Only Humans Need Apply: Winners and Losers in the Age of Smart Machines

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Leaders Excellence

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Many Roads Lead to Automation

Expensive labor

Too much data

Need for accurate decisions

Tedious work

Powerful technologies
Smart People Are Concerned About AI

- “I am in the camp that is concerned about super intelligence…I don’t understand why some people are not concerned.” (Bill Gates)

- “The development of full artificial intelligence could spell the end of the human race.” (Stephen Hawking)

- “Advancing machine intelligence is the most important problem facing the world today.” (Nobel economist Robert Schiller)

- “We will soon be looking at hordes of citizens of zero economic value…[It is] the greatest challenge facing free market economies in this century.” (Michael Malone, Bill Davidow)
Why Should We Care?

► Work matters to human meaning and happiness
► The technology is getting more capable by the day, and we aren’t
► Previous technological revolutions have created substantial dislocations, and the middle class is already threatened
► Our society is already highly unequal, and becoming more so
► Unless we determine the appropriate role for humans in this revolution, there may be substantial resistance to a technology that could provide substantial value

Ned Ludd
And Automation Is a Pain

► At a minimum, substantial displacement of human workers in the short run
► In many cases, humans prefer to be served by humans
► Automation is often a race to the bottom
► Difficult to combine automation with creativity and frequent innovation
Yet Service Automation Is Proceeding Apace

Service jobs with substantially automated components:

1. Secretary—appointment scheduling
2. Landscaper—lawn mowing
3. Hamburger chef
4. Taxi driver
5. Long-distance truck driver
6. Farm equipment driver
7. Longshoreman—loading ships
8. Hotel clerk/concierge—checking in, providing advice
9. Call center representative—solving customer problems
10. IT technician—fixing servers and networks
Is Knowledge Work Next to Go?

- Mechanical Systems
- Transactional Computers
- Cognitive/Analytical Computers

- Manual Labor Jobs
- Admin/Service Jobs
- Knowledge Work Jobs

18th-19th C.  20th C.  21st C.
My Answer Is…Yes…and No

- Many knowledge work job *tasks* are at risk of being automated
- Some knowledge workers will lose their jobs, but it will be on the margins
  - We’ll need 8 lawyers instead of 10
- There are going to be a lot (no one knows how many) of jobs working alongside smart machines
- We’ll have plenty of productivity gains, so we can afford to retrain and redeploy people if we want to
- But there is no room for complacency!
Ten Automatable Knowledge Work Jobs

1. Teacher/Professor—online content, adaptive learning
2. Lawyer—e-discovery, predictive coding, etc.
3. Accountant—automated audits and tax
4. Radiologist—automated cancer detection
5. Reporter—automated story-writing
6. Marketer—programmatic buying, focus groups, personalized e-mails, etc.
7. Financial advisor—”robo-advisors”
8. Architect—automated drafting, design
9. Financial asset manager—index funds, trading
10. Pharmaceutical scientist—cognitive creation of new drugs
Technologies Driving Knowledge Work Automation

► Analytics and big data
► Machine learning
► Neural networks/deep learning
► Rule engines
► Event stream/complex event processing
► Natural language processing
► Robotic process automation
► Custom integrations and combinations of these in a “cognitive cloud”
## Just How Smart Are Smart Machines?

<table>
<thead>
<tr>
<th>Level of Intelligence</th>
<th>Task Type</th>
<th>Human Support</th>
<th>Repetitive Task Automation</th>
<th>Context Awareness and Learning</th>
<th>Self-Aware intelligence</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Analyze Numbers</td>
<td>BI, Data visualization, hypothesis driven analytics</td>
<td>Operational analytics, scoring, model management</td>
<td>Machine learning, neural nets</td>
<td>Not yet</td>
</tr>
<tr>
<td></td>
<td>Digest Words, Images</td>
<td>Character and speech recognition</td>
<td>Image recognition, machine vision</td>
<td>Q&amp;A, natural language processing</td>
<td>Not yet</td>
</tr>
<tr>
<td></td>
<td>Perform Digital Tasks (Admin and Decisions)</td>
<td>Business process management</td>
<td>Rules engines, Robotic process automation</td>
<td>Not yet</td>
<td>Not yet</td>
</tr>
<tr>
<td></td>
<td>Perform Physical Tasks</td>
<td>Remote operation</td>
<td>Industrial robotics, collaborative Robotics</td>
<td>Fully autonomous robots, vehicles</td>
<td>Not yet</td>
</tr>
</tbody>
</table>
The Technology Is Great—But How About People and Processes?

► People
   ▶ We need an alternative to automation
   ▶ We need to begin preparing people for the impacts of these technologies

► Processes
   ▶ Identify those in need of more and better cognition
   ▶ Measure them, implement quickly, achieve value quickly
   ▶ Design what people and cognitive technologies do in them

(Pages and pages of similar graphics on Google Image, so all three must be necessary!)
People: Automation or Augmentation?

► Augmentation—smart humans helping smart machines, and vice-versa

► People do this by aiding automated systems that are better than humans at their particular tasks, or by focusing those tasks at which humans are still better

► The classic example: freestyle chess
  ► Better than humans or automated chess systems acting alone
  ► Humans can choose among multiple computer-recommended moves
  ► Humans know strengths and weaknesses of different programs

► We’ve seen this before: textile machinery, spreadsheets
Five Ways of Stepping

► **Step in**—humans master the details of the system, know its strengths and weaknesses, and when it needs to be modified

► **Step up**—humans take a big-picture view of computer-driven tasks and decide whether to automate new domains

► **Step aside**—humans focus on areas they do better than computers, at least for now

► **Step narrowly**—humans focus on knowledge domains that are too narrow to be worth automating

► **Step forward**—humans build the automated systems
The Five Augmentation Steps for Financial Advisors

► **Step in**—advisors become experts in online advice, and assist clients to use it to their best advantage

► **Step up**—advisors identify the domains most in need of automation, or those already automated needing improvement

► **Step aside**—advisors primarily communicate with clients, but don’t make decisions for them—or work outside investments

► **Step narrowly**—advisors identify a narrow client segment or investment type

► **Step forward**—advisors use their expertise to build and support robo-advisor systems
Cognitive Processes—Criteria and Examples

- Knowledge bottleneck
  - Veterinary diagnosis and treatment
- Need for decision quality and consistency
  - Insurance policy, credit underwriting
- Too much data or content for humans to digest/analyze
  - Oncology, digital marketing
- Cognition currently too expensive for broad application
  - Investment advice, college education
Oncology Treatment, For Example

- Over 400 types of cancer
- Hundreds of oncogenes and tumor suppressor genes
- Biome probably implicated in cancer too
- Oncology information needs to be integrated with EMR data
- Over 75 different drugs for breast cancer alone
- Treatment options changing very quickly
- In short, too hard for humans, but machines don’t find it easy either—yet
Implications for Organizations

- Take an augmentation perspective from the beginning
- Pick the right cognitive technology for your problem
- Get good at work design for smart humans and smart machines
- Give your people the options and the time to transition to them
- Put someone in charge of thinking about this
Implications for Government and Education

**Government**
- Start a public dialogue on automation and augmentation
- If necessary, guarantee jobs, not incomes
- Encourage augmentation with tax and licensing policies
- Engage with NGOs and private sector organizations for planning and policy

**Education**
- STEM and computer science for step in, step forward roles
- Arts, social/emotional intelligence for step aside roles
- Let students follow their passions for step narrowly roles
What Are You Waiting For?

► The technology is good, and getting better rapidly
► Knowledge workers are ready to have their work augmented and to augment smart machines
► Cognitive processes need improvement and innovation
► Start your machines!