NIOSH Robotics Research in Other Industries

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Center for Occupational Robotics Research (CORR)

- NIOSH virtual center established in September 2017
- Includes researchers from divisions and branches throughout NIOSH with a wide range of expertise
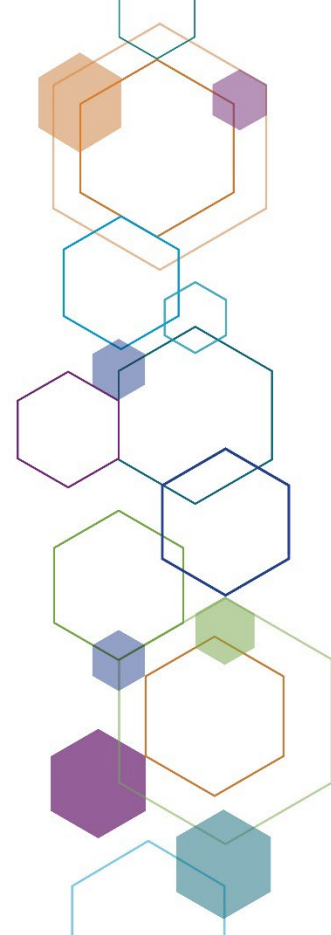- Encompassed within the NIOSH *Future of Work* Initiative, which was launched in 2019

Spokane

Pittsburgh

Cincinnati

Morgantown

Washington, DC

Atlanta

CORR Mission

Provide scientific leadership to guide the development and use of occupational robots that enhance worker safety, health, and wellbeing.
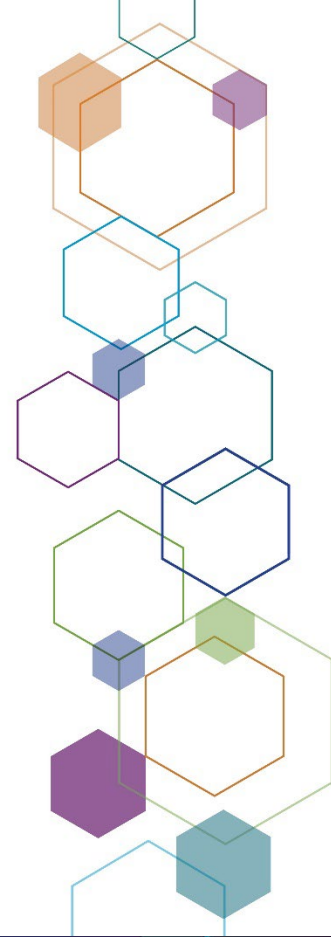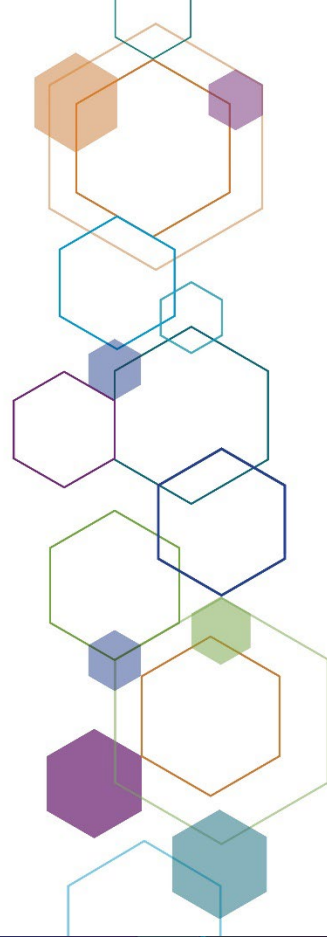
CORR Laboratories

Scope of CORR Research

- Traditional industrial robots
- Emerging robotic technologies, such as:
  - Collaborative robots
  - Co-existing or mobile robots
  - Wearable robotics or powered exoskeletons
  - Remotely controlled or autonomous vehicles and drones
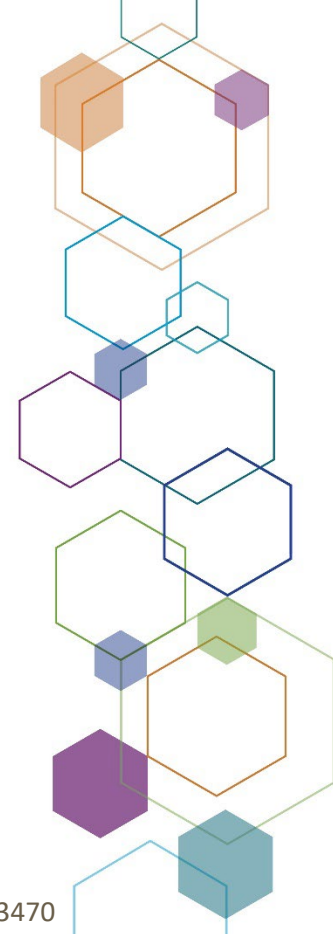 - Robots that increasingly use advanced artificial intelligence

Traditional robots have a good safety record

Image by © 2016 Thossaphol/ Getty Images

- 41 robot-related fatalities were identified between 1992 and 2017
  - Identified using a keyword search of data from the Census of Fatal Occupational Injuries (CFOI)
  - 34 (83%) involved stationary robots
  - 32 (78%) occurred in the manufacturing industry
  - 32 (78%) involved a robot striking a worker
  - 24 (59%) occurred during maintenance of the robot

Layne, LA. Robot-related fatalities at work in the United States, 1992–2017. Am J Ind Med. 2023; 66: 454-461. doi:10.1002/ajim.23470

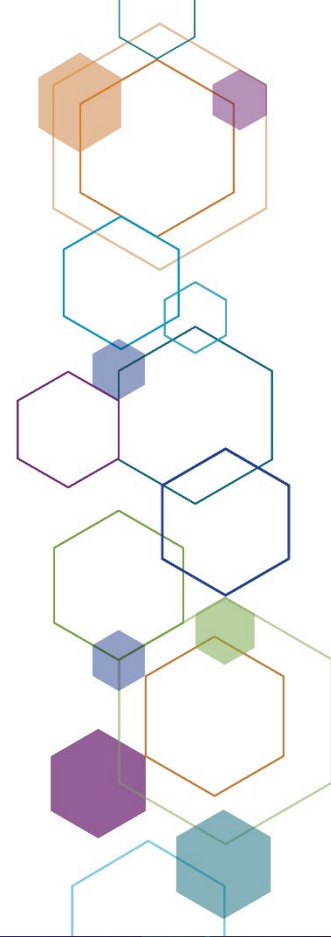# Emerging technologies are the focus of our safety and health research

Image by © 2015 pixone/Getty Images

Image by © vitpho/Getty Images

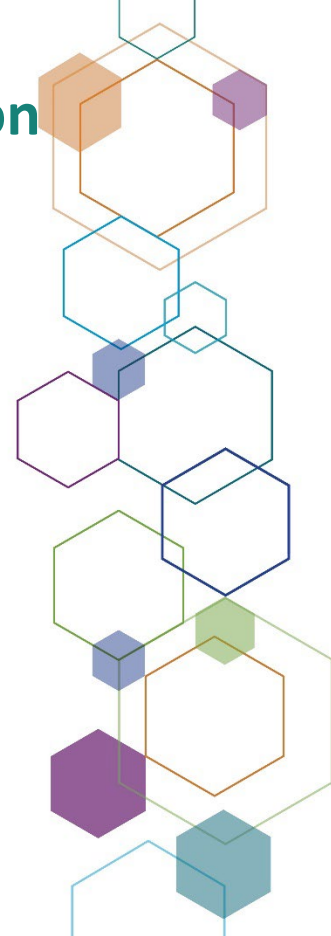Image source: NIOSH Science Blog: blogs.cdc.gov/niosh-science-blog/2016/03/04/exoskeletons/

Collaborative robots are becoming increasingly common

Assembly of single sockets with child safety lock

Video source: https://cobots.robotics.abb.com/en/robots/yumi/
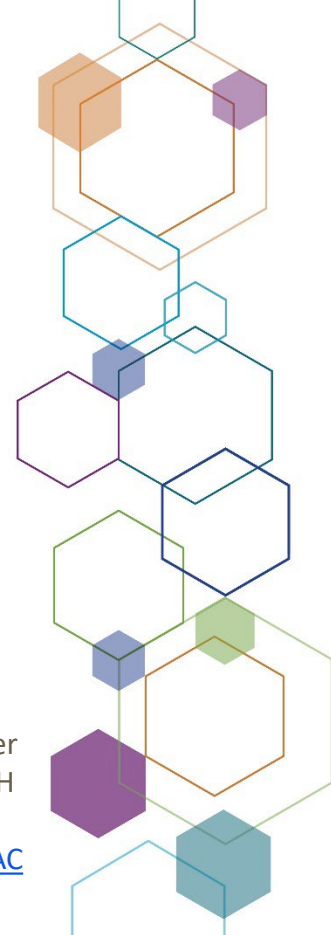
Case Study
Worker crushed by robotic forklift

Washington State Fatality Assessment and Control Evaluation (FACE) Program [2018]. Warehouse worker crushed by forks of laser guided vehicle. Supported in part by NIOSH cooperative agreement.
http://www.lni.wa.gov/Safety/Research/FACE/Files/WorkerCrushedByLGVForks.pdf
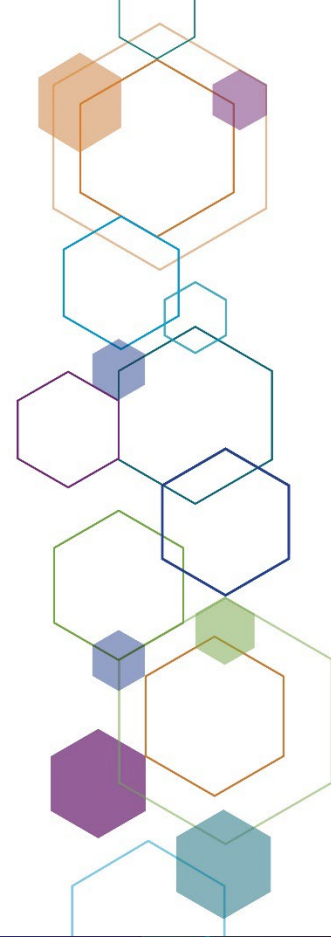
Case Study

Workers crushed by demolition robot

Washington State Fatality Assessment and Control Evaluation (FACE) Program [2019]. Workers Severely Injured Using Demolition Robots. Supported in part by NIOSH cooperative agreement.
https://lni.wa.gov/safety-health/safety-research/files/2019/DemolitionRobotAlert.pdf

CORR Research

Research Focus Areas

- Increasing understanding of human and robot interactions

- Identifying opportunities to better protect worker safety and health using robotics

- Providing guidance on working safely with robotics

- Improving the ability to identify and track injuries and fatalities involving robotics

Basic/ Etiologic Research

Surveillance
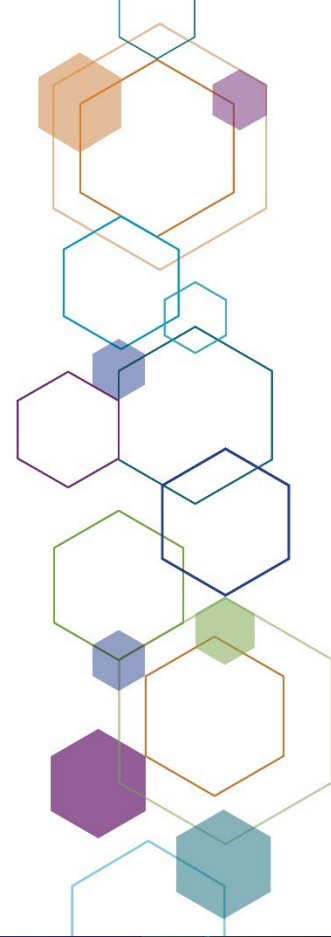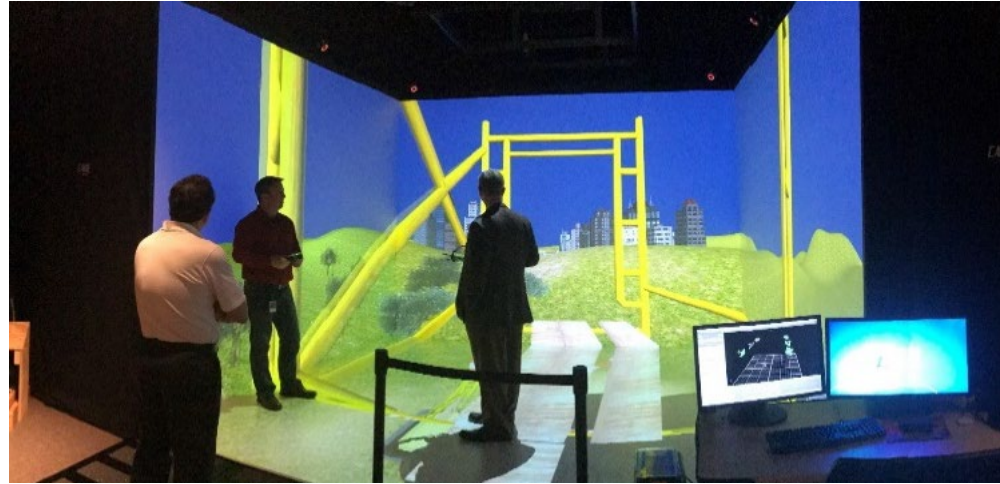
Occupational robotics research needs

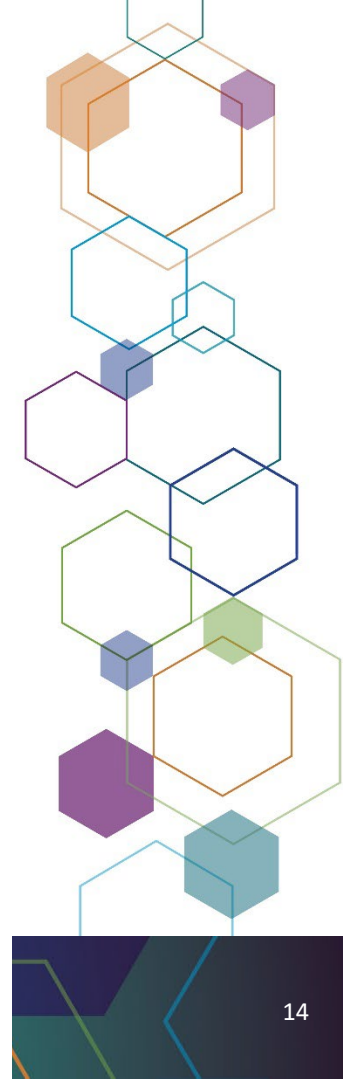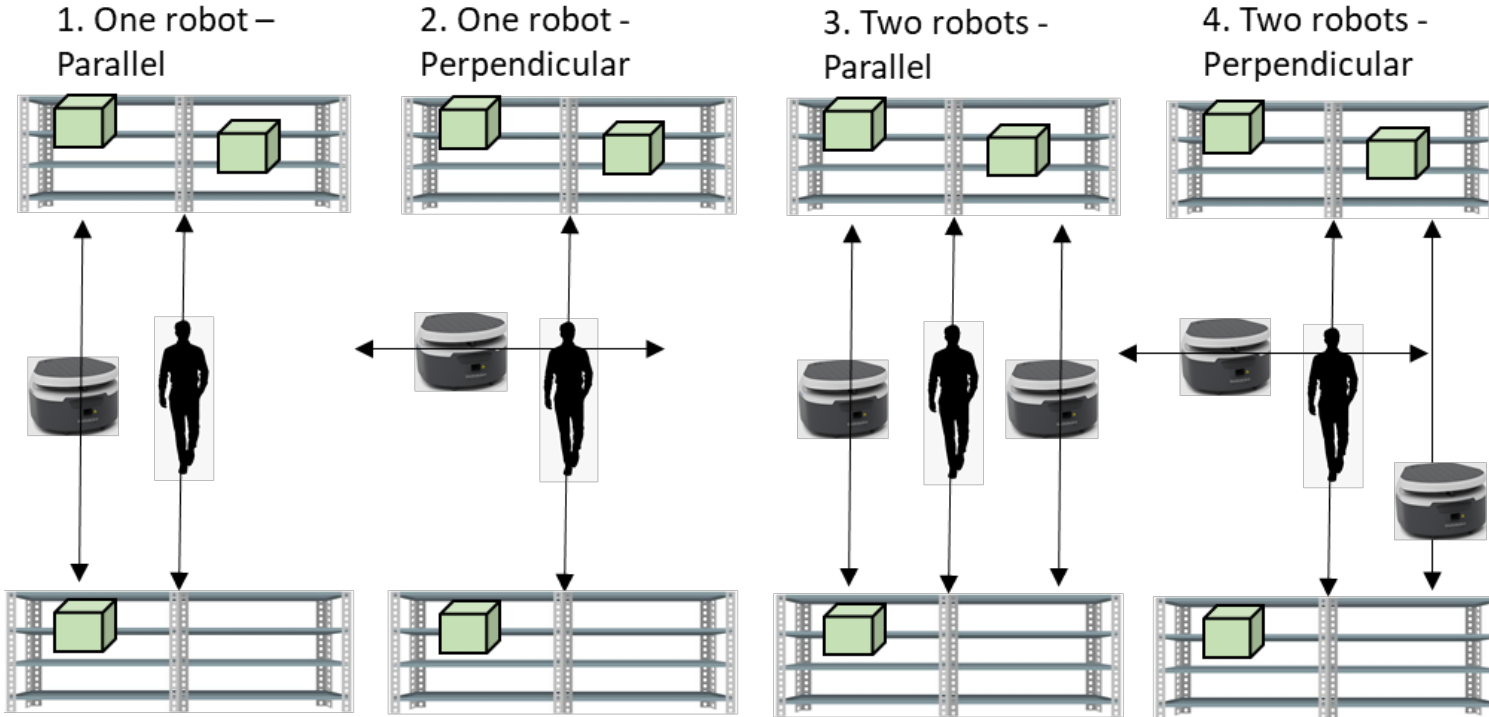Intervention Research

Research Translation

Examples of Intramural Robotics Research

Drone Use in Construction and Their Effects on Workers at Heights

Examples of Intramural Robotics Research

Investigation on Safety and Trust When Working Alongside Industrial Mobile Robots

1. One robot – Parallel
2. One robot - Perpendicular
3. Two robots - Parallel
4. Two robots - Perpendicular

Examples of Intramural Robotics Research

Identification of Hazards and Risk Factors for Demolition Robot Operators

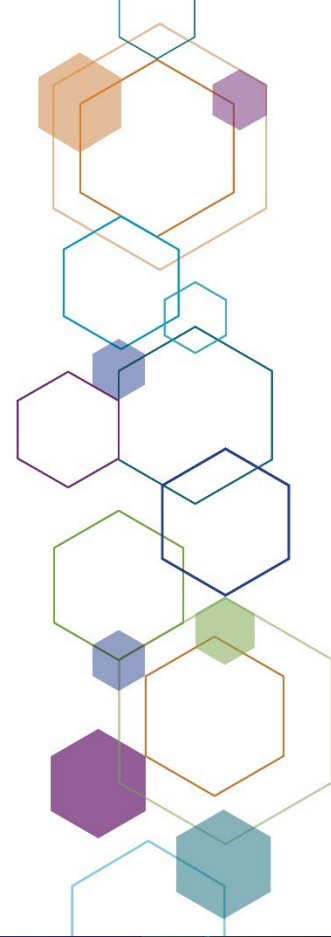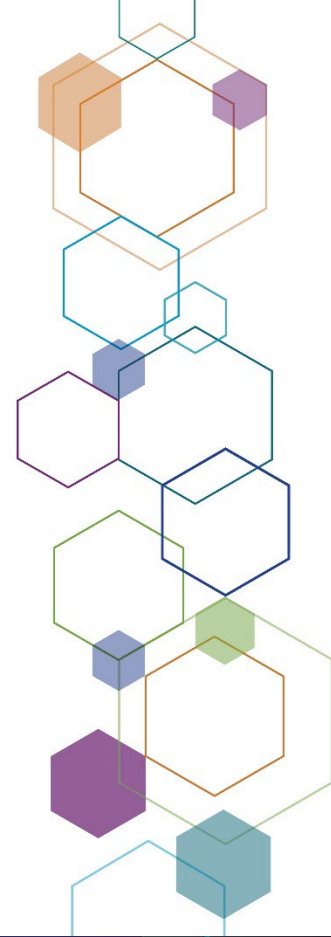# Examples of Intramural NIOSH Robotics Research

Contact Avoidance between Human Workers

and Collaborative Robots

Examples of Intramural Robotics Research

Robot-related Interventions: Measuring the Success of an Insurer-supported Grant Program

- Ohio Workers' Compensation program
- 63 case studies of advanced programmable manufacturing automation (includes 17 industrial robot interventions)

Examples of Extramural Robotics Research Supported by NIOSH

- Safety Challenges of UAV Integration in the Construction Industry: Focusing on Workers at Heights
- Rule-based Safety Checking System for Autonomous Heavy Construction Equipment
- Design and Demonstration of Intelligent Mines Evacuation and Mine Rescue System
- Evaluation of Trunk and Arm Support Exoskeletons for Construction
- Customizable Lower-Limb Wearable Robot using Soft-Wearable Sensor to Assist Occupational Workers
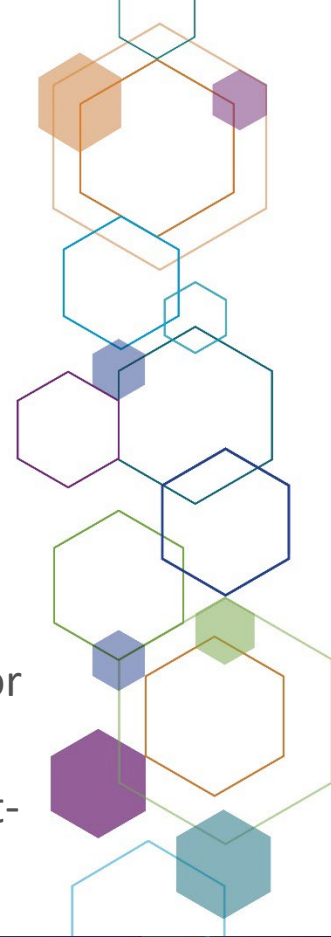
Partnerships

Partnerships are critical to the success of CORR

- Helps ensure relevance of research
- Establishes collaborative research opportunities
- Provides access to field study locations
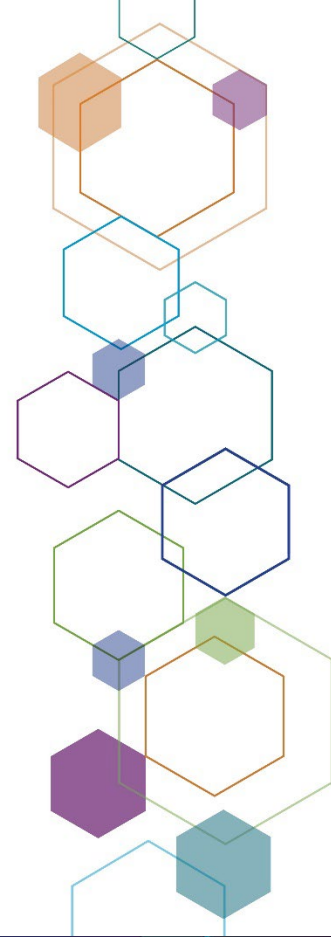- Builds pathway to put research into practice

Image source: arminstitute.org

October 5, 2017 signing ceremony for the OSHA, NIOSH, A3 (formerly RIA) Alliance

Networking and Information Technology Research and Development (NITRD) Program

Intelligent Robotics and Autonomous Systems(IRAS) Interagency Working Group

Research supported through the National Science Foundation (NSF) National Robotics Initiative (NRI):

- Customizable Lower-Limb Wearable Robot using Soft-Wearable Sensor to Assist Occupational Workers

- Transparent and Intuitive Teleoperation Interfaces for the Future Nursing Robots and Workers

SAFER AG Workshop

- Safety for Emerging Robotics and Autonomous aGriculture (SAFER AG) Workshop

- First workshop held November, 2022 through partnership with USDA and the University of Illinois Urbana-Champaign
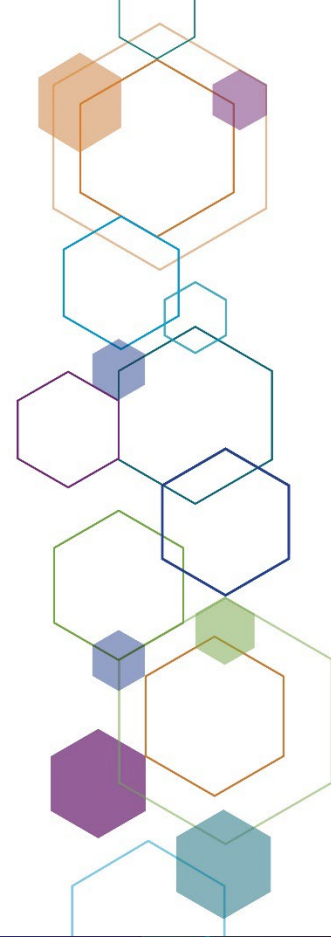
CORR Participation in Standards Development

- ANSI/RIA R15.06 – Industrial Robots and Robot Systems Safety

- ANSI/RIA R15.08 – Industrial Mobile Robot Safety (NEW)

- ISO/TC 299– Robotics

Under development

- ASTM F48 – **Exoskeletons and Exosuits**

Pre-Standard

- ANSI **Unmanned Aircraft Systems** Standardization Collaborative Roadmap

- ANSI/ASSP/NSC Z15.3- Safety Management of **Partially and Fully Automated Vehicles** *(Technical report)*

For more information, visit our webpage
cdc.gov/niosh/topics/robotics

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The National Institute for Occupational Safety and Health (NIOSH)

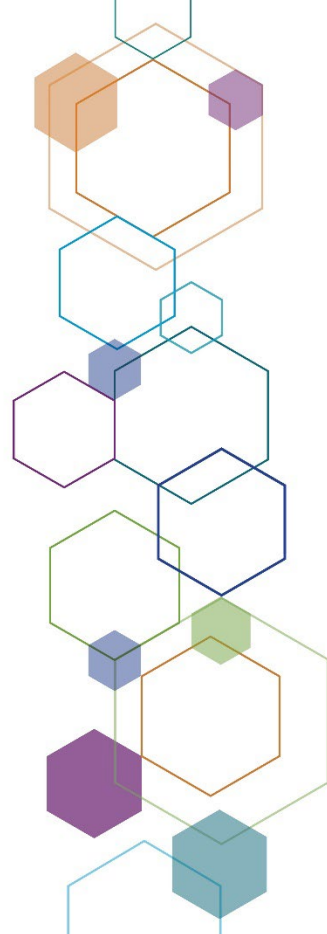Workplace Safety & Health Topics

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ROBOTICS

Thank you for your interest and attention!

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www.cdc.gov/niosh/topics/robotics/

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