# Mapping the Human-Technology Partnership

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# The Challenge

- The landscape of jobs and work is changing at unprecedented speed, driven by
  - **Technological advances**: artificial intelligence, robotics, global connectivity, flexible manufacturing, …
  - **New models of work, careers, education**: gig economy, remote workforce, life-long learning, …
  - **External forces**: globalization, pandemics, geopolitics, …
- Historical opportunities, but many challenges
  - Mismatch of US education system and needs of employers
  - Threats to privacy and algorithmic bias
  - Tension between economic efficiency and robustness to “black swan” events

# NSF FoW-HTF Program

- Joint program of the NSF directorates for
  - Engineering
  - Social, Behavioral, & Economic Sciences
  - Education & Human Resources
  - Computer & Information Sciences & Engineering
- One of NSF's "Big Ideas"
  - Now in its 3rd year
  - $30 million @ year in awards

# Future of Work at the Human Technology Frontier

**Convergent** research integrating future work, future technology, and future workers.

- **Future Workers:** Address the worker as an individual or in teams, including education & training
- **Future Technology:** Engineering & computer science technologies that will develop the human-technology partnership in future workspaces, including offices, classrooms, warehouses, farms, & factories
- **Future Work:** Considers a societal, economic, professional, occupational, industrial, or national context

The FW-HTF program occupies the intersection of these elements

# Objectives

The specific objectives of the FW-HTF program are to …

- **Facilitate convergent research** among engineering, computer science, learning sciences, research on education and workforce training, and the social, behavioral, and economic sciences;
- **Encourage the development of a research community** dedicated to designing intelligent technologies and work organization and modes;
- **Promote deeper basic understanding** of the interdependent human-technology partnership to advance societal needs; and
- **Understand, anticipate, and explore mitigation** of potential risks

# Stakeholder Workshops

- Help NSF learn perspectives of industry, non-profits, workers, researchers, and other government agencies
- Outcomes of workshop will shape FoW-HTF and other programs
- Virtual workshops:
  - Restructuring the physical and virtual workspace
  - Exploring the human-technology partnership
  - Fostering reskilling, upskilling, and lifelong learning
  - Identifying ethical questions and the implications for policy

# Exploring the human-technology partnership

- For most jobs, technology will not simply replace humans, but will partner with them
- People and technology must *both* adapt
- Examples
  - As AI takes over many routine tasks, it can enable people to focus on non-routine, “high human touch” work
  - Flexible micro-manufacturing technology could enable reshoring of manufacturing – replacing many long-distance fragile supply chains

# Example award from FoW-HTF

- Kristian Kloeckl and collaborators at Northeastern University are designing methods for humans and robots to work collaboratively in the seafood processing industry, for increased worker productivity, safety, and job satisfaction
- Economic and ethical workforce practices are analyzed to guide the potential on-shoring of a $20 billion industry

# Panel and Discussion

- Lawrence Jeff Johnson
  - Director Research Department, International Labour Organization
- Rebekah Kowalski
  - VP, Manpower Manufacturing and Client Workforce Solutions, ManpowerGroup North America
- Mike Richey
  - Chief Learning Scientist, Boeing
- Martha Russell
  - Stanford Human Sciences and Technologies Advanced Research Institute

# Breakout Sessions

- Small group facilitated discussions, followed by report back
- Opportunities and Challenges in Mapping the Human-Technology Partnership
- Questions
  - What new jobs will emerge, and what new skills will people need to acquire?
  - How can technology make the workplace *better* as well as more productive?
  - How should the mix of technology and labor be negotiated?
  - What will be future modes of interaction between people and technology?

Questions about today's workshop?

Questions about the NSF Future of Work program?