

## 2022 CILTNA Fall Outlook Conference

Larry Jordan | Wi-Tronix, LLC | President and CEO



### Who is Wi-Tronix?



#### Wi-Tronix is an IoT platform and solutions provider for rail

Our platform is installed on over 13,000 locomotives and transit vehicles in North America and Australia

We provide real-time visibility to rail operations to improve safety, efficiency, reliability and sustainability

The Wi-Tronix platform is the vehicle's "Black-Box" and "Digital Video Recorder"

We are deploying Artificial Intelligence to solve complex problems and drive new outcomes



Any significantly advanced technology is indistinguishable from magic.

Author C. Clarke





### Artificial Intelligence: The Magic

- Artificial intelligence (AI) is intelligence demonstrated by machines, as opposed to the natural intelligence displayed by animals and humans.
- Artificial Neural Networks or Deep Neural Networks are inspired by the biological neural networks of human and animal brains.
- Deep Neural Networks combined with modern sensors create the ability to See, Hear, Feel and Smell





### **Artificial Intelligence: Pragmatic Reality**



- Artificial Neural Networks must be trained
  - Training is time-consuming
  - Training is on-going
  - Training is expensive
  - Training does not cover all cases encountered in the real world
- Artificial Neural Networks are typically trained by humans
  - Shadow mode training
  - Data labeling by humans

### **Typical AI Training Loop**



Iteration speed is critical to quick learning.



### **AI Enabled Transport Applications - Rail**

- Inspection of vehicle and mobile equipment
- Inspection of infrastructure
  - Track and ballast
  - Crossing gates and light
- Monitor operator performance
  - Mobile Device Detection
  - Alertness Detection
- Determine hazards
  - Near-miss Detection
  - Intruder Detection
  - Passenger Aggression Detections
- Fully automated trains
  - AAR Automated Train Operations







### Railcar Inspection Portal



Autonomous Track Inspection Vehicles



### Use Case:

### Crossing Gate Inspection using Artificial Intelligence

R&D funded by a grant from the United States Department of Transportation Improve public safety while reducing inspection costs by using forward facing camera already installed on most locomotives

#### **Current State**

• Manual Inspection every month (US) or week (Canada)

#### **Future State**

- An inspection occurs every time a train passes through a crossing
- Defects can automatically adjust rail operations
- Problems reported by the general public can be quickly validated





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### Automation in Rail - Mobile Device Detection





### **Mobile Device Detection System**



#### AI detects 2 people and 1 phone





### **Lessons from Autonomous Driving**

- The total global investment in autonomous vehicle technology exceeds \$200 billion
- "One year away" for several years
- Waymo One<sup>™</sup> is a ride-hailing service currently offering fully autonomous rides in the East Valley of Phoenix
- Tesla Full Self Driving Beta system is deployed to 160,000 vehicles and traveled 60 million miles
- Last week, Argo AI (Ford/Volkswagen/Lyft) announced that the company would be disbanded after posting an \$827M net-loss for the third quarter. (\$3.6 Billion & 1,800 employees)
- Unclear global regulatory approach
- Unclear liability & insurance approach



TESLA

ARGO

### **Obstacles to Conquer**

- Artificial intelligence is generally probabilistic as opposed to deterministic
  - Many industries have a tradition of "deterministic" safety
- Established regulation is centered around human operations
  - Industry and regulators need to team to shift to performance-based regulation to enable innovative technology such as artificial intelligence
- Human error is more tolerated by society than machine error
  - Litigious environment requires AI based systems to have performance significantly higher than humans
  - Tesla's objective is performance 10x better than the average human driver
  - Human performance levels may not be well understood







# Thank you

Larry Jordan Ijordan@wi-tronix.com



