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RAIL: MOVING AMERICA FORWARD

Artificial Intelligence Research at FRA
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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.

*Accident/Incident data current through 2/28/2019

Source: FRA Office of Safety Database (5/22/2019)
Related FRA Research Projects

- Neural Networks for Dynamic Simulation (2007)
- Joint Bar Inspection System (2009)
- Automated Track Geometry Exception Editing (2010)
- Machine Vision of Concrete Ties (2014)
- Risked-Based Scheduling Prioritization (2014)
- Rail Temperature Prediction Through Weather Modeling (2016)
- Passive Non-Contact High-Speed Rail Inspection (2016)
- Simulation-Based, Broken-Rail Derailment Risk Analysis (2017)
- 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
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
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