

NATIONAL SCIENCE FOUNDATION
Proposal Abstract

Proposal:1936997

PI Name:Srivastava , Siddharth

Proposal Title: Convergence Accelerator Phase I (RAISE): Safe Skill-Aligned On-The-Job Training with Autonomous Systems
Institution: Arizona State University
Abstract Date: 07/29/19

The NSF Convergence Accelerator supports team-based, multidisciplinary efforts that address challenges of national importance and show potential for deliverables in the near future.

The broader impact/potential benefit of this Convergence Accelerator Phase I project stems from empowering the global competitiveness of our future workforce. Although staying competitive requires the productivity of US manufacturing to increase with the utilization of artificial intelligence (AI) and autonomous robotics, advanced robotic systems currently require a workforce with, at the least, 4-year degrees in engineering, computer science or AI. The problem is amplified by the fact that current robotics technologies do not inherently support adaptability, safety and explainability. This project will address these issues by creating autonomous on-the-job training platforms that use safe, self-explaining, adaptive robots. In order to achieve these objectives, our team employs a convergent approach drawing upon ideas and tools from research on intelligent tutoring systems (ITS), AI, robotics, manufacturing processes, human systems engineering, and cognitive science. The project's team also includes experts on resolving legal and socio-ethical challenges of bringing advanced technology to existing social infrastructure. This project synthesizes these diverse approaches in coordination with multiple industrial partners to enable an autonomous on-the-job training platform that would empower our national workforce for working with autonomous systems.

This Convergence Accelerator Phase I project aims to initiate the invention, development and evaluation of intelligent training systems and self-explaining autonomous systems for providing safe on-the-job training for work with autonomous systems. Although autonomous systems have immense potential for empowering a highly productive workforce, this potential cannot be realized with the current state of the art. Training for work with today's autonomous systems presents unique challenges not addressed by current training paradigms, which are designed for operational systems characterized by fixed functionality and behavior. In contrast, AI systems will, by definition, change from day to day in their functionality and behavior. This interdisciplinary project will utilize safe and taskable self-explaining autonomous systems to develop a new class of intelligent tutoring systems that provide on-the-job training for work with autonomous systems. In the process, it will also advance methods for creating self-explaining autonomous systems, for the automated synthesis of task-specific robot behavior that is safe and compliant with workplace regulations, and for the evaluation of collaborative human-autonomy teamwork. In addition, it will advance research in these areas through the development of reproducible testbeds in consultation with industry experts in the domain of collaborative human-robot advanced manufacturing.

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This award reflects NSF's statutory mission and has been deemed worthy of support through evaluation using the Foundation's intellectual merit and broader impacts review criteria.