

# Rethinking the Impact of Automation and AI on U.S. Employment and Wage Trends

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**Frey and Osborne (2017)** estimated the susceptibility of over 700 U.S. occupations to automation, concluding that nearly half (47%) of existing jobs faced a high risk.

**Their findings underscored a key divide: routine, lower-wage occupations were more vulnerable to automation, while higher-wage, cognitively intensive jobs were more resistant.**

They identified 3 engineering bottlenecks that constrained automation's reach:

1. Perception and manipulation
2. Creative intelligence
3. Social intelligence

**Since 2017 technological advancements have mitigated many aspects of these challenges.**

# Perception & Manipulation

## Earlier Technology

Could not navigate unstructured environments  
or handle objects reliably



Path blocked.  
Task cannot continue.  
Please clear manually.



- ❌ Static. Rule-based.
- ❌ No understanding of environment.
- ❌ Unreliable and error prone.

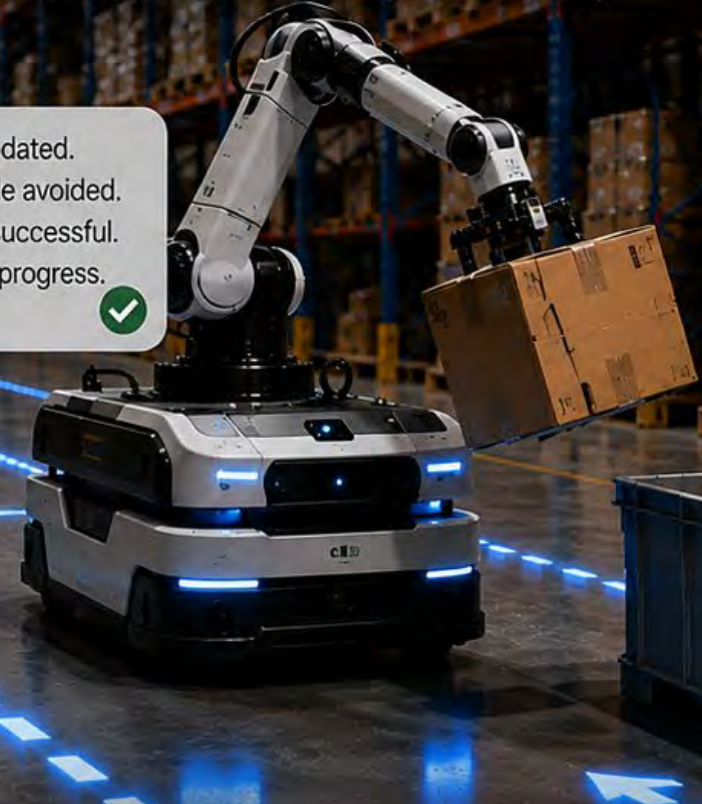


## AI Today

Understands its environment, adapts,  
and manipulates objects reliably



Path updated.  
Obstacle avoided.  
Grasp successful.  
Task in progress.

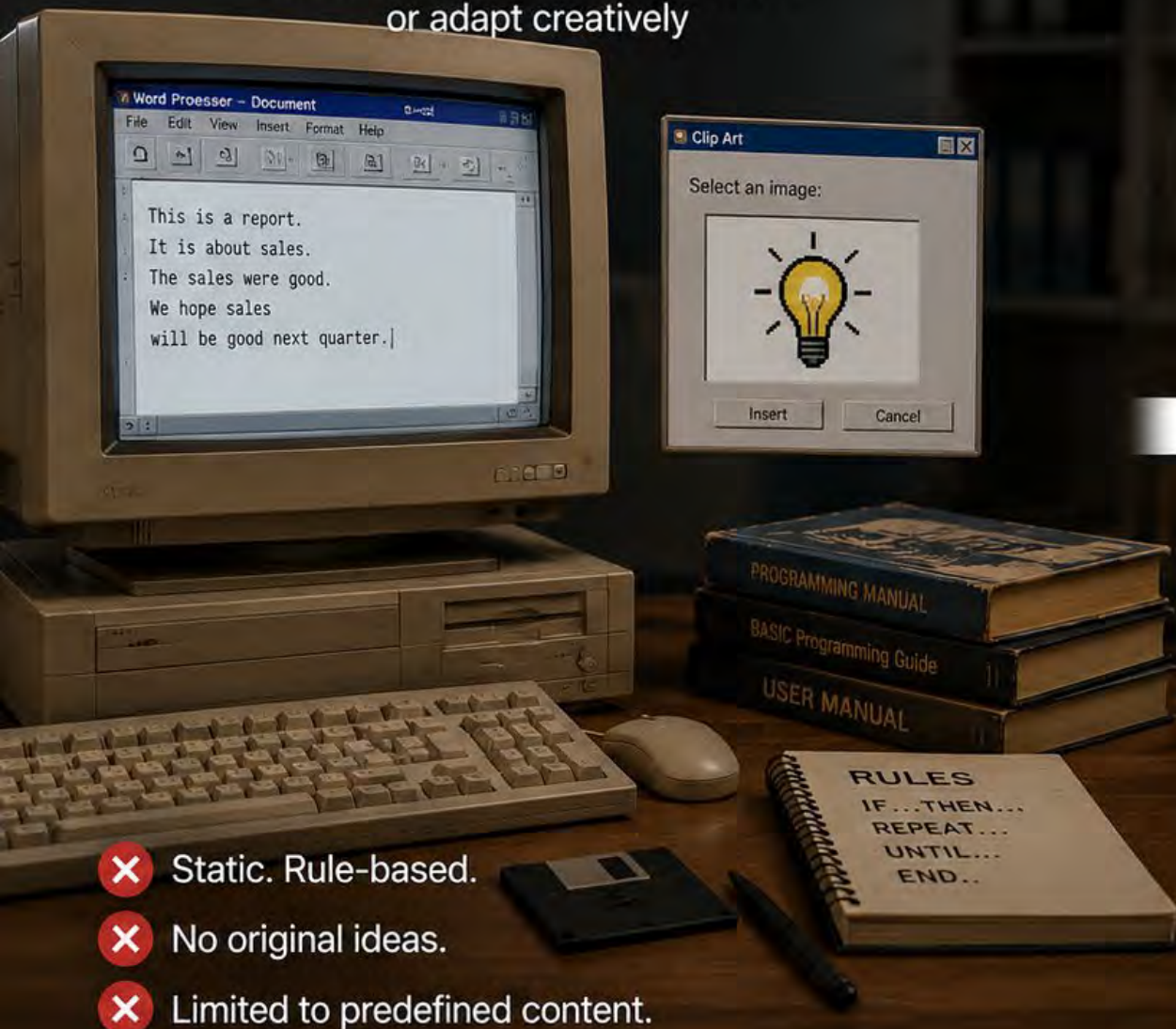


- ✅ Dynamic. Context-aware.
- ✅ Understands and navigates environment.
- ✅ Reliable and adapts to changes.

# Creative Intelligence

## Earlier Technology

Could not generate original ideas  
or adapt creatively



- ❌ Static. Rule-based.
- ❌ No original ideas.
- ❌ Limited to predefined content.

## AI Today

Generates original content, adapts,  
and iterates with user input



- ✅ Dynamic. Context-aware.
- ✅ Generates original ideas.
- ✅ Adapts and iterates with feedback.

# Social Intelligence

## Earlier Technology

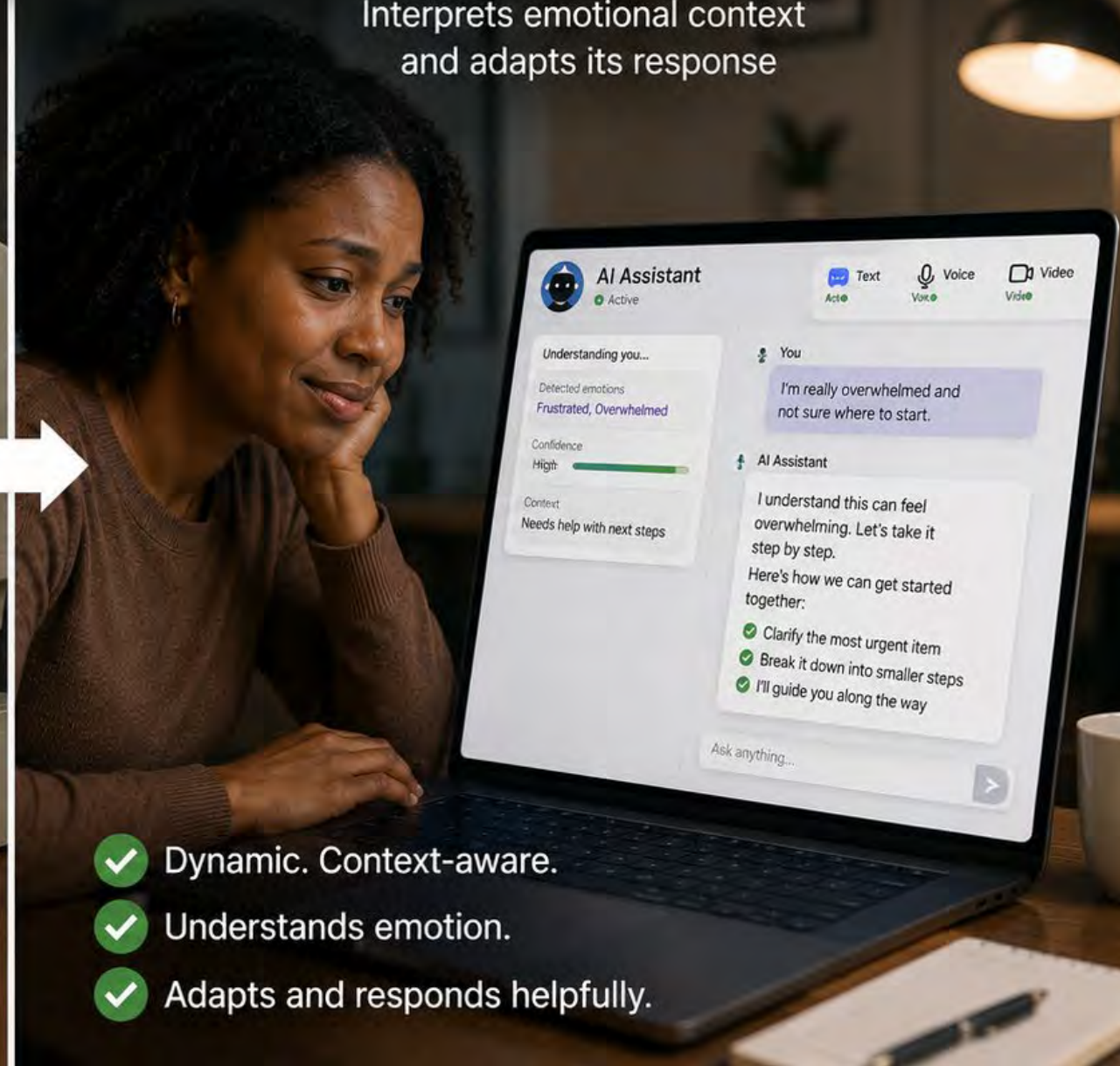
Could not interpret human emotions  
or respond to social context



- ❌ Static. Rule-based.
- ❌ No understanding of emotion.
- ❌ Unresponsive to context.

## AI Today

Interprets emotional context  
and adapts its response



- ✅ Dynamic. Context-aware.
- ✅ Understands emotion.
- ✅ Adapts and responds helpfully.

## **A New Way to Think About AI: Tomlinson et al. (2025)**

- They analyzed human interactions with Microsoft Copilot, constructing “AI applicability scores” that highlight which occupations are most exposed to AI assistance or substitution.
- Findings: Writing, editing, programming, sales, and customer service occupations (many of which Frey and Osborne originally classified as relatively safe) are now highly susceptible to automation.

# Which Occupations Have the Highest and Lowest AI Applicability?

Tomlinson et al. (2025) identified:

**40** occupations with the highest AI applicability scores

**40** occupations with the lowest AI applicability scores

## HIGHEST AI APPLICABILITY



### Examples

-  Interpreters & Translators
-  Writers & Authors
-  Customer Service Representatives
-  Sales Representatives
-  Journalists
-  Web Developers
-  Editors

**Common thread:**  
Creating, processing,  
and communicating  
information



## LOWEST AI APPLICABILITY



### Examples

-  Construction Laborers
-  Machinists
-  Heavy & Tractor-Trailer Truck Drivers
-  Food Service Workers
-  Stockers & Order Fillers
-  Janitors & Building Cleaners

**Common thread:**  
Physical work, machinery,  
and manual tasks

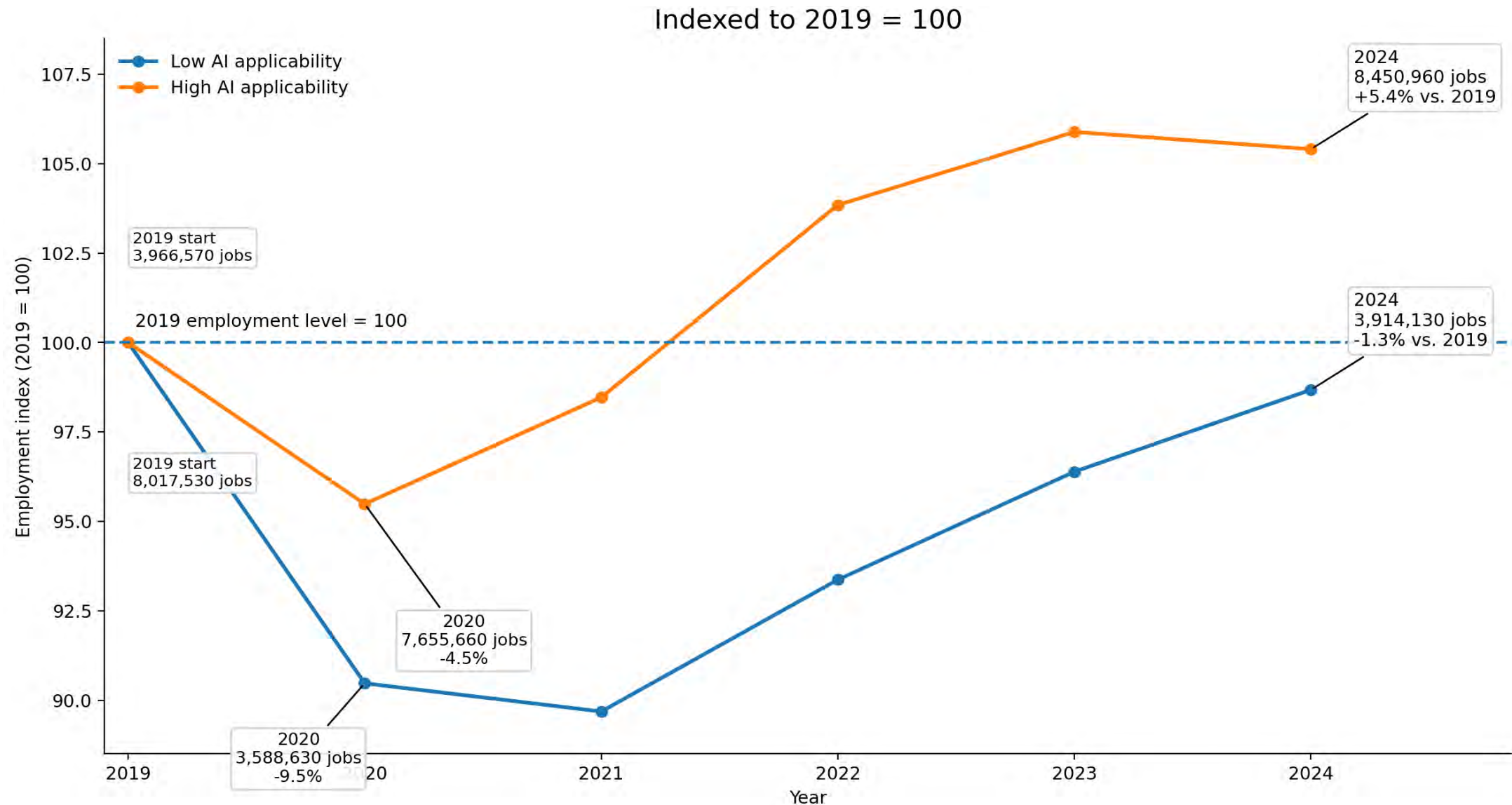


What happened to employment and wages in these two groups between 2019 and 2024?

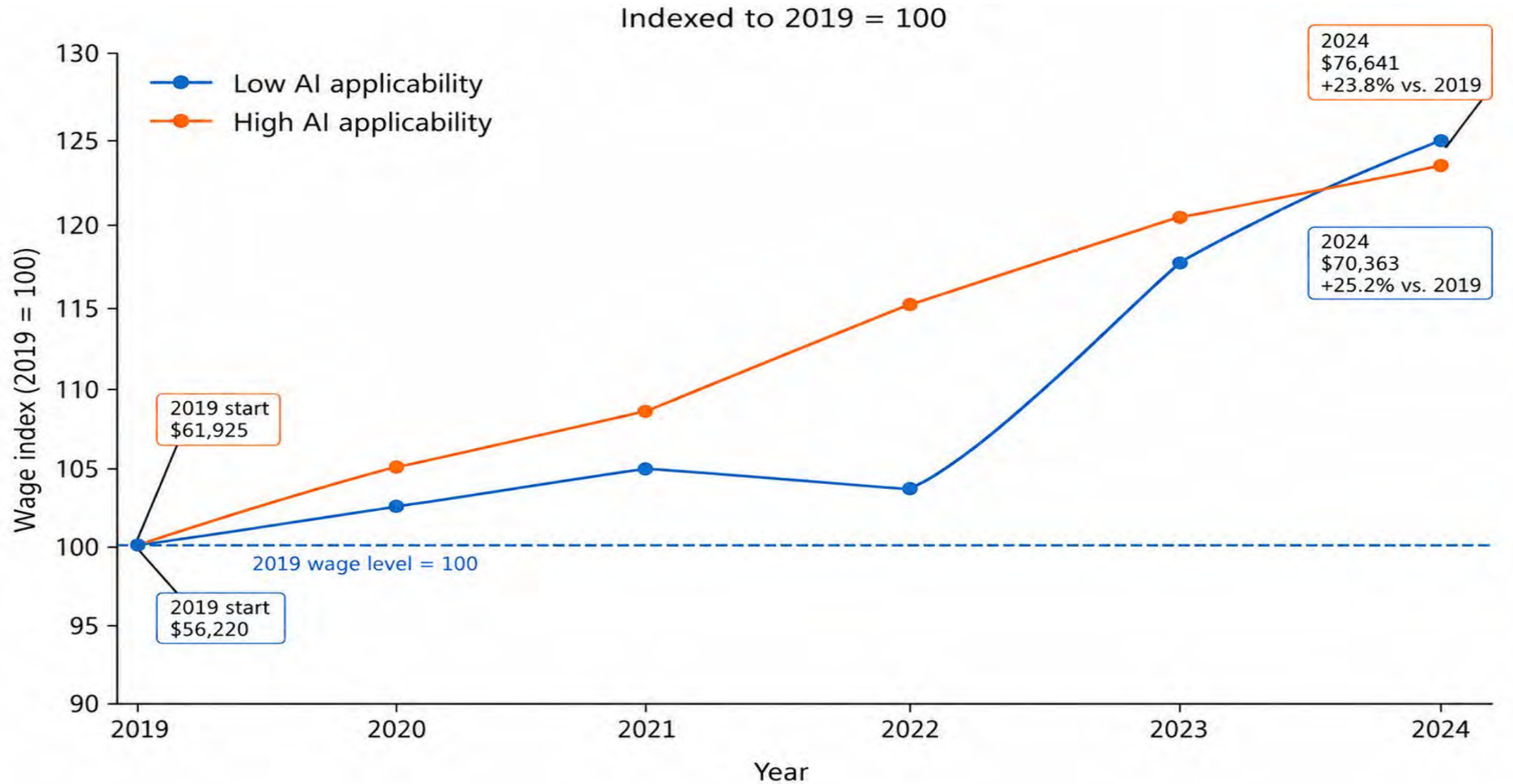
# Employment and Wage Trends by AI Applicability Score, 2019–2024



# Employment Trends by Tomlinson et al. AI Applicability Score 2019–2024



# Wage Trends by Tomlinson et al. AI Applicability Score 2019–2024



Source: Author's calculations using BLS, O\*NET, Frey and Osborne (2017), and Tomlinson et al. (2025); visualization created with OpenAI ChatGPT.

## Measuring Employment and Wage Trends

1. We evaluated whether occupations classified as high-, moderate-, or low-risk of being impacted by automation experienced changes in employment and annual wages between 2019 and 2024.
2. To compare recent AI applicability patterns with earlier automation forecasts, we matched 73 of the 80 occupations identified by Tomlinson et al. (2025) with automation risk scores from Frey and Osborne (2017).

# Occupations by Probability of Computerization

Representative occupations from high-, moderate-, and low-risk categories

**HIGH RISK**  
Higher probability of computerization  
0.70 and above

Telemarketers / Call Center Workers

Switchboard Operators

Machine Feeders and Offbearers

Industrial Truck and Tractor Operators

Technical Writers

TEMPLATE LIBRARY

STYLE GUIDE

CONTENT MANAGEMENT

**MODERATE RISK**  
Mixed human-technology task content  
0.30 to 0.699

Personal Financial Advisors

Market Research Analysts and Marketing Specialists

Customer Service Representatives

Hazardous Materials Removal Workers

Helpers-Production Workers

**LOW RISK**  
Lower probability of computerization  
Below 0.30

Management Analysts

Prosthodontists

Postsecondary Teachers

First-Line Supervisors of Firefighting and Prevention Workers

Mathematicians

$$f(x) = \sum_{n=1}^{\infty} a_n \phi_n(x)$$

$$\int_a^b f(x) dx$$

$$\frac{\partial f}{\partial x} = 0$$

$$\nabla \cdot \vec{F} = 0$$


Lower probability of computerization



# Average Employment and Wage Changes, 2019–2024

Average percentage change within Frey & Osborne (2017) computerization-risk categories



**On average, employment declined in high- and moderate-risk occupations and increased slightly in low-risk occupations. Wages increased substantially across all three groups.**

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# High Computerization Risk: Largest Employment Declines and Gains

Selected from 36 matched occupations in the high-risk category • Ranked by percentage change in employment, 2019–2024

## Five largest employment declines

| Occupation                                                    | F&O Risk | AI Applicability | Employment | Annual Wage |
|---------------------------------------------------------------|----------|------------------|------------|-------------|
| Telemarketers                                                 | 99.0%    | 40.0%            | -50.7%     | +22.1%      |
| Switchboard operators, including answering service            | 96.0%    | 35.0%            | -47.5%     | +27.6%      |
| Helpers—Roofers                                               | 72.0%    | 1.0%             | -42.3%     | +26.1%      |
| Dredge Operators                                              | 92.0%    | 0.0%             | -33.5%     | +8.7%       |
| Helpers—Painters, Paperhangers, Plasterers, and Stucco Masons | 94.0%    | 3.0%             | -33.5%     | +24.1%      |

## Five largest employment gains

| Occupation                                       | F&O Risk | AI Applicability | Employment | Annual Wage |
|--------------------------------------------------|----------|------------------|------------|-------------|
| Plant and System Operators, All Other            | 86.0%    | 3.0%             | +23.2%     | +8.4%       |
| Medical Equipment Preparers                      | 78.0%    | 2.0%             | +27.9%     | +23.9%      |
| Industrial Truck and Tractor Operators           | 93.0%    | 1.0%             | +28.0%     | +26.1%      |
| Gas Compressor and Gas Pumping Station Operators | 91.0%    | 1.0%             | +48.5%     | +14.4%      |
| Models                                           | 98.0%    | 35.0%            | +130.6%    | +123.8%     |

AVERAGE — ALL 36 JOBS

F&O Risk

88.5%

AI Applicability

17.1%

Employment

-2.6%

Annual Wage

+25.9%

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# Moderate Computerization Risk: Largest Employment Declines and Gains

Selected from 18 matched occupations in the moderate-risk category • Ranked by percentage change in employment, 2019–2024

## Five largest employment declines

| Occupation                  | F&O Risk | AI Applicability | Employment | Annual Wage |
|-----------------------------|----------|------------------|------------|-------------|
| Helpers—Production Workers  | 66.0%    | 2.0%             | -44.7%     | +31.2%      |
| Statistical assistants      | 66.0%    | 36.0%            | -39.9%     | +7.4%       |
| Foundry Mold and Coremakers | 67.0%    | 0.0%             | -27.7%     | +27.1%      |
| Advertising Sales Agents    | 54.0%    | 36.0%            | -24.9%     | +18.1%      |
| Roustabouts, Oil and Gas    | 68.0%    | 1.0%             | -23.1%     | +18.8%      |

## Five largest employment gains

| Occupation                                         | F&O Risk | AI Applicability | Employment | Annual Wage |
|----------------------------------------------------|----------|------------------|------------|-------------|
| Public safety telecommunicators                    | 49.0%    | 35.0%            | +6.1%      | +23.7%      |
| Motorboat Operators                                | 62.0%    | 0.0%             | +12.3%     | +12.9%      |
| Hazardous Materials Removal Workers                | 53.0%    | 3.0%             | +14.3%     | +16.8%      |
| Market research analysts and marketing specialists | 61.0%    | 35.0%            | +26.9%     | +20.8%      |
| Personal financial advisors                        | 58.0%    | 35.0%            | +28.7%     | +34.3%      |

AVERAGE — ALL 18 JOBS

F&O Risk

57.4%

AI Applicability

20.7%

Employment

-6.3%

Annual Wage

+21.4%

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# Low Computerization Risk: Largest Employment Declines and Gains

Selected from 19 matched occupations in the low-risk category • Ranked by percentage change in employment, 2019–2024

## Five largest employment declines

| Occupation                                                     | F&O Risk | AI Applicability | Employment | Annual Wage |
|----------------------------------------------------------------|----------|------------------|------------|-------------|
| Surgical Assistants/Physician Assistants                       | 14.0%    | 1.0%             | -78.7%     | +42.4%      |
| Database administrators and Architects                         | 3.0%     | 36.0%            | -41.7%     | +24.9%      |
| Mathematicians                                                 | 4.7%     | 39.0%            | -15.6%     | +14.2%      |
| Library Science Teachers, Postsecondary/Postsecondary Teachers | 3.2%     | 34.0%            | -6.6%      | +9.3%       |
| Economics Teachers, Postsecondary/Postsecondary Teachers       | 3.2%     | 35.0%            | -6.4%      | +11.7%      |

## Five largest employment gains

| Occupation                                                    | F&O Risk | AI Applicability | Employment | Annual Wage |
|---------------------------------------------------------------|----------|------------------|------------|-------------|
| Farm and Home Management Educators                            | 0.8%     | 41.0%            | +17.7%     | +14.7%      |
| Management Analysts                                           | 13.0%    | 35.0%            | +25.9%     | +20.0%      |
| Web Developers and Digital Interface Designers                | 4.2%     | 35.0%            | +28.3%     | +27.6%      |
| First-Line Supervisors of Firefighting and Prevention Workers | 0.4%     | 1.0%             | +34.6%     | +18.3%      |
| Prosthodontists                                               | 5.5%     | 2.0%             | +55.1%     | +17.1%      |

|                       |          |                  |            |             |
|-----------------------|----------|------------------|------------|-------------|
| AVERAGE — ALL 19 JOBS | F&O Risk | AI Applicability | Employment | Annual Wage |
|                       | 6.4%     | 28.1%            | +1.9%      | +23.5%      |

# Interim Takeaways

- **Earlier automation risk is reflected in the average employment trends.**  
Employment declined in high- and moderate-risk occupations and increased in low-risk occupations.
- **But occupations within each risk category had very different experiences.**  
Substantial employment gains and declines occurred across all three groups.
- **High AI applicability has not corresponded with broad employment declines.**  
Occupations with the highest AI applicability experienced overall employment growth between 2019 and 2024.
- **Wages increased across all of the groups examined.**