially lower than support for increased funding for universities engaged in the same pursuit. About one in four Americans (26%) "agree" or "strongly agree" that the government should offer tax breaks to such companies. Again, there are significant differences by type of community; more than one in four of those residing in the suburbs of large cities (29%) or large cities (27%) "agree" or "strongly agree" with the provision of company tax incentives, compared with 16% of those in rural areas.

AI Adoption and Job Loss

While Americans are generally optimistic about the impact of AI on work and life, they also believe its increased use will eliminate more jobs than it creates, resulting in net job loss and impacting some sectors of the economy more severely than others. However, the vast majority of U.S. adults do not believe their own jobs will be impacted by the shift to AI.

AMERICANS BELIEVE AI ADOPTION WILL RESULT IN NET JOB LOSS

Overall, nearly three in four U.S. adults (73%) say the adoption of AI technology will eliminate more jobs than it creates in the country. There is a substantial difference in opinions by job type, with 71% of white-collar workers saying there will be a net job loss, compared with 82% of blue-collar workers.

FIGURE 4

THINKING ABOUT THE NUMBER OF JOBS IN THE U.S., DO YOU BELIEVE AN INCREASE IN THE USE OF ARTIFICIAL INTELLIGENCE WILL …

	Create more jobs than AI eliminates	Eliminate more jobs than AI creates	No impact on number of jobs in the U.S.
All Americans	14%	73%	13%
Age			
18-35	10%	78%	12%
36-50	15%	75%	11%
Education			
Less than bachelor's degree	13%	74%	13%
Bachelor's degree or higher	16%	72%	12%
Job Type			
White collar	17%	71%	12%
Blue collar	9%	82%	10%

AMERICANS SAY AI ADOPTION WILL LIKELY INCREASE GAP BETWEEN RICH AND POOR

Job loss isn't the only potential downside Americans see from AI. The majority of U.S. adults (63%) also expect the technology to widen the gap between rich and poor Americans. While a majority, excluding the most conservative Americans, say AI will widen the gap between rich and poor, results do differ by political ideology. Seventy-one percent of self-described liberal Americans say AI will widen this gap versus 60% of conservative Americans. The high percentages across political groups that say AI will increase inequality could be driving the overall belief among U.S. adults this will occur.

AMERICANS' FEARS OF JOB LOSS FROM AI ADOPTION BY INDUSTRY

Gallup asked working Americans to name the type of job in which they are currently employed, with the responses aggregated into larger industry categories for analysis. The results point to varying degrees of pessimism by industry regarding job losses related to AI adoption.

Workers in the "installation, maintenance or repair worker and manufacturing or production worker," "clerical or office worker" and "service worker and transportation worker" sectors had the highest level of pessimism about the likelihood of net job loss, with at least eight in 10 respondents in these areas saying they believed job loss in their industry would be a result of new technology. This contrasts sharply with the 61% of workers in the "education, training and library and life, physical and social sciences" category. Concern among workers in fields commonly associated with manual labor may be related to the fact that robotics and automation have already been introduced on a larger scale in these industries than others.[6] These industries in particular have experienced significant job losses in the U.S. in recent years, falling from 14.5 million workers in 2006 to 12.3 million in 2016.[7]

---

6   https://www.brookings.edu/blog/techtank/2016/06/02/how-technology-is-changing-manufacturing/
7   https://www.brookings.edu/blog/techtank/2016/06/02/how-technology-is-changing-manufacturing/

FIGURE 5

AMERICANS' BELIEF AI ADOPTION WILL RESULT IN NET JOB LOSS, BY INDUSTRY

THINKING ABOUT THE NUMBER OF JOBS IN THE U.S., DO YOU BELIEVE AN INCREASE IN THE USE OF ARTIFICIAL INTELLIGENCE WILL ELIMINATE MORE JOBS THAN AI CREATES? (AMONG AMERICANS EMPLOYED IN THESE INDUSTRIES)

Industry	Percentage
Installation, Maintenance or Repair Worker + Manufacturing or Production Worker	90%
Clerical or Office Worker	83%
Service Worker + Transportation Worker	80%
Financial, Insurance, Real Estate or Consulting	79%
Sales Worker	76%
Healthcare	71%
Manager, Executive or Official	71%
Architecture or Engineering + Computer and Mathematical	70%
Community and Social Services + Legal	69%
Education, Training and Library + Life, Physical and Social Sciences	61%

AMERICANS WORRY ABOUT JOB LOSS OVERALL, BUT NOT THEIR PERSONAL JOB

Though 73% of adults believe the shift to AI will result in net job loss, less than a quarter of those who are employed (23%) are "very worried" or "somewhat worried" they may lose their own job to new technology. This group is substantially higher than the 8% average of employed U.S. adults who said in a separate April 2017 nationally representative Gallup poll they were "very likely" or "fairly likely" they would be laid off in the next 12 months.[8]

This level of worry is relatively constant across most subgroups, with some important exceptions. Fifteen percent of U.S. workers with a bachelor's degree or higher level of education say they are "very worried" or "somewhat worried" about losing their job to new technology, compared with 28% of those with less than a bachelor's degree.

---

8   http://news.gallup.com/poll/209378/americans-fears-laid-off-record-low.aspx

WORRY ABOUT JOB LOSS TO NEW TECHNOLOGY, BY AGE GROUP

% VERY/SOMEWHAT WORRIED AMONG EMPLOYED AMERICANS

18-35	36-50	51-65	66+
25%	21%	27%	12%
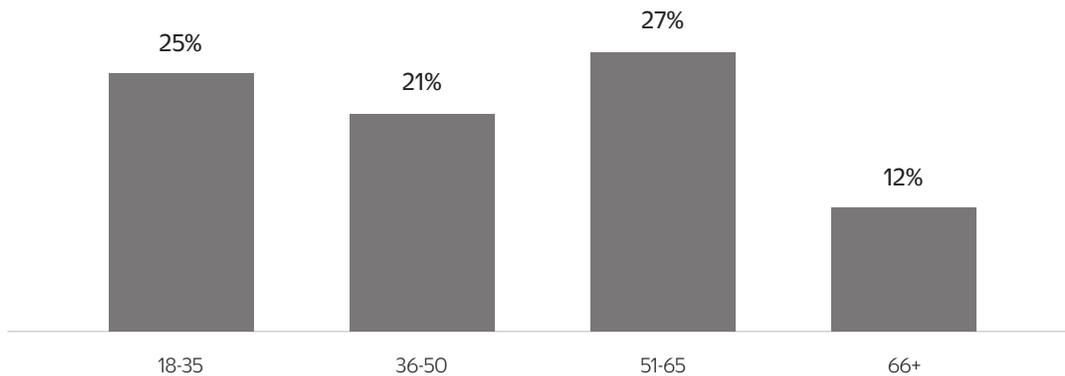
Relatively few working Americans may personally fear losing a job because of AI, but Americans in general are split on how best to insulate the U.S. workforce from potential job losses. Nearly half (49%) say it is more important for American workers to cultivate "soft" skills, such as teamwork, communication, creativity and critical thinking, to protect themselves from losing their job to AI. Alternatively, 51% say "hard" skills, such as math, science, coding and the ability to work with data, are more important to prevent job loss. There are few differences in perceptions across demographic groups. Those with a bachelor's degree or more education (53%) are somewhat more likely than those with less than a four-year degree (48%) to favor soft skills.

U.S. WORKERS MORE WORRIED ABOUT LOSING JOBS TO NEW TECHNOLOGY THAN TO IMMIGRANTS

Working Americans are more concerned about losing their own job because of AI technology than they are about losing it to immigrants. Only 12% of working Americans are "somewhat worried" or "very worried" about losing their own job to someone from another country, about half the 23% who say the same about new technology. The highest levels of worry about job loss to immigrants are among employed Americans who describe themselves as "very conservative" (25%). Additionally, a majority of self-identified Republicans (52%) identify immigration and offshoring as a greater threat to jobs in the U.S., while 48% say AI is the greater threat. Americans overall view the threats in the reverse order: 58% of Americans say AI is the greater threat, and 42% see the greatest threat from immigration.

AMERICANS SEE MANUFACTURING AND CONSTRUCTION SECTORS AS MOST VULNERABLE TO AI ADOPTION, LAW OR PUBLIC POLICY LEAST VULNERABLE

Americans who believe AI will eliminate more jobs than it creates believe some sectors of the economy are more likely to be impacted than others. These respondents are most likely, at 62%, to say jobs in the manufacturing and construction sector are most likely to be among those eliminated first. This is followed closely by 55% who say retail jobs will be among the first eliminated by expanded use of AI, with transportation sector positions third at 52%.

FIGURE 7

JOBS AMERICANS SAY WILL BE ELIMINATED FIRST BY AI

AMONG AMERICANS WHO BELIEVE AI WILL RESULT IN A NET JOB LOSS; RESPONDENTS ALLOWED TO CHOOSE MORE THAN ONE RESPONSE

Sector	Percentage
Manufacturing or Construction	62%
Retail	55%
Transportation	52%
Computer/Information Systems/Mathematical	46%
Education/Training/Library	37%
Science/Engineering/Architecture	28%
Military/Defense	24%
Finance/Insurance/Real Estate	22%
Healthcare	22%
Community/Social Services	16%
Arts/Design/Entertainment/Sports/Media	15%
Law or Public Policy	9%

Law and public policy posts appear the safest in the minds of respondents, with only 9% saying jobs in this sector will be eliminated first. Respondents are only somewhat more likely to say jobs in the fields of arts, entertainment and sports (15%), or community or social services (16%) will be among those first eliminated.

17

Responses to Job Loss Related to New Technology

Employed Americans largely understand they would need to obtain additional training and education if they lost their jobs because of new technology. However, many lack confidence they would be able to secure this education and training. Working adults are most likely to expect employers to fund training and education for workers who lose their jobs as a result of this new technology. But they are more divided on other strategies for helping with this economic transition, including proposed universal basic income programs.

WORKERS UNDERSTAND THEY NEED ADDITIONAL EDUCATION, SHOULD THEY LOSE THEIR JOB

A slim majority of employed Americans, 51%, say they "agree" or "strongly agree" they would need additional education or training to find another job at the same salary, should they lose their current position to new technology. Interestingly, white-collar workers (52%) and blue-collar workers (50%) are similarly likely to agree they would need additional education or training to find an equivalent position.

There are substantial differences in attitudes among Americans in different regions of the country and in different communities. Sixty percent of working U.S. adults who reside in the West report they would need additional training or education to obtain a new job, compared with 42% in the Midwest.

FIGURE 8

BELIEF ADDITIONAL EDUCATION WOULD BE REQUIRED TO SECURE A NEW EQUIVALENT POSITION, FOLLOWING JOB LOSS TO NEW TECHNOLOGY

% "AGREE" OR "STRONGLY AGREE" AMONG EMPLOYED AMERICANS

West 60%
Midwest 42%
East 52%
South 48%
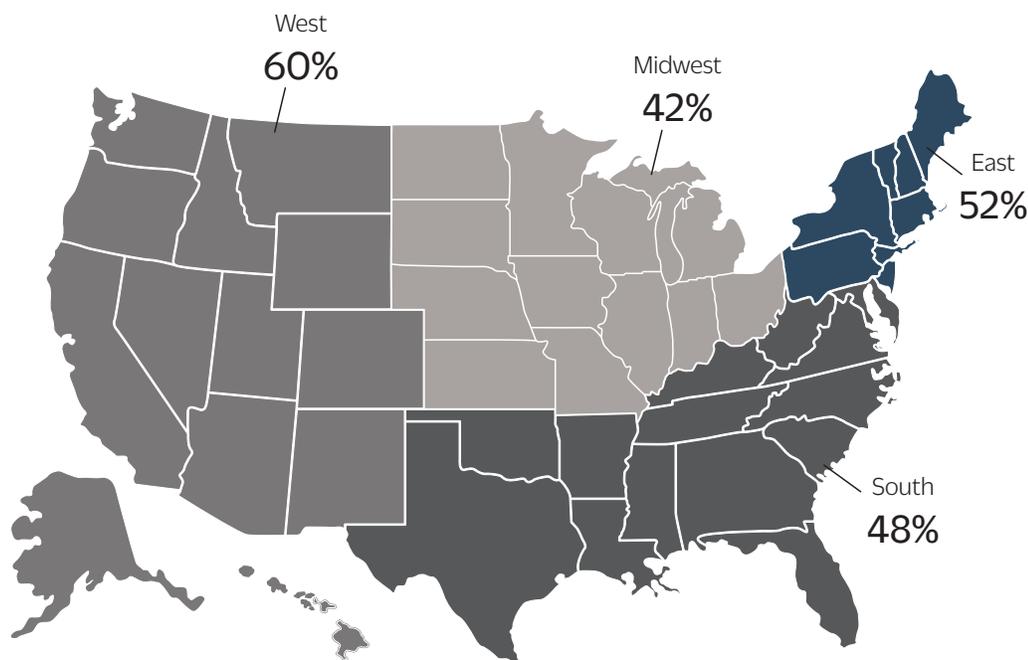
A majority of working Americans who reside in large cities (54%) say they "agree" or "strongly agree" that they would need additional training or education to secure a new job, while 46% of those who reside in rural areas say the same.

Working Americans' belief that they would require additional education or training to secure equivalent positions may in part reflect the low proportion of those who feel prepared to work with AI. Slightly more than one in five Americans with a bachelor's degree or higher level of education (22%) report that their education prepared them "well" or "very well" for working with AI, with 9% saying they were prepared "very well."

While working Americans understand they may need more training and education should they lose their jobs to the new technology, many in the U.S. are not currently making career decisions based on this potential outcome. Only 12% of all Americans indicate they have made current career decisions based on what they know about developments in AI. Interestingly, this lack of preparation for the future of AI holds across education levels, including 12% of those with less than a bachelor's degree and 13% of those with a four-year degree or more.

U.S. ADULTS LACK CONFIDENCE THEY CAN SECURE THE EDUCATION THEY NEED

Those with a bachelor's degree or higher level of education are among the most confident they could secure the education they would need to find equivalent jobs, with 53% saying they are "extremely confident" (24%) or "confident" (29%) they could do so. This compares with slightly more than one-third (37%) of those with less than a bachelor's degree, among whom 15% are "extremely confident" and 22% are "confident" they could secure this education. There is a similar gap by job type; 51% of those with a white-collar job are "extremely confident" (23%) or "confident" (28%) they could secure the education they would need to obtain a similar position, compared with 34% of blue-collar workers who are "extremely confident" (13%) or "confident" (21%) they could do so.

FIGURE 9

IF ARTIFICIAL INTELLIGENCE CAUSED YOU TO LOSE YOUR JOB TODAY, HOW CONFIDENT ARE YOU THAT YOU WOULD BE ABLE TO OBTAIN THE TRAINING OR EDUCATION YOU NEED TO FIND ANOTHER JOB AT SIMILAR SALARY?

AMONG EMPLOYED AMERICANS

	"Confident" or "Extremely confident"
Working Americans	43%
Age	
18-35	52%
36-50	46%
Education	
Less than bachelor's degree	37%
Bachelor's degree or higher	53%
Job Type	
White collar	51%
Blue collar	34%

WORKERS LOOK TO EMPLOYERS FOR RETRAINING OPPORTUNITIES

When asked to choose between five options for retraining, just under half of employed Americans (49%) say they would prefer on-the-job training or other opportunities offered by an employer if they lost their current job because of new technology. The next most common option is in-person educational programs at colleges and universities, with 21% saying they would look to these institutions for additional training. Online educational or training programs at universities and colleges are the third most popular option (16%). Taken together, 37% of Americans would look to colleges and universities for either in-person or online training or education programs, 12 percentage points lower than the percentage who would prefer to acquire new skills from their employer.

Preferred sources of additional training vary by job types and education. More than half of blue-collar workers (59%) would look to new employers for training, compared with 41% of white-collar workers. Additionally, among U.S. workers without a bachelor's degree, 56% would look to employers, compared with 36% of those with a four-year degree or more. Those with a bachelor's degree or higher level of education (30%) are twice as likely as those with lower education levels (15%) to look to a college or university for additional training.

FIGURE 10

SOURCES OF EDUCATION AMERICANS WOULD LOOK TO IF THEY LOST THEIR JOB TO NEW TECHNOLOGY

AMONG EMPLOYED AMERICANS

Source	Percentage
On-the-job training or other training offered by an employer	49%
In-person licensing, certificate, certification, or degree-granting program at a college or university	21%
Online licensing, certificate, certification, or degree-granting program offered by a college or university	16%
Self-taught education or training you complete on your own through free online courses	10%
Accelerated coding or data skills boot camp or course offered by a private company	5%

U.S. ADULTS EXPECT EMPLOYERS TO PAY FOR RETRAINING PROGRAMS

Americans were asked to choose among seven options concerning which entities should pay for retraining. A clear majority of U.S. adults overall (61%) say employers should fund these programs for those who lose their jobs because of new technology. Of the options presented to Americans surveyed, this was the most popular source of funding for retraining, with the federal government second at 50%.

FIGURE 11

WHO AMERICANS SAY SHOULD PAY FOR WORKER RETRAINING

RESPONDENTS ALLOWED TO CHOOSE MULTIPLE RESPONSES

Category	Percentage
Employers	61%
Federal government	50%
Unions, industry or trade associates	37%
State government	35%
Workers themselves	27%
Local government	23%
Colleges and universities	14%
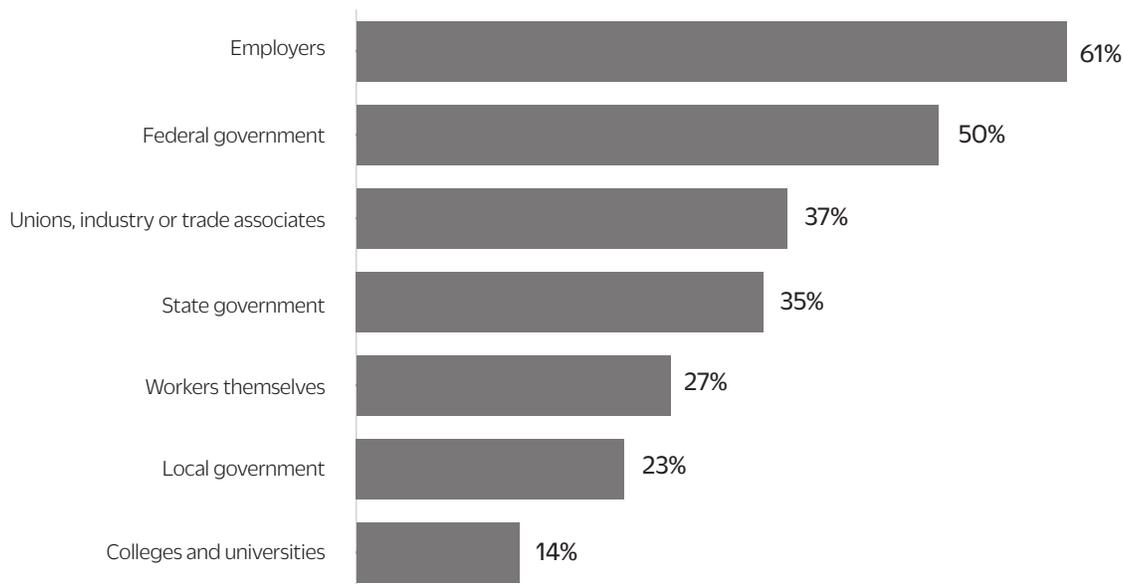
SUPPORT MIXED FOR UNIVERSAL BASIC INCOME PROGRAM

Americans are divided on other policies that would help support those who lose their jobs to new technology, such as implementation of a proposed universal basic income program. Under such a program, the federal government would provide every adult below a certain income threshold with a specific amount of money each year. Currently, 48% of U.S. adults say they would support such a program, while 52% are opposed. Yet slight majorities of those with less than a bachelor's degree (51%) and respondents who know someone who lost their job to AI (52%) support it.

Not surprisingly, there is a significant partisan divide in these results, with universal basic income favored by more than twice as many Democrats (65%) than Republicans (28%). A full 81% of Americans who identify as "very liberal" say they would support the program, compared with 27% of those who say they are "very conservative."

FIGURE 12

**DO YOU SUPPORT OR NOT SUPPORT A UNIVERSAL BASIC INCOME PROGRAM AS
A WAY TO HELP AMERICANS WHO LOSE THEIR JOBS BECAUSE OF ADVANCES IN
ARTIFICIAL INTELLIGENCE?**

	Support	Do not support
All Americans	48%	52%
Age		
18-35	54%	46%
36-50	50%	50%
Education		
Less than bachelor's degree	51%	49%
Bachelor's degree or higher	42%	58%
Political Affiliation		
Republican	28%	72%
Democrat	65%	35%
Independent	48%	52%

Among those Americans who support the idea of a universal basic income, 46% say they are willing to pay higher taxes to fund such a program, while 54% would not. However, U.S. adults are much more likely to agree with the idea of taxing businesses to fund such a program; 80% of those who support the idea of the program say they "agree" or "strongly agree" that companies who benefit from the adoption of AI should pay for a universal basic income for those displaced by this economic shift.

Demographic Comparisons

Job Type

Differences in attitudes toward AI between white-collar and blue-collar Americans may be the most pronounced of any subgroup in the U.S. Among those who believe AI will bring about fundamental change in people's lives and work, nearly eight in 10 white-collar workers (78%) say they are "positive" or "mostly positive" about the impact of the technology on people's lives and work over the next 10 years, compared with 68% of blue-collar workers. Additionally, blue-collar workers are more likely than white-collar workers to say AI adoption will result in a net loss of jobs, 82% vs. 71%, respectively. Should blue-collar workers lose their jobs to new technology, 34% say they are "confident" or "extremely confident" they could secure training to find an equivalent job, compared with 51% of white-collar workers. Blue-collar workers are also substantially more likely to look to an employer for that training, compared with white-collar workers, 59% to 41%.

78%

Nearly eight in 10 white-collar workers say they are "positive" or "mostly positive" about the impact of the technology on people's lives and work over the next 10 years, compared with 68% of blue-collar workers.

FIGURE 13

JOB TYPE COMPARISON: WHITE COLLAR VS. BLUE COLLAR

Artificial intelligence will widen the gap between the rich and poor in the United States. *(% Agree)*

66%
WHITE COLLAR

59%
BLUE COLLAR

How worried are you about your job being eliminated as a result of new technology, automation, robots or artificial intelligence? *(% Somewhat/Very worried)*

WHITE COLLAR — 19%

BLUE COLLAR — 26%

If artificial intelligence caused you to lose your job today, how confident are you that you would be able to obtain the training or education you need to find another job at similar salary? *(% Confident/Extremely confident)*

51% **WHITE COLLAR**

34% **BLUE COLLAR**

Thinking about the number of jobs in the U.S., do you believe an increase in the use of artificial intelligence will ... *(% Eliminate more jobs than AI creates)*

71%
WHITE COLLAR

82%
BLUE COLLAR

In general, how positively or negatively has artificial intelligence impacted your life so far? (% Mostly/Very positive)

WHITE COLLAR 87%   **BLUE COLLAR** 73%

If I lost my job because of new technology, automation, robots or artificial intelligence, I would need to obtain additional training or education to find another job with a similar salary. *(% Agree/Strongly agree)*

52%
WHITE COLLAR

50%
BLUE COLLAR

The federal government should do more to regulate companies that use artificial intelligence in order to protect consumers' personal information, privacy and security. *(% Agree/Strongly agree)*

WHITE COLLAR 70%

BLUE COLLAR 71%

Do you support or not support a universal basic income program as a way to help Americans who lose their jobs because of advances in artificial intelligence? *(% Support)*

WHITE COLLAR 45%

BLUE COLLAR 46%

If you lost your job because of new technology, automation, robots or artificial intelligence, which of the following types of training or education would you prefer?

	On-the-job training or other training offered by an employer	In-person licensing, certificate, certification, or degree-granting program at a college or university	Online licensing, certificate, certification, or degree-granting program offered by a college or university	Self-taught education or training you complete on your own through free online courses	Accelerated coding or data skills boot camp or course offered by a private company
White collar	41%	26%	17%	10%	6%
Blue collar	59%	14%	15%	9%	3%

Education

Americans' views of AI and its impact also differ depending on their level of education. Eighty-two percent of those with higher levels of education, who say AI will have a fundamental impact on people's lives and work, say that impact will be "very positive" or "mostly positive" in 10 years, vs. 74% of those with less education. Employed Americans with less than a four-year degree are more likely to worry about losing their jobs to new technology, with 28% saying they are "very worried" or "somewhat worried," compared with 15% with a bachelor's degree or higher. Additionally, 53% of those Americans with a bachelor's degree or more say they are "confident" or "extremely confident" they could acquire the training to secure an equivalent position, should they lose their current job to new technology, compared with 37% of Americans with less education.

82%

Of those with **higher levels of education,** who say AI will have a fundamental impact on people's lives and work, say that impact will be "very positive" or "mostly positive" in 10 years, vs. 74% of those with less education.

FIGURE 14

EDUCATION ATTAINMENT COMPARISON: BACHELOR'S DEGREE OR HIGHER VS. LESS THAN A BACHELOR'S DEGREE

Artificial intelligence will widen the gap between the rich and poor in the United States. *(% Agree)*

66%
≥BACHELOR'S DEGREE

62%
<BACHELOR'S DEGREE

How worried are you about your job being eliminated as a result of new technology, automation, robots or artificial intelligence? *(% Somewhat/Very worried)*

≥BACHELOR'S DEGREE 15%

<BACHELOR'S DEGREE 28%

If artificial intelligence caused you to lose your job today, how confident are you that you would be able to obtain the training or education you need to find another job at similar salary? *(% Confident/Extremely confident)*

53%
≥BACHELOR'S DEGREE

37%
<BACHELOR'S DEGREE

Thinking about the number of jobs in the U.S., do you believe an increase in the use of artificial intelligence will ... *(% Eliminate more jobs than AI creates)*

72%
≥BACHELOR'S DEGREE

74%
<BACHELOR'S DEGREE

In general, how positively or negatively has artificial intelligence impacted your life so far? (% Mostly/Very positive)

≥BACHELOR'S DEGREE 89%   **<BACHELOR'S DEGREE** 74%

If I lost my job because of new technology, automation, robots or artificial intelligence, I would need to obtain additional training or education to find another job with a similar salary. *(% Agree/Strongly agree)*

47%
≥BACHELOR'S DEGREE

52%
<BACHELOR'S DEGREE

The federal government should do more to regulate companies that use artificial intelligence in order to protect consumers' personal information, privacy and security.
(% Agree/Strongly agree)

≥BACHELOR'S DEGREE 70%

<BACHELOR'S DEGREE 71%

Do you support or not support a universal basic income program as a way to help Americans who lose their jobs because of advances in artificial intelligence? *(% Support)*

≥BACHELOR'S DEGREE 42%

<BACHELOR'S DEGREE 51%

If you lost your job because of new technology, automation, robots or artificial intelligence, which of the following types of training or education would you prefer?
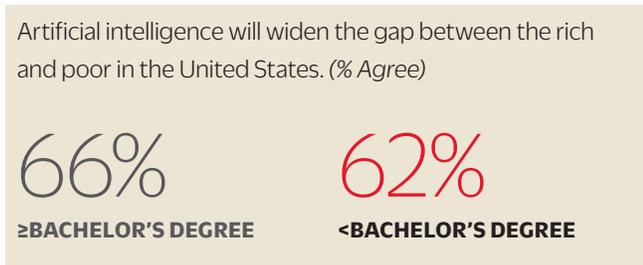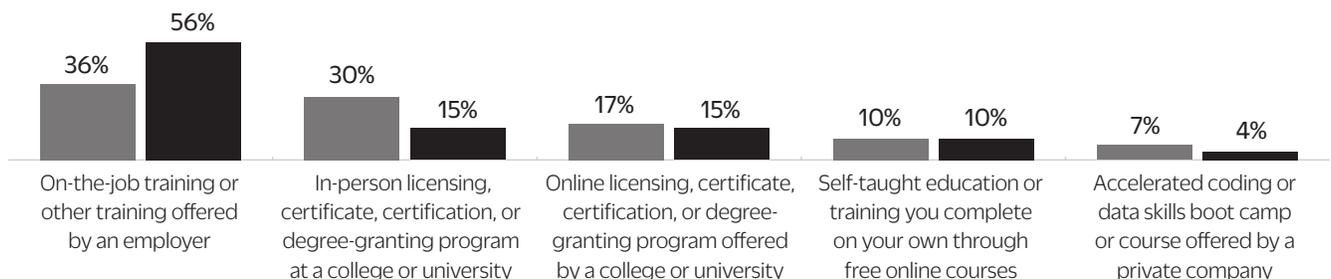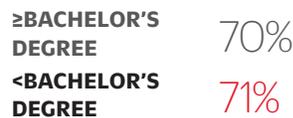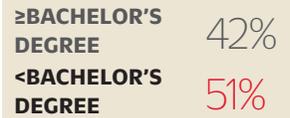
	On-the-job training or other training offered by an employer	In-person licensing, certificate, certification, or degree-granting program at a college or university	Online licensing, certificate, certification, or degree-granting program offered by a college or university	Self-taught education or training you complete on your own through free online courses	Accelerated coding or data skills boot camp or course offered by a private company
≥Bachelor's	36%	30%	17%	10%	7%
<Bachelor's	56%	15%	15%	10%	4%

Generational

The current survey finds that Americans aged 18 to 35 are slightly more optimistic about AI than those aged 36 to 50. However, there are relatively few significant differences in attitudes between the two age groups. On a few issues, the younger group is slightly more pessimistic. U.S. adults aged 18 to 35 are nine percentage points more likely than Americans aged 36 to 50 to say AI will widen the gap between the rich and poor in the U.S., 69% vs. 60%. Additionally, those aged 18 to 35 are somewhat less likely to say they "agree" or "strongly agree" they would need additional training or education should they lose their jobs to new technology, with 47% saying they would, compared with 53% of those aged 36 to 50.
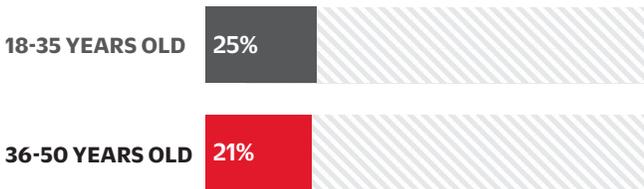
79%

Of 18- to 35-year-olds believe artificial intelligence will have a "positive" or "mostly positive" impact on how people work and live in the next 10 years, compared to 75% of 36- to 50- year-olds.

FIGURE 15

AGE GROUP COMPARISON: MILLENNIALS VS. MID-CAREER

Artificial intelligence will widen the gap between the rich and poor in the United States. *(% Agree)*

69%
18-35 YEARS OLD

60%
36-50 YEARS OLD

How worried are you about your job being eliminated as a result of new technology, automation, robots or artificial intelligence? *(% Somewhat/Very worried)*

18-35 YEARS OLD 25%

36-50 YEARS OLD 21%

If artificial intelligence caused you to lose your job today, how confident are you that you would be able to obtain the training or education you need to find another job at similar salary? *(% Confident/Extremely confident)*

52%
18-35 YEARS OLD

46%
36-50 YEARS OLD

Thinking about the number of jobs in the U.S., do you believe an increase in the use of artificial intelligence will ... *(% Eliminate more jobs than AI creates)*

78%
18-35 YEARS OLD

75%
36-50 YEARS OLD

In general, how positively or negatively has artificial intelligence impacted your life so far? (% Mostly/Very positive)

18-35 YEARS OLD 89%   **36-50 YEARS OLD** 83%

If I lost my job because of new technology, automation, robots or artificial intelligence, I would need to obtain additional training or education to find another job with a similar salary. *(% Agree/Strongly agree)*

47%
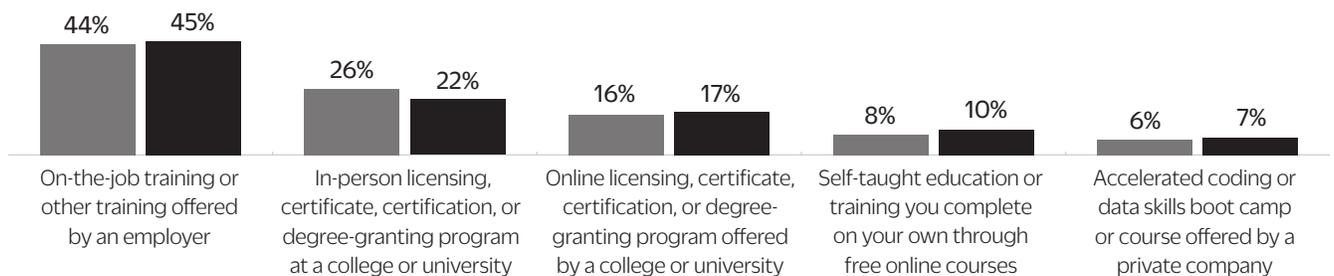**18-35 YEARS OLD**

53%
36-50 YEARS OLD

The federal government should do more to regulate companies that use artificial intelligence in order to protect consumers' personal information, privacy and security. *(% Agree/Strongly agree)*

18-35 YEARS OLD 68%

36-50 YEARS OLD 65%

Do you support or not support a universal basic income program as a way to help Americans who lose their jobs because of advances in artificial intelligence? *(% Support)*

18-35 YEARS OLD 54%

36-50 YEARS OLD 50%

If you lost your job because of new technology, automation, robots or artificial intelligence, which of the following types of training or education would you prefer?

	On-the-job training or other training offered by an employer	In-person licensing, certificate, certification, or degree-granting program at a college or university	Online licensing, certificate, certification, or degree-granting program offered by a college or university	Self-taught education or training you complete on your own through free online courses	Accelerated coding or data skills boot camp or course offered by a private company
	44% 45%	26% 22%	16% 17%	8% 10%	6% 7%

Conclusion

It is clear that while Americans are optimistic about the positive impact that AI may have on people's jobs and lives, many are also concerned about the short-term effect on jobs. However, the relatively low proportion of U.S. workers who are worried about their own jobs suggests some may be underestimating the likely impact of this technology. This is not unusual, as Americans tend to be more positive about conditions in their own lives than those in the country as a whole on a range of issues. However, this lack of awareness may present a challenge for efforts to equip Americans with the skills they need to compete in the emerging global AI economy.

White-collar workers and those with bachelor's degrees or higher levels of education tend to be more optimistic in their assessments of the potential impact of AI on work and life. Given reports that the introduction of AI could eliminate up to 70% of white-collar jobs within the next 20 years,[1] these individuals in particular may be poorly prepared and overly confident in their ability to respond to the coming shift in the economy.

As with previous shifts in the economy, the adoption of AI will involve substantial disruption. Providing Americans who lose their jobs with the skills they need to secure equivalent positions is essential, and colleges and universities must play a key role in this effort. These institutions are the most equipped to deliver training in both the hard and soft skills required to succeed in the emerging economy. With more Americans anticipating that they will look to employers than higher education for their training in the AI economy, there is an opportunity for colleges and universities to partner with employers to deliver relevant programs in the workplace.

---

1   http://www.businessinsider.com/fred-destin-artificial-intelligence-will-wipe-out-white-collar-jobs-2017-6

Appendix

EDUCATIONAL CHOICES BY KEY SUBGROUPS

	All Employed Americans	White Collar	Blue Collar	Bachelor's Degree or Higher	Less Than Bachelor's Degree	18-35 Years Old	36-50 Years Old
How worried are you about your job being eliminated as a result of new technology, automation, robots or artificial intelligence? (% Somewhat/Very worried)	23%	19%	26%	15%	28%	25%	21%
If I lost my job because of new technology, automation, robots or artificial intelligence, I would need to obtain additional training or education to find another job with a similar salary. (% Agree/Strongly agree)	51%	52%	50%	47%	52%	47%	53%
If artificial intelligence caused you to lose your job today, how confident are you that you would be able to obtain the training or education you need to find another job at similar salary? (% Confident or Extremely confident)	43%	51%	34%	53%	37%	52%	46%
If you lost your job because of new technology, automation, robots or artificial intelligence, which of the following types of training or education would you prefer?							
• On-the-job training or other training offered by an employer	49%	41%	59%	36%	56%	44%	45%
• In-person licensing, certificate, certification, or degree-granting program at a college or university	21%	26%	14%	30%	15%	26%	22%
• Online licensing, certificate, certification, or degree-granting program offered by a college or university	16%	17%	15%	17%	15%	16%	17%
• Self-taught education or training you complete on your own through free online courses	10%	10%	9%	10%	10%	8%	10%
• Accelerated coding or data skills boot camp or course offered by a private company	5%	6%	3%	7%	4%	6%	7%

FIGURE 17

EDUCATIONAL CHOICES BY KEY SUBGROUPS

	All Employed Americans	East Region	Midwest Region	South Region	West Region
How worried are you about your job being eliminated as a result of new technology, automation, robots or artificial intelligence? (% Somewhat/Very worried)	23%	20%	24%	23%	23%
If I lost my job because of new technology, automation, robots or artificial intelligence, I would need to obtain additional training or education to find another job with a similar salary. (% Agree/Strongly agree)	51%	52%	42%	48%	60%
If artificial intelligence caused you to lose your job today, how confident are you that you would be able to obtain the training or education you need to find another job at similar salary? (% Confident or Extremely confident)	43%	46%	41%	46%	40%
If you lost your job because of new technology, automation, robots or artificial intelligence, which of the following types of training or education would you prefer?					
• On-the-job training or other training offered by an employer	49%	51%	54%	45%	47%
• In-person licensing, certificate, certification, or degree-granting program at a college or university	21%	21%	18%	23%	21%
• Online licensing, certificate, certification, or degree-granting program offered by a college or university	16%	15%	17%	16%	15%
• Self-taught education or training you complete on your own through free online courses	10%	8%	8%	11%	11%
• Accelerated coding or data skills boot camp or course offered by a private company	5%	6%	3%	5%	5%

Methods

Results for the Northeastern University-Gallup survey on artificial intelligence are based on surveys conducted by mail from Sept. 15 to Oct. 10, 2017, with a random sample of 3,297 U.S. adults aged 18 and older. The survey package included an English and a Spanish survey to provide respondents with the flexibility to reply in their preferred language.

Gallup selected the sample of U.S. residents using address-based sampling (ABS), a sampling technique used to select households from a list of all households on file with the United States Postal Service (USPS). Gallup chooses respondents within the household at random based on which household member would have the next birthday. Gallup used a series of postcard reminders to encourage participation in the survey.

Gallup weighted the data to match national demographics of gender, age, education, race, Hispanic ethnicity, education and region.

All reported margins of sampling error include the computed design effects for weighting.

- For results based on the total sample of 3,297 U.S. adults, the margin of sampling error is ±2 percentage points at the 95% confidence level.

- For results based on the sample of 2,871 employed U.S. adults, the margin of sampling error is ±3 percentage points at the 95% confidence level.

- For results based on the sample of 1,586 U.S. adults with a bachelor's degree or higher, the margin of sampling error is ±3 percentage points at the 95% confidence level.

- For results based on the sample of 1,560 U.S. adults with less than a bachelor's degree, the margin of sampling error is ±3 percentage points at the 95% confidence level.

- For results based on the sample of 461 U.S. adults aged 18-35, the margin of sampling error is ±6 percentage points at the 95% confidence level.

- For results based on the sample of 662 U.S. adults aged 36-50, the margin of sampling error is ±5 percentage points at the 95% confidence level.

- For results based on the sample of 590 U.S. adults in the Eastern Census Region, the margin of sampling error is ±6 percentage points at the 95% confidence level.

- For results based on the sample of 883 U.S. adults in the Midwestern Census Region, the margin of sampling error is ±5 percentage points at the 95% confidence level.

- For results based on the sample of 1,128 U.S. adults in the Southern Census Region, the margin of sampling error is ±4 percentage points at the 95% confidence level.

- For results based on the sample of 696 U.S. adults in the Western Census Region, the margin of sampling error is ±5 percentage points at the 95% confidence level.

- For results based on the sample of 490 U.S. adults in blue-collar jobs, the margin of sampling error is ±6 percentage points at the 95% confidence level.

- For results based on the sample of 1,121 U.S. adults in white-collar jobs, the margin of sampling error is ±4 percentage points at the 95% confidence level.

Margins of error may differ for other subgroups of the population. In addition to sampling error, question wording and practical difficulties in conducting surveys can introduce error or bias into the findings of public opinion polls.

About Gallup

Gallup delivers forward-thinking research, analytics and advice to help leaders solve their most pressing problems. Combining more than 80 years of experience with its global reach, Gallup knows more about the attitudes and behaviors of the world's constituents, employees and customers than any other organization. Gallup consultants help private and public sector organizations boost organic growth through measurement tools, strategic advice and education.

About Northeastern University

Founded in 1898, Northeastern is a global research university that pushes learning and discovery far beyond the boundaries of classroom and campus. This distinctive approach is built on a tradition of actively engaging the university community with industry and nonprofit partners around the world.

Northeastern is the recognized leader in experiential learning. We offer students opportunities for professional work, research, service, and global learning with 3,153 employers in more than 100 countries.

The integration of classroom study and professional experience has drawn an outstanding pool of high-talent students from around the world. Three-quarters of our fall 2017 freshmen graduated in the top 10% of their high school class.

The same spirit of engagement guides a use-inspired research enterprise that integrates faculty across disciplines to solve global challenges. We focus on research with maximum impact, in fields including physical and cybersecurity, drug discovery and delivery, coastal sustainability, and global resilience. External funding for faculty research exceeded $140 million last year, growing by 189% since 2006.

Northeastern's entrepreneurial ecosystem — the university is ranked among the top institutions nationally for undergraduate and graduate entrepreneurship programs — includes the student-run venture accelerator IDEA, and strong connections to the VC communities in Boston and Silicon Valley.

Our regional campuses in Charlotte, North Carolina; Seattle; Silicon Valley; and Toronto are platforms for flexible professional learning programs, undergraduate and graduate experiential opportunities, and industry research partnerships.

Northeastern offers a comprehensive range of undergraduate and graduate programs leading to degrees through the doctorate in nine colleges and schools, as well as one of the largest online graduate degree and certificate programs of any private nonprofit university in the nation.

Northeastern
University

northeastern.edu