Artificial Intelligence:
A Practical Primer

2024 NADO & DDAA Washington Conference

March 2024

AI has been around for 70 years

Artificial Intelligence, the science and engineering of making intelligent machines ›

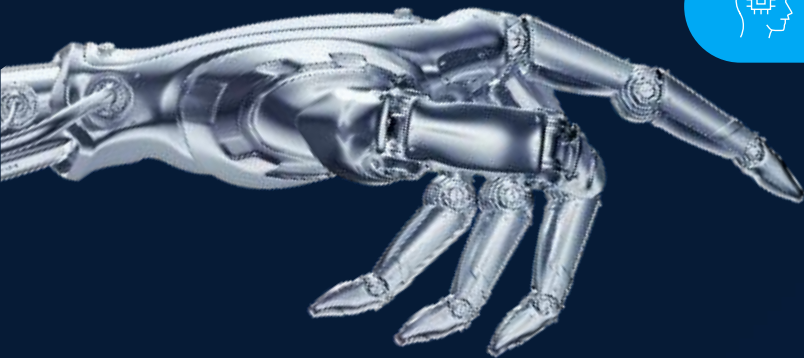**Machine Learning**, a major approach to realize AI ›

Deep Learning ›

Generative AI ›

1950's *1960's* *1970's* *1980's* *1990's* *2000's* *2010's* *2020's*

Artificial Intelligence

Is the broad field of developing machines that can replicate human behavior, including all aspects of **perceiving, reasoning, learning**, and **problem solving**

Machine Learning

Is a major approach to **achieve AI by teaching machines to learn relationships hidden in data, and build approximate models of real systems**
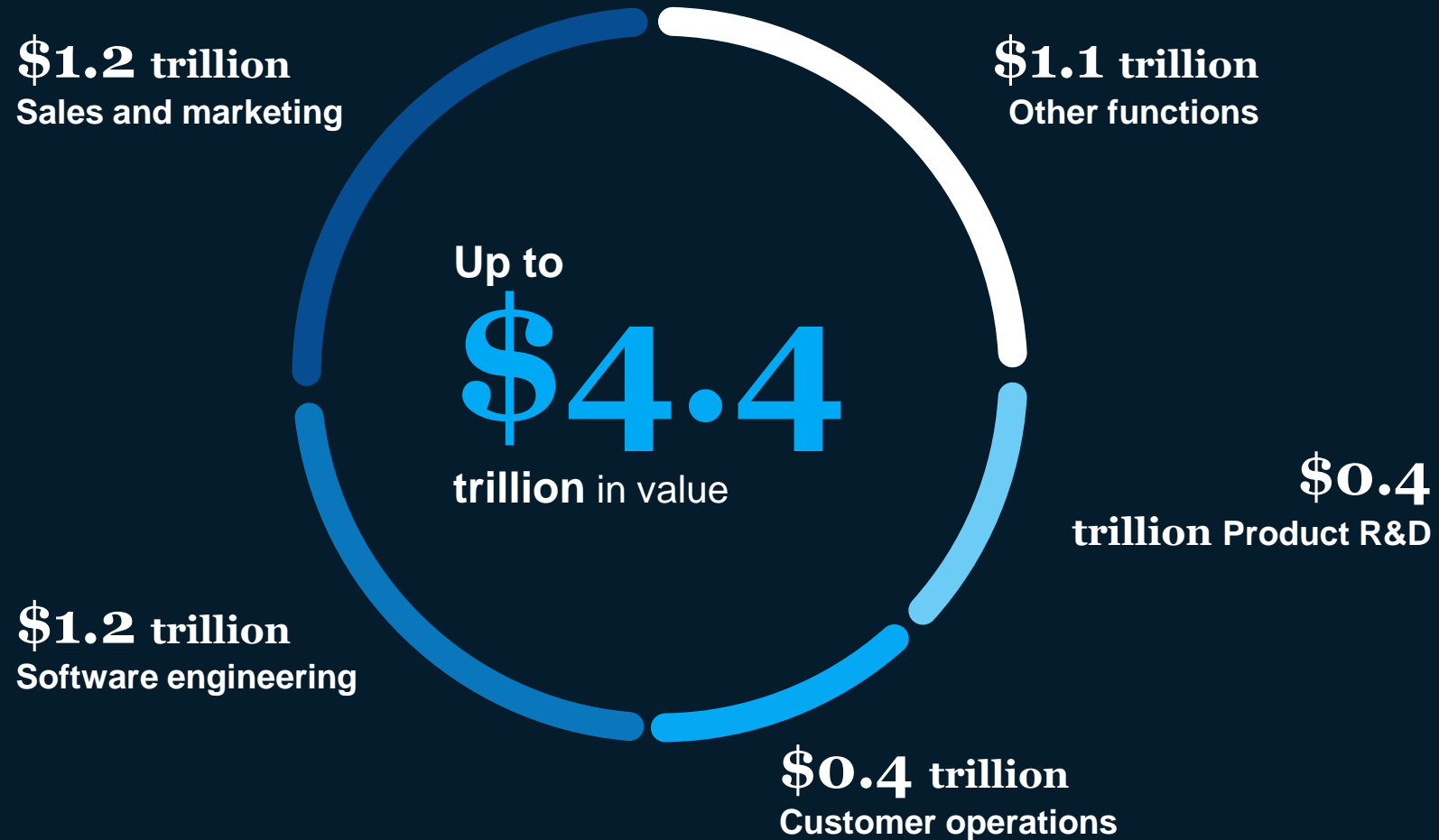
Deep Learning

is a **branch of Machine Learning** that uses '**neural networks**' to **model real systems** by mimicking how the human brain works, utilizing millions of computational 'neurons'

Generative AI

are a **branch of Deep Learning** that uses exceptionally large neural nets called **Large Language Models** (with 100's of billions of neurons) that can learn especially abstract patterns

Applying these language models to interpret and create text, images, video, and data has become known as **Generative AI**

Generative AI is poised to boost performance and unlock trillions of dollars across functions

$1.2 trillion
Sales and marketing

$1.1 trillion
Other functions

Up to
$4.4
trillion in value

$0.4
trillion Product R&D

$1.2 trillion
Software engineering

$0.4 trillion
Customer operations

Advances in technical capabilities could have the most impact on activities performed by educators, professionals, and creatives

Impact of generative AI on technical automation potential in midpoint scenario, 2023

■ With generative AI   ■ Without generative AI[1]

Occupation group	Overall technical automation potential, % in 2023		Share of global employment[2], %
	With generative AI	Without generative AI[1]	
Educator and workforce training	54	15	4
Business/legal professionals	62	32	5
STEM professionals	57	28	3
Community services	65	39	3
Creatives and arts management	53	28	1
Office support	87	66	9
Managers	44	27	3
Health professionals	43	29	2
Customer service and sales	57	45	10
Property maintenance	38	29	4
Health aides, technicians, and wellness	43	34	3
Production work	82	73	12
Food services	78	70	5
Transportation services	49	42	3
Mechanical installation & repair	67	61	4
Agriculture	63	59	21
Builders	53	49	7
Total	63	51	**100**

Note: Figures may not sum, because of rounding.
1. Previous assessment of work automation before the rise of generative AI.
2. Includes data from 47 countries, representing around 80% of employment across the world.

Source: "The economic potential of generative AI: The next productivity frontier", McKinsey Global Institute, June 2023.

We see 4 leading uses of AI

Archetype	Content Synthesis	Coding & Software	Content generation	Customer Engagement
Description	Generate insights and drive actions based on summarization and synthesis of unstructured data	Interpret and generate code and documentation	Support ideation for new product development or generate personalized marketing copy	Streamline interactions by interpreting text or model customer journeys
Selected use cases	Extract insights from large document sets (e.g., ESG information from sustainability reports) Augment capabilities of operations staff (e.g., chat interface for maintenance operator)	Generate code and assist developers Refactor or translate code to accelerate mainframe migration	Personalized customer comms or marketing Generate RfPs or technical documents Generate visuals (images, designs, 3D models) to accelerate the product design process	Streamline customer communications, e.g., issue resolution (driving action to resolve) and Q&A Model and predict elements in patient or customer journey
Examples	Technical report query	Code optimization	Design ideation	Always on chat bot

The world of Generative AI is far broader than ChatGPT and large language models, and has many applications

Text

| Content writing | Analysis, summary & synthesis | Search E.g., enhancing internal search tools | Chatbots/ assistants | Text embedding for downstream tasks | Grammar & style improve- ments |

Code

| Code generation | Dataset generation | Application prototype & design | Code translation |

Image

| Stock image generation | Image editing & customi- zation | Design concept generation |

Audio

| Text to voice generation | Audio editing | Sound creation |

Video

| Video editing & facial adjustments | Video creation | Voice translation & adjustments |

Other

| 3D object generation | Product design & discovery | Molecule discovery |

AI's impact on organizations will be faster, broader and deeper

Continuation..   ➕   **...and exacerbation of talent challenges and opportunities**

Automation and digitization reshaping Future of Work and Future of Workforce

Demographic shifts changing structure of workforces and talent pools

Employees placing increased demands on their (potential) employers

Faster
The pace of workforce transformation is likely to accelerate

Broader
GenAI will reshape the way we work impacting all employees, incl. occupations with higher levels of education

Deeper
GenAI has the potential to change the anatomy of work, augmenting individual tasks for all employees

10 year
acceleration of widespread automation compared to pre-GenAI

70%
of jobs significantly exposed to automation due to GenAI – with some professions 2X compared to pre GenAI
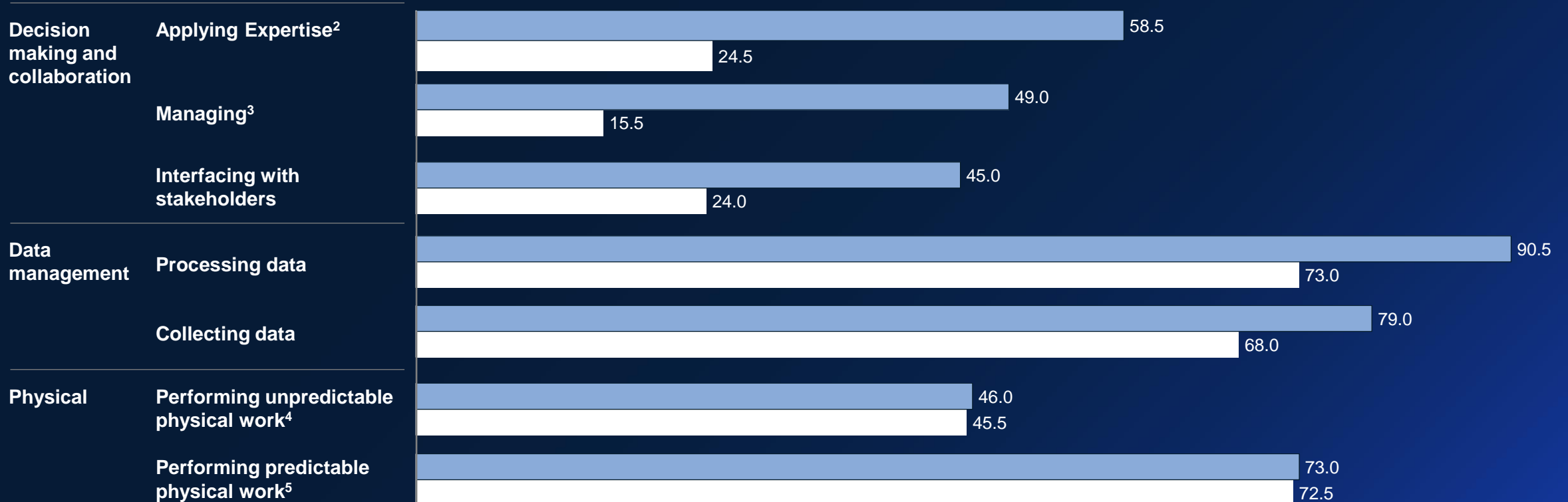
25%
of employees' time previously not automatable, is now potentially automatable by AI

The growth of GenAI could have the biggest impact on collaboration and the application of expertise, activities that previously had a lower potential for automation

Overall technical automation potential, comparison in midpoint scenarios, % in 2023

■ With generative AI   ■ Without generative AI[1]

Activity groups

Decision making and collaboration	**Applying Expertise**[2]	With generative AI	58.5
		Without generative AI	24.5
	Managing[3]	With generative AI	49.0
		Without generative AI	15.5
	Interfacing with stakeholders	With generative AI	45.0
		Without generative AI	24.0
Data management	**Processing data**	With generative AI	90.5
		Without generative AI	73.0
	Collecting data	With generative AI	79.0
		Without generative AI	68.0
Physical	**Performing unpredictable physical work**[4]	With generative AI	46.0
		Without generative AI	45.5
	Performing predictable physical work[5]	With generative AI	73.0
		Without generative AI	72.5

Note: Figures may not sum, because of rounding
1. Previous assessment of work automation before the rise of generative AI.   2. Applying expertise to decision making, planning, and creative tasks.
3. Managing and developing people. 4. Performing physical activities and operating machinery in unpredictable environments.
5. Performing physical activities and operating machinery in predictable environments.

Source: McKinsey Global Institute analysis

Generative AI increases the potential for technical automation most in occupations requiring high levels of educational attainment.

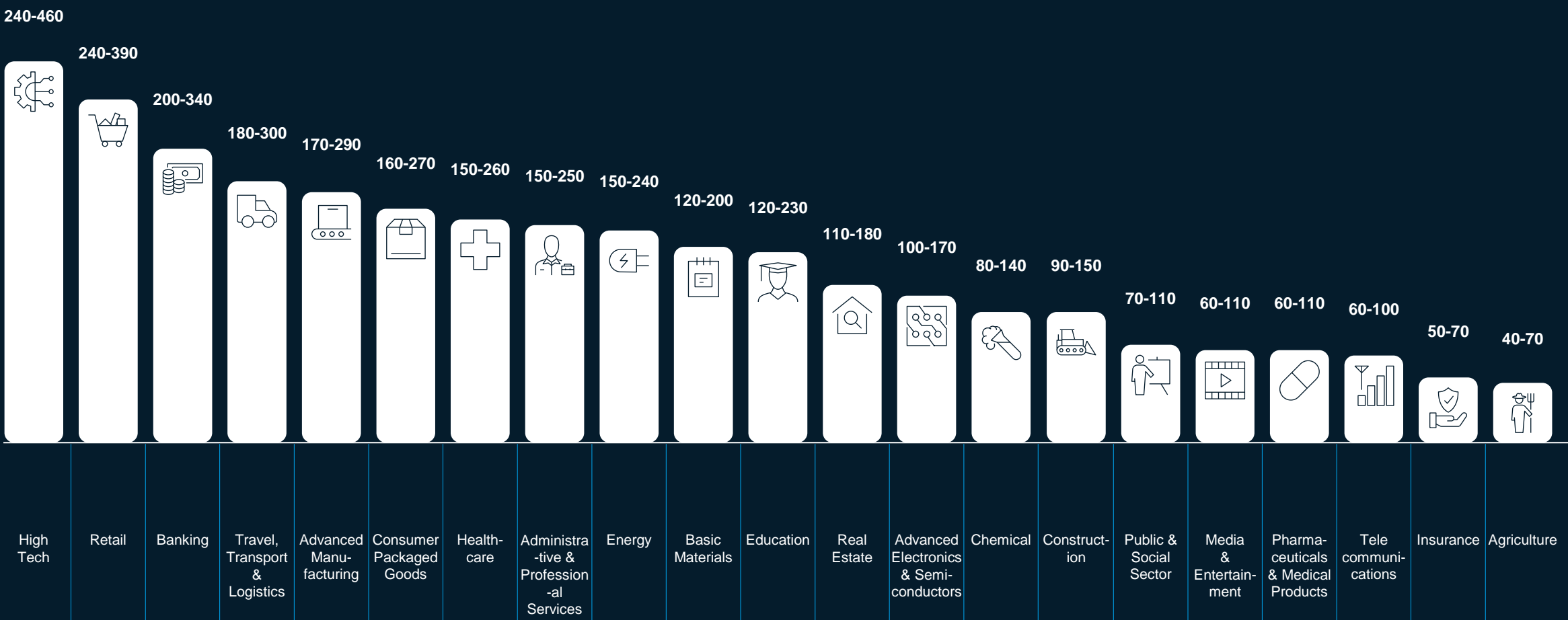**Impact of generative AI on technical automation potential in midpoint scenario, 2023**

■ With generative AI ■ Without generative AI[1]

Education level	Overall technical automation potential, comparison in midpoint scenarios, % in the United States in 2023	Share of US employment, %
Master's, PhD, or higher	57 / 28	13
Bachelor's degree	60 / 36	22
Associate's degree	62 / 45	9
Some college	64 / 48	22
High school diploma or equivalent	64 / 51	24
No high school degree	63 / 54	9

1. Previous assessment of work automation before the rise of generative AI.

Source: McKinsey Global Institute analysis
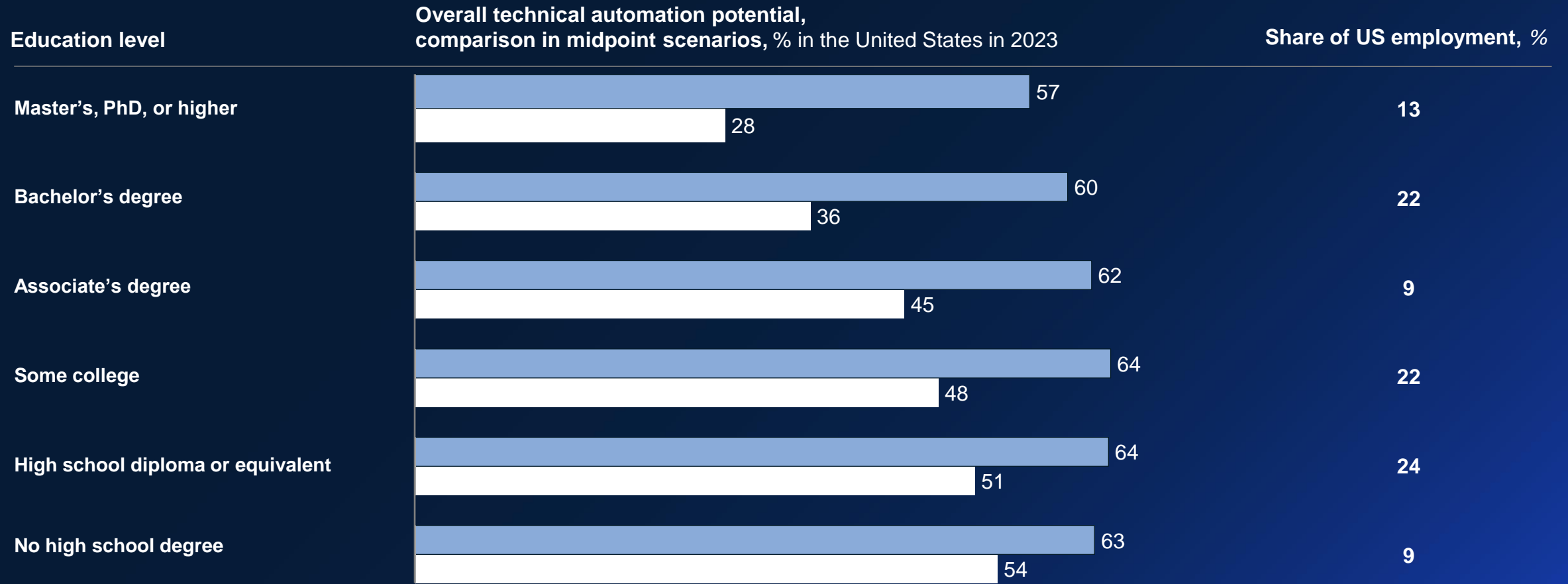
Generative AI will have a significant impact across all industry sectors

Generative AI productivity impact by sector (Total, $ billion)

Sector	Impact
High Tech	240-460
Retail	240-390
Banking	200-340
Travel, Transport & Logistics	180-300
Advanced Manu-facturing	170-290
Consumer Packaged Goods	160-270
Health-care	150-260
Administra-tive & Profession-al Services	150-250
Energy	150-240
Basic Materials	120-200
Education	120-230
Real Estate	110-180
Advanced Electronics & Semi-conductors	100-170
Chemical	80-140
Construct-ion	90-150
Public & Social Sector	70-110
Media & Entertain-ment	60-110
Pharma-ceuticals & Medical Products	60-110
Tele communi-cations	60-100
Insurance	50-70
Agriculture	40-70

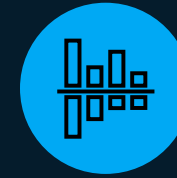# But contrary to mainstream opinion, generative AI is not yet the answer in every situation

High-stakes scenarios where errors, factual inaccuracies, or value judgements can cause harm

Disease diagnostic

Applications involving **heavy volume** of requests and**/or** tight response **time limits**
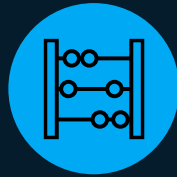
High frequency stock trading

Unconstrained, long, open-ended generation that may expose **harmful or biased content** to users

Legal document creation

Applications requiring **explainability** and/or full understanding of potential failure modes (e.g., highly regulated environments)

Credit scoring

Applications requiring **numerical reasoning** (from basic arithmetic to optimization)

Demand Forecasting

Artificial Intelligence and the Future of Work

1   **Do you think AI will create more jobs than it eliminates?**

2   **What types of jobs do you think are most at risk due to AI?**
- Manual Labor, Data Entry, Customer Servuce, Creative Professions, Management

3   **Do you think that AI could ever fully perform your job?**

4   **Which sector do you think will be most positively transformed by AI?**
- Healthcare, Transportation, Manufacturing, Entertainment, Education

5   **Should there be ethical guidelines for the use of AI in hiring?**