What AI and Robotics May Mean to Our Professions and Education

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THE WORLD AROUND US
There are lots of ways of being smart that aren’t “smart like us.”
Computers are becoming increasingly capable.
• Watson in healthcare: Combines clinical guidelines, medical literature and patient data equivalent to 300 million books; other uses in manufacturing, logistics, finance
• AI will contribute up to $15.7 trillion to the world economy by 2030
  • $6.6T from increased productivity
  • $9.1T from consumption-side effects
• Global GDP may grow 14% as a result of AI

Artificial Intelligence

• Solves problems but doesn’t replicate the thinking process of humans
• Uses “brute force” computing” enabled by massive processing power and memory
• By the early 2020’s Watson will sit on a smartphone

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Machines develop new knowledge by feeding on information.
Knowledge Integration Toolkit (KnIT) mines literature to formulate hypotheses that are most promising.

Automated hypothesis generation helps researchers focus lab resources in the most promising areas.

Tool read medical literature to understand functional properties of protein p53 then made predictions.

- Knowledge processing may extricate us from information overload.
- One new scientific paper published every 30 seconds.
- Scientists read 1-5 per day.
- Helps scientists deal with > 50 million papers in public databases.
Machines can work alongside professionals as partners.
Robotic Sensing

- Ability to hear (signal processing)
- Ability to see (image processing)
- Ability to touch (pressure and pattern processing)
- Sense speed, temperature, pressure, wind

Robots Interact with the World

Uses of robots include:

- Manufacturing
- Remove and minimally invasive surgery
- Underwater exploration
- Investigating hazardous environments
- Companions
Machines can amplify human performance.
“Man and Machine”

- Deep Blue beat Garry Kasparov in 1997
- Kasparov pioneered man-plus-machine matches: Freestyle chess matches
- Marries human intuition and creativity with brute-force calculations

Centaur Chess
- Centaur players listens to the moves suggested by AI but may override them
- Today’s best chess player is a centaur
- In 2014 Freestyle Battle Centaurs won 53 games; AI won 42
- More people than ever play chess
Machines can empathize.
AI and the Aging

- Social companion technology
- Goes beyond a home assistant
- Animatronic gestures, content, and support
- Monitors wellness
- Can help the elderly navigate technology

ElliQ
- Uses video chats, online games, social media, messaging
- Recommends activities, appointments or medication reminders, etc.
- Designed as a table object not a robot
- “Body language” (position, tone, light) conveys emotion
- Learns preferences, behavior and personality of owner
Machines can discern patterns, identify trends and make accurate predictions.
Machines can perform cognitive tasks that often required human intelligence.
Machines can interact with manual skill and dexterity in the physical world.
Machines can detect and express emotions.
THE PROFESSIONS
Professional work is being reconfigured.
Knowledge processing may extricate us from information overload.
Patterns & Predictions

• Move beyond information retrieval to knowledge processing
• Helps solve problems by offering advice
• Discern patterns and make predictions
• Highlight patterns, correlations and insights not previously seen

Artificial Intelligence for Drug Discovery

Atomwise is the creator of AtomNet, the first Deep Learning technology for novel small molecule discovery, characterized by its unprecedented speed, accuracy, and diversity.

Research groups that partner with Atomwise gain powerful advantages in the scope, scale, and success rates of their drug discovery programs.

Atomwise
• Uses algorithms to speed drug discovery
• Focuses on existing drugs and compounds
• Takes the side effects of known drugs and looks for those that might help solve a pressing medical issue
• Early success: 2 drugs help reduce the spread of Ebola
New sources of expertise are emerging.
By actively involving people in their own care, we’re changing lives...

Sounds great, but how does it work? Let’s break it down:

1. **People like you share symptoms, treatment info, and health outcomes.**
2. **PatientsLikeMe turns that into millions of data points about disease.**
3. **...and aggregates and organizes the data to reveal new insights.**
4. **We share back what we’ve learned with everyone – that’s our give data, get data philosophy.**
5. **Then, we share the patient experience with the industry so they can develop better products, services, and care.**

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**Community of Experience**

- Clinical research platform
- Members contribute data which is used by clinicians, pharmaceutical companies, federal agencies, research institutions
- Patients use platform to find new options for treatments and connect with others

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**PatientsLikeMe**

- Social networking site for patients/families with rare and chronic diseases
- 500,000 people report on their experience with 2,700 conditions; 40 million member data points
- In 2016 partnered with Duke’s ALS clinic speeding enrollment to 9.5 patients/month vs 1-2 for other trials
Talent strategies are replacing hiring strategies.
Nearly all job openings are posted online
With natural language processing resumes, transcripts, test results and job descriptions are machine readable
Technology can tackle the “skills gap” by improving matching, reducing time-to-hire and improving retention

78% of large companies rate talent analytics as urgent
Tools include:
• Quality of hire analysis
• Competency-based hiring
The way professionals are identified and selected is changing.
Discovering Talent

• Simulation as a predictor of on-the-job performance
• Helps identify top talent at institutions employers don’t usually recruit from
• 48% of hired students are female (compared to 75% male new hires in companies)

EquitySim
• Simulation platform for trading stocks, bonds, currencies and securities
• Target audience: employers seeking talent
• EquitySim serves as recruiter for entry-level trading positions
Expertise is more accessible and affordable than ever before.
Rethink Access to Justice

- Online dispute resolution is a means of resolving low-level civil claims
- eBay resolves 60 M disputes/year with ODR
- Other uses: No-fault insurance disputes and property tax appeal resolutions

Rechwijzer: Online Dispute Resolution

- Online dispute resolution platform for relational disputes (divorce, separation, custody disputes)
- Designed for empowerment rather than efficiency
- ODR helps address “crisis of access to justice” with more affordable and user-friendly service with cost savings for the court system
Occupations will evolve alongside increasingly capable machines.
Jobs Gained, Changed and Lost by 2030

- One-third of the workforce may need to learn new skills or occupations
- 8-9% of labor demand will be in new types of occupations
- It will be a challenge to ensure professionals have the skills to support the transition to new positions

Jobs Changed

- New technologies have spurred the creation of more jobs than they have destroyed
- When tasks are automated, workers perform new tasks
- New technologies have raised productivity growth
IMPLICATIONS
Machines will augment human capability.
AI in Higher Education

- Teacherbots may facilitate discussion (e.g., “Jill Watson” at Georgia Tech)
- Integrated student support platforms
- Augmented hypothesis generation

Genie (Deakin University)

- Intelligent virtual assistant provides student advice
- Genie is a platform, presented through a mobile application, comprised of chatbots, artificial intelligence, voice recognition, and a predictive analytics engine
- Platform is integrated with LMS, library and Watson
Changes in our professions will challenge the talent building capacity of academia and business.
IBM Badges and Northeastern University

- IBM badge credentials can be used towards 3 Northeastern University professional master’s degrees:
  - Data analytics
  - Project management
  - Program and portfolio management

- Provides pathway from workplace learning to academic degrees
- IBM has issued more than 500,000 badges; more than half have been matched to NU’s academic portfolio
- NU has other learning initiatives with other firms (e.g., General Electric)
Learning will come in all sizes.
Micro-learning

- Microlearning: skill-based education using micro-content
- Activities can be integrated into the learner’s daily routine
- Example: Series of emails with simple suggestions

Google “Whisper” Courses

- Microlearning is used to nudge managers to take action when they receive management survey results
- Managers who receive whisper lessons improve on the attribute by 22-40%
- 95% of participants recommend the course
The transparency between education and the labor market will grow.
Online talent platforms help match job-seekers with skills and link to the labor market—a way of closing the skills gap. They can reduce time-to-hire.

Credential and competency clearinghouse across consumers, employers and institutions.

530M registered members; 200 countries.

An “operating system” for connecting talent.

Skill development options help aspirants prepare for better careers.

Ranking and outcomes database for colleges and universities.
The demand for integrated and validated credentials will expand.
Degreed Skills Certification

- Scores skills in areas such as writing, sales, programming, leadership
- Scoring process involves peer and expert review
- Machine learning and inter-rater reliability will improve consistency and confidence in reviews

Validate Current Skills

- Measures what people know regardless of how they learned it
- Companies can codify the skills of employees
- Employees can have their skills professionally certified
- Reduces many forms of bias, such as gender or age
Sustainable career paths depend on transferable skills.
“Mobility Skills”

“Soft skills” are really employability or mobility skills

- Critical thinking
- Problem-solving
- Communication
- Collaboration
- Planning and project delivery
- Teamwork
- Metacognition

- Creativity and problem-solving are in demand even as more tasks are done by computers
- Skills in high demand, but less commonly found in graduates, include:
  - Communication skills
  - Creative problem solving
  - Strategic thinking
QUESTIONS
What are the implications for the curriculum?

• Will shorter educational experiences throughout life become the “new normal”?

• How do we prepare students for a new division of labor between people and machines?

• Should understanding algorithms become part of the curriculum? Should students become “data literate”? 
Does a degree expand into a lifelong talent strategy?

• How should institutions address the need for a “talent strategy” and interconnect education and labor markets?

• How should institutions address the demand for long-term learning relationships that build “mobility” skills and new credentials?

• How will colleges and universities work with business and government? What policies might change?
Are we prepared to work alongside machines and systems as partners?

- How do we make expertise more accessible and affordable than ever before?
- How do we best allocate tasks between humans and machines?
- How do we reinforce the importance of moral capability and taking responsibility for choices made?
CLOSING THOUGHTS
Computers are increasingly capable.
Professional work is being reconfigured.
Our students must learn to work with machines as “co-workers.”