COMS 493

AI, ROBOTS & COMMUNICATION

Agenda

- Review
- Social Issues
- Preview

Review
Technological Unemployment

- Definitions and History
- Current Situation
- Examples
  - Manufacturing
  - Intellectual Work
- Consequences

"I did not do my home-work cause this topic will be solved by A.I very soon."

Definitions
Automation

Machine != Tool
"The machine is a mechanism that, after being set in motion, performs with its tools the same operations as the worker formerly did with similar tools." – Marx 1867
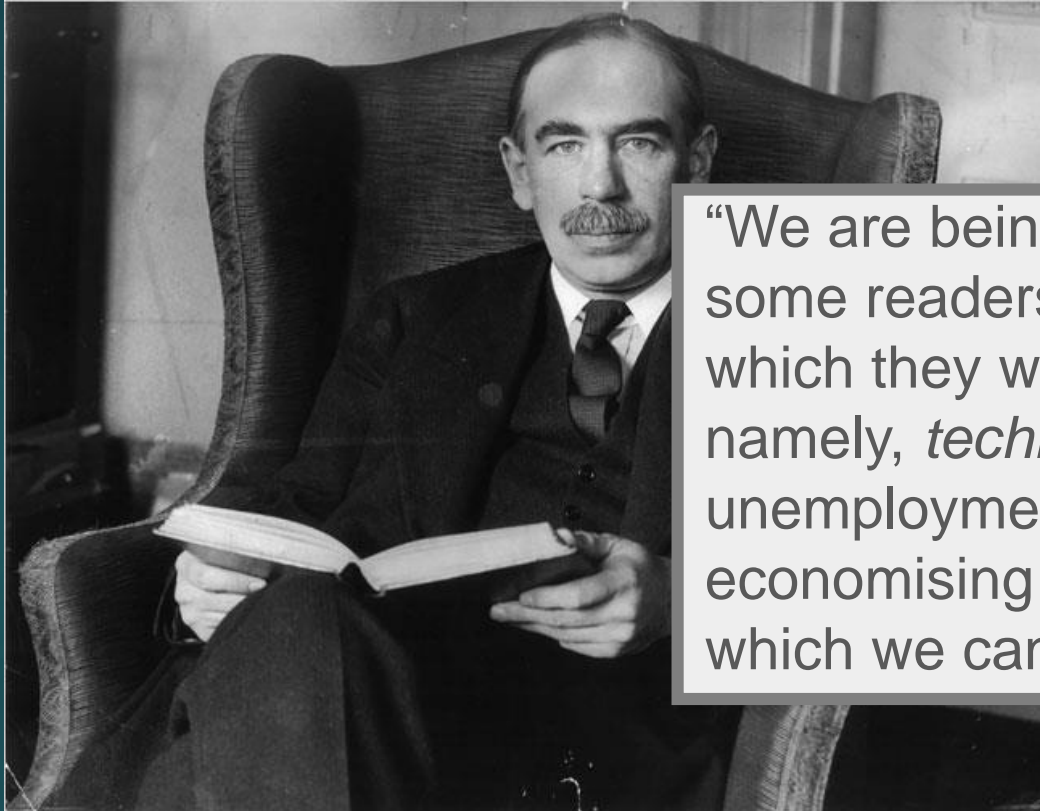
Definitions
Automation

Instrumental Theory
"The shift will ultimately challenge one of our most basic assumptions about technology: that machines are tools that increase the productivity of workers. Instead, machines themselves are turning into workers." – Martin Ford 2015

Definitions
Technological Unemployment

John Maynard Keynes, 1883-1946

2 ECONOMIC POSSIBILITIES FOR OUR GRANDCHILDREN

This essay was first presented in 1928 as a talk to several small societies, including the Essay Society of Winchester College and the Political Economy Club at Cambridge. In June 1930 Keynes expanded his notes into a lecture

"We are being afflicted with a new disease of which some readers may not yet have heard the name, but of which they will hear a great deal in the years to come—namely, *technological unemployment*. This means unemployment due to our discovery of means of economising the use of labour outrunning the pace at which we can find new uses for labour." – Keynes, 1930

the national income; we are muddling away one and sixpence in the £, and have only 18s 6d, when we might, if we were more sensible, have £1; yet, nevertheless, the 18s 6d mounts up to as much as the £1 would have been five or six years ago. We forget that in 1929 the physical output of the industry of Great Britain

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History

Industrial Revolution 1800s

- Skilled textile workers replaced by machines that automated weaving – Jacquard Loom
- Luddite Movement - Revolt of workers against the use of automation
- Short term loss vs. long term gain – new opportunities replace lost jobs
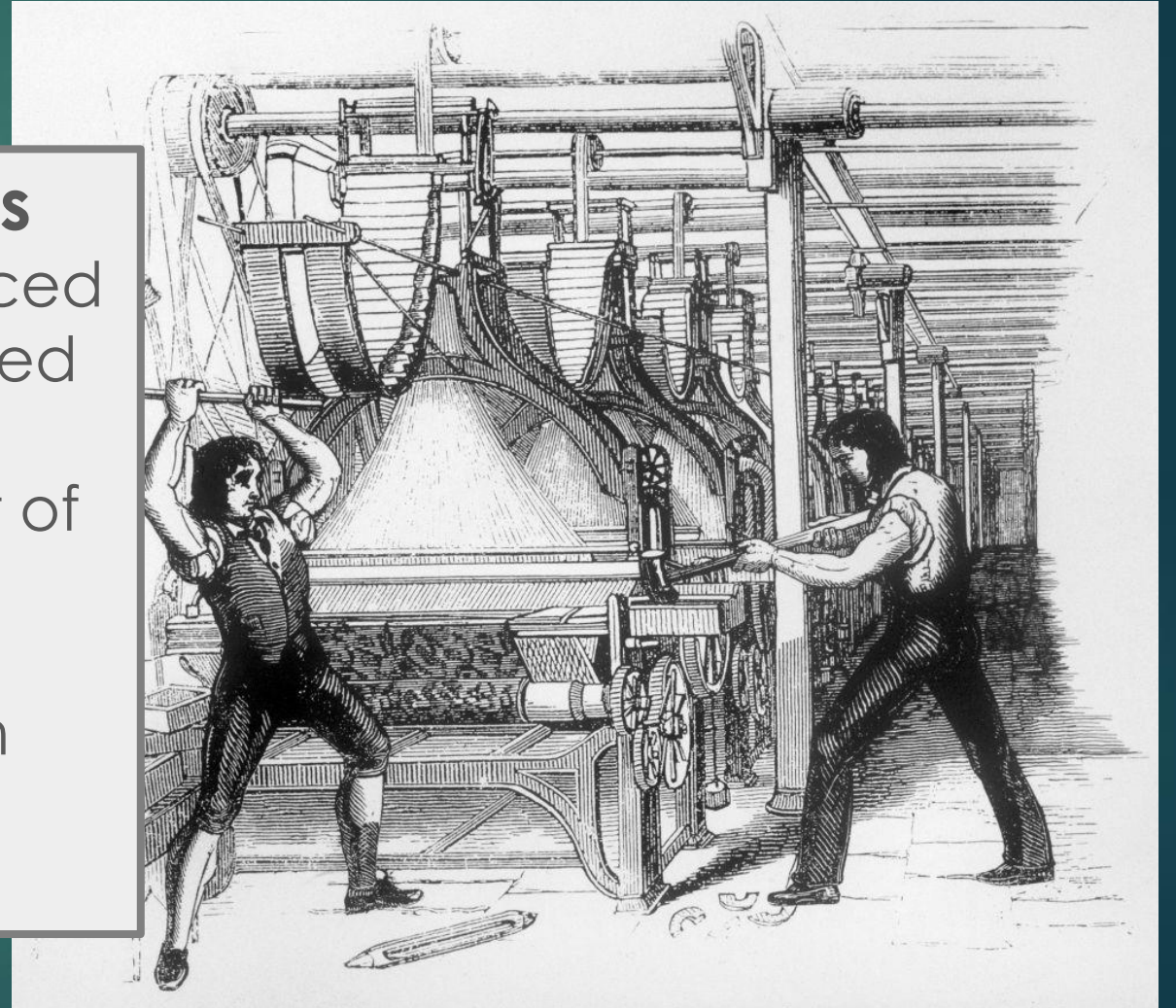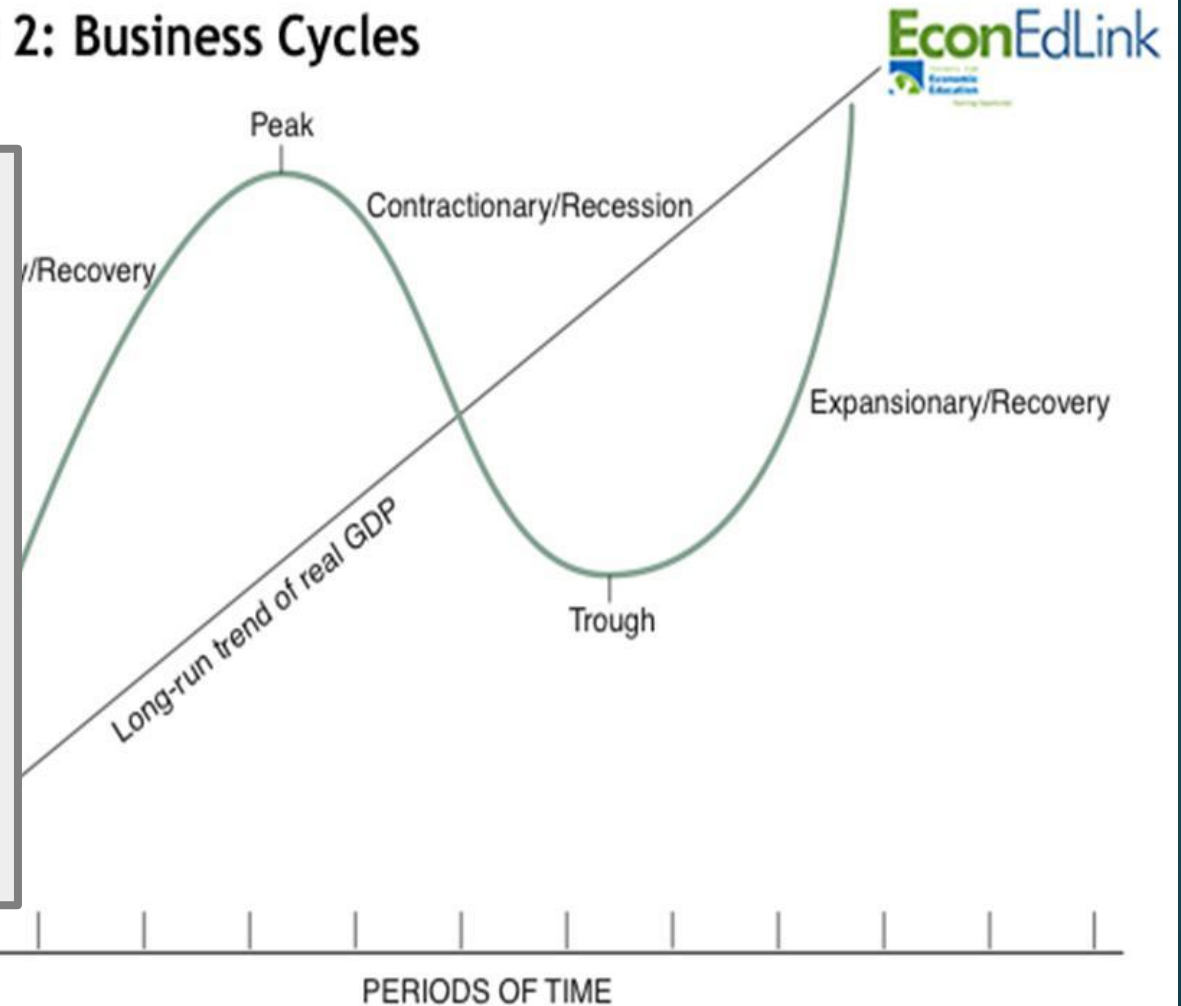
History

Great Depression 1930s

"In the United States, for example, the mechanization of the railways around the time Keynes was writing his essay put nearly half a million people out of work. Similarly, rotary phones were making switchboard operators obsolete, while mechanical harvesters, plows, and combines were replacing traditional farmworkers, just as the first steam-engine tractors had replaced horses and oxen less than a century before. Machine efficiency was becoming so great that President Roosevelt, in 1935, told the nation that the economy might never be able to reabsorb all the workers who were being displaced. The more sanguine *New York Times* editorial board then accused the president of falling prey to the "calamity prophets." In retrospect, it certainly looked as if he had. Unemployment, which was at nearly 24 percent in 1932, dropped to less than 5 percent a decade later." – Halpern 2015

History

Business as Usual

"This was a pattern that would reassert itself throughout the twentieth century: the economy would tank, automation would be identified as one of the main culprits, commentators would suggest that jobs were not coming back, and then the economy would rebound and with it employment, and all that nervous chatter about machines taking over would fade away." – Halpern 2015

Figure 2: Business Cycles

EconEdLink

Peak

Contractionary/Recession

w/Recovery

Expansionary/Recovery

Long-run trend of real GDP

Trough

PERIODS OF TIME

History

Deloitte.

Technology and people:
The great job-creating machine

August 2015
http://www2.deloitte.com

Key findings

- Technology has created more jobs than it has destroyed in the last 144 years

- It has been saving us from dull, repetitive and dangerous work. Agriculture was the first major sector to experience this change. In 1871 it employed 6.6% of the workforce of England and Wales. Today that stands at 0.2%, a 95% decline

- Overall, technological innovation has resulted in fewer humans being deployed as sources of muscle power and more engaged in jobs involving the nursing and care of others. Just 1.1% of the workforce was employed in the caring professions during the 1871 census. By 2011, these professions employed almost a quarter of the England and Wales workforce

- Technology has boosted employment in knowledge-intensive sectors such as medicine, accounting and professional services

- Finally technology has lowered the cost of essentials, raising disposable incomes and creating new demand and jobs. In 1871, there was one hairdresser for every 1,793 English and Welsh citizens; now there is one for every 287.

History

Deloitte.
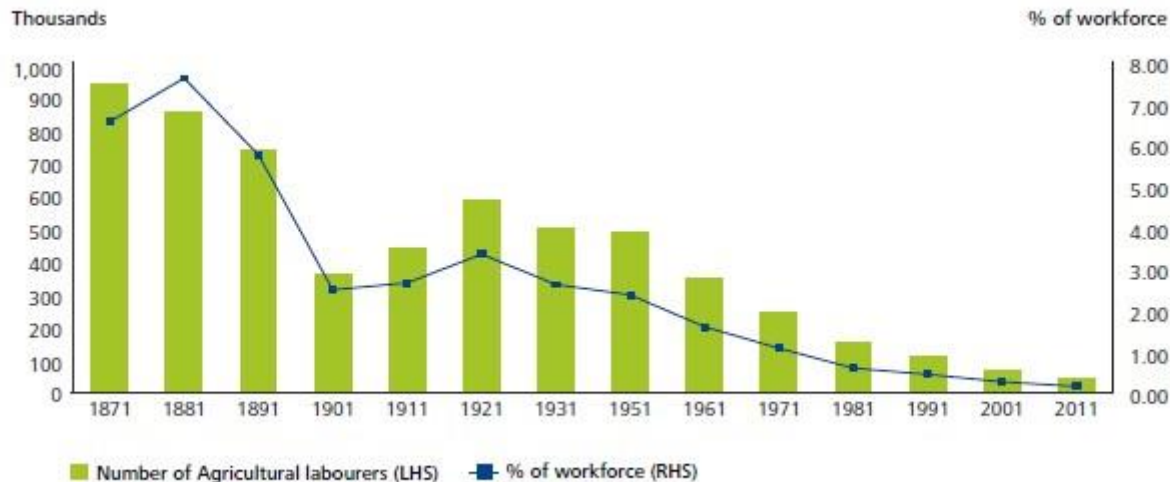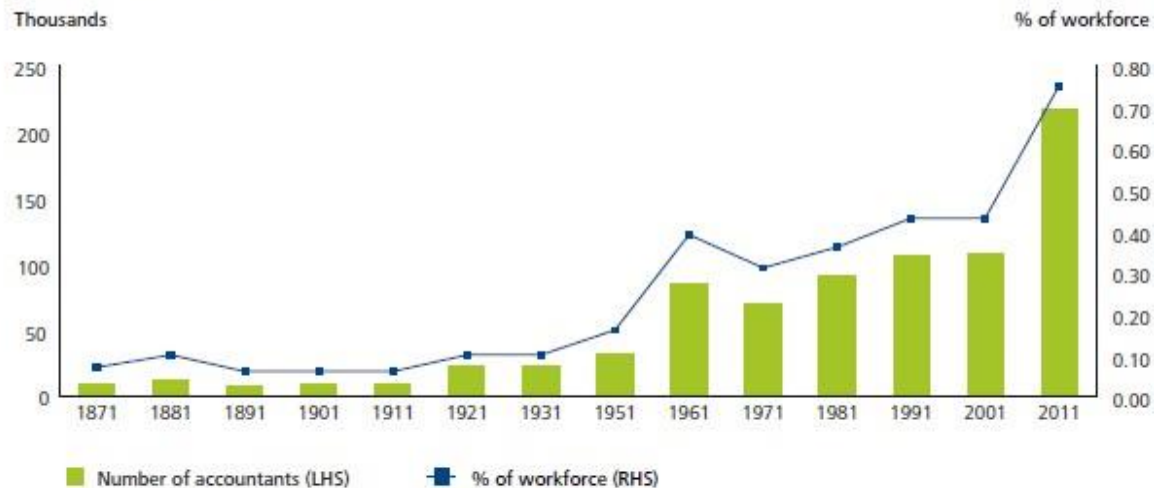
Technology and people:
The great job-creating machine

August 2015
http://www2.deloitte.com

Chart 1. Agricultural labourers

Thousands — % of workforce

Number of Agricultural labourers (LHS) — % of workforce (RHS)

Source: England and Wales Census records, authors' calculations

Chart 4. Accountants

Thousands — % of workforce

Number of accountants (LHS) — % of workforce (RHS)
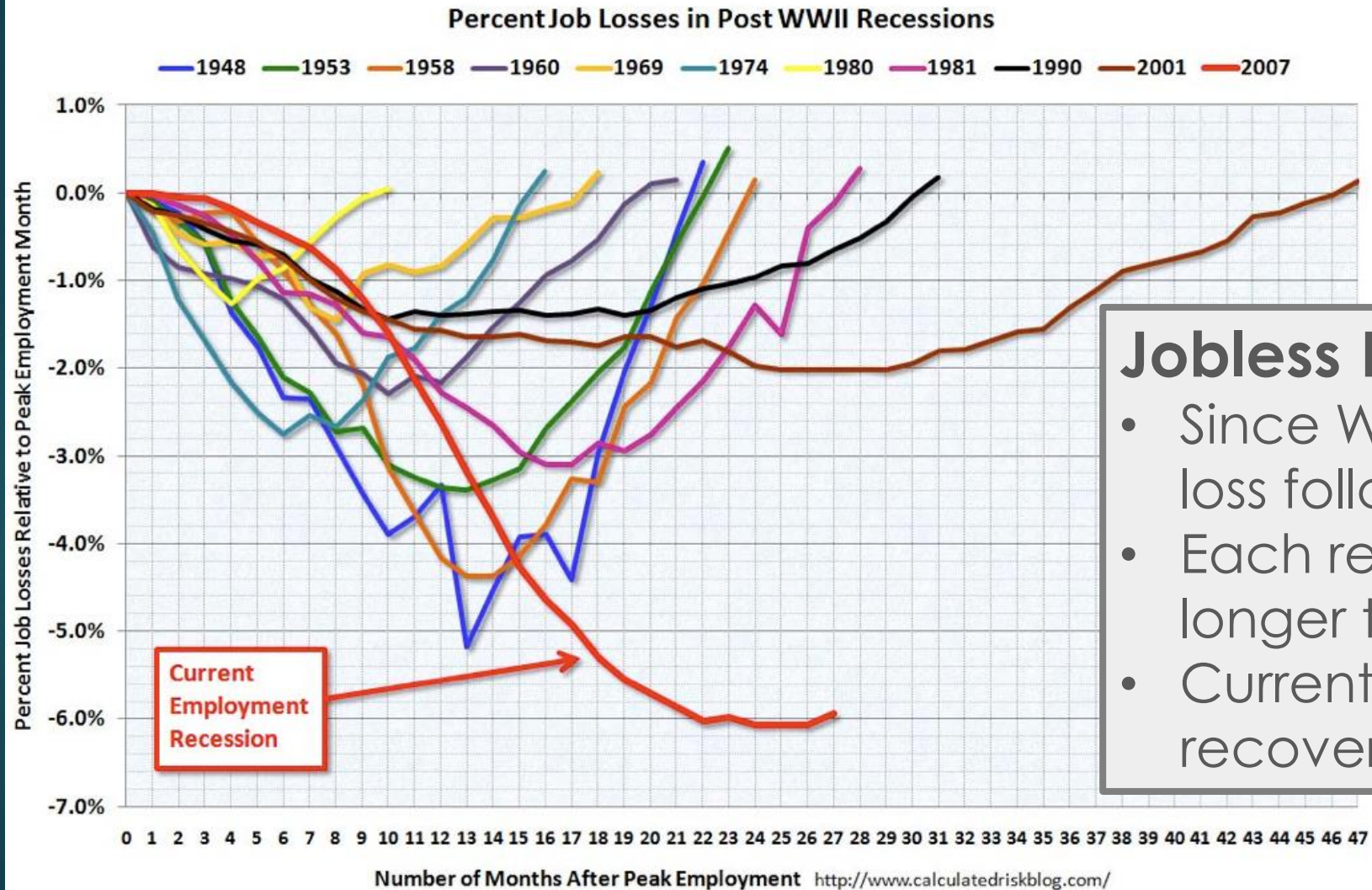
Source: England and Wales Census records, authors' calculations
Data for 1921 and 1931 have been interpolated due to discontinuities in definitions and data

Current Situation

Percent Job Losses in Post WWII Recessions

—1948 —1953 —1958 —1960 —1969 —1974 —1980 —1981 —1990 —2001 —2007

Current Employment Recession

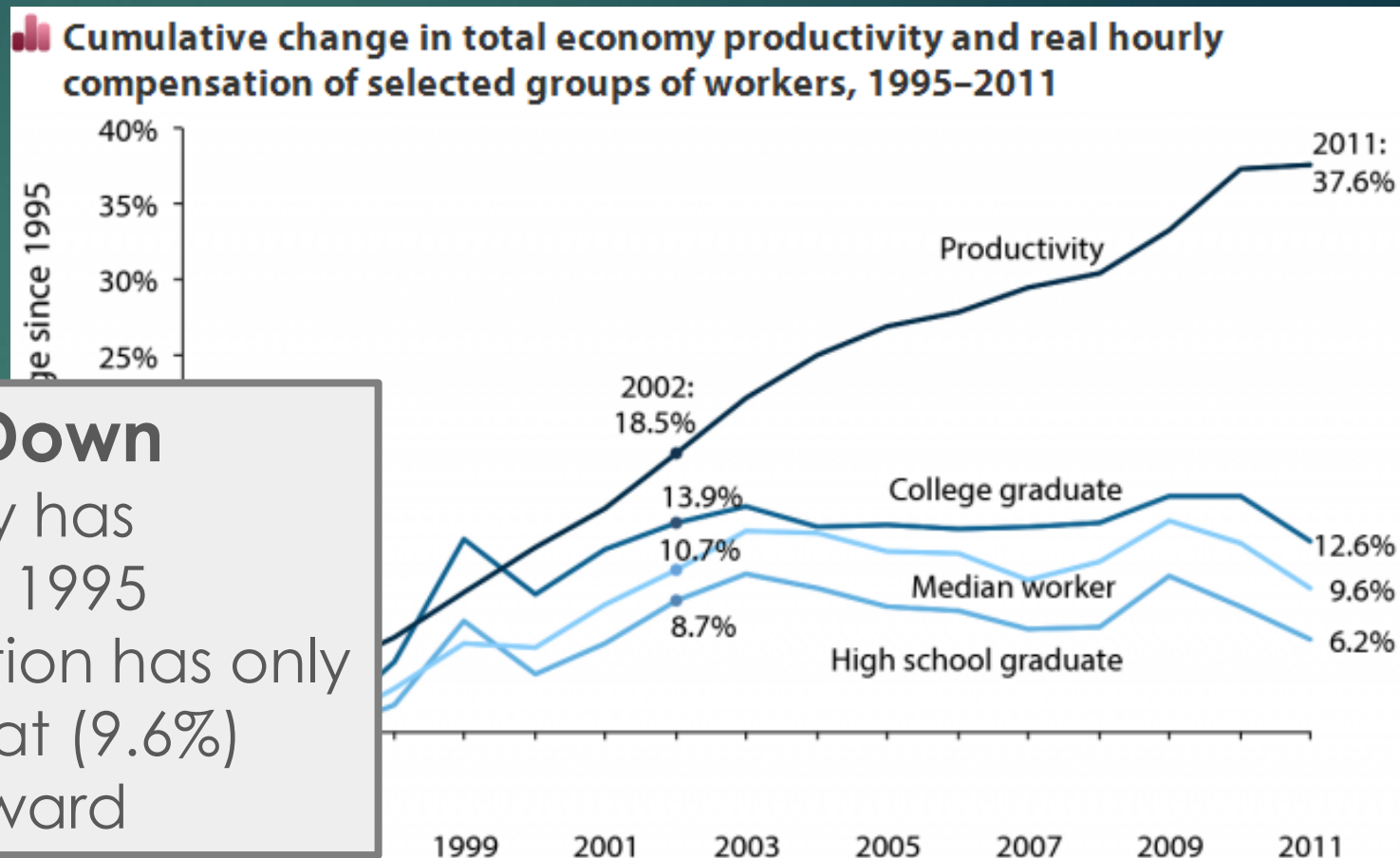Number of Months After Peak Employment http://www.calculatedriskblog.com/

Jobless Recovery?
- Since WWII, sequence of job loss followed by recovery
- Each recovery has taken longer than the previous one
- Current situation: Jobless recovery or just really slow?

Current Situation

Economy Up / Jobs Down
- Economic productivity has increased 37.6% since 1995
- Employee compensation has only improved by 1/3 of that (9.6%) and is trending downward

Cumulative change in total economy productivity and real hourly compensation of selected groups of workers, 1995–2011

40%

35%

30%

25%

ge since 1995

2011: 37.6%

Productivity

2002: 18.5%

College graduate

13.9%

10.7%

Median worker

8.7%

High school graduate

12.6%

9.6%

6.2%

1999   2001   2003   2005   2007   2009   2011

Source: Authors' analysis of unpublished Total Economy Productivity data from the Bureau of Labor Statistics Labor Productivity and Costs program, Bureau of Economic Analysis National Income and Product Accounts data, and Current Population Survey Outgoing Rotation Group microdata
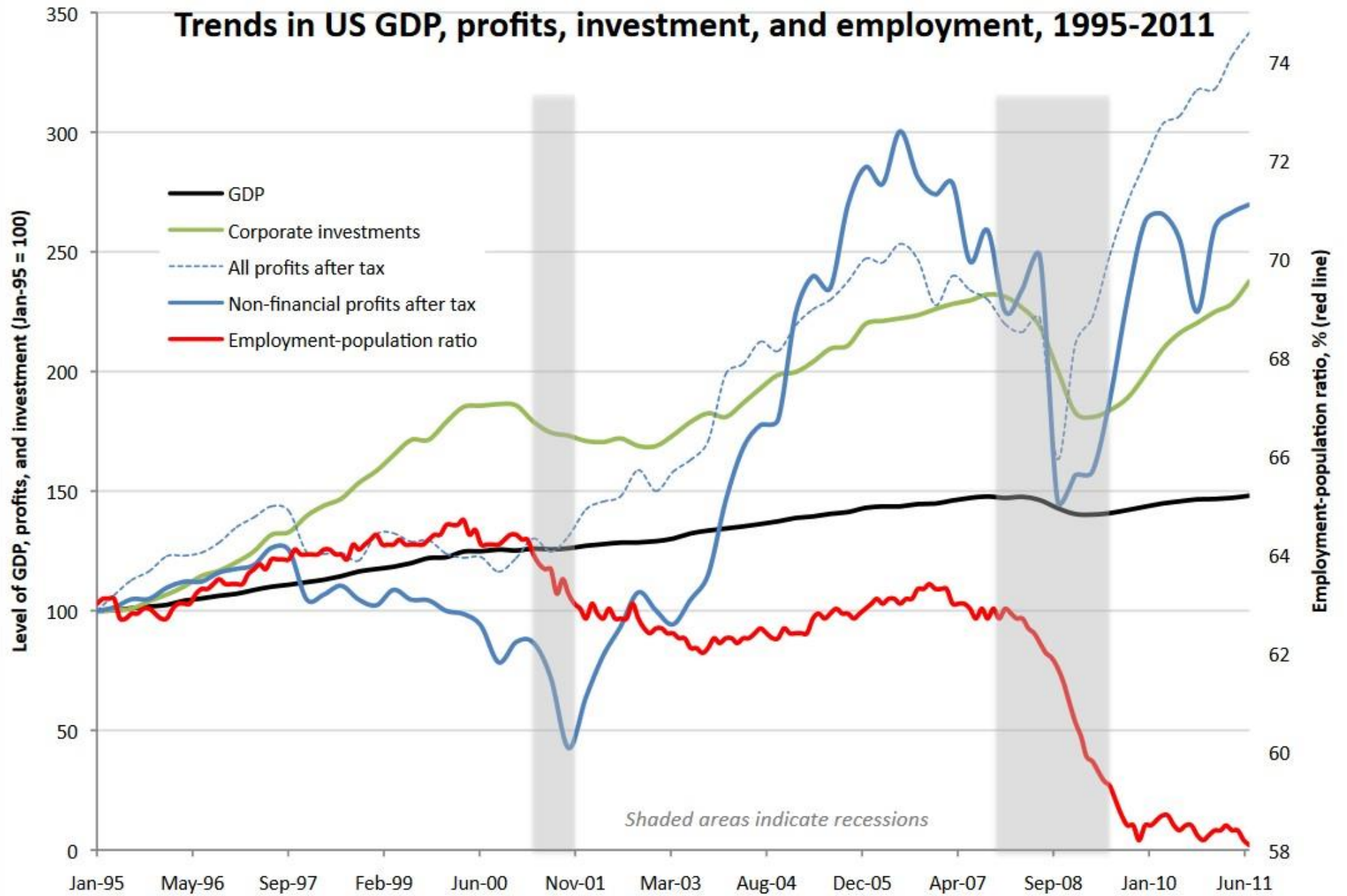
Economic Policy Institute

Current situation

Andrew McAfee:

Are droids taking our jobs?

TEDxBoston 2012 · 14:07 · Filmed Jun 2012

25 subtitle languages

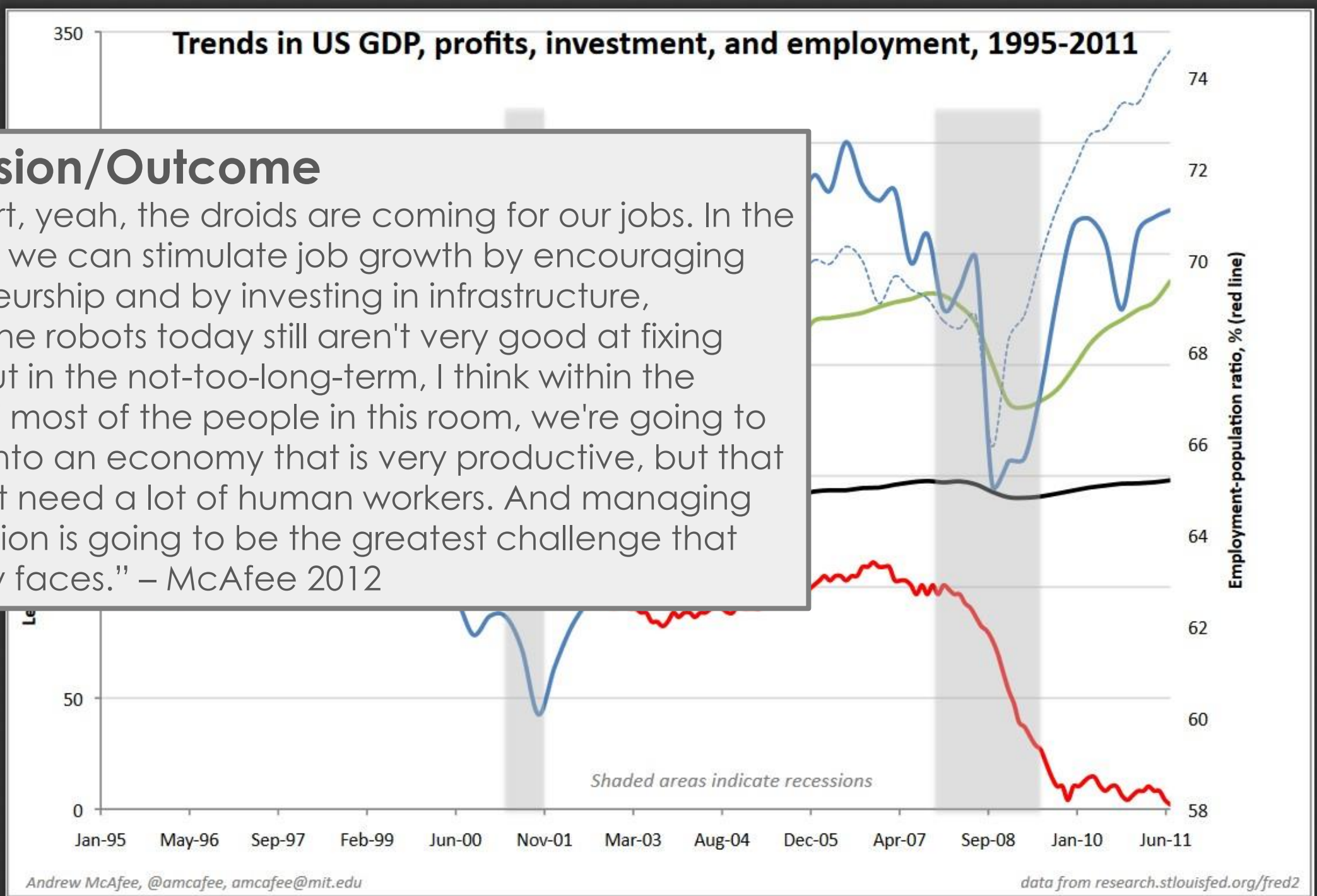View interactive transcript

Analysis of the Current Situation
"Corporate profits are quite high; in fact, if you include bank profits, they're higher than they've ever been. And business investment in gear—in equipment and hardware and software—is at an all-time high. So the businesses are getting out their checkbooks. What they're not really doing is hiring." – McAfee 2012

Trends in US GDP, profits, investment, and employment, 1995-2011

Legend:
- GDP
- Corporate investments
- All profits after tax
- Non-financial profits after tax
- Employment-population ratio

Left axis: Level of GDP, profits, and investment (Jan-95 = 100)
Right axis: Employment-population ratio, % (red line)

Shaded areas indicate recessions

Andrew McAfee, @amcafee, amcafee@mit.edu

data from research.stlouisfed.org/fred2

Trends in US GDP, profits, investment, and employment, 1995-2011

Conclusion/Outcome

"So, in short, yeah, the droids are coming for our jobs. In the short term, we can stimulate job growth by encouraging entrepreneurship and by investing in infrastructure, because the robots today still aren't very good at fixing bridges. But in the not-too-long-term, I think within the lifetimes of most of the people in this room, we're going to transition into an economy that is very productive, but that just doesn't need a lot of human workers. And managing that transition is going to be the greatest challenge that our society faces." – McAfee 2012

Shaded areas indicate recessions

Employment-population ratio, % (red line)

Jan-95 May-96 Sep-97 Feb-99 Jun-00 Nov-01 Mar-03 Aug-04 Dec-05 Apr-07 Sep-08 Jan-10 Jun-11

Andrew McAfee, @amcafee, amcafee@mit.edu

data from research.stlouisfed.org/fred2

Examples

THE FUTURE OF EMPLOYMENT: HOW SUSCEPTIBLE ARE JOBS TO COMPUTERISATION?*

Carl Benedikt Frey[†] and Michael A. Osborne[‡]

September 17, 2013

Abstract

We examine how susceptible jobs are to computerisation. To as-

"According to our estimates, about 47 percent of total US employment is at risk."

Keywords: Occupational Choice, Technological Change, Wage Inequality, Employment, Skill Demand

JEL Classification: E24, J24, J31, J62, O33.

*We thank the Oxford University Engineering Sciences Department and the Oxford Martin Programme on the Impacts of Future Technology for hosting the "Machines and Employment" Workshop. We are indebted to Stuart Armstrong, Nick Bostrom, Eris Chinellato, Mark Cummins, Daniel Dewey, David Dorn, Alex Flint, Claudia Goldin, John Muellbauer, Vincent Mueller, Paul Newman, Seán Ó hÉigeartaigh, Anders Sandberg, Murray Shanahan, and Keith Woolcock for their excellent suggestions.
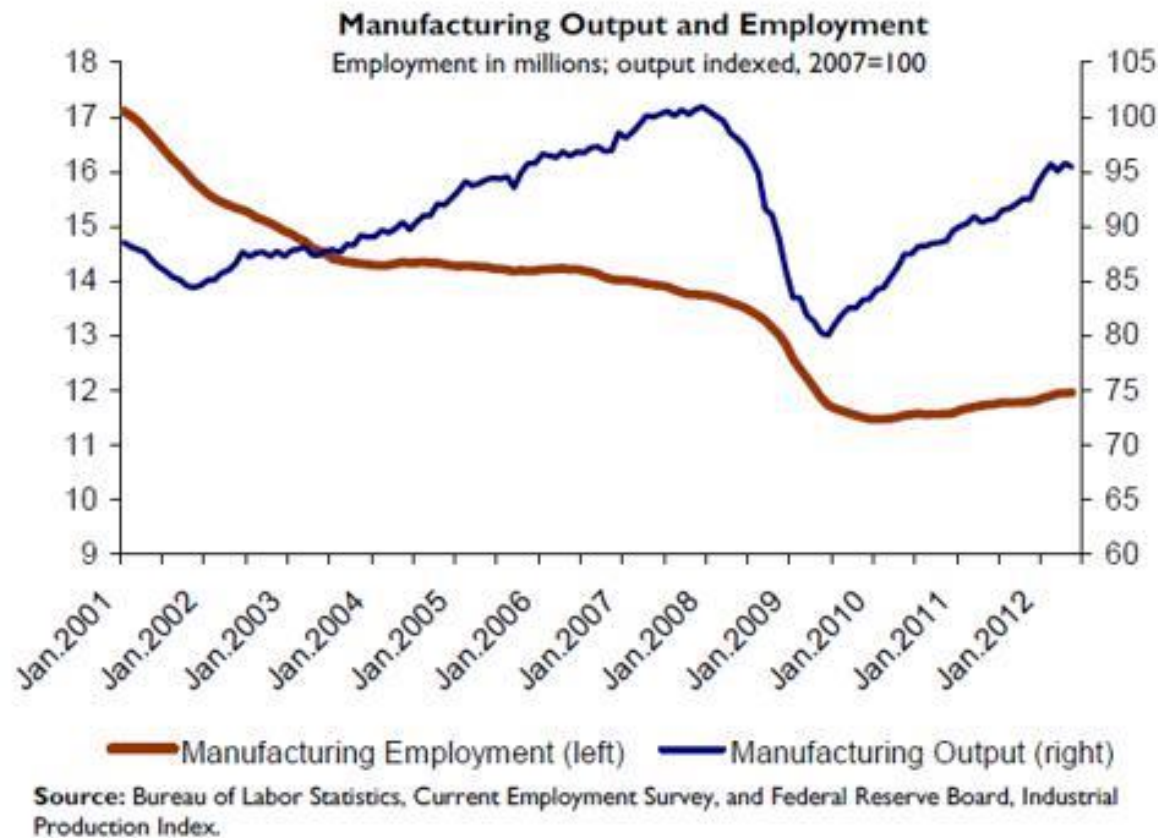[†]Oxford Martin School, Programme on the Impacts of Future Technology, University of Oxford, Oxford, OX1 1PT, United Kingdom, carl.frey@philosophy.ox.ac.uk.
[‡]Department of Engineering Science, University of Oxford, Oxford, OX1 3PJ, United Kingdom, mosb@robots.ox.ac.uk.

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Examples - Manufacturing

Recent Developments
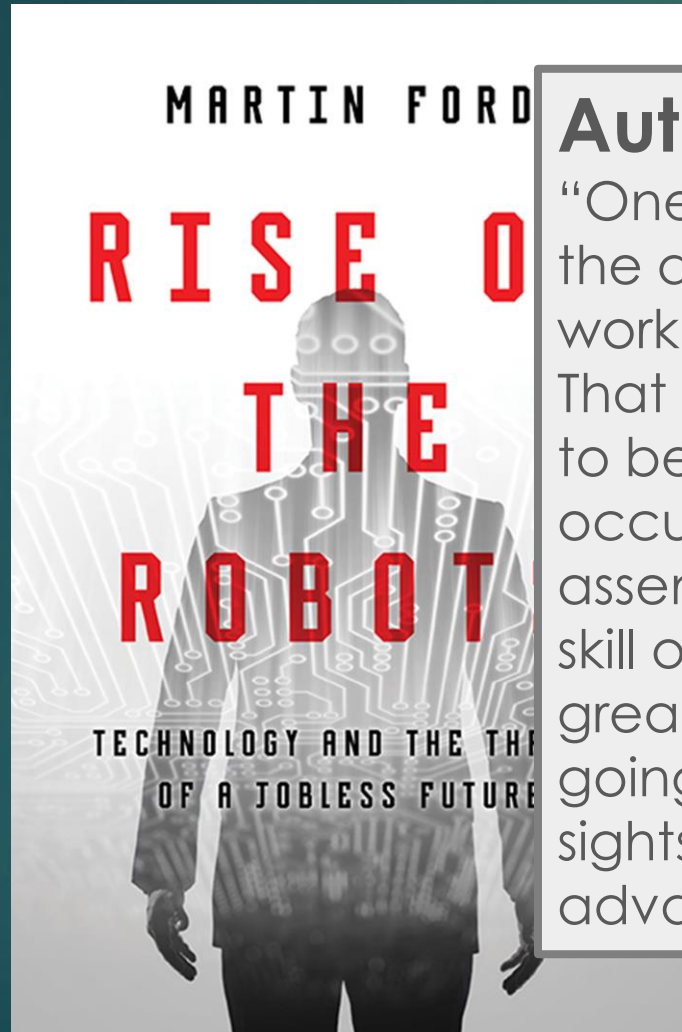 - Reshoring of Manufacturing
 - Lights-out Factories

Manufacturing Output and Employment
Employment in millions; output indexed, 2007=100

— Manufacturing Employment (left)　　— Manufacturing Output (right)

Source: Bureau of Labor Statistics, Current Employment Survey, and Federal Reserve Board, Industrial Production Index.

Examples - Manufacturing


Rodney Brooks – Rethink Robotics

Example – Intellectual Work

Automation – Assumption vs. Reality

"One widely held belief that is certain to be challenged is the assumption that automation is primarily a threat to workers who have little education and lower-skill levels. That assumption emerges from the fact that such jobs tend to be routine and repetitive…At one time, a 'routine' occupation would probably have implied standing on an assembly line. The reality today is far different. While lower-skill occupations will no doubt continue to be affected, a great many college educated, white collar workers are going to discover that their jobs, too, are squarely in the sights as software automation and predictive algorithms advance rapidly in capability." – Ford 2015

MARTIN FORD

RISE O
THE
ROBOT

TECHNOLOGY AND THE THR
OF A JOBLESS FUTURE

Example – Intellectual Work
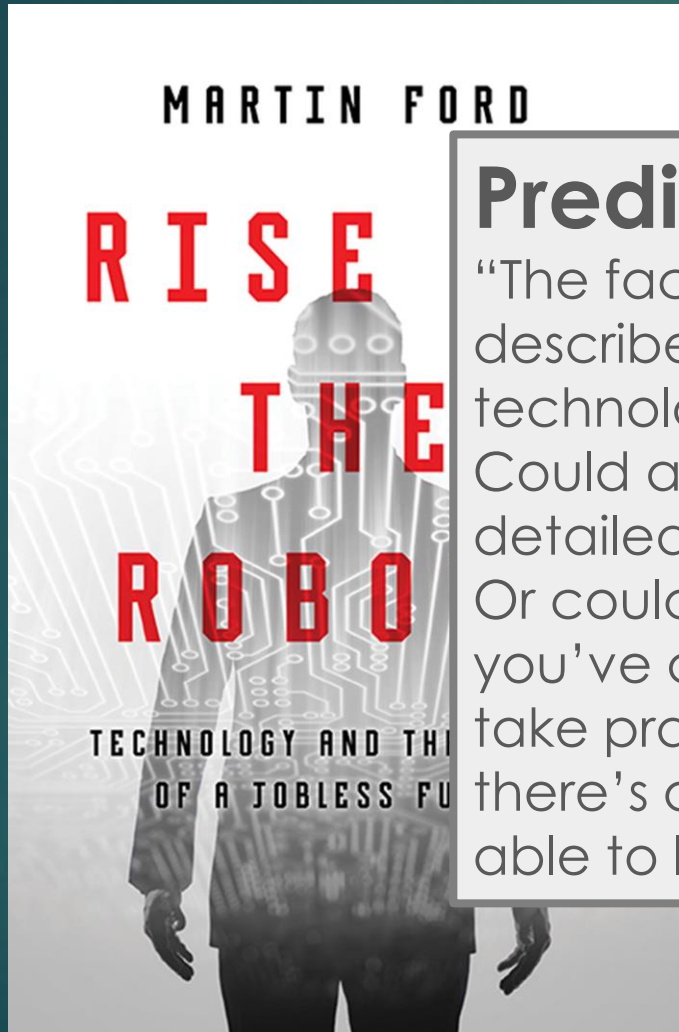
Predictability is a Good Predictor

"The fact is that 'routine' may not be the best word to describe the jobs that are most likely to be threatened by technology. A more accurate term might be 'predictable.' Could another person learn to do your job by studying a detailed recorded of everything you've done in the past? Or could someone become proficient by repeating the task you've already completed, in the way that a student might take practice tests to prepare for an exam? If so, then there's a good chance that an algorithm may someday be able to learn to do much, or all of your job" – Ford 2015

MARTIN FORD

RISE THE ROBO

TECHNOLOGY AND THI
OF A JOBLESS FU

"Hollowing Out"
- Lose entry-level "Medium" employment to automation
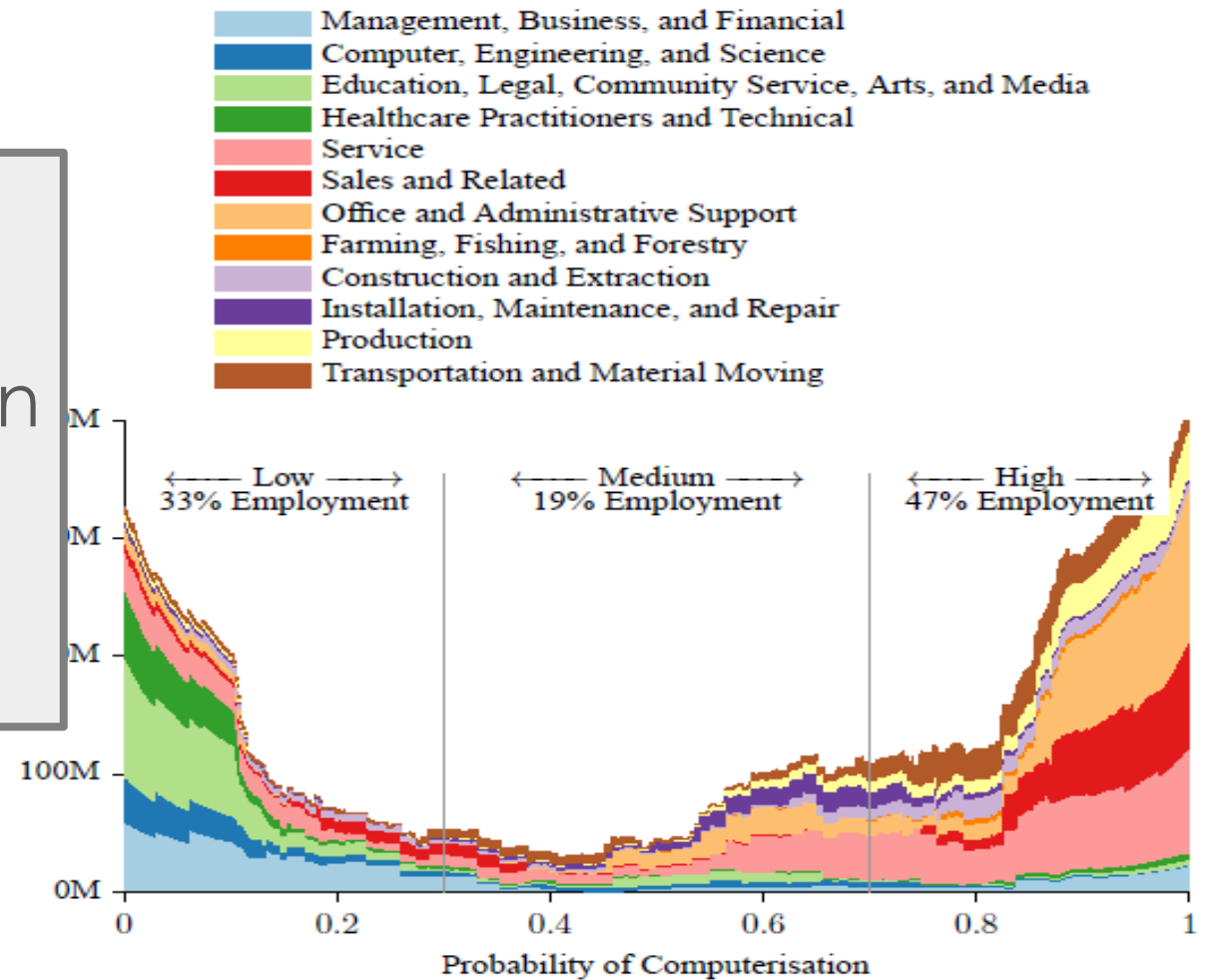- Push employment into the high and low ends of the spectrum

Legend:
- Management, Business, and Financial
- Computer, Engineering, and Science
- Education, Legal, Community Service, Arts, and Media
- Healthcare Practitioners and Technical
- Service
- Sales and Related
- Office and Administrative Support
- Farming, Fishing, and Forestry
- Construction and Extraction
- Installation, Maintenance, and Repair
- Production
- Transportation and Material Moving

Low 33% Employment — Medium 19% Employment — High 47% Employment

Probability of Computerisation

FIGURE III. The distribution of BLS 2010 occupational employment over the probability of computerisation, along with the share in low, medium and high probability categories. Note that the total area under all curves is equal to total US employment.

Figure 3

Occupational growth rates, indexed to 2001

Lower-wage occupations

Higher-wage occupations

Mid-wage occupations
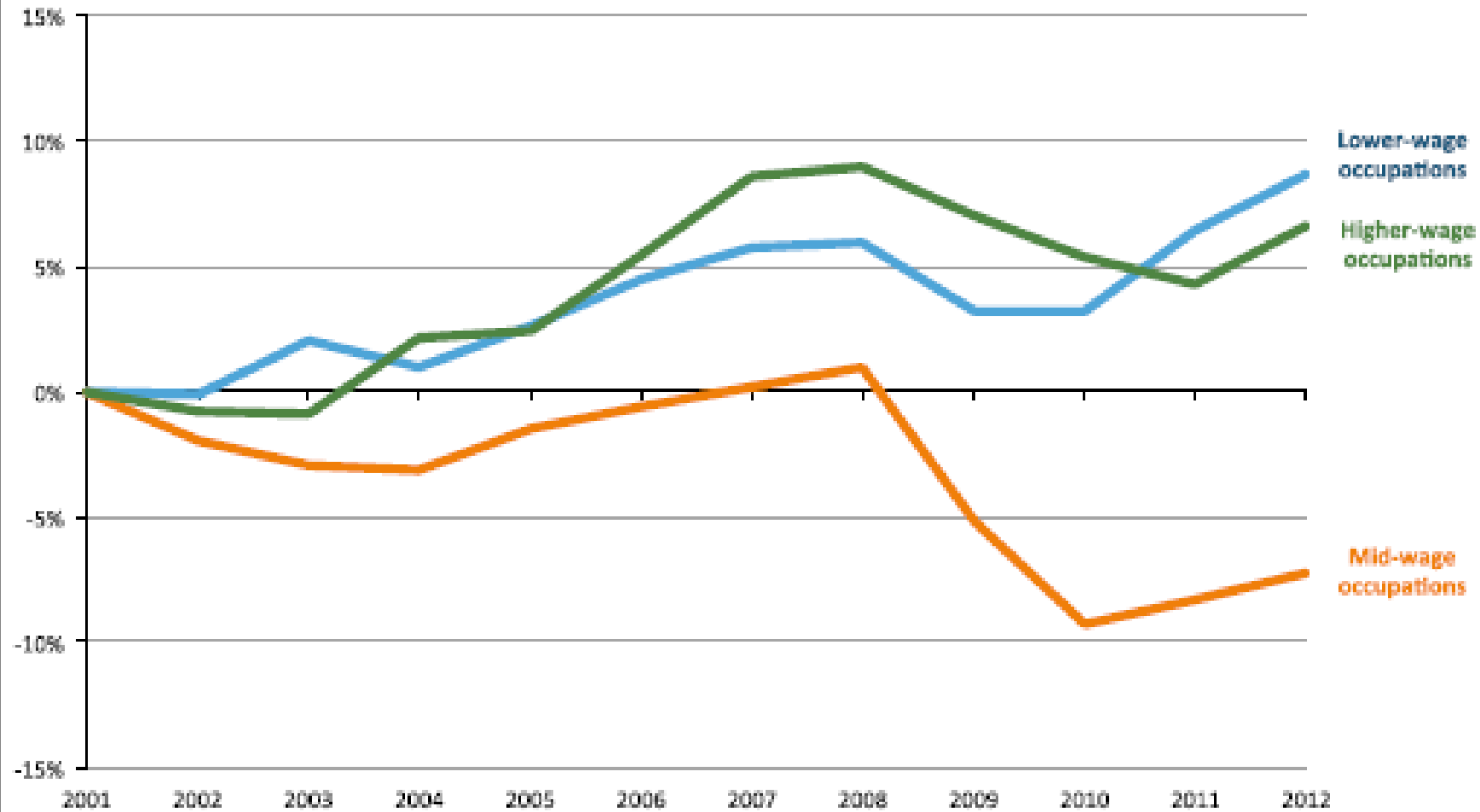
Source: NELP analysis of Current Population Survey.
All estimates measured at Quarter 1.

Example – Intellectual Work

**Big Data
+
Machine Learning
+
Cloud Distribution**

Example – Intellectual Work
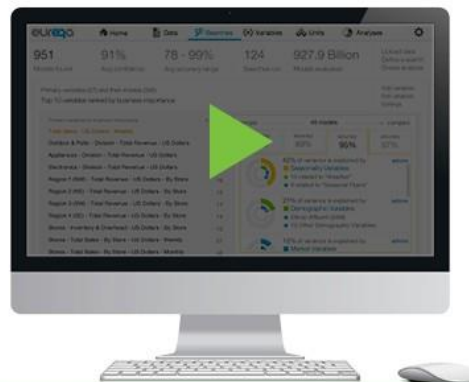
Consequences
1. Optimistic/Utopian

THE SECOND MACHINE AGE

WORK, PROGRESS, AND PR[...]
IN A TIME OF
BRILLIANT TECHNOLOGIE[...]

ERIK BRYNJOLFSSON
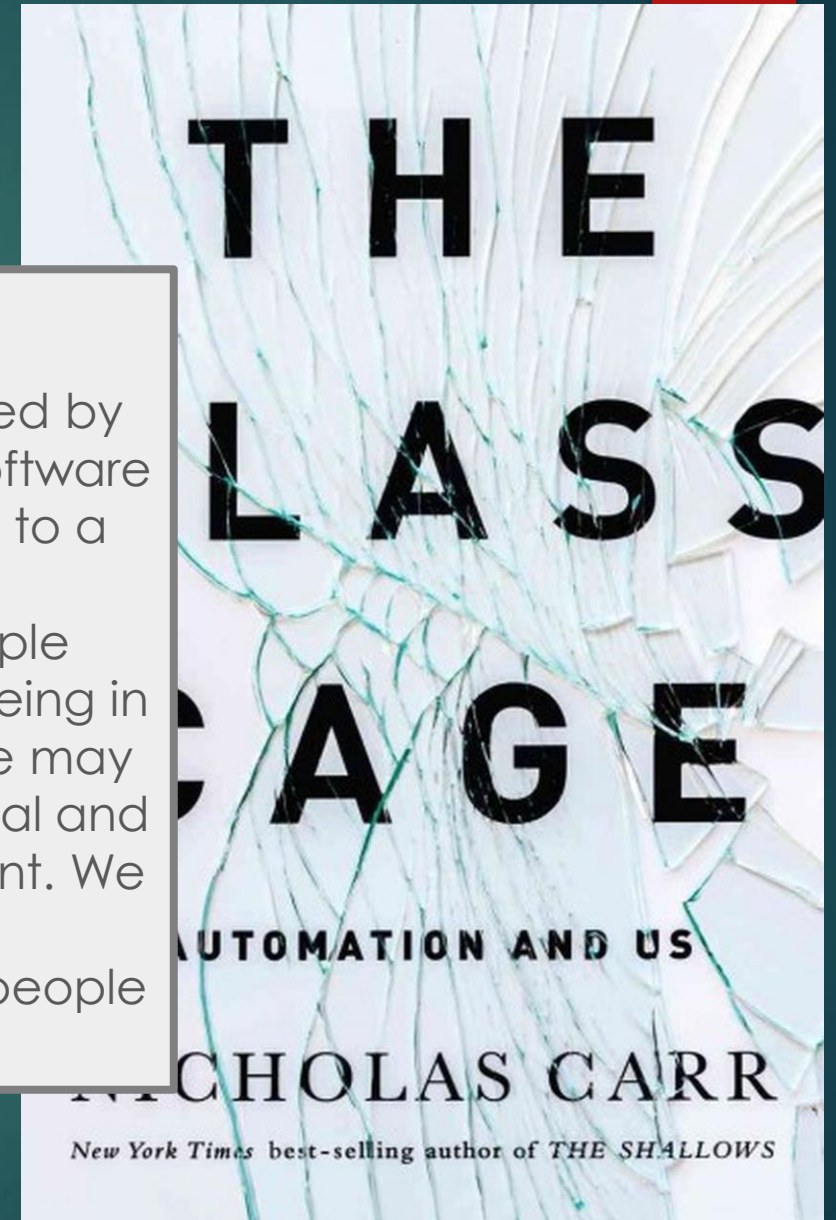ANDREW McAFEE
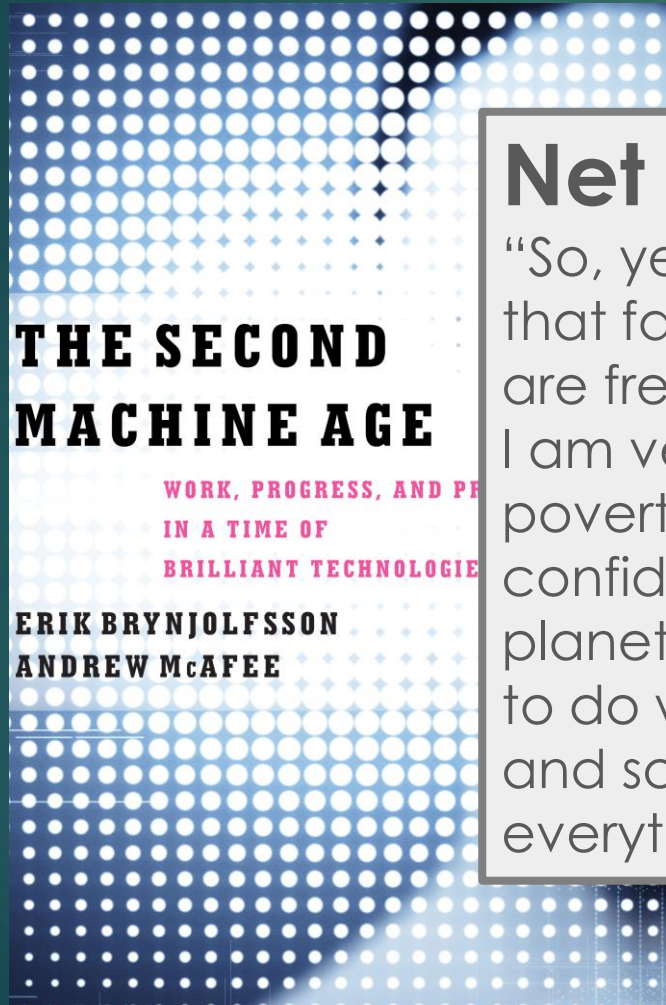
Net Outcome = Good, if not Brilliant

"So, yeah, the droids are taking our jobs, but focusing on that fact misses the point entirely. The point is that then we are freed up to do other things, and what we're going to do, I am very confident, what we're going to do is reduce poverty and drudgery and misery around the world. I'm very confident we're going to learn to live more lightly on the planet, and I am extremely confident that what we're going to do with our new digital tools is going to be so profound and so beneficial that it's going to make a mockery out of everything that came before." – McAfee 2012

Consequences
2. Pessimistic/Dystopian

Warning: Social Strife

"The social and economic problems caused or exacerbated by automation aren't going to be solved by throwing more software at them. Our inanimate slaves aren't going to chauffeur us to a utopia of comfort and harmony. If the problems are to be solved, or at least attenuated, the public will need to grapple with them in their full complexity. To ensure society's well-being in the future, we may need to place limits on automation. We may have to shift our view of progress, putting emphasis on social and personal flourishing rather than technological advancement. We may even have to entertain an idea that has come to be considered unthinkable, at least in business circles: giving people precedence over machines." – Carr 2014

THE GLASS CAGE

AUTOMATION AND US

NICHOLAS CARR

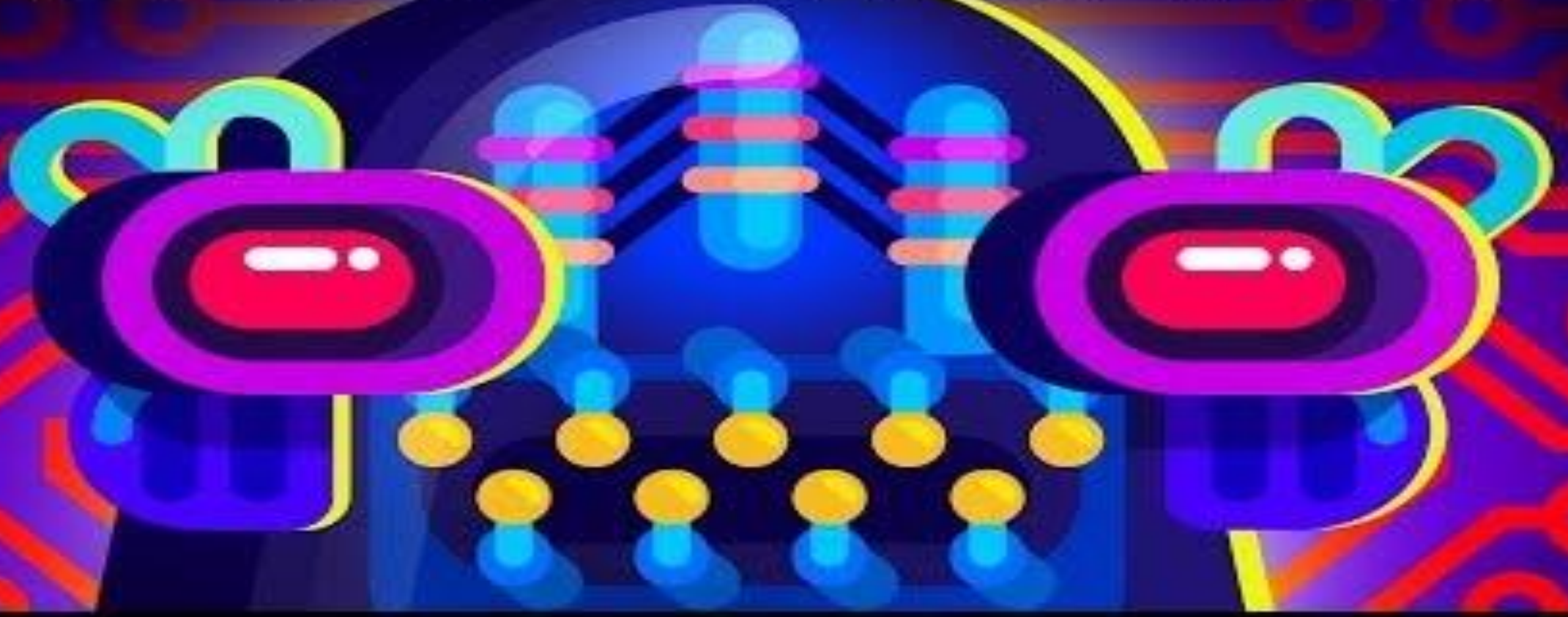New York Times best-selling author of THE SHALLOWS

Consequences

- Questions
  - **Evaluation** - In your opinion, what is the net result of increased automation? Do you agree with the utopian or dystopian predictions? Why?
  - **Planning** - What can we do to address the impact of automation? What can be done in terms of education? What can you do as an individual for your own future?

Today

- **Social Issues**
  - Crawford & Whittaker - AI Now Initiative (video) / (transcript)
  - Knight - The Dark Secret at the Heart of AI
  - Gunkel - Mind the Gap

Preview

▶ Next Class = 28 November

THE MACHINE QUESTION

CAL PERSPECTIVES ON AI,
OTS, AND ETHICS

ID J. GUNKEL

Chapters 1 and 2