

# **MIS 0855 Spring 2015 – Data Science**

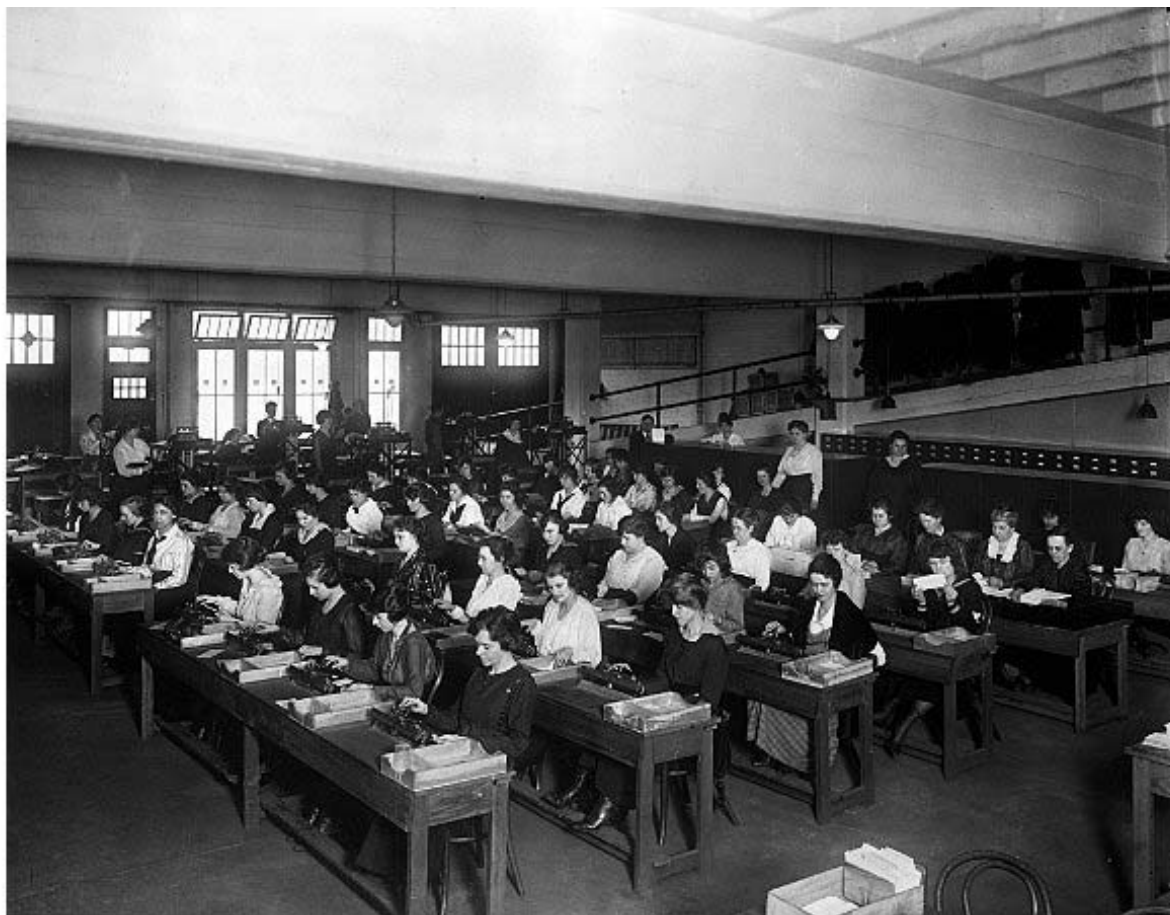
## ***Day 38 – Data Science and Your Career***

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***Apr. 17<sup>th</sup>, 2015***

## Women Mathematicians at World War II



who were called “Computers.”

<http://www.theatlantic.com/technology/archive/2013/10/computing-power-used-to-be-measured-in-kilo-girls/280633/>

## Today's Question

- How to *survive* in the job market and *thrive* in your career by *winning* the battle against the machine?



# A Good but Not-So-Good News – Jobless Recovery

September 5, 2009



## In Unemployment Report, Signs of a Jobless Recovery

BUSINESS | January 17, 2012



## Man vs. Machine, a Jobless Recovery

*U.S. Companies Are Spending to Upgrade Factories but Hiring Lags; Robots Pump Out Sunny Delight*

AROUND THE STREET November 6, 2009, 10:19AM EST



## October Data Point the Way to a 'Jobless Recovery'

American unemployment

### Forgotten men

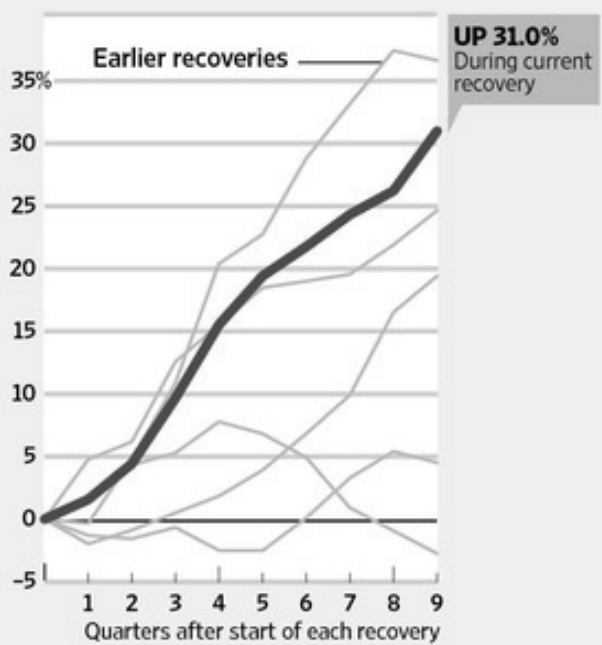
The jobless recovery, long prophesied, is here



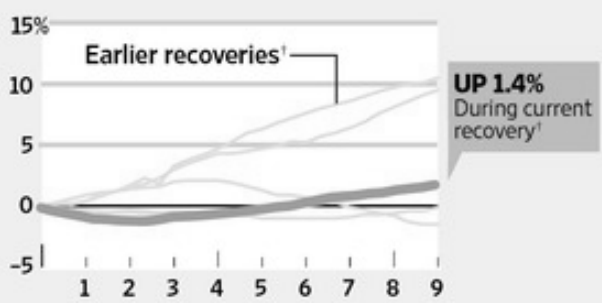
# Spending Spree | Businesses splurge on machines, not muscle

Change since each recovery began in ■ spending by business on equipment, software; adjusted for inflation\* ■ the number of private-industry jobs

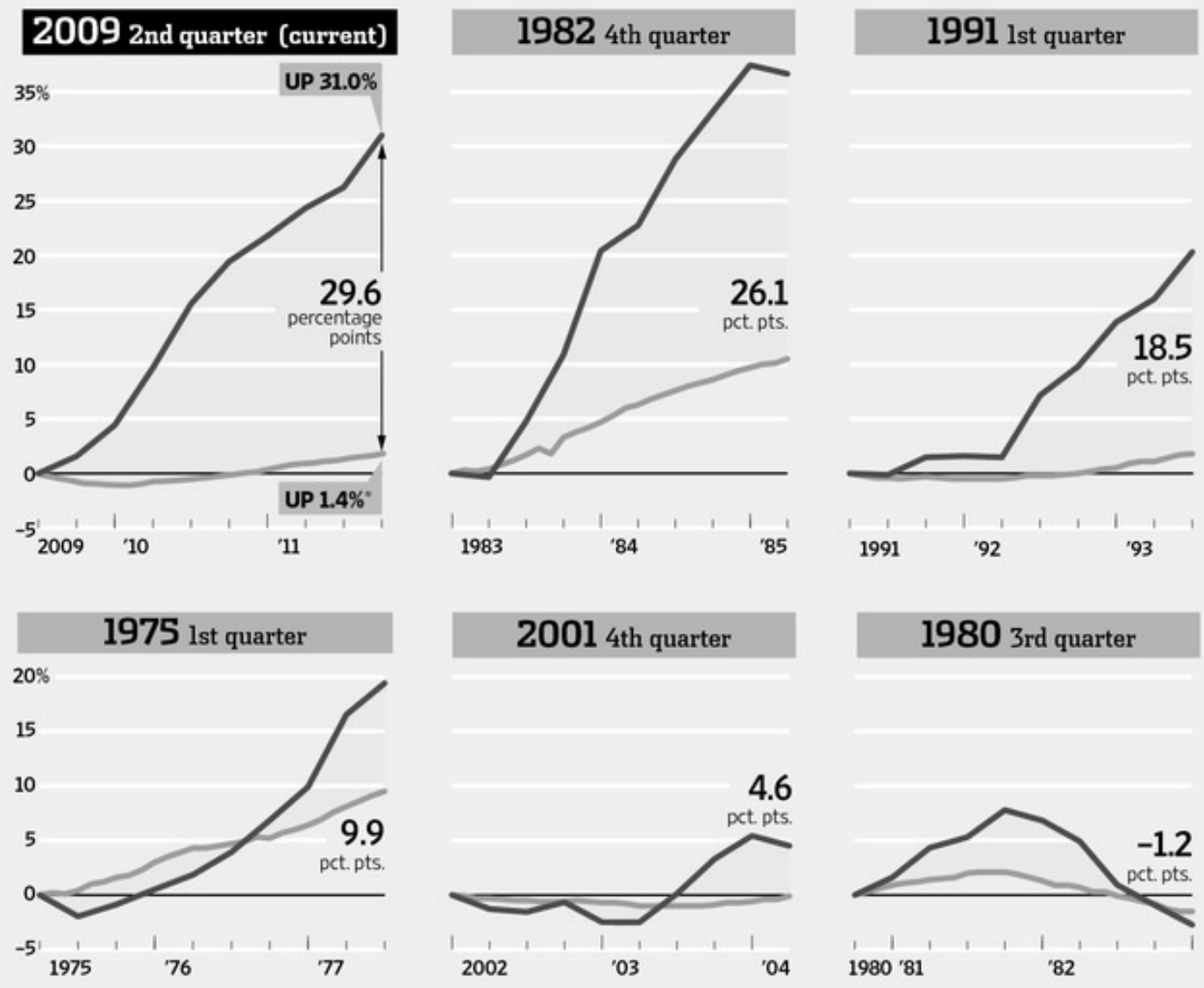
In the current recovery, **business spending on equipment and software** has rebounded faster than usual...



...while **private-industry jobs** have been relatively slow to return...



The **difference** between the speed of the rebound in business investment in equipment and software and that in private-industry hiring is **the widest in decades**, as a result.



†The 1991 recovery was so similar to the current one that the lines overlap.

\*Through September because latest figure available for nonresidential fixed investment in equipment and software is for the third quarter of 2011. As of December, the number of private-industry jobs had risen 1.8% from the June 2009 level

Note: Start date for each chart is the first full quarter of each recovery as defined by National Bureau of Economic Research.

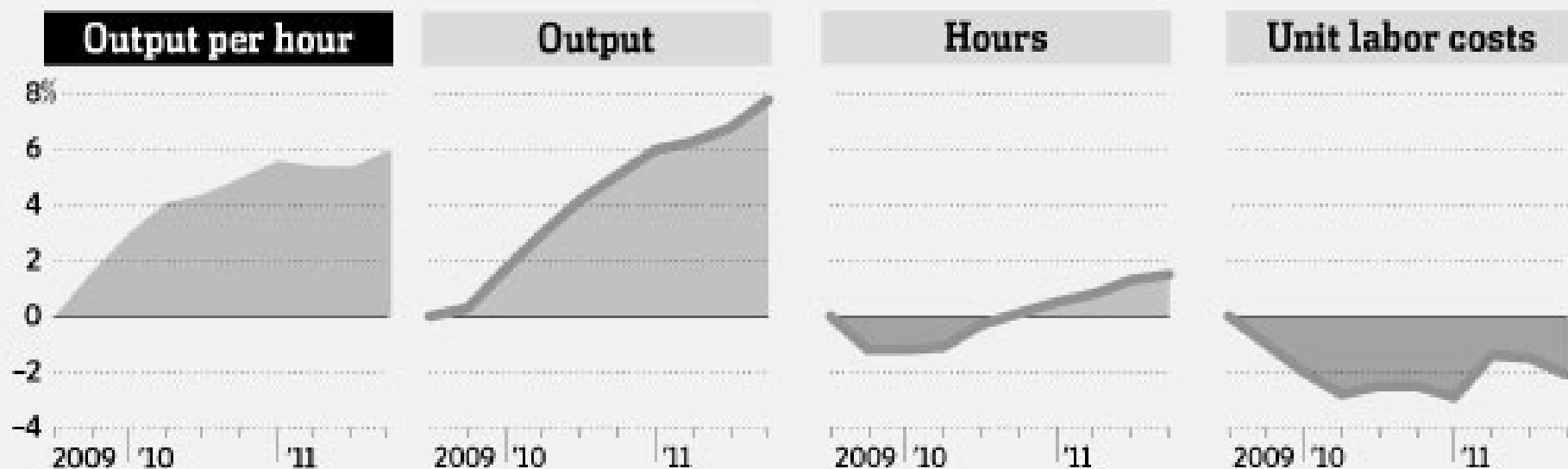
Sources: Commerce Department; Labor Department

# What does this mean and *Why?*

## More Bang for the Buck

The value of goods and services produced for every hour worked has grown sharply in the nonfarm business sector during this recovery—while the total number of hours worked is up only a bit. The upshot: The ratio of compensation to productivity, or unit labor costs, has been falling.

Change since the recovery's start in:



Source: Labor Department

Pat Minczeski/The Wall Street Journal

# Why Jobless Recovery? – Automation (1/2)



<http://www.washingtonpost.com/blogs/dr-gridlock/wp/2012/10/31/beltway-express-lanes-to-open-before-thanksgiving-operators-say/>  
<http://stormhighway.com/blog/july2109a.shtml>  
<http://auto.howstuffworks.com/e-zpass2.htm>



# Why Jobless Recovery? – Automation (2/2)



*What if every item in a grocery store has an EZPass (an RFID chip)?*

[http://www.flickr.com/photos/whole\\_foods/4495467654/](http://www.flickr.com/photos/whole_foods/4495467654/)  
<http://earthpulse.nationalgeographic.com/earthpulse/focus-us-text>



# Why Jobless Recovery? – Outsourcing

## The Man Who Makes Your iPhone

Foxconn founder Terry Gou might be regarded as Henry Ford reincarnated if only a dozen of his workers hadn't killed themselves this year. An exclusive look inside a postmodern industrial empire

**Bloomberg  
Businessweek**

2 of 19



**Inside the iPhone Maker**



PHOTOGRAPH BY TONY LAW FOR BLOOMBERG BUSINESSWEEK

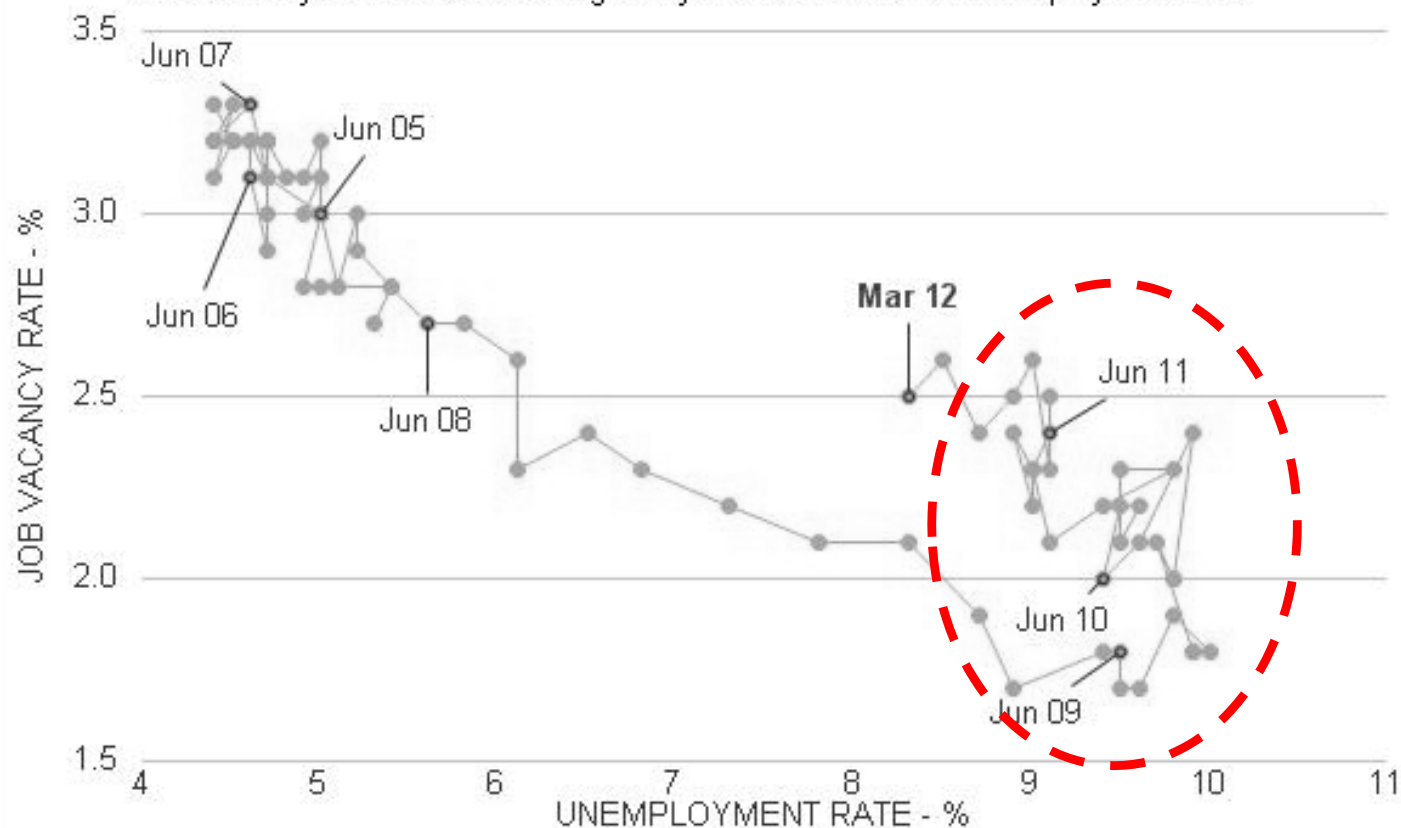
[http://www.businessweek.com/magazine/content/10\\_38/b4195058423479.htm](http://www.businessweek.com/magazine/content/10_38/b4195058423479.htm)

[http://images.businessweek.com/ss/10/09/0909\\_foxconn/2.htm](http://images.businessweek.com/ss/10/09/0909_foxconn/2.htm)

# Why Jobless Recovery? – Skill Mismatch (1/2)

## U.S. Beveridge Curve

Job vacancy rate tends to be negatively correlated with the unemployment rate

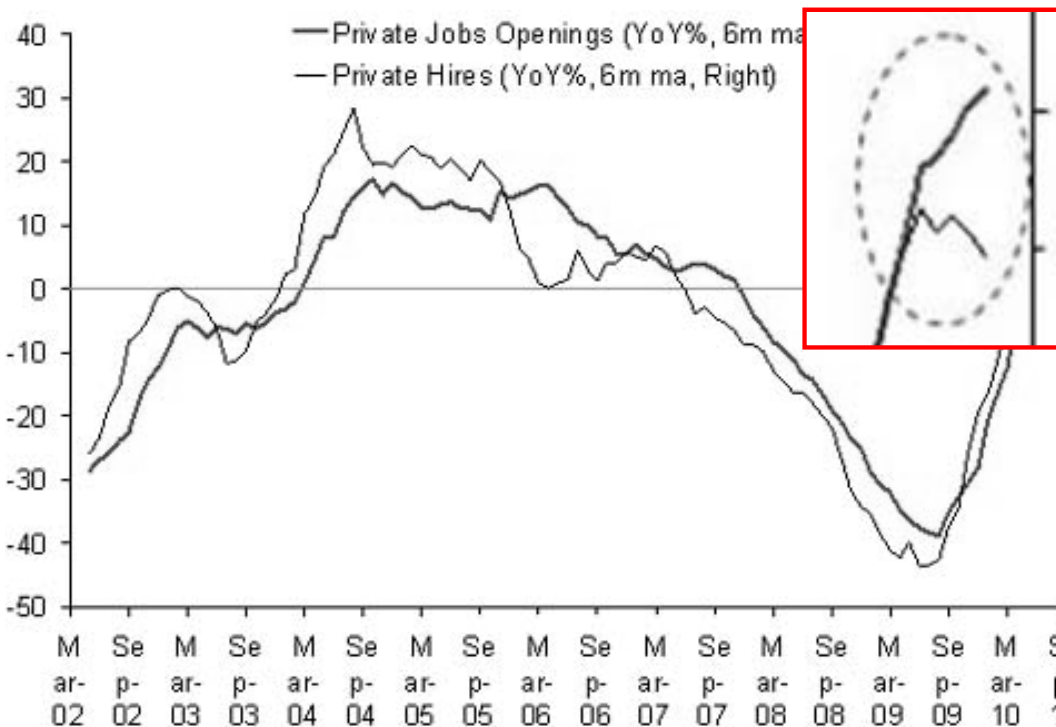


Source: Thomson Reuters Datastream

Reuters graphic/Van Tsui 3/26/2012

<http://alphanow.thomsonreuters.com/2012/01/the-%E2%80%9Cbeveridge-curve%E2%80%9D-signals-a-possible-skills-mismatch-in-job-market/>

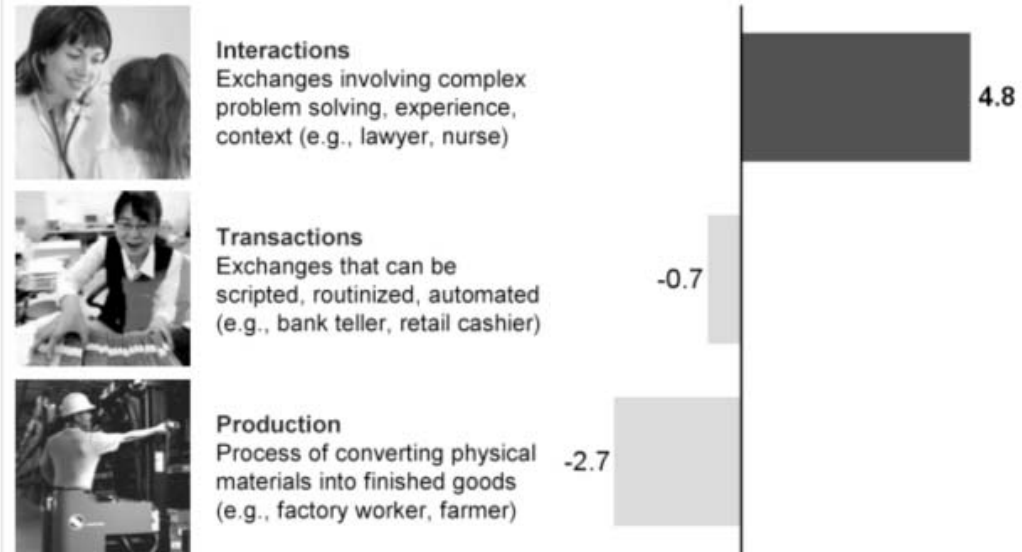
# Why Jobless Recovery? – Skill Mismatch (2/2)



**There are jobs, but they are not filled.**

**Most job growth in mature economies involves complex interactions, not routine production or transaction work**

New jobs created in the United States, 2001–09  
Million employees

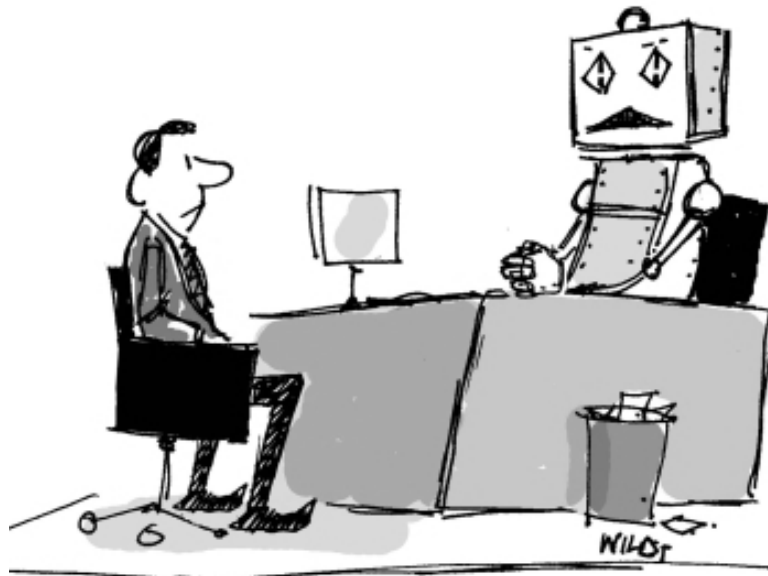


SOURCE: US Bureau of Labor Statistics; McKinsey Global Institute analysis

<http://economix.blogs.nytimes.com/2011/02/08/still-nearly-5-unemployed-workers-for-every-opening/>  
[http://www.foreignpolicy.com/articles/2012/03/16/help\\_wanted?page=full](http://www.foreignpolicy.com/articles/2012/03/16/help_wanted?page=full)

# Race Against the Machine

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search ID: cwin2663

"You're hired, but remember, you can be replaced by a machine...believe me."

## Erik Brynjolfsson Andrew McAfee **Race Against The Machine**



**How the Digital Revolution is Accelerating Innovation,  
Driving Productivity, and Irreversibly Transforming  
Employment and the Economy**

<http://www.cartoonstock.com/directory/o/outsourcing.asp>

# Wall Street Bankers vs. the Machines



**Bloomberg Businessweek**  
Markets & Finance

Wall Street banks are replacing people with computers to trade financial instruments that once generated some of their biggest profits. Late last month, UBS (UBS), Switzerland's biggest bank, fired its head of credit-default swap index trading, David Gellers, and replaced him with computer algorithms that trade using mathematical models, according to two people familiar with the matter

Photo illustration by 731; Trading floor: Jin Lee/Bloomberg; Monitors: Oleksiy Maksymenko/Alamy

Swaps

## Computers Elbow Swaps Traders Aside

<http://www.businessweek.com/articles/2012-11-15/computers-elbow-swaps-traders-aside>

# Accountants vs. the Machines

**TurboTax**  
Choose Easy.

Personal Taxes | Small Business Taxes | Why Choose TurboTax | Tax Ca

## Let's get your guaranteed biggest tax refund

- Get live, one-on-one advice from a tax professional, 7 days a week
- We find every tax deduction and credit you deserve so you get the biggest tax refund possible
- We guide you step by step and guarantee 100% accurate calculations

*New to TurboTax?*

**Start for Free**

We'll guide you to the right TurboTax version for you

TurboTax Expert, Lisa Skelly





# Doctors vs. the Machines (1/2)

- Wikipedia now has the biggest source of medical info.

## Hypertension

From Wikipedia, the free encyclopedia

*This article is about arterial hypertension. For other forms of hypertension, see Hypertension (disambiguation).*


**Hypertension (HTN)** or **high blood pressure**, sometimes called **arterial hypertension**, is a chronic medical condition in which the blood pressure in the arteries is elevated. This requires the heart to work harder than normal to circulate blood through the blood vessels. Blood pressure involves two measurements, systolic and diastolic, which depend on whether the heart muscle is contracting (systole) or relaxed between beats (diastole). Normal blood pressure at rest is within the range of 100-140mmHg systolic (top reading) and 60-90mmHg diastolic (bottom reading). High blood pressure is said to be present if it is persistently at or above 140/90 mmHg.

Hypertension is classified as either primary (essential) hypertension or secondary hypertension; about 90–95% of cases are categorized as "primary hypertension" which means high blood pressure with no obvious underlying medical cause.<sup>[1]</sup> The remaining 5–10% of cases (secondary hypertension) are caused by other conditions that affect the kidneys, arteries, heart or endocrine system.

Hypertension is a major risk factor for stroke, myocardial infarction (heart attacks), heart failure, aneurysms of the arteries (e.g. aortic aneurysm), peripheral arterial disease and is a cause of chronic kidney disease. Even moderate elevation of arterial blood pressure is associated with a shortened life expectancy. Dietary and lifestyle changes can improve blood pressure control and decrease the risk of associated health complications, although drug treatment is often necessary in people for whom lifestyle changes prove ineffective or insufficient.

### Hypertension

Classification and external resources



Automated arm blood pressure meter showing arterial hypertension (shown a systolic blood pressure 158 mmHg, diastolic blood pressure 99 mmHg and heart rate of 80 beats per minute).

<b>ICD-10</b>	I10 <a href="#">↗</a> , I11 <a href="#">↗</a> , I12 <a href="#">↗</a> , I13 <a href="#">↗</a> , I15 <a href="#">↗</a>
<b>ICD-9</b>	401 <a href="#">↗</a>
<b>OMIM</b>	145500 <a href="#">↗</a>
<b>DiseasesDB</b>	6330 <a href="#">↗</a>

# Doctors vs. the Machines (2/2)



**Diagnostic Imaging**  
**November 2003**

**COVER STORY**

## **Globalization comes to radiology**

*Global nighthawks thrive while outsourcers hire foreign-trained radiologists to read for U.S. imaging practices*

On most weekday mornings, Dr. Arjun Kalyanpur can be found in his Bangalore, India, office performing imaging diagnoses for dozens of hospitals in the U.S. CT and ultrasound studies from as many as 35 hospitals flash across his workstation screen.

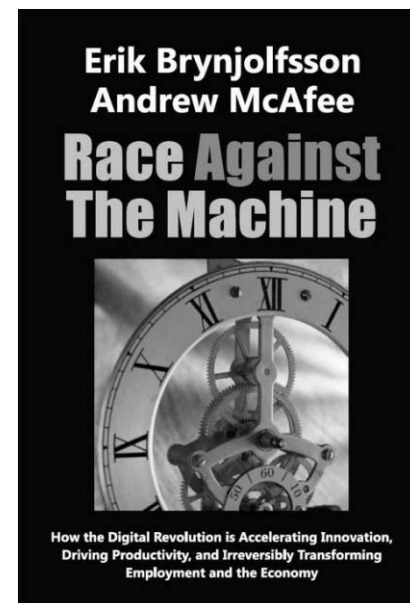
With a fellowship in abdominal imaging from Cornell University and another in neuroradiology from Yale, Kalyanpur is well qualified to perform these preliminary interpretations. He has done preliminary studies for Logic Radiology, a group practice in Atlanta, GA, for nine months without a single notable discrepancy.

"He is probably the best imager in my group," said Dr. Garrett Ward, the group's president.

Elsewhere in Bangalore, Indian-trained radiologists contracted by Wipro HealthScience are performing similar tasks. Unlike Kalyanpur and his partner, who trained at Baylor University, the 12 radiologists employed in Wipro's global radiology reading room do not possess American Board of Radiology certification. They are not licensed to practice in any state, nor are they credentialed to practice in any U.S. hospital. Only two are qualified to call themselves radiological subspecialists, but their advanced training was received in India.

<http://web.mit.edu/outsourcing/class1/DI-radiology-1.htm>

<http://www.cedarparkregional.com/Our%20Services/Pages/Diagnostic%20Imaging.aspx>



## Lawyers vs. the Machines

In January, for example, Blackstone Discovery of Palo Alto, Calif., helped analyze 1.5 million documents for less than \$100,000. ...

"From a legal staffing viewpoint, it means that a lot of people who used to be allocated to conduct document review are no longer able to be billed out," said Bill Herr, who as a lawyer at a major chemical company used to muster auditoriums of lawyers to read documents for weeks on end.

"People get bored, people get headaches. Computers don't."

The computers seem to be good at their new jobs. ... Herr ... used e-discovery software to reanalyze work his company's lawyers did in the 1980s and '90s. His human colleagues had been only 60 percent accurate, he found. "Think about how much money had been spent to be slightly better than a coin toss," he said.

# Pilots vs. the Machines



## Ryanair's O'Leary Calls for Single-Pilot Commercial Flights

AIN AIR TRANSPORT PERSPECTIVE » SEPTEMBER 10, 2010

by CHARLES ALCOCK

September 10, 2010, 7:26 AM



Where did he go?

al chief executive Michael O'Leary indicated that he will start to phase out copilots in his Boeing fleet renewal remains a matter of speculation. (Photo: Matt Banks)

Ryanair chief executive Michael O'Leary is pushing for single-pilot commercial aircraft operations. In a September 8 interview with the Financial Times, O'Leary argued that copilots are essentially redundant in modern airliners because "the computer does most of the flying." The Ireland-based low-cost carrier subsequently confirmed that it initiated a dialogue with aviation authorities regarding the possibility of legalizing single-pilot operations, but in a statement made clear that the proposal remains at an early stage. "No formal approach has been

made, but we are starting the debate so that we can look to reduce costs without compromising safety," Ryanair said in the statement. "Given the sophistication of our aircraft we believe that one pilot flying can operate safely on short routes and reduce fares for all passengers."

<http://www.airfield-ghent.be/documents1/index.html>

<http://www.ainonline.com/aviation-news/ain-air-transport-perspective/2010-09-10/ryanairs-oleary-calls-single-pilot-commercial-flights>

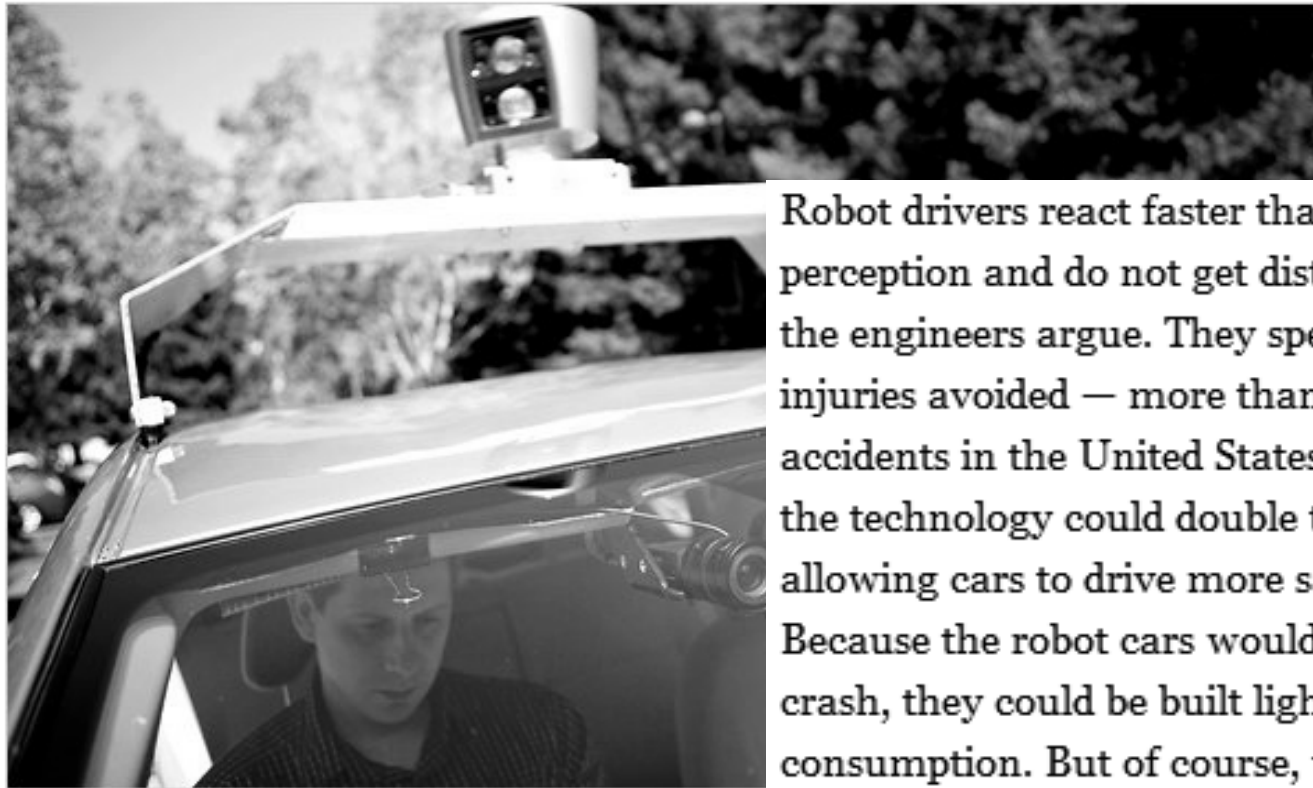


# Drivers vs. the Machines

SMARTER THAN YOU THINK

## Google Cars Drive Themselves, in Traffic

# The New York Times



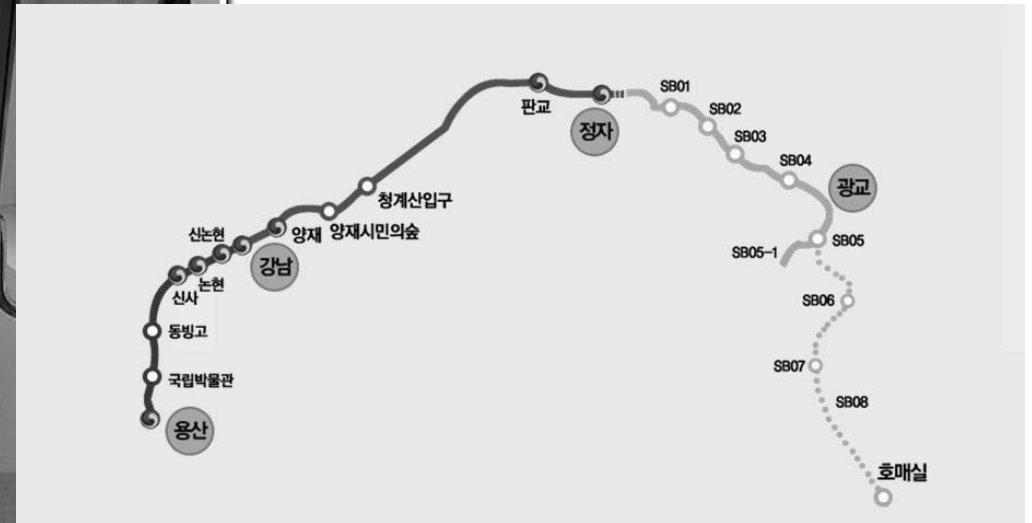
Dmitri Dolgov, a Google engineer, in a self-driving car parked in Silicon V

By JOHN MARKOFF

Published: October 9, 2010

Robot drivers react faster than humans, have 360-degree perception and do not get distracted, sleepy or intoxicated, the engineers argue. They speak in terms of lives saved and injuries avoided — more than 37,000 people died in car accidents in the United States in 2008. The engineers say the technology could double the capacity of roads by allowing cars to drive more safely while closer together. Because the robot cars would eventually be less likely to crash, they could be built lighter, reducing fuel consumption. But of course, to be truly safer, the cars must be far more reliable than, say, today's personal computers, which crash on occasion and are frequently infected.

# Subway Conductors vs. the Machines

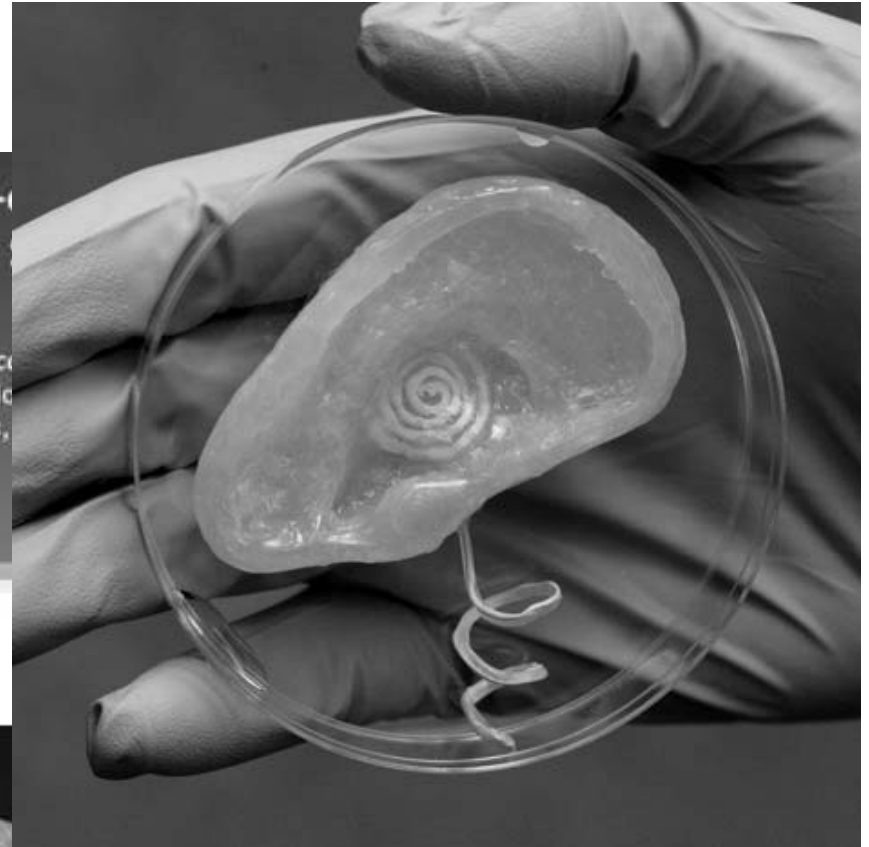


- A new 10.7-mile subway line with no conductor

<http://dragonphoto.tistory.com/535>  
<http://m.blog.daum.net/el-tor/8446015>



## 3D Printer vs. who?

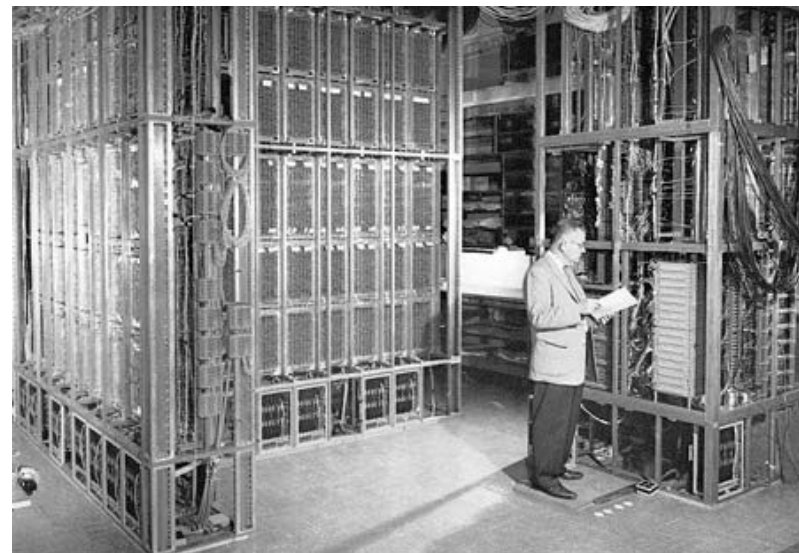


***Whose job is in danger if every household has one of these?***

<http://www.itechdiary.com/desktop-factory-125ci-3d-printer-3d-printer-is-a-small-and-cheap.html>  
<http://www.dezeen.com/2013/05/03/scientists-3d-print-bionic-ear-hears-beyond-human-range/>

## How long do you want to live?

- How long do you think you'll live?
- Then, when do you have to retire if you want to live up to 100 years?
- What kind of technology breakthroughs will take place *for the next 50 years*?



<http://physics.illinois.edu/history/timelines/1960s.asp>

## Let's face it.

- Automation and outsourcing are irreversible trends.
- No occupation is immune to this trend.
- New technologies will continue to emerge for our lifetime and *fundamentally transform* the society and the job market (probably faster and faster).



[http://www.bizbash.com/will\\_these\\_tech\\_advances\\_change\\_the\\_future\\_of\\_events/new-york/story/25226/](http://www.bizbash.com/will_these_tech_advances_change_the_future_of_events/new-york/story/25226/)

## Let's discuss.

- Which kind of occupation will be neither replaced by the machines nor outsourced for the next 30 years?



## In order not to be replaced, what kind of skills do we need that the machines don't have?

- Creative, innovative, analytic thinking
- Problem-solving skills for complex, unstructured, open-ended, non-routine problems
- Face-to-face, human-touch, communication skills (e.g. negotiation, persuasion, writing)
- Entrepreneurship and leadership
- anything else?



<http://www.kansasbob.com/2011/02/man-vs-machine.html>

## We are NOT doomed.

- Advances in technologies are creating new opportunities and increasing demands for different skills.
  - Techs destroy some jobs but create new ones too, with the skills in the previous page.
- Tech developments have historically increased the size of the economies for the last several centuries.
- If you can survive in the waves of new technologies, you'll be more thriving than ever before.

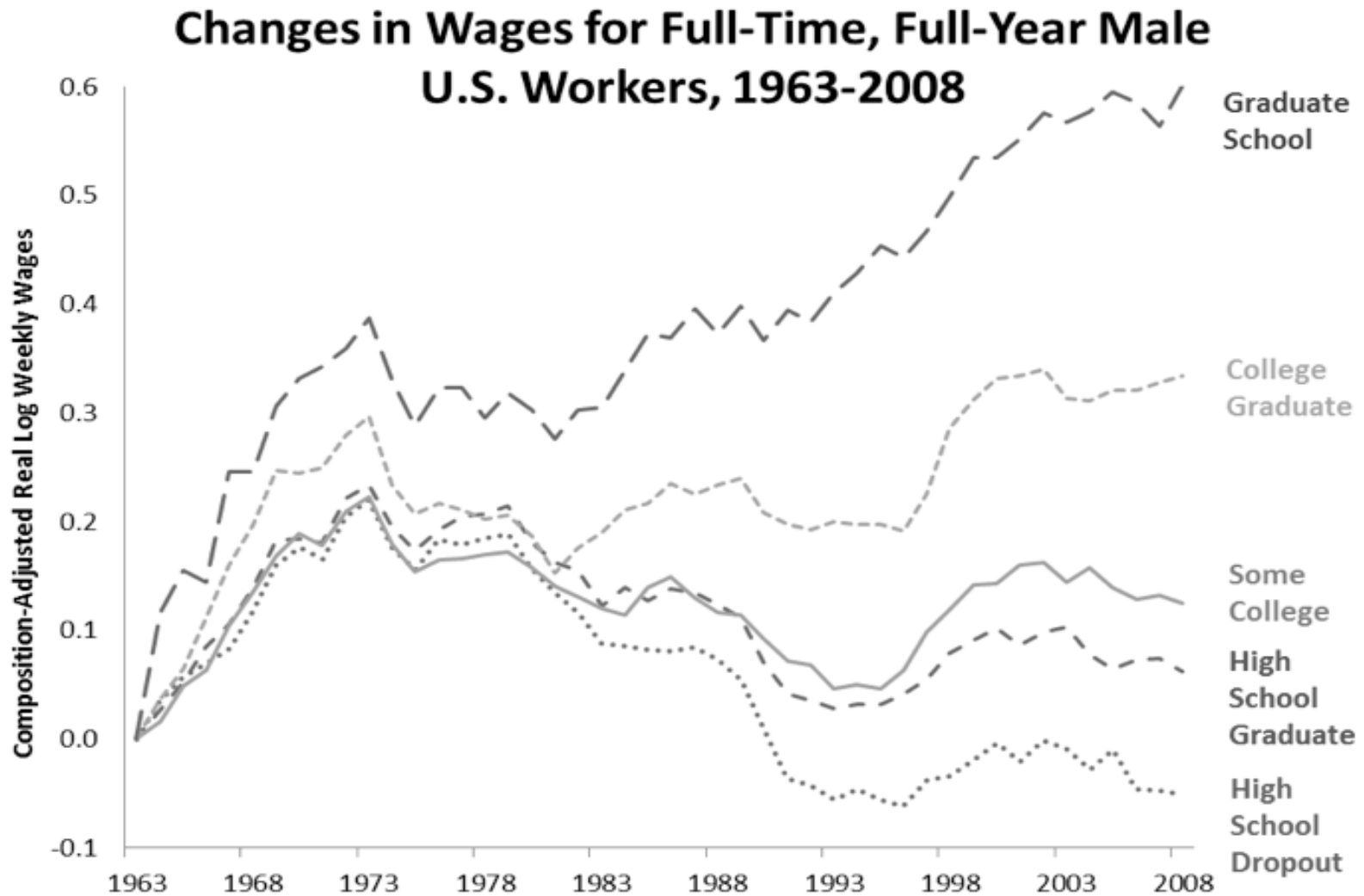


[http://en.wikipedia.org/wiki/Survivor\\_\(U.S.\\_TV\\_series\)](http://en.wikipedia.org/wiki/Survivor_(U.S._TV_series))



## How to survive? – Be Ambidextrous

- You'll need to develop multiple skills and abilities to survive.
- Having one major may not be enough.
- Double major or graduate degree in a *distant* field
- so that, when you lose a job, you can jump into another occupation right away.



**Figure 3.5: Wages have increased for those with the most education, while falling for those with the least.** Source: Acemoglu and Autor analysis of the Current Population Survey for 1963-2008.

# Why Software Is Eating The World

THE WALL STREET JOURNAL.

Article

Video

Comments (445)



Save



Recommend

18k

By MARC ANDREESSEN

This week, Hewlett-Packard (where I am on jettisoning its struggling PC business in favor of where it sees better potential for growth. My move to a cellphone handset maker Motorola Mobility is also in line with a trend I've seen about the future growth of the American economy in the stock market.



In an interview with WSJ's Kevin Delaney, Groupon and LinkedIn investor Marc Andreessen insists that the recent popularity of tech companies does not constitute a bubble. He also stressed that both Apple and Google are undervalued and that "the market doesn't like tech."

Today, the world's largest bookseller, Amazon, is a software company—its core capability is its amazing software engine for selling virtually everything online, no retail stores necessary. On top of that, while Borders was thrashing in the throes of impending bankruptcy, Amazon rearranged its web site to promote its Kindle digital books over physical books for the first time. Now even the books themselves are software.

Today's largest video service by number of subscribers is a software company: Netflix. How Netflix eviscerated Blockbuster is an old story, but now other traditional entertainment providers are facing the same threat. Comcast, Time Warner and others are responding by transforming themselves into software companies with efforts such as TV Everywhere, which liberates content from the physical cable and connects it to smartphones and tablets.

Today's dominant music companies are software companies, too: Apple's iTunes, Spotify and Pandora. Traditional record labels increasingly exist only to provide those software companies with content. Industry revenue from digital channels totaled \$4.6 billion in 2010, growing to 29% of total revenue from 2% in 2004.

Today's fastest growing entertainment companies are videogame makers—again, software—with the industry growing to \$60 billion from \$30 billion five years ago. And the fastest growing major videogame company is Zynga (maker of games including FarmVille), which delivers its games entirely online. Zynga's first-quarter revenues grew to \$235 million this year, more than double revenues from a year earlier. Rovio, maker of Angry Birds, is expected to clear \$100 million in revenue this year (the company was nearly bankrupt when it debuted the popular game on the iPhone in late 2009). Meanwhile, traditional videogame powerhouses like Electronic Arts and Nintendo have seen revenues stagnate and fall.

## How to survive? – Continue to Learn

- Some of the things you are learning here will probably be *obsolete* in the next couple of decades.
- New knowledge keeps produced in an increasingly faster rate.
- Will need to know not only how to use certain software tools (Excel, Tableau), but also how to learn new technology that is not invented yet.
- Will need to be flexible and to transform yourself anytime with new knowledge and skills
- Always be vigilant over and aware of technology trends and take advantage of them

ANALYTICS

# Data Scientist: The Sexiest Job of the 21st Century

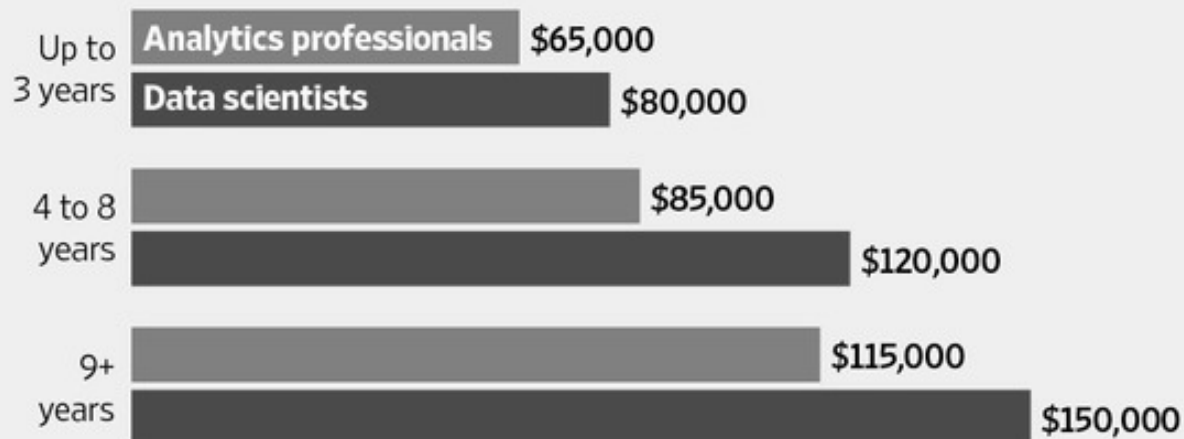
Harvard Business Review

by Thomas H. Davenport and D.J. Patil

FROM THE OCTOBER 2012 ISSUE

## Big Data, Big Paycheck

Median salary for analytics professionals and those specifically within data science, by level of experience.



Note: Data do not include managers Source: Burtch Works

The Wall Street Journal

<https://hbr.org/2012/10/data-scientist-the-sexiest-job-of-the-21st-century/>  
<http://www.wsj.com/articles/SB10001424052702304819004579489541746990638>

## How to survive? – Be data-smart!

- Whatever occupation you'll have, you'll need a skill
  - to find right data sources
  - to analyze a large amount of data, and
  - to get valuable insights and knowledge from data
- for critical-thinking, creative abilities, analytic skills
- for an ability to solve open-ended, unstructured, non-routine problems.



<http://www.mycustomer.com/feature/data/getting-smart-how-create-data-strategy-develop-actionable-insights/166504>



**The illiterate of the 21st century  
will not be those who cannot read  
and write, but those who cannot  
learn, unlearn and relearn.**

**- Alvin Toffler**

