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# A.I., Robotics, and the Future of the Staffing Industry


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Tuesday, Oct. 25
2:15–3:30 p.m.

# A.I., Robotics, and the Future of the Staffing Industry

Panel facilitated by
Jason Leverant, PHR, CSP, CSC
President and Chief Operating Officer
@Work Group

Tuesday, Oct. 25, 2:15–3:30 p.m.

1.25 CE

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NEAR FUTURE



## The Emergence of Intelligent Machines

**Bart Selman**
**Cornell University**

## The Emergence of Artificial Intelligence

I *Emergence of (semi-)intelligent autonomous systems in society*
--- Self-driving cars and trucks. Autonomous drones (surveillance and other). Fully autonomous trading systems. Household and service robots. Intelligent assistants.

II *Shift of AI research from academic to real-world*
--- Enabled by qualitative change in the field, driven by "Deep Learning" / Big Data.

## Reasons for Accelerated Progress in AI

--- series of events

--- main one: ***machine perception*** is starting to work (finally!)

systems are starting to "*hear*" and "*see*"

after "only" 50+ yrs or research…

--- dramatic change: lots of AI techniques (reasoning, search, reinforcement learning, planning, decision theoretic methods) were developed assuming perceptual inputs were "somehow" provided to the system. But, e.g., robots could not really see or hear anything…

(e.g. 2005 Stanley car drove around "blind", Thrun)

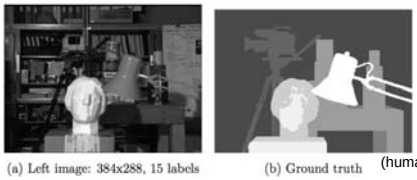
Now, we can use output from a perceptual system and leverage a broad range of existing AI techniques.

Our systems are finally becoming "grounded in (our) world."

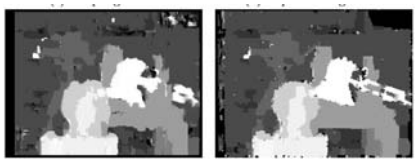
Already: super-human face recognition (Facebook)

super-human traffic sign recognition (Nvidia)

## Computer vision / Image Processing ca. 2005



(a) Left image: 384x288, 15 labels (b) Ground truth (human labeled)



Processed image

## Computer vision today

### DEEP LEARNING FOR SELF-DRIVING CARS

(Nvidia 2016)

Real-time tracking of environment (360 degrees/ 50+m) and decision making.

## Opportunities

**Example: RoboBrain project (Saxena et al.)**

**--- goal: build a shared, large knowledge base for robots to be able to function in human environment (e.g. house) ("assistive robotics")**

**--- robot learns to recognize human activities from video input ("activity recognition")**

**--- *anticipates* human behavior for collaboration**

**--- uses planning and reasoning techniques to synthesize action sequences with hundreds of actions (leveraging existing technology)**

**robots are starting to learn and plan in new and complex behaviors in rich unconstrained environments**

## Factors in accelerated progress, cont.

**--- deep learning / deep neural nets**

**success is evidence in support of the "hardware hypothesis" (Moravec) (*)**

***core neural net ideas from mid 1980s***

**needed: several orders of magnitude increase in computational power and data**

**(aside: this advance was not anticipated/predicted *at all*; many AI/ML researchers had moved away from neural nets…)**

**+ BIG DATA!**

## Computer vs. Brain


**approx. 2025**

**Current: Nvidia: tesla personal super-computer 1000 cores 4 teraflop**

Progress, cont.

**--- crowd-sourced human data --- *machines need to understand our conceptualization of the world.* E.g. vision for self driving cars trained on 100,000+ miles of labeled road data.**

**--- engineering teams (e.g. IBM's Watson)**
**strong commercial interests**
**at a scale never seen before in our field**

**--- Investments in AI systems are being scaled-up by an order of magnitude (to billions).**
**Google, Facebook, Baidu, IBM, Microsoft, Tesla etc. ($1B+)**
**+ military ($19B proposed)**

**An AI "arms race"**

**The emergence of intelligent autonomous machines among us is expected to have a major impact on society.**

***"Preparing for the Future of Artificial Intelligence"***
**White House Report,**
**Executive Office of the President, Oct. 2016**

**Issues:**
**1) AI Safety & Ethics**
**2) Who benefits?**
**3) Employment**

## Humans, Machines, and Work: The Future is Now

*Moshe Y. Vardi*
Rice University

*Follow me on social media*

## The Automobile: Societal Costs

*Worldwide*:

- 1.25M deaths in 2013
- 20-50M are injured or disabled annually
- More than half of all road traffic deaths occur among young adults ages 15-44
- Road crashes are the leading cause of death among young people ages 15-29,
- Road crashes cost annually > $0.5T
- *Human error accounts for more than 90% of car crashes*

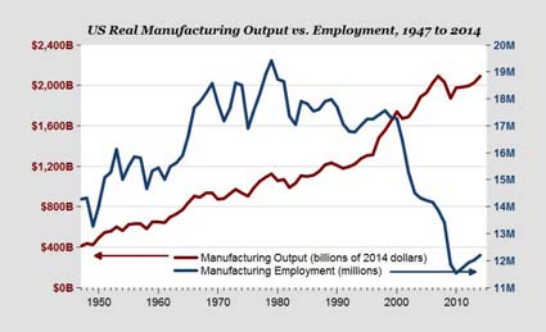
## The Automation of Driving

- 30 companies are now making self-driving cars – *estimated market: $2-5T over next decade*
- Technical issues to be resolved within 10 yrs
- Many legal issues need to be resolved
- Profound business disruption:
  - Major industrial contraction (cars are now idle 90% of the time)
  - "Major loss of business" for insurance, legal, and medical industry
- ***Huge societal benefit***: *reduce accidents, liberate elders and the disabled*

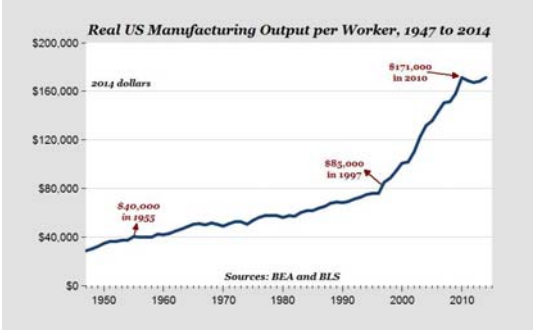
## What about the Drivers?

- 4M truck+taxi drivers in the US
- 15M US jobs involve operating a vehicle
- Automation of the whole supply chain is expected: *cargo ships, ports, trucking, warehouses, delivery*, …
- ***Bottom Line***: Massive loss of jobs!
  - But, new jobs will be created. Right?
- ***Comparison***: Driving vs Manufacturing

## Decoupling in US Manufacturing

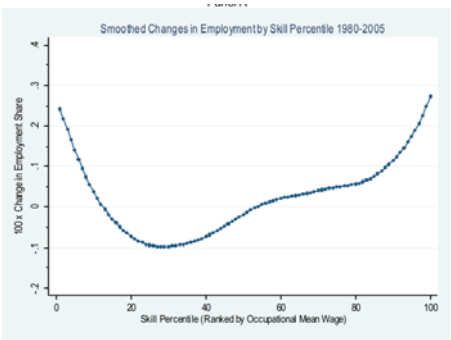



## Driving Force: Automation

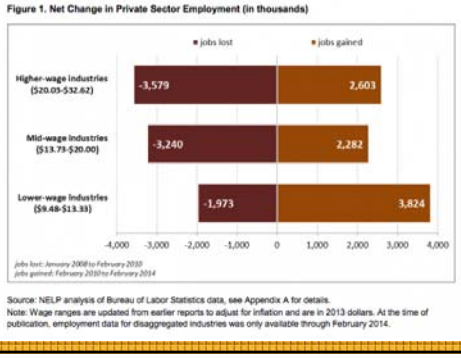


## Tesla Model S Factory Floor

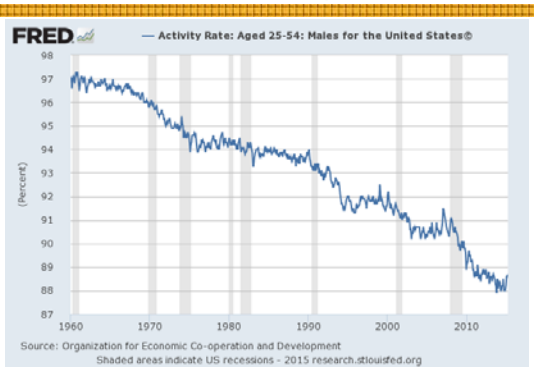
## Job Polarization



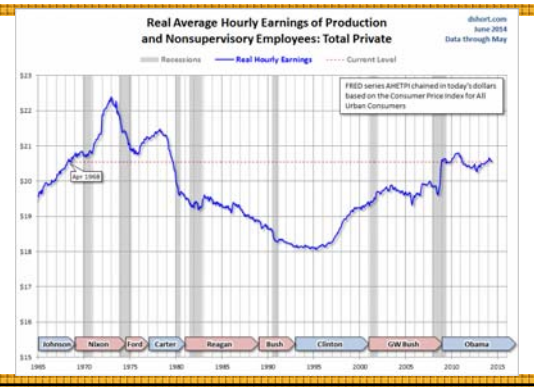

## Jobs Lost and Gained



## Labor-Force Participation - Men




## Real Hourly Earnings




## Technology and Work

**Threefold Impact**:

- **Substitution**: replacement of human labor by machines
- **Unbundling**: replacement of "jobs" by collection of "tasks"
- **Disintermediation**: elimination of intermediaries

## Unbundling of Jobs

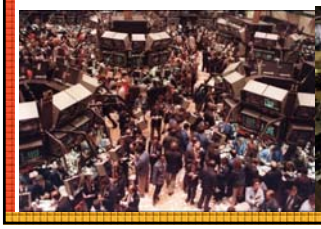
- R. Coates, 1937: "The Nature of the Firm"
  - Firms hire workers to reduce transaction costs
- **Conclusion**: If transaction costs can be reduced, then firms should contract out and not hire.
- **Job**: an organizational role to perform a set of tasks
- **Conclusion**: If transaction costs are low enough, then jobs can be broken into their constituent tasks and contracted out.

## The Contingent Workforce

- US GAO, May 2015 -- *Contingent Workforce: Size, Characteristics, Earnings, and Benefits*:
  - "We estimate that contingent workers comprised 35.3 percent of employed workers in 2006 and 40.4 percent in 2010."
- McKinsey, Oct. 2016 -- *Independent work: Choice, necessity, and the gig economy*: "1 in 3 workers employed in Gig Economy, but not all by choice"

## Disintermediation

- *The removal of intermediaries from a supply chain in connection with a transaction or a series of transactions.*



## Disintermediation of Travel Agents


## The Platform Economy

- Uber, Lyft
- Airbnb
- LinkedIn
- Amazon, Google, Microsoft
- TaskRabbit, UpWork, Fiverr

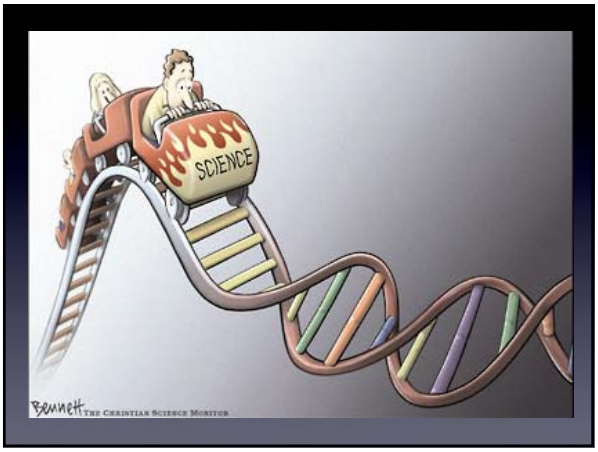
**Question**: How many participants will Staffing World have in 2026?

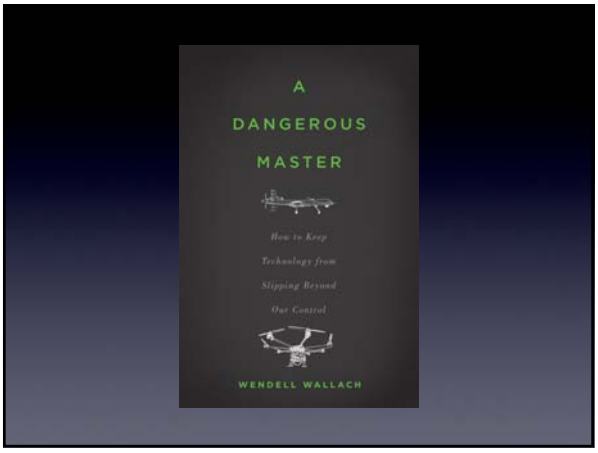
## Humans, Machines, and the Future of Work

- Conference at Rice University, Dec. 5-6, 2016, delange.rice.edu

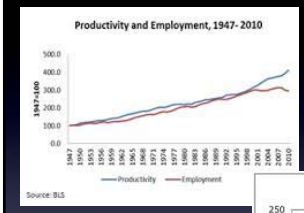
# Policy Responses To Technological Unemployment

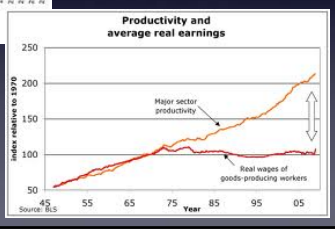
Wendell Wallach
Yale Interdisciplinary Center for Bioethics
San Diego – October 2016



# Technological Unemployment



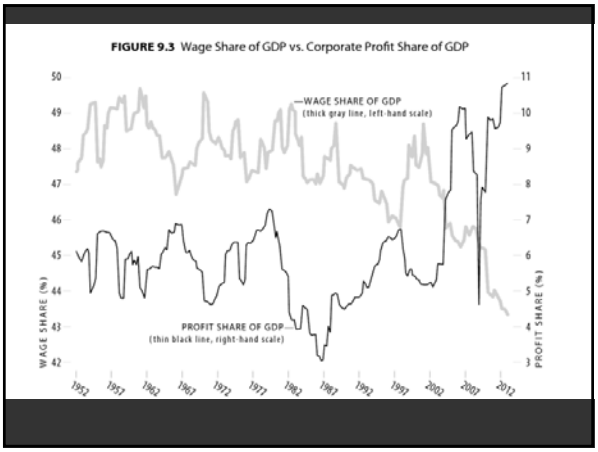

..more jobs are lost to cheap overseas markets than to robots being implemented in existing companies…

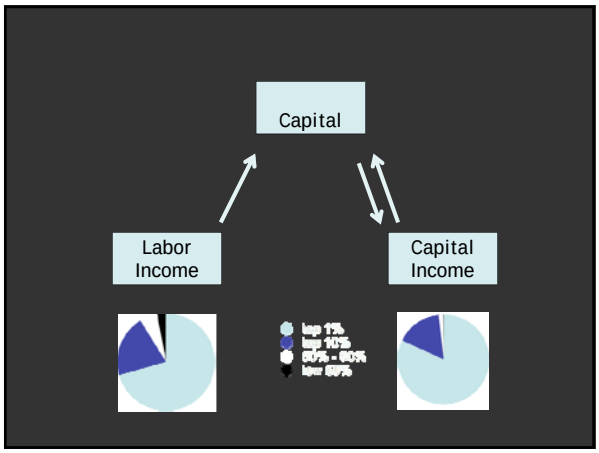
Robots are generally used in positions better suited to robots..

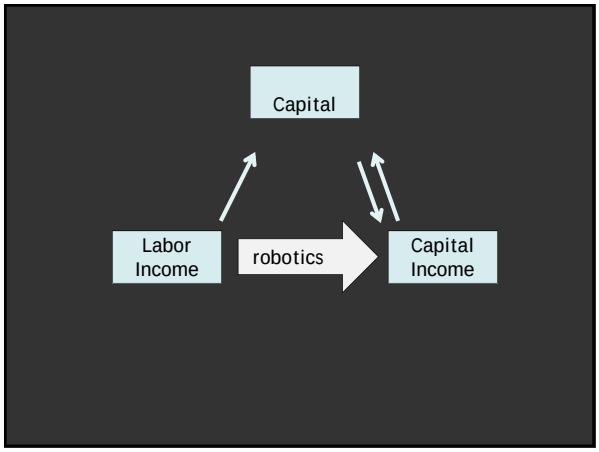
People are designed to use their minds.

- John Dulchinos, Adept

Also:
People are living longer and retiring later.

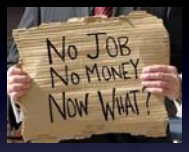





## Policy Responses

- Protect Employment
- Shorten Work Week – Year – Life
- Retraining and Curricular Innovation
- Make New Work
- Redistribution and Expansion of the Social Safety Net




Martin Ford (2015) Rise of the Robots:

Gary E. Marchant, Yvonne A. Stevens and James Hennessy (2014) "Technology, Unemployment & Policy Options"

James J. Hughes (2015) "Preparing for Technological Unemployment

## Protecting Unemployment

- Option:
  - Mandate human workers
  - Place legal and regulatory limits on tech. development
- Downside:
  - Can reduce quality, consumer convenience and increase cost
  - New Jersey gas station owners now want a ban on self-serve reversed

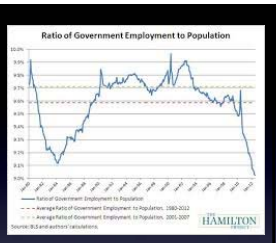

## Shorter Work Week, Year, Life

- Options:
  - Lower mandatory retirement
  - Mandate more vacation time
  - Shorter work week
- Upside
  - Quality of life is improved
- Downside
  - Exacerbates quality of old-age for some
  - Redistribution of existing jobs has costs and can lower consistency and continuity


## Retraining and Curricular Innovation

- Option:
  - Expand subsidized higher education
  - Online education competency
  - Focus on high-end liberal arts skills rather than training for narrow occupations.
- Upside:
  - Encourage broad curricula
  - Make Higher Ed more accessible
- Downside:
  - Increases fiscal burden on state


## Make New Work




- Options
  - Expand or guarantee public employment
  - National service
  - Subsidize private sector work
- Upside
  - Provides needed jobs and services
- Downsides
  - Increases fiscal burden


## High Touch Economy

## Redistribution, Expansion of Safety Net

- Option:
  - Expand universal healthcare and other social programs
  - Negative income tax or universal basic income guarantee
- Upside:
  - Improves financial security
- Downsides
  - Increases burdens on state
  - Political resistance
    - Opposition to “entitlements”

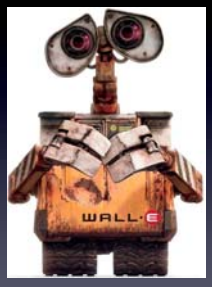
## Importance of a Job

- Fundamental to one's sense of self.
  - Can well-being be maintained without a job?

## Conclusions

- Technological change is a cause of unemployment and inequality.
- Expansion of safety net, educational investment, and public job creation are all necessary to support economic growth.
- Everyone will increasingly come to rely on "entitlements" and redistribution.

## Thank You!




Email address: wendell.wallach@yale.edu

## Thank You for Attending

Jason Leverant, PHR, CSP, CSC
President and Chief Operating Officer
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