

# O IMPACTO DA INTELIGÊNCIA ARTIFICIAL E ROBÓTICA NO FUTURO DO EMPREGO E TRABALHO

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16 de outubro de 2018



Nós já estamos vivendo o  
futuro digital!

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E a inteligência artificial já faz parte do dia-a-dia.

# Algoritmos e IA no dia-a-dia

coleta de dados e tomada de decisão

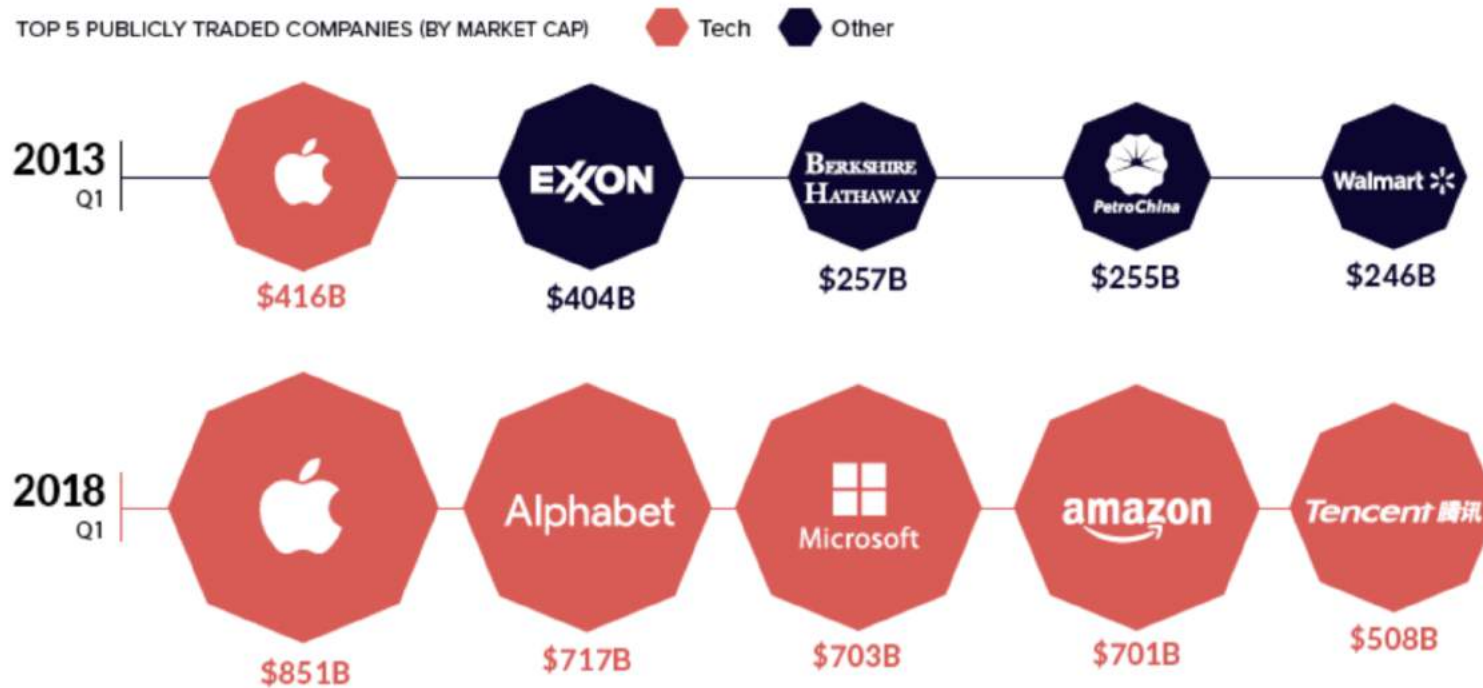


“In 2015, Uber, the world’s largest taxi company owns no vehicles, Facebook the world’s most popular media owner creates no content, Alibaba the most valuable retailer has no inventory, and Airbnb the world’s largest hotelier owns no real estate.”

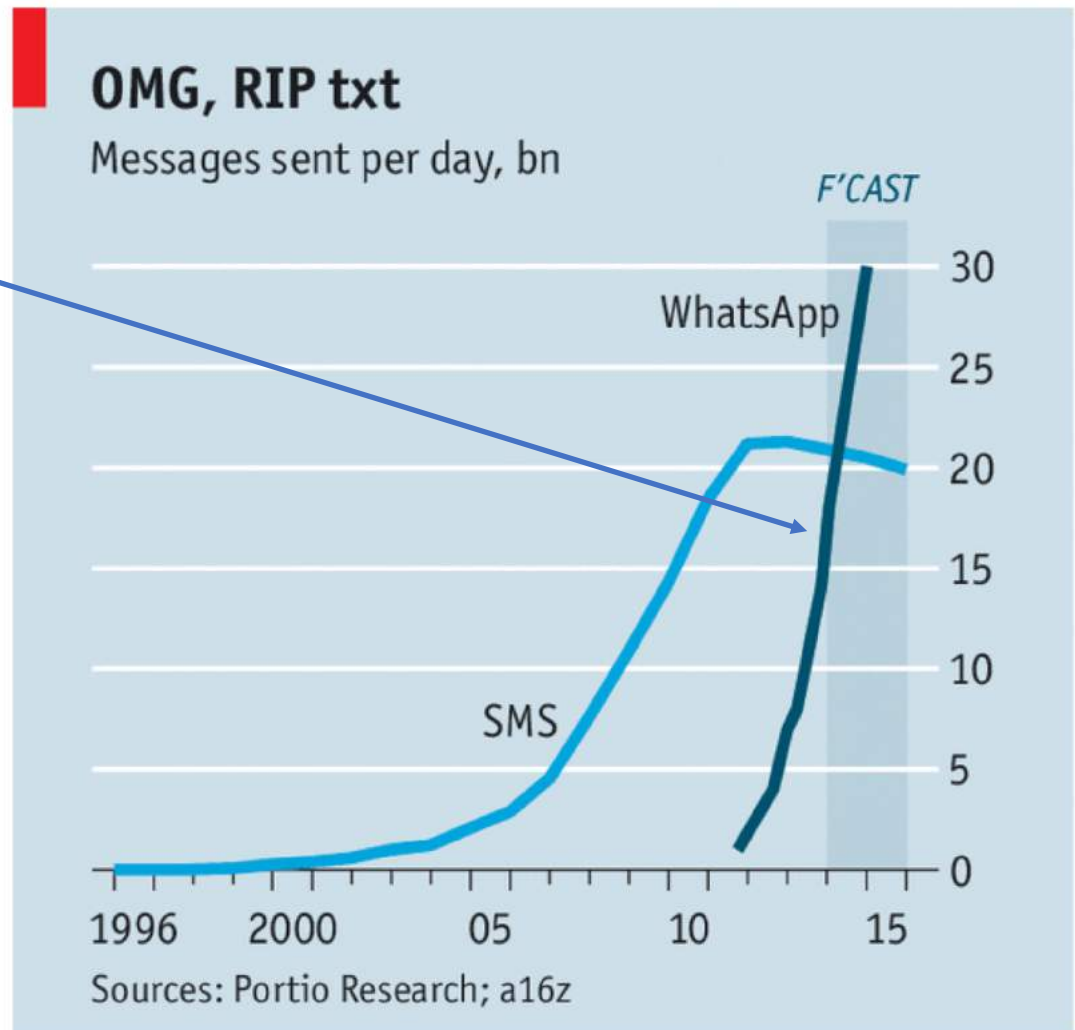


*Tom Goodwin, Sr. VP of Strategy Havas Media*

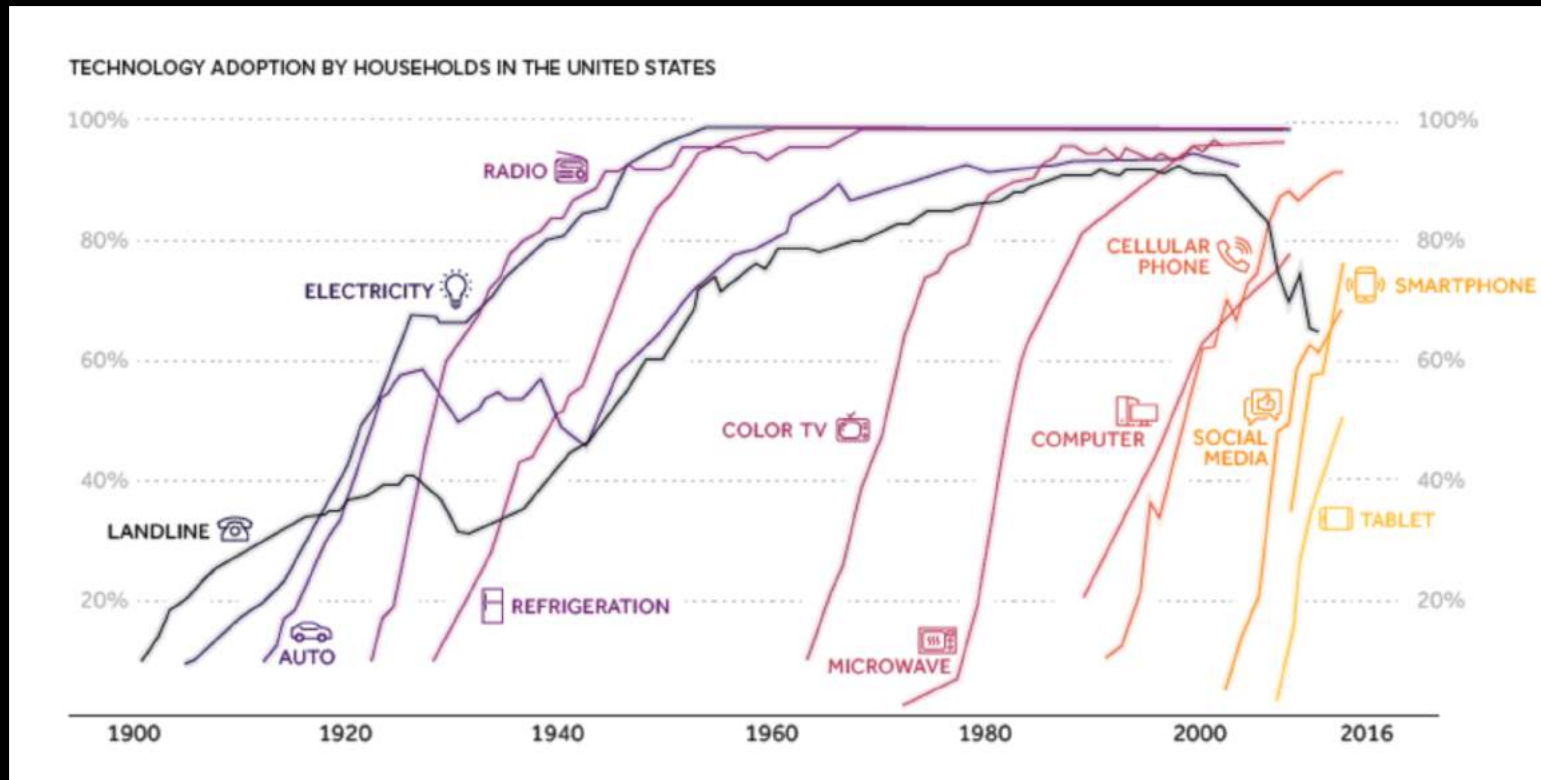
# Impacto das tecnologias digitais



# Velocidade da Disrupção Digital



# Adoção de novas tecnologias



# Algumas perguntas:

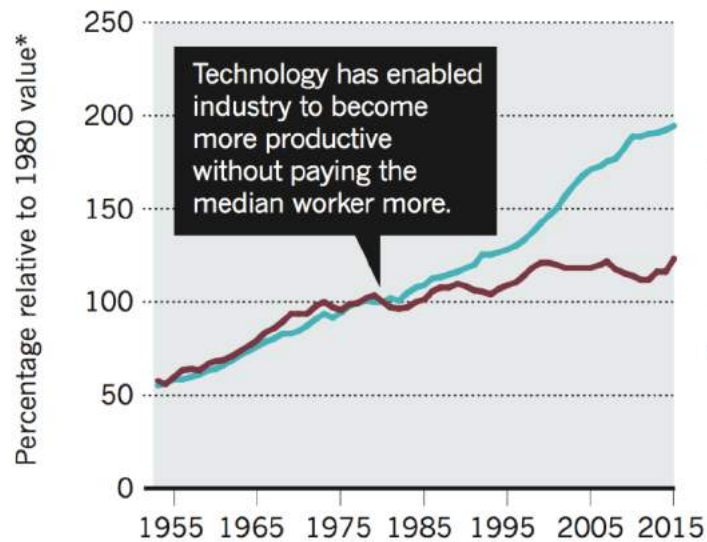
- Qual o impacto da IA+Robótica sobre: 1) sociedade; 2) economia e 3) ciência
- Questões abertas:
  - Quais tarefas, ocupações e indústrias serão mais afetadas pela IA + Robótica?
  - Quais são as implicações para a economia e a sociedade dos países em desenvolvimento?
  - Quais políticas devemos considerar para minimizar as desvantagens e maximizar os benefícios da IA + Robótica?
  - Como a sociedade brasileira pode usar a IA + Robótica para acelerar o desenvolvimento social e econômico?



# Impacto da automação

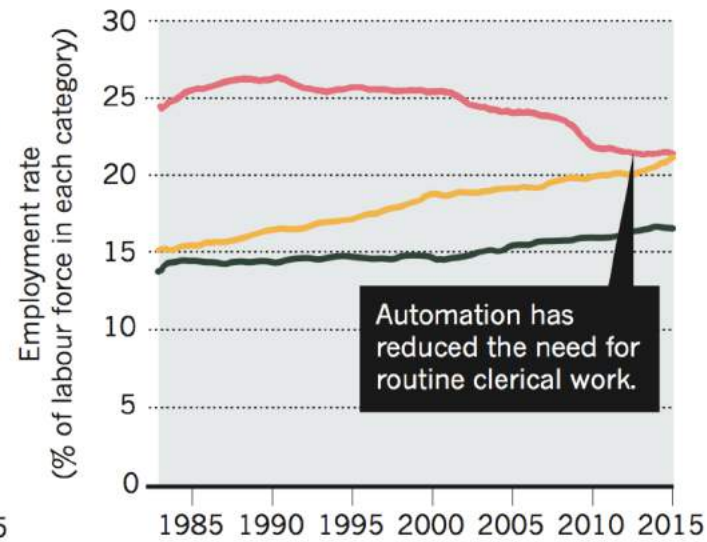
## A Levels of productivity and median income

- Productivity (US\$ output per hour)
- Real median family income (US\$ earned per year)



## B Employment type

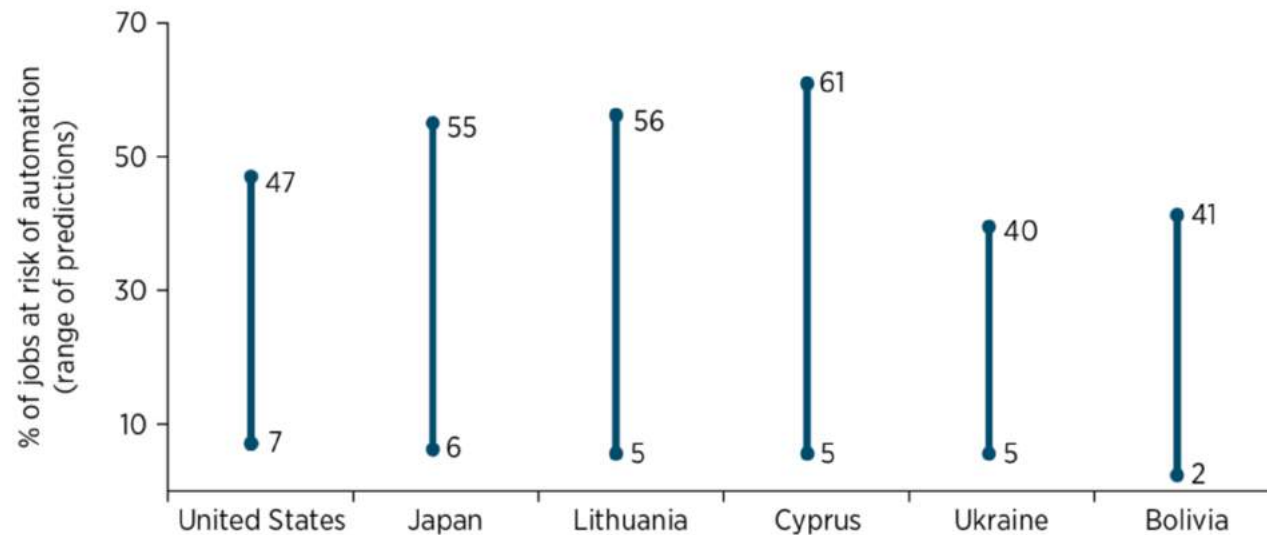
- Clerical and sales
- Professional
- Service



\*In 1980, real median family income was \$57,600 a year and productivity was \$55 per hour.

# Quantos empregos estão em risco?

**FIGURE 1.1** Estimates of the percentage of jobs at risk from automation vary widely



Sources: WDR 2019 team, based on World Bank (2016); Arntz, Gregory, and Zierahn (2016); David (2017); Hallward-Driemeier and Nayyar (2018).

Note: The figures represent the highest and lowest estimates of the percentage of jobs at risk of automation in economies for which more than one estimate has been produced by different studies. A job is at risk if its probability of being automated is greater than 0.7.



1 Billion

monthly active users



42 Billion

messages sent per day



1.6 Billion

photos shared per day



1 Billion

total groups



53 Languages

supported



250 Million

videos shared per day

(c) Virgilio Almeida, 2018



57 Engineers

and we are hiring

- "Não é que estejamos sem trabalho ou empregos em si", David Autor, M.I.T. economista que estuda o impacto da automação no emprego, disse.

“Mas um subconjunto de pessoas com baixos níveis de habilidade pode não conseguir obter um padrão de vida razoável com base em seu trabalho. Já vemos isso”. Como a automação deprime os salários, os empregos nas fábricas tornam-se menos abundantes e menos atraentes. Esse processo, segundo Autor e outros economistas, também pode **exacerbar a desigualdade.**





TECHNOLOGY

# These 11 Industries Are Most at Risk From Artificial Intelligence

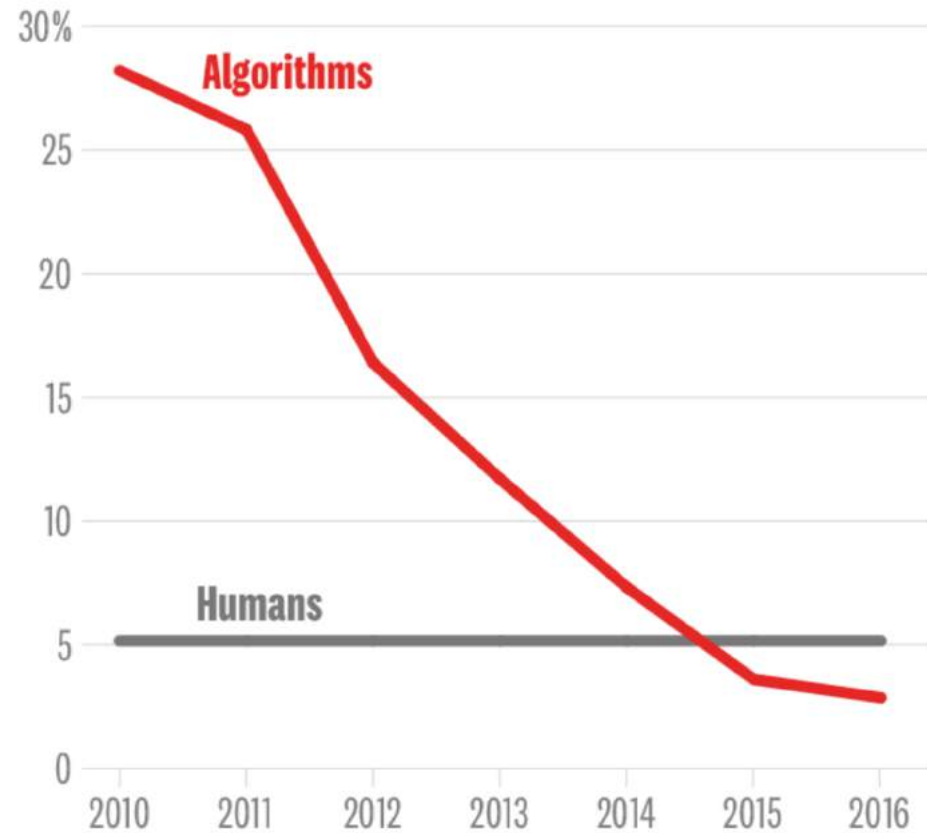
As AI prevalence expands, a new report sheds light on its impact in the workforce.

11. Science (4%)
10. Healthcare/hospitals (4%)
9. Policing/security (5%)
8. Farming (6%)
7. Taxi drivers (7%)
6. Insurance companies (8%)
5. Financial analysis (9%)
4. Public transport (9%)
3. Construction (10%)
2. Banking (18%)
1. Manufacturing workers (19%)

AI -> general purpose technology

A taxa de erro para reconhecer imagens de um grande banco de dados chamado ImageNet, com vários milhões de fotografias de imagens comuns, obscuras ou completamente estranhas, caiu de mais de 30% em 2010 para cerca de 4% em 2016.

## VISION ERROR RATE

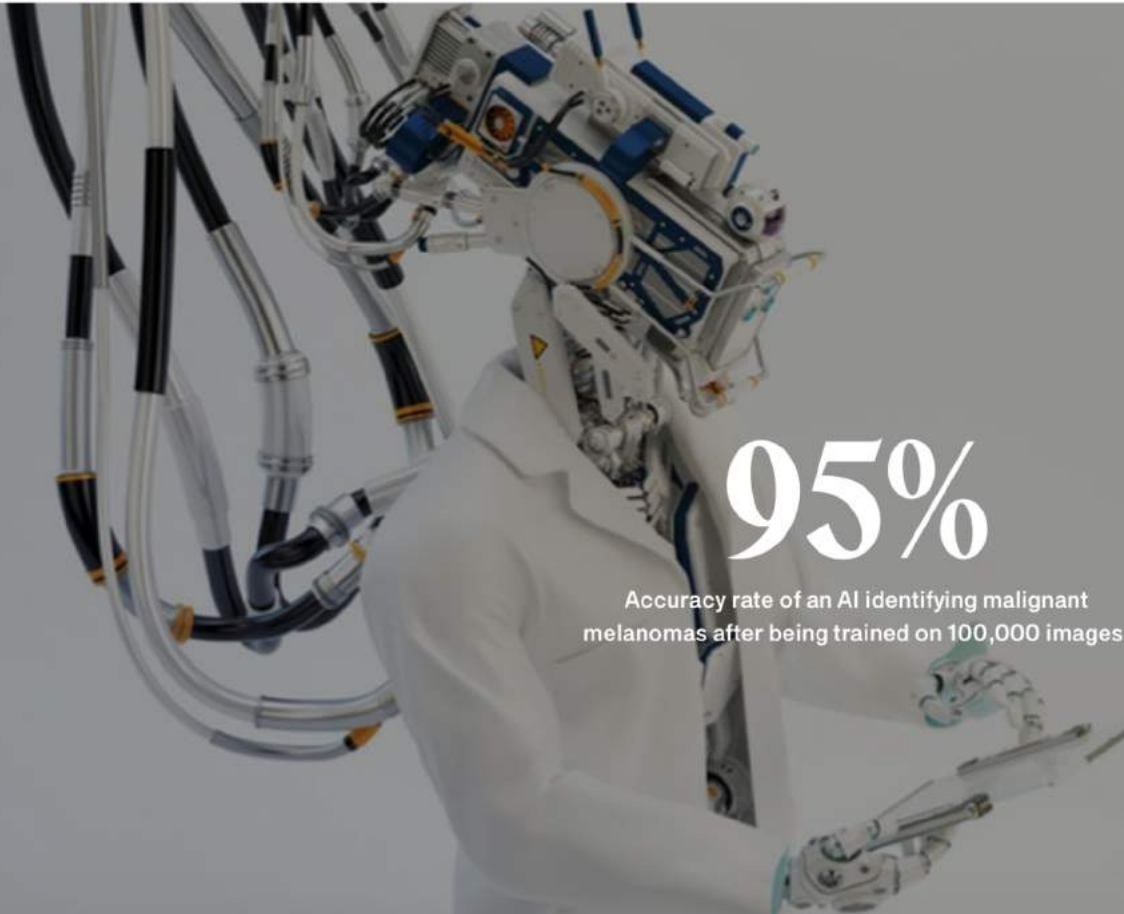


SOURCE ELECTRONIC FRONTIER FOUNDATION © HBR.ORG



# Dermatologists hate him! Meet the skin-cancer detecting robot

A new study shows they're better at it than humans.



95%

Accuracy rate of an AI identifying malignant melanomas after being trained on 100,000 images.

Paris Martineau

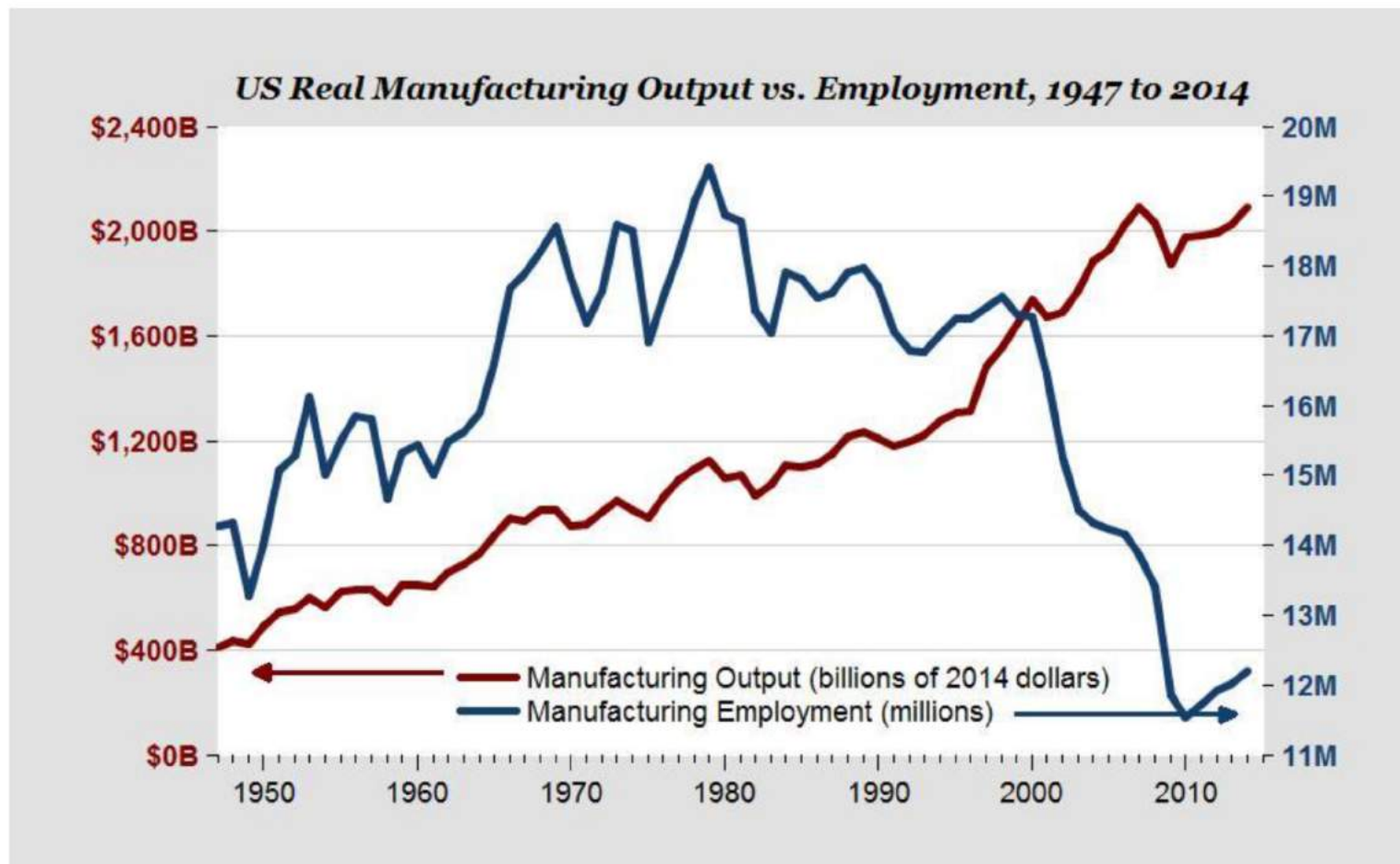
MAY—29—2018 02:09PM EST

When it comes to diagnosing skin cancer, man may actually be worse than machine. A new study from the University of Heidelberg found that a form of artificial intelligence known as a deep learning convolutional neural network (CNN) was able to more accurately identify malignant and benign skin lesions than a fleet of dermatologists.

# Impacto na manufatura



# Manufacturing: Output vs. Jobs



## **New Jobs?**

- ◆ **Detroit 1990:** The three largest companies had a combined market value of \$65 billion (real), with 1.2 million workers.
- ◆ **Silicon Valley 2016:** The three largest companies had a combined market value of \$1.5 trillion, with about 190,000 workers.

Chinese factory replaces 90% of human workers with robots. Production rises by 250%, defects drop by 80%

11,3k

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MIHAI ANDREI



FEBRUARY 3, 2017

**A**fter a factory in Dongguan, China, replaced most of its workers with robots, it witnessed a spectacular rise in productivity.



# Impacto no Comércio

## Varejo nos EUA

- Entre 2010 e 2014, o comércio eletrônico cresceu em média US \$ 30 bilhões por ano. Nos últimos três anos, o crescimento médio anual aumentou para US \$ 40 bilhões.
- Lojas de departamentos e outras lojas de mercadorias em geral, como supercenters e shoppings, foram duramente atingidas, perdendo 89.000 empregos entre novembro de 2016 e março de 2017.





**James Pethokoukis** ✓ @JimPethokoukis · 14h

Goldman Sachs on automation, driverless cars, and jobs

- Technology will continue to have profound effects on different parts of the workforce. The shift of retail sales to e-commerce firms—which require only 0.9 employees per million dollars of sales compared with 3.5 for brick and mortar stores—is already lowering total retail employment growth by about 100k per year. The shift to driverless car could lower drivers' employment growth by about 300k per year, but probably only in about 25 years from now.
- The cases of retail and transportation show that new advances will likely add to existing challenges of labor market polarization and labor force drop-out. But we remain constructive on the long-run outlook for aggregate employment as we expect continued job growth in large swathes of the service and technology sectors.

Visit [America](#), 2017

♥ Kate Crawford and Tiffany Li liked



**Vala Afshar** @ValaAfshar · Dec 27

Number of robots working in Amazon warehouses:

2016: 45,000

2015: 30,000

2014: 15,000

2013: 1,000 — @JonErichman



**How Things Work**



# Amazon Sets Sights on U.K. Grocery With Checkout-Free Trademark

by **Sam Chambers**

May 19, 2017, 10:55 AM GMT-3

- U.K. approves trademark for futuristic Amazon Go stores
- Amazon seeking to build share of \$800 billion grocery market



Virgilio

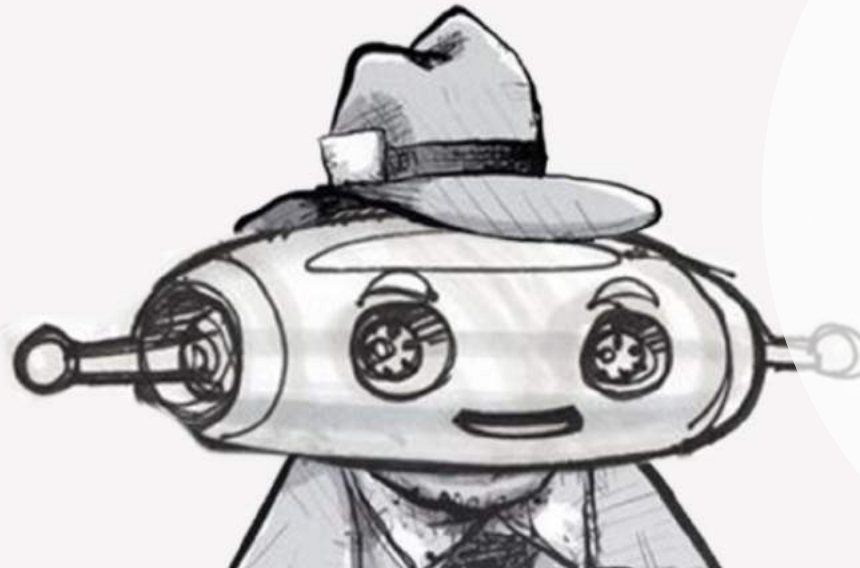




MODERN NEWSROOM

# The Washington Post's robot reporter has published 850 articles in the past year

SEPTEMBER 14, 2017 by [Lucia Moses](#)



O futuro com IA+robótica

# The Robots Are Coming, and Sweden Is Fine

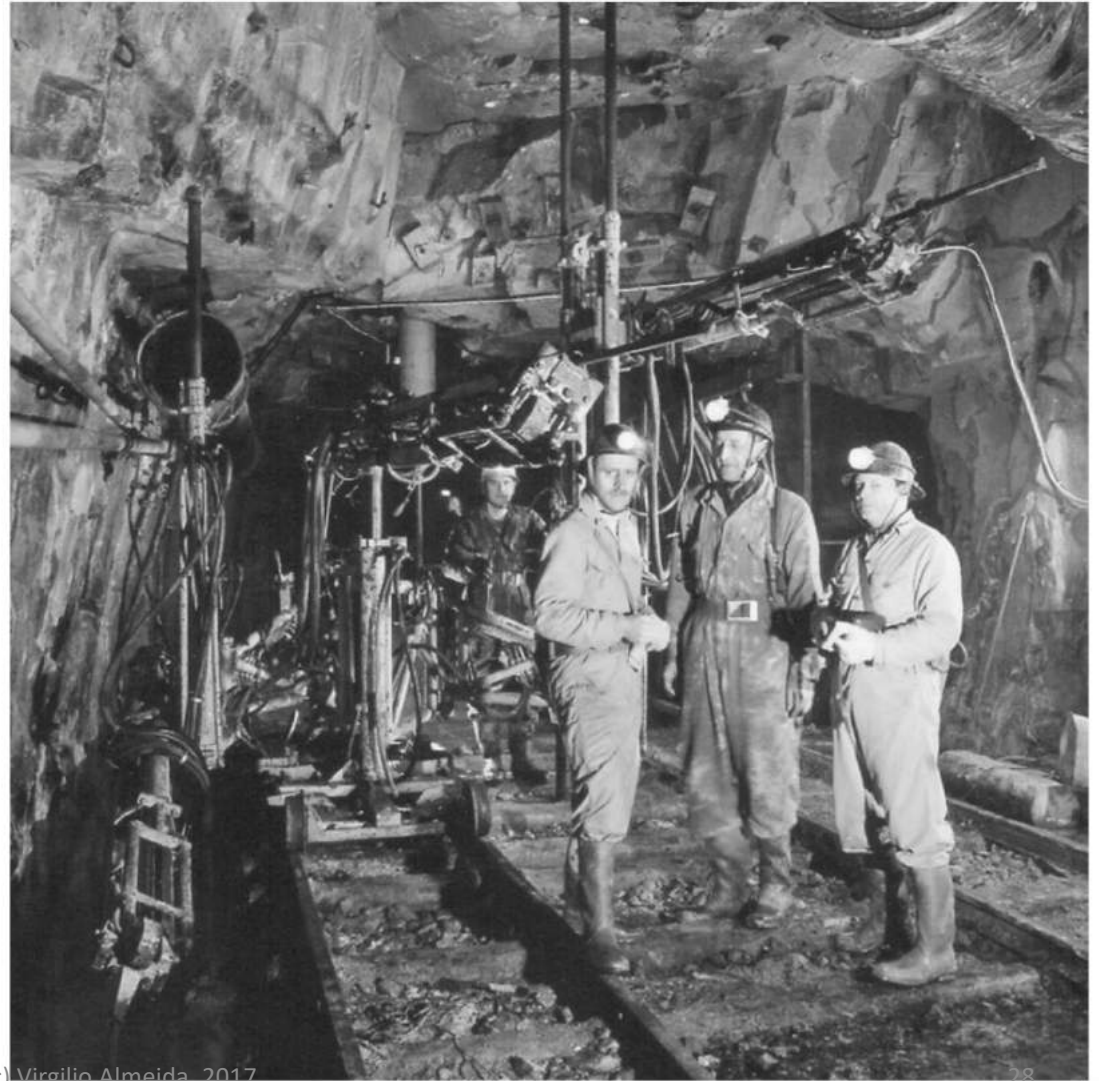
In a world full of anxiety about the potential job-destroying rise of automation, Sweden is well placed to embrace technology while limiting human costs.

By **PETER S. GOODMAN** DEC. 27, 2017



“In Sweden, if you ask a union leader, ‘Are you afraid of new technology?’ they will answer, ‘No, I’m afraid of old technology,’” says the Swedish minister for employment and integration, Ylva Johansson. “The jobs disappear, and then we train people for new jobs. We won’t protect jobs. But we will protect workers.”

Eighty percent of Swedes express positive views about robots and artificial intelligence, according to a survey this year by the European Commission. By contrast, a survey by the Pew Research Center found that 72 percent of Americans were “worried” about a future in which robots and computers substitute for humans.



(c) Virgilio Almeida, 2017

The Garpenberg mine in 1966. It has been in operation more or less since 1257. Boliden

## Artificial intelligence (AI)

- Apart from fears of mass unemployment, accidents with machinery, restrictions on freedom, increased economic inequality and a devalued human experience, the public are broadly optimistic about the arrival of artificial intelligence, according to one of the first surveys of British opinions about the technology.



This article is 6 months old

95 60

**Ian Sample**  
Science editor

[@iansample](#)

Tuesday 25 April 2017  
00.01 BST

# Artificial intelligence survey finds UK public broadly optimistic

Support for 'machine learning' depended on what it would be used for, with mass unemployment among main fears



**i** Ipsos Mori found a two-thirds of the UK public believe the benefits of machine learning outweighed the risks or were balanced. Photograph: Nic Delves-Broughton/PA

TECH \ ARTIFICIAL INTELLIGENCE \ ROBOT

# Robots and AI are going to make social inequality even worse, says new report

*Rich people are going to find it easier to adapt to automation*

by James Vincent | @jvincent | Jul 13, 2017, 8:25am EDT



## NOW TRENDING





# Indian Technology Workers Worry About a Job Threat: Technology

By NIDA NAJAR JUNE 25, 2017



Sudhakar Choudhari, who was recently laid off from his job at Tech Mahindra, searching for job listings at his apartment in suburban Pune. Atul Loke for The New York Times

## RELATED COVERAGE



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Everyone a Paych

## Desafios Sociais da IA+robótica

- As aplicações de IA podem levar a novos desafios ou ampliar preocupações e pontos de tensão pré-existentes:
  - Justiça e igualdade.
  - Uso de força.
  - Segurança e certificação.
  - Privacidade.
  - Deslocamento de trabalho e tributação.
- Pergunta: Quais serão os impactos sociais da AI + Robótica em um país semelhante à Belgica + India?





FEATURE

# Learning to Work With Robots

BY MOLLY KINDER  
ILLUSTRATION BY THE RED DRESS FOR  
FOREIGN POLICY

**AI will change everything. Workers must  
adapt — or else.**

## Algumas questões para o futuro:

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Quais são as diferenças entre o impacto da IA + Robótica nos países desenvolvidos e nas economias emergentes?

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Quais habilidades são necessárias para o mercado de trabalho do futuro?

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Quais mudanças educacionais são necessárias?

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Como podemos preservar e aumentar a mobilidade social em uma economia impulsionada pela IA?

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Quais políticas econômicas e sociais são necessárias para integrar pessoas nos futuros mercados de trabalho?

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Como o Brasil deve se preparar para aproveitar os benefícios e mitigar o lado negativo da IA + Robótica?

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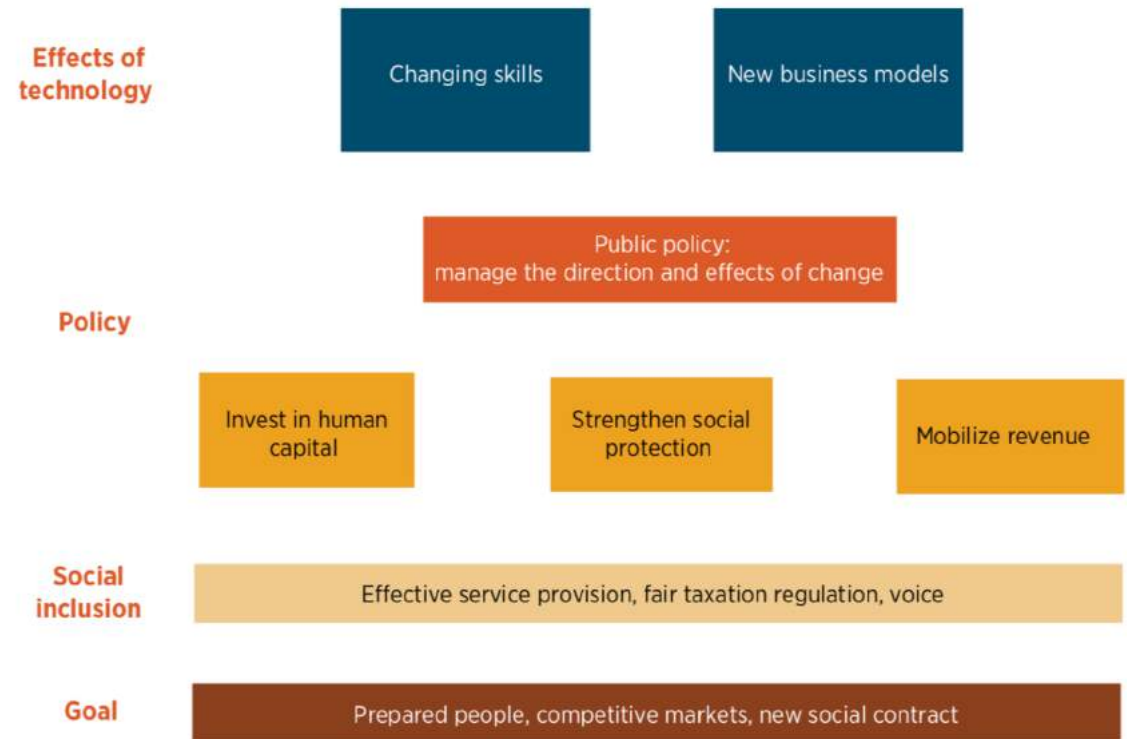
Qual é o papel global das economias emergentes na era da IA + Robótica?

# Relatório do Banco Mundial

Set. 2018

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**FIGURE 0.3** Responding to the changing nature of work



Source: WDR 2019 team.

# Obrigado!

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