



Presented By:

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Office of Research, Development & Technology

# RAIL:

***MOVING AMERICA FORWARD***

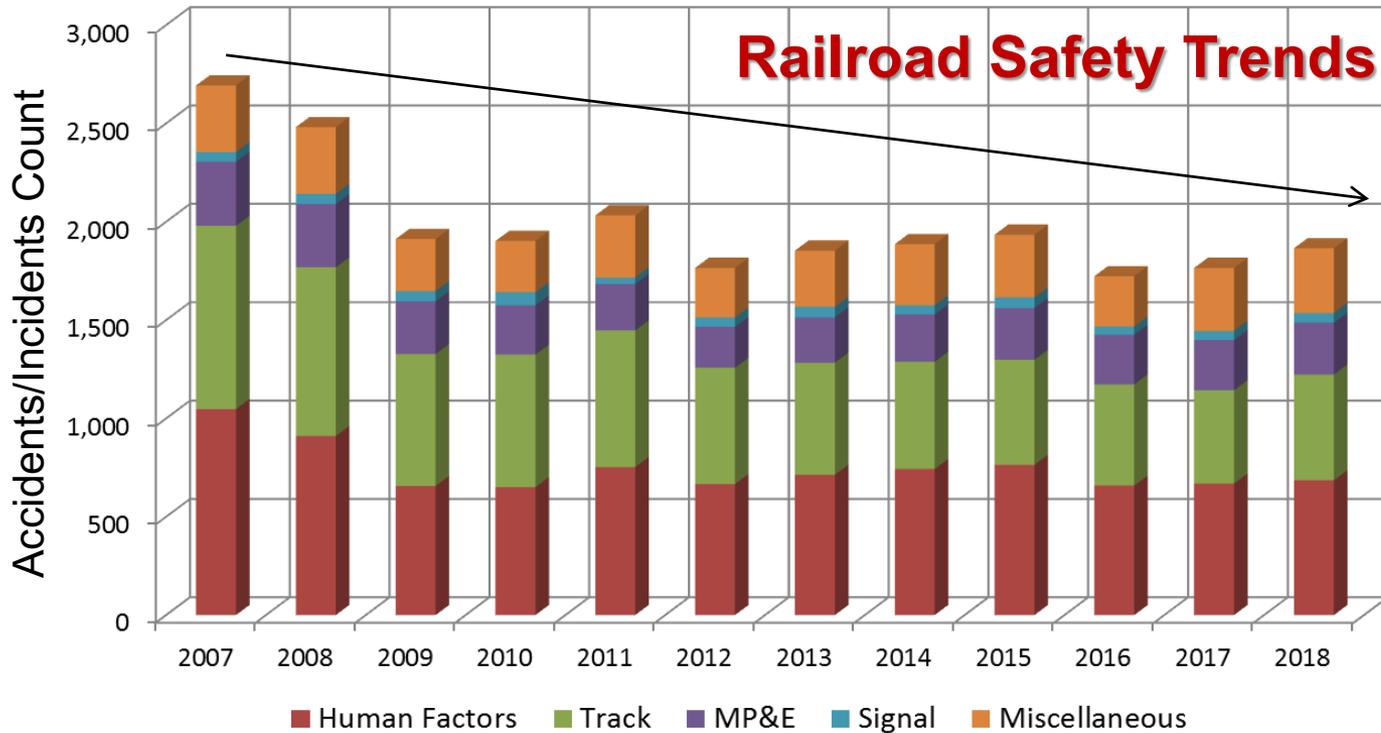
***Artificial Intelligence Research at FRA***

June 5, 2019



U.S. Department of Transportation  
Federal Railroad Administration

# Driving Derailments to Zero!

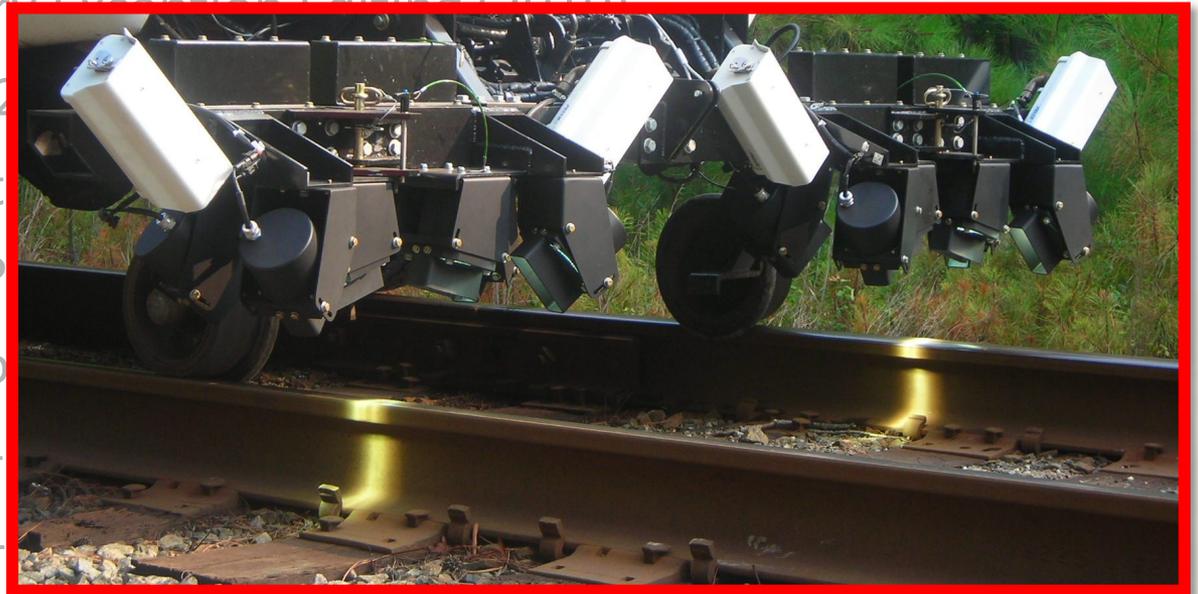


The Federal Railroad Administration's mission is to enable the safe, reliable, and efficient movement of people and goods for a strong America, now and in the future.



# Related FRA Research Projects

- Force Estimation Using Track Geometry Data (2002)
- Neural Networks for Dynamic Simulation (2007)
- **Joint Bar Inspection System (2009)**
- Automated Track Geometry Exception Editing (2010)
- Machine Vision Learning (2010)
- Machine Vision of Concrete (2010)
- Risked-Based Scheduling P (2010)
- Rail Temperature Prediction (2010)
- Passive Non-Contact High-Speed Rail (2010)
- Simulation-Based, Broken-Rail Detection (2010)
- Application of Change Detection Software in a Rail Environment (2017)

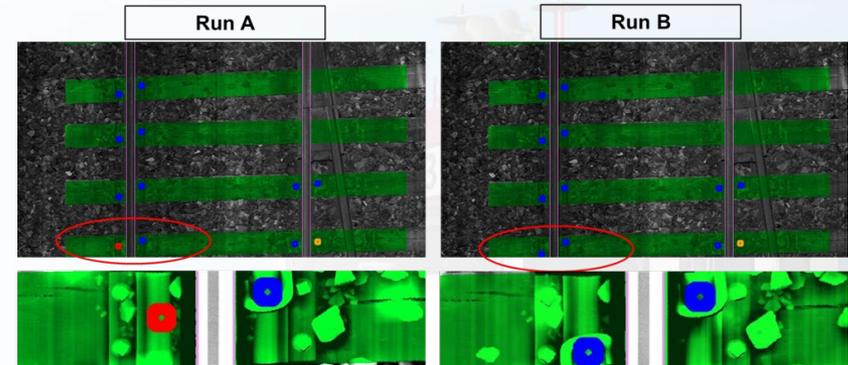


# Strategic Goals for AI

- AI-based Risk Analyses & Processing
  - Development of a suite of technologies utilizing AI
  - Focus on the application of predictive analytics capabilities
- Autonomous Inspection Technologies
  - Expand the utilization of autonomous inspection methods
  - Imaging of the track and structures for manual review and/or automated interpretation
  - Focus on defect-detecting payloads carried by UAS and/or revenue service rail cars, automation of the data processing



# Automated Change Detection



- Detect relevant safety-critical changes between time-separated images/scans
  - The “Eyes of a Track Inspector”
  - “What’s different today? Should I take action?”
- Technology Deployment:
  - Railcars or Inspection Vehicles
  - Hi-Rail Vehicles
  - Unmanned Aircraft Systems (UAS)
- Artificial Intelligence Applications:
  - Processing and alignment of imagery
  - Isolate relevant from irrelevant changes



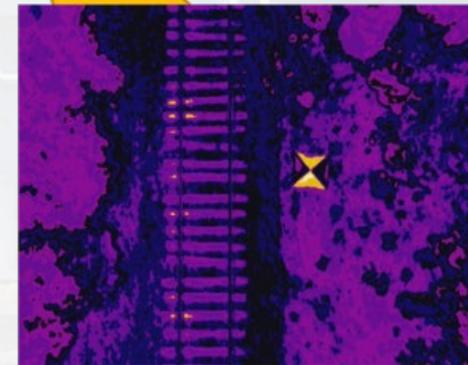
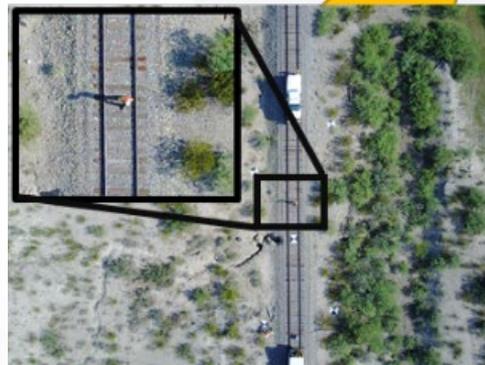
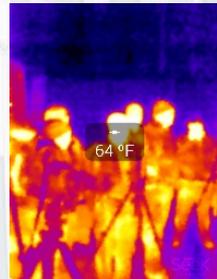
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# Railroad AI Intruder Learning System “RAILS”

- Effectiveness of AI technology for intruder detection on railroad property
- Ground- and UAS-based systems equipped with AI-aided processing algorithms for automated detection of trespassers

## *Benefits to the Railroad*

- Multi-source remote sensing
- Automatic notification of trespassers in real-time
- Improve safety outcomes while reducing cost



# Where We Are Going From Here

- **Improve** data collection system effectiveness and efficiency for AI applications
- **Implement** AI-enabled technologies to address safety-critical issues facing railways now and in the future
- **Inspire** the next generation of subject-matter experts proficient in AI-related applications for railway engineering



Driving High-Consequence Derailments to Zero!



# CONTACT US

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