

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

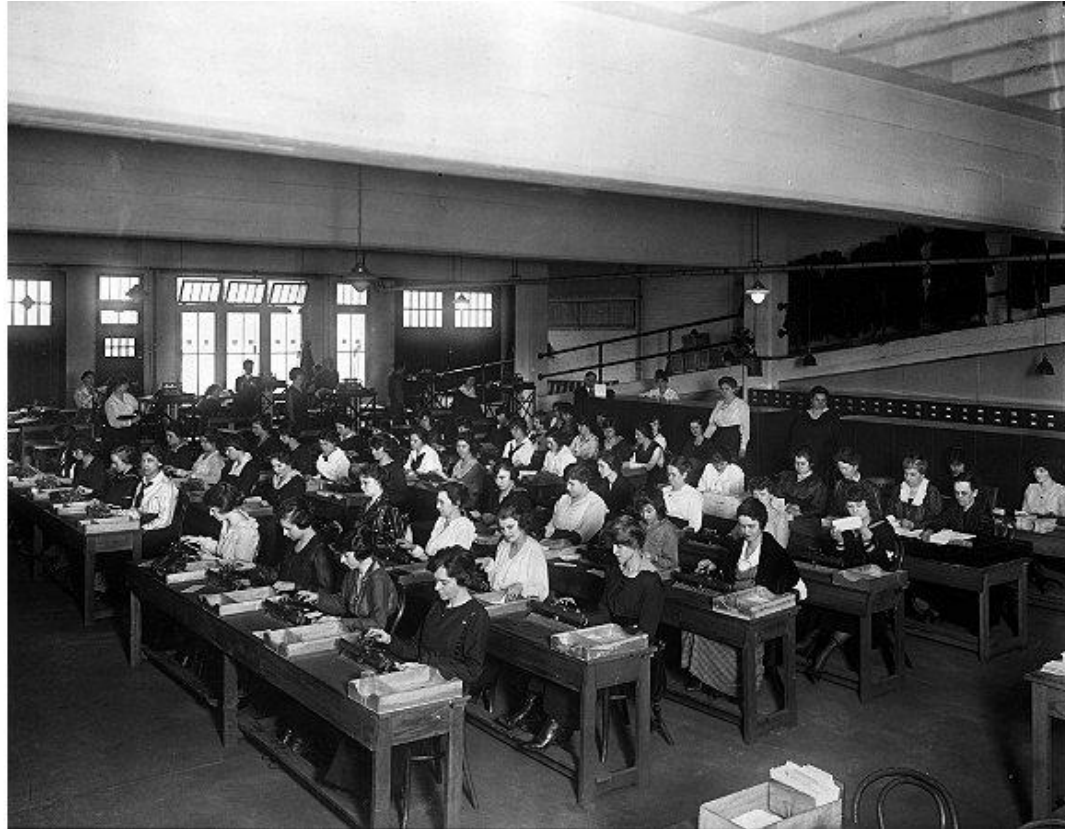
## ***Day 33 – Data Science and Your Career***

**Min-Seok Pang**

**Management Information Systems  
Fox School of Business, Temple University  
minspang@temple.edu**

***Nov. 18<sup>th</sup>, 2015***

# Women Mathematicians at World War II

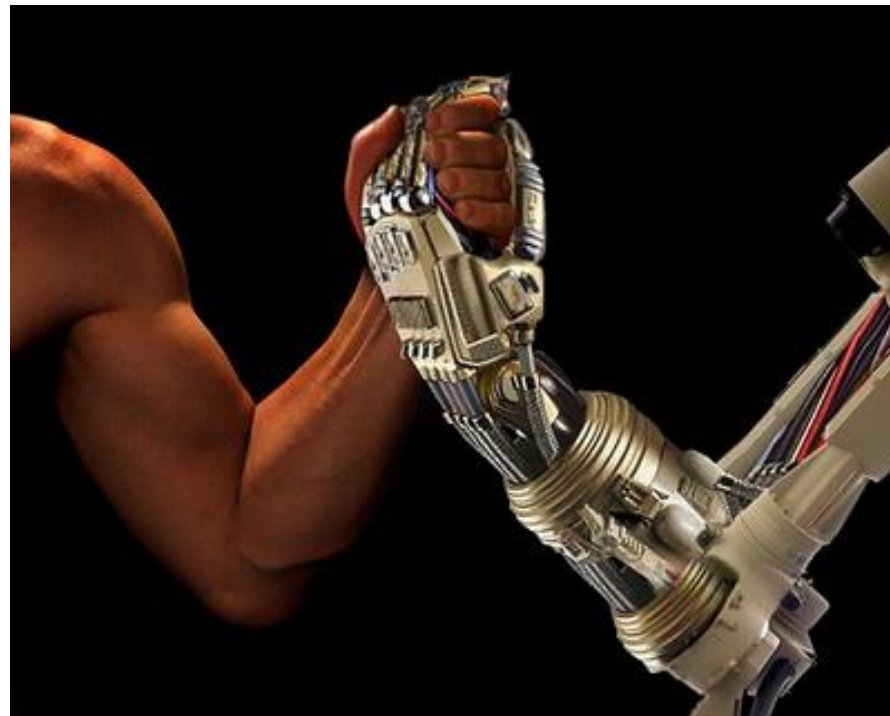


**who were called “Computers.”**

<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?



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

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

September 5, 2009

**The New York Times**

**In Unemployment Report, Signs of a Jobless Recovery**

BUSINESS | January 17, 2012

**THE WALL STREET JOURNAL.**

**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

**Bloomberg  
Businessweek**

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

**American unemployment**

**Forgotten men**

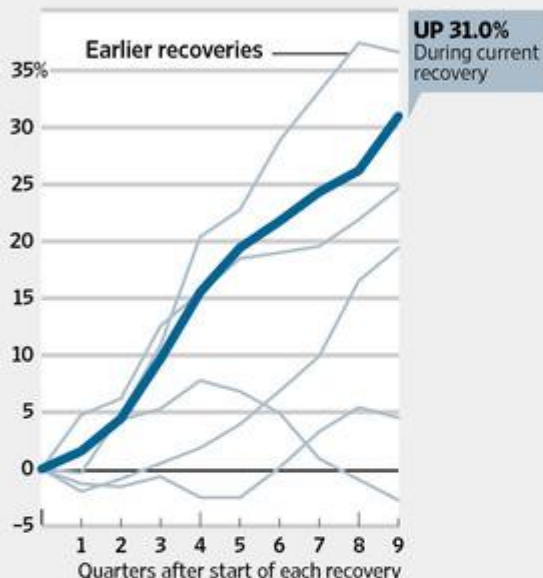
The jobless recovery, long prophesied, is here

**The  
Economist**

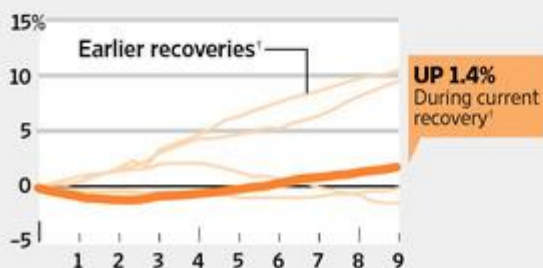
# Spending Spree | Businesses splurge on machines, not muscle

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...



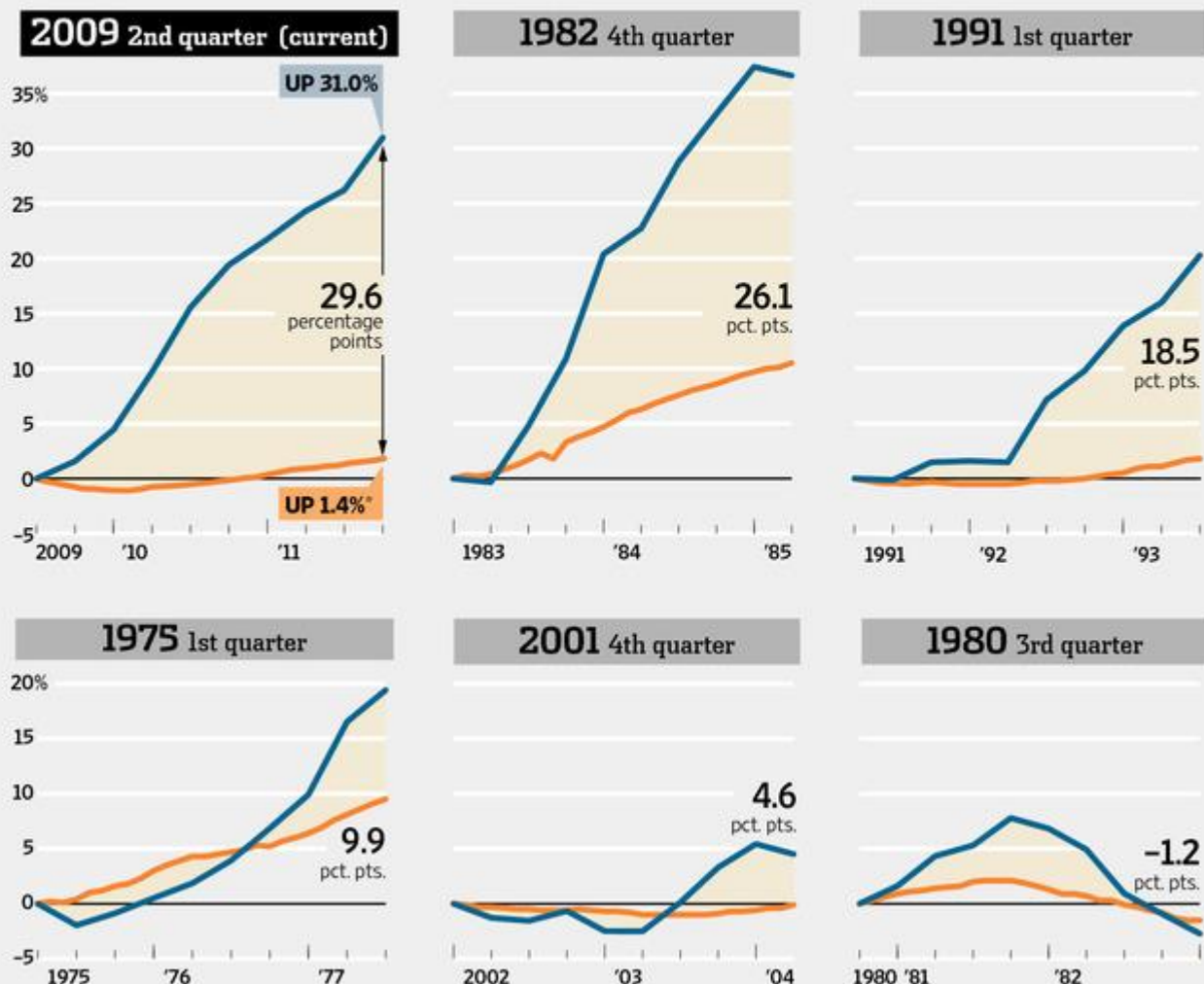
†The 1991 recovery was so similar to the current one that the lines overlap.

\*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

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.



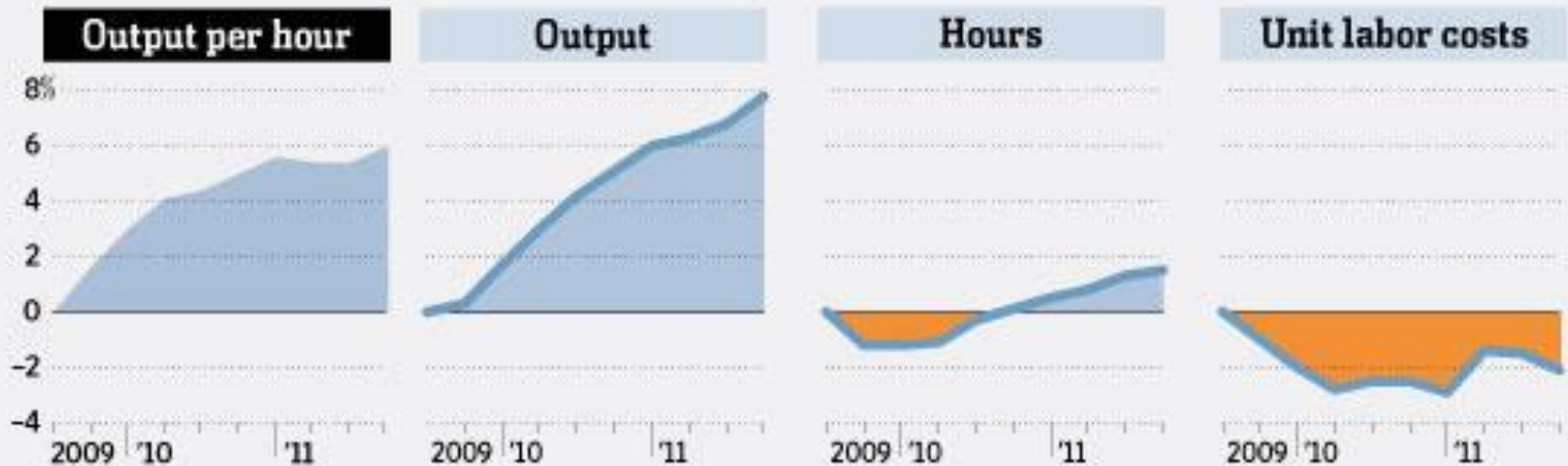


# What does this mean and *Why?*

## 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)



## Pennsylvania Turnpike to test out cashless interchanges next year

*E-ZPass and license plate-scanner program will be rolled out at Beaver Valley Expressway and Delaware River Bridge*

UPDATED 11:51 AM EDT Sep 28, 2015

Text Size: A A A



<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://www.wtae.com/news/pennsylvania-turnpike-to-test-ez-pass-cashless-interchange-at-beaver-valley/35527534>



## 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

Inside the iPhone Maker

**Bloomberg  
Businessweek**

2 of 19



PHOTOGRAPH BY TONY LAW FOR BLOOMBERG BUSINESSWEEK

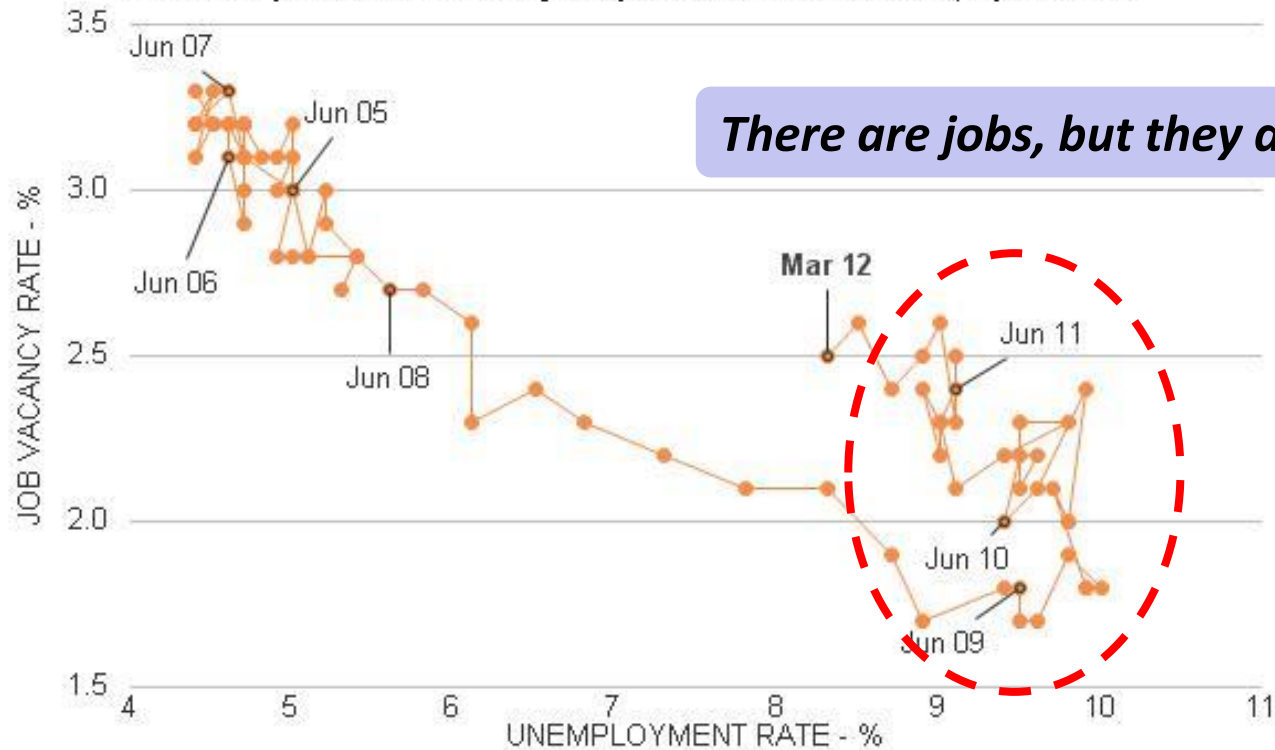
[http://www.businessweek.com/magazine/content/10\\_38/b4195058423479.htm](http://www.businessweek.com/magazine/content/10_38/b4195058423479.htm)

[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%9Dsignals-a-possible-skills-mismatch-in-job-market/>

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

**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



### Interactions

Exchanges involving complex problem solving, experience, context (e.g., lawyer, nurse)



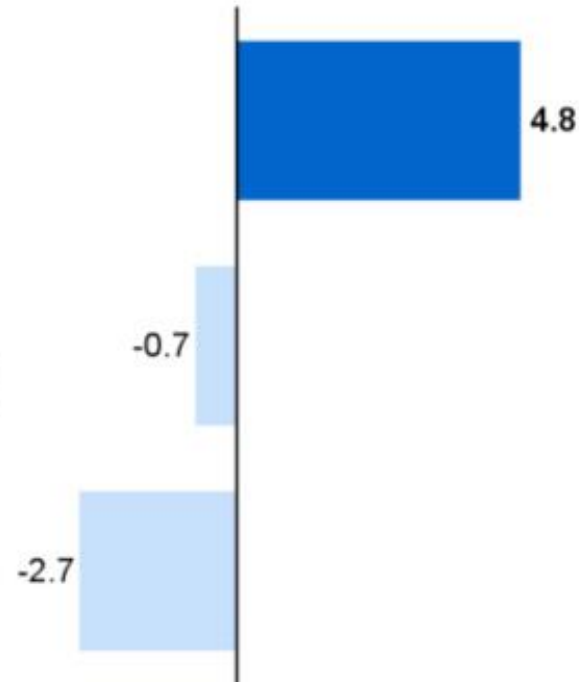
### Transactions

Exchanges that can be scripted, routinized, automated (e.g., bank teller, retail cashier)



### Production

Process of converting physical materials into finished goods (e.g., factory worker, farmer)



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



# Race Against the Machine

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[www.CartoonStock.com](http://www.CartoonStock.com)



"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

# Wall Street Bankers vs. the Machines



**BloombergBusinessweek**  
**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

### When It's Not All About Wages

Pay of outsourced entry-level accountants in Argentina is higher than in India. But they still earn less than the \$23 hourly wage in the U.S.

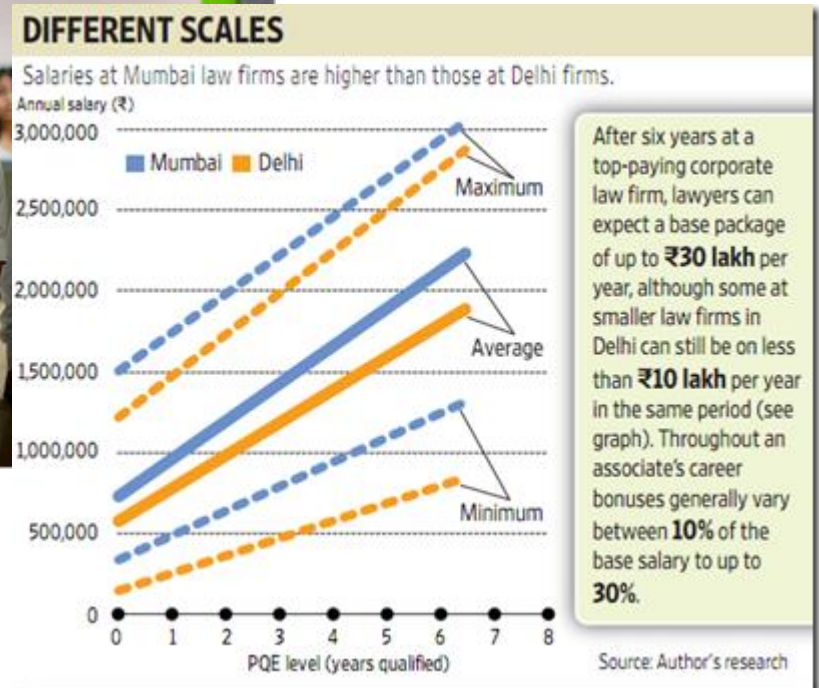




## Journalists vs. the Machines



# Lawyers vs. the Machines



[http://www.nytimes.com/2010/08/05/business/global/05legal.html?\\_r=0](http://www.nytimes.com/2010/08/05/business/global/05legal.html?_r=0)

<http://www.legallyindia.com/201111252419/Analysis/>

# Pilots vs. the Machines

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

AIN AIR TRANSPORT PERSPECTIVE » SEPTEMBER 10, 2010

by CHARLES ALCOCK



Where did he go?

Ryanair chief executive Michael O'Leary has indicated that he will start to phase out copilots in his Boeing 737 fleet renewal remains a matter of speculation. (Photo: Matt Banks)

September 10, 2010, 7:26 AM

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



<http://bits.blogs.nytimes.com/2014/05/13/a-trip-in-a-self-driving-car-now-seems-routine/>  
[http://wot.motortrend.com/1505\\_google\\_self\\_driving\\_cars\\_begin\\_tests\\_on\\_city\\_roads\\_this\\_summer.html](http://wot.motortrend.com/1505_google_self_driving_cars_begin_tests_on_city_roads_this_summer.html)

# Subway Conductors vs. the Machines



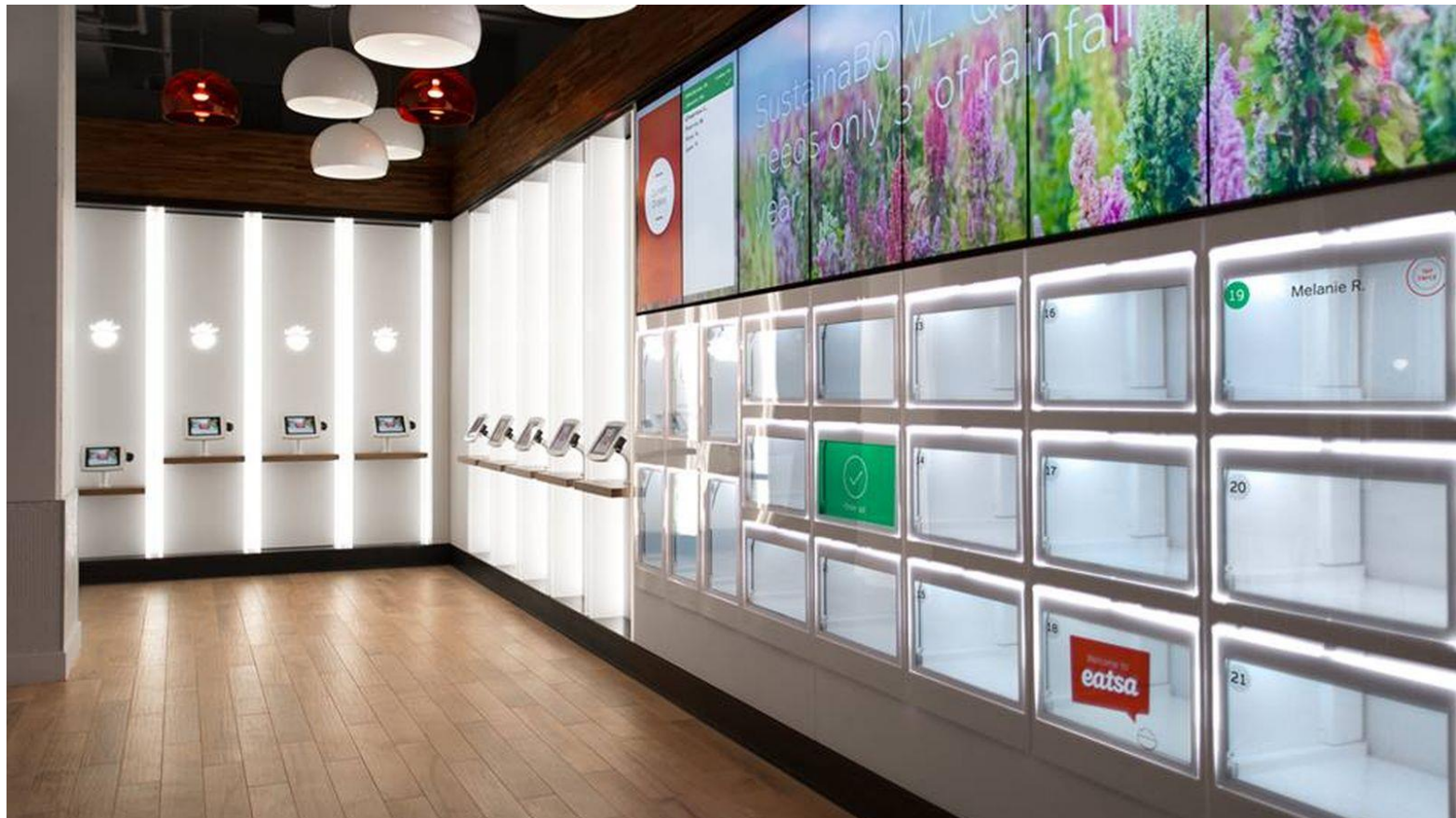
- A new 10.7-mile subway line with no conductor

# Warehouse Workers vs. the Machines



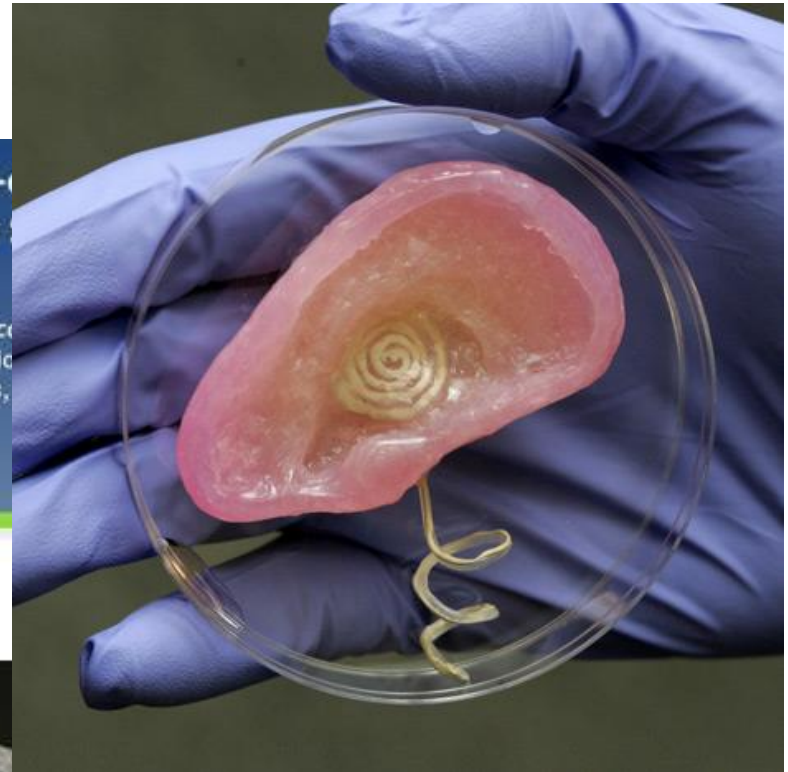


# Restaurant Servers vs. the Machines



<http://sf.eater.com/2015/9/2/9252149/eatsa-the-early-word-san-francisco>

## 3D Printer vs. who?



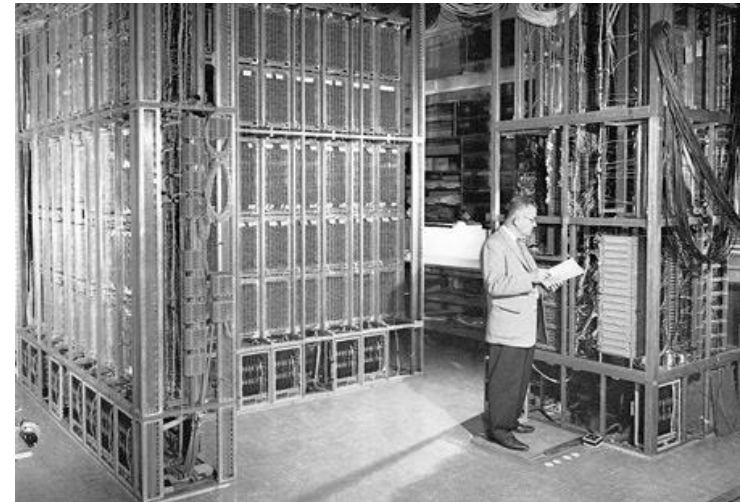
***Whose job is in danger if every household has one of these?***

<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/)

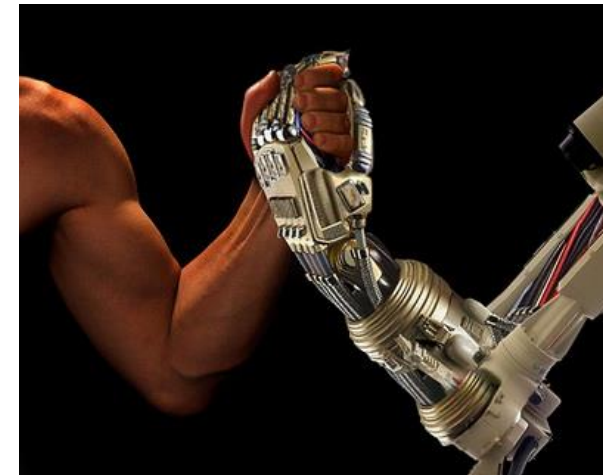
## Let's discuss.

- 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.

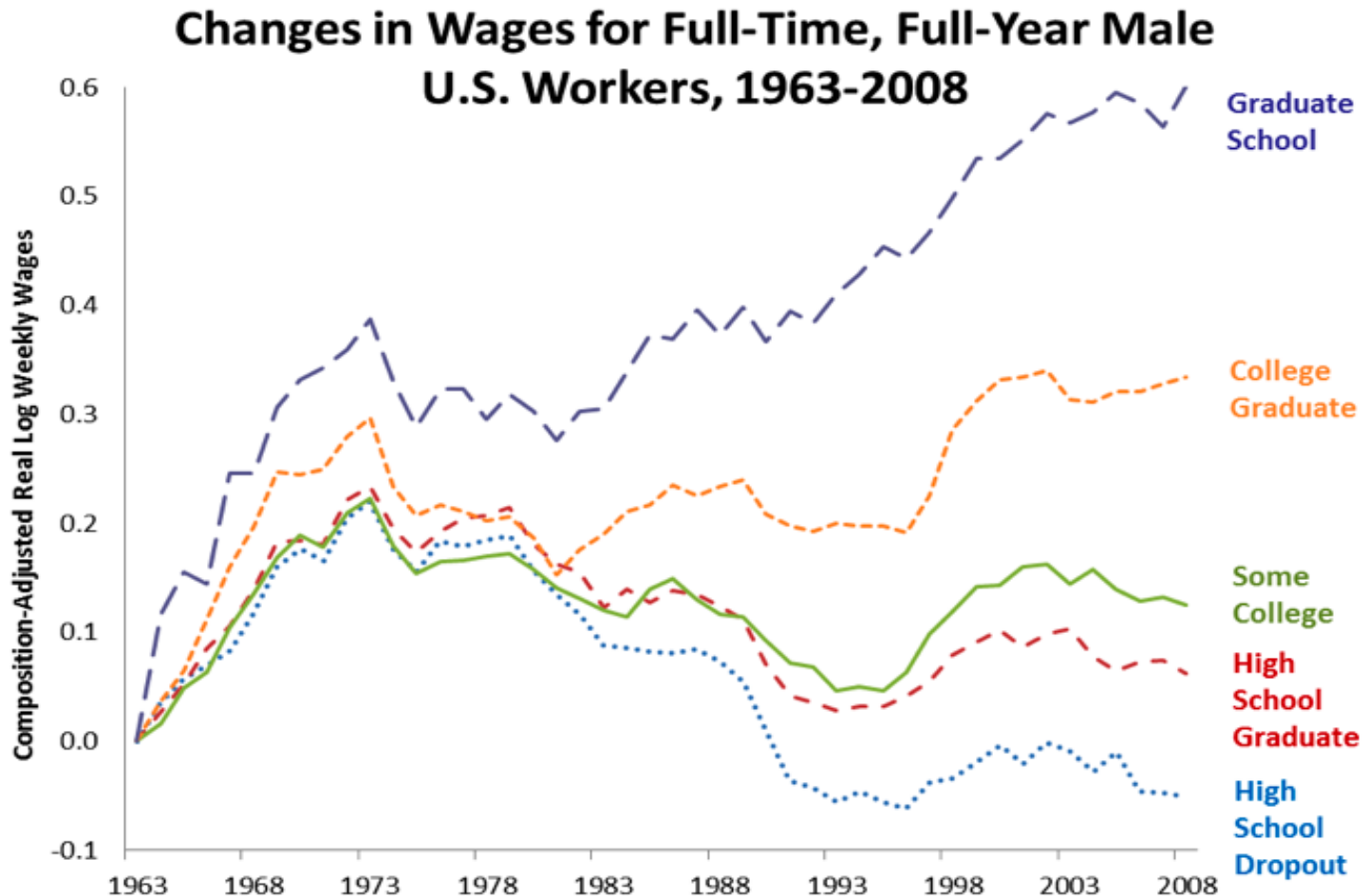
- Advances in technologies are creating new opportunities and increasing demands for different skills.
  - Techs destroy some jobs but create new ones too, with the skills in the previous page.
- Tech developments have historically increased the size of the economies for the last several centuries.
- 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. Motorola Mobility's move to a smartphone handset maker Motorola Mobility both moves are 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.

**Forbes / Tech**

The Little Black Book of Billionaire Secrets

JUL 29, 2015 @ 09:45 AM **833,901** VIEWS

# That 'Useless' Liberal Arts Degree Has Become Tech's Hottest Ticket

Such creativity can't be programmed. Instead, much of it is minted by one of Slack's 180 employees, [Anna Pickard](#), the 38-year-old editorial director. She earned a theater degree from Britain's Manchester Metropolitan University before discovering that she hated the constant snubs of auditions that didn't work out. After winning acclaim for her blogging, videogame writing and cat impersonations, she found her way into tech, where she cooks up zany replies to users who type in "I love you, Slackbot." It's her mission, Pickard explains, "to provide users with extra bits of surprise and delight." The pay is good; the stock options, even better.

What kind of boss hires a thwarted actress for a business-to-business software startup? Stewart Butterfield, Slack's 42-year-old cofounder and CEO, whose estimated double-digit stake in the company could be worth \$300 million or more. He's the proud holder of an undergraduate degree in philosophy from Canada's University of Victoria and a master's degree from Cambridge in philosophy and the history of science.

<http://www.forbes.com/sites/georgeanders/2015/07/29/liberal-arts-degree-tech/>

## 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

by Thomas H. Davenport and D.J. Patil

FROM THE OCTOBER 2012 ISSUE

Harvard  
Business  
Review

## 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>

## Min-Seok Pang – Nov.18.2015

**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**

