AI, Complexity, and the Future of Work

Morgan R. Frank



Automation! Ahh, scary!



May 26th 2025 | SAN FRANCISCO

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FORTUNE

Anthropic CEO warns AI could eliminate half of all entry-level white-collar jobs

BY CHRIS MORRIS CONTRIBUTING WRITE

May 28, 2025 at 11:27 AM ED1



Anthropic CEO Dario Amodei is warning that AI could be a job killer. FABRICE COFFRINI/AFP VIA GETTY IMAGES



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300 million jobs could be affected by la wave of AI, says Goldman Sachs

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ChatGPT may be coming for our jobs. Here are the 10 role most likely to replace.

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What Does ChatGPT Really Mean For Your Job?





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ChatGPT is the Myspace of AI: It's fun, but it's far from taking yo white-collar job		





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300 million jobs could be affected by latest wave of AI, says Goldman Sachs

How ChatGPT Will Destabilize So should we be worried? ar Work

INSIDER ChatGPT may be coming for our jobs. Here are the 10 roles that Al is most likely to reached and ecode of studies estimate Al exposure.

Forbes

What Does ChatGPT Really **Mean For Your Job?**





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No technology in modern memory has caused mass job loss among highly educated workers. Will generative AI be an exception?

Can we resolve this uncertainty?

INSIDER

ChatGPT is the Myspace of AI: It's fun, but it's far from taking your white-collar job







Measuring Technology Exposure

Wave	Study	Year First Available	Description
1	Acemoglu & Autor	2011	Assess occupations on cor cognitive or manual requir
	O*NET	2003	The fraction of workers in
	Bachelors		degree.
2	Frey & Os-	$\operatorname{preprint}$	Combined a subset of oc
	borne	2013	assessments of fully auton
	Arntz et al	2016	Considered a complete set automation risk in OECD
	O*NET	2016	The relative amounts of r
	Degree of		the worker will perform as
	Automa-		
	tion		
3	Brynjolfsson	2018	Surveyed ML experts in or
	et al		suitability for ML.
	Felten et al	2018	Crowdsource gig workers to
			AI application capabilities
	Webb	2019	Uses NLP to compare tec
			tasks.



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- mputer usage, routineness, andrements.
- an occupation with a bachelor's
- cupation skills with subjective natable or non-automatable oc-
- of occupations' skills to assess countires.
- coutine versus challenging work s part of a job.
- rder to assess occupations' task
- o establish connections between s and occupation abilities. chology patents to occupation

- Wave 1: Theory based
- Wave 2: Occupations are bundles of skills
- Wave 3: Quantify what technology can actually do
- Each study validates against *education*, employment, or wages







Measuring Technology Exposure







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- 50	zed S	lmpa
- 25	rmali	(More
0	No	



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The future of employment: How susceptible are jobs to computerisation? **(Preprint 2013)**

Out of Oxford University

Highly cited (Google scholar: 16,212)

Estimate automation exposure by job title

Survey experts on "certainly" automatable occupations and assess 9 O*NET skills

"Because <u>creativity</u>, by definition, involves not only novelty but value, and because values are highly variable, it follows that many arguments about creativity are rooted in disagreements about value....In the absence of engineering solutions to overcome this problem, it seems unlikely that occupations requiring a high degree of creative intelligence will be automated in the next decades."







Future of Work

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GPTs are GPTs: Labor market impact potential of LLMs (2024)





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- OpenAI + Daniel Rock (Wharton School, Penn) focusing on LLMs
- Published in Science, a top research journal
- Estimate automation exposure by job title
- Ask Turkers to assess 2,000 detailed workplace activities
- Ask ChatGPT to self-assess







Technology exposure is uncertain...

...so what happens to exposed workers?



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Skill biased technological change



Programmers & Machine Learning





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Truck Drivers & Autonomous Vehicles







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to unionise.	
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to unionise.	
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Everybody Dance Now (arXiv:1808.07371)





Everybody Dance Now (arXiv:1808.07371)



College-educated *employment* is stable



CHART: THE ECONOMIST





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CHART: THE ECONOMIST

Why AI hasn't taken your job. The Economist



College-educated salaries are unstable

"Recent" graduates completed their terminal degree after January 2020.

Career histories for 1.6 million recent graduates and 3.3 million not-recent graduates.

Here, controlling for state, occupation category, education field of study, and degree-granting institution.





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Does LLM exposure relate to salary?



Salary sensitivity to LLM exposure dropped across education levels making recent graduates more similar to that of not-recent graduates.

Seniority does not preclude workers from impact.

LLM-exposed work is less now earns lower salaries.

Controlling for state, job sector, education field of study, and degree-granting institution.









Jobs Starting 1/2020 to 1/2025



Does LLM exposure relate to salary?



Recent graduates see the largest relative drop in salary sensitivity to LLM exposure.



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Symptoms of technology exposure



We need something reflecting *job disruption* that at least varies by *occupation* (bonus if data is representative and varies spatially, by industry, or temporally)

Options from the US Bureau of Labor Statistics (BLS) detail the full pipeline of symptoms:

- O*NET Database: Annual skill profiles of over 700 occupations across US economy
- Job Openings & Labor Turnover Survey (JOLTS): Monthly total separations by state
- Local Area Unemployment Statistics (LAUS): Monthly total unemployment rates



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Skill complexity and the future of work







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Unpacking the polarization of workplace skills





Unpacking the polarization of workplace skills







Unpacking the polarization of workplace skills



Taxi Driver (\$23k)



Dishwasher (\$18k)





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Chief Executive (\$166k)





LLMs may exacerbate skill polarization

For the first time, LLMs may automate many white collar workplace activities

Career progression may change in surprising ways

Example:

- Paralegals \rightarrow partner if LLMs automate document lookup and synthesis?
- Will the effectiveness of education change?

The skill network offers a road map based on skills











How do skills relate to career mobility?

How do changing skill demands from Al alter career pathways?



spatial career mobility

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Skill matching and career mobility

Air Traffic Controller

Surgeon

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Career mobility and skill complexity

- Assistant Professor, University of Pittsburgh, Pittsburgh, PA (2020-Present)
- Postdoctoral Researcher, MIT, Boston, MA (2019-2020)
- Research Assistant, MIT, Boston, MA (2014 - 2019)
- Research Assistant, University of Vermont, **Burlington**, VT (2012 - 2014)

New occupation, **New location**

New occupation, **Same location**

Same occupation, **New location**

Burlington, VT (2013)

Research Assistant, Low Embeddedness in Burlington, VT

Does embeddedness in your labor market indicate **Complementarity or Competition?**

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Career mobility and skill complexity

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Lower embeddedness, higher wages

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- spatial career mobility

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