Day 1: Wednesday December 15, 2021

8:30 - 9:45  Session I: Welcome and Introduction
Allan M. Zarembski, Professor, Director, Railroad Research and Safety Program, University of Delaware
Dennis Assanis, President, University of Delaware
David Martin, Associate Dean for Research and Entrepreneurship, College of Engineering, University of Delaware
Anne Canby, Founder, OneRail and Chair of the Railroad Advisory Board at University of Delaware

Keynote Speaker
Introduction: Anne Canby, Chair of the Railroad Advisory Board at University of Delaware
Keynote: Honorable Amit Bose, Administrator (nominated), US Federal Railroad Administration

9:45 to 10:00 - Break

10:00-12:00 Session II: Railroad and FRA Big Data Applications and Needs
Session Chair: Allan M. Zarembski, University of Delaware
Mabby Amouie, Chief Data Scientist, Norfolk Southern, “Automated Baselining and Change-Management of Critical Features using High-Precision LiDAR and Deep Learning”
Jay Baillargeon, Program Manager, FRA, “Update on FRA’s Predictive Analytics Research”
Charity Duran, Assistant Director of Roadway Planning, BNSF, “Utilizing Big Data Analytics to Evaluate ATIP Performance”
Stephen C. Love, CSX and Joshua Doran Visistack Transportation, “Updates on Leveraging Advanced Data Analytics to See a Clearer Future”
Janet St. John AAR “Cybersecurity in the Rail Industry: Gathering and Protecting Sensitive Data.”

12:00 to 1:00 - Lunch

1:00-3:15  Session IIIA: Big Data Applications and Case Studies: Railway Infrastructure Asset Management
Session Chair: Joseph Palese, University of Delaware
Andrew Mitchem, Network Rail Consulting, “High Speed Automated Track Inspection for Rail – UK”
Fabian Hansmann, Plasser & Theurer, “Development of Smart Tamping Tool”
Jeb Belcher, Director Emerging Technologies and IP, Loram Technologies, Inc., “AI processing of X-Ray Data”
Serkan Sandikcioglu, ENSCO: “Track Geometry Prediction Methodologies with Discontinuity Removal Techniques”
David Zavetz and Emilio Barcelos – Alstom, Wayside Device Data for Crossing, Track, and Switch Machine Monitoring and Analytics at the Edge”

3:15 to 3:30 - Break

3:30 -5:30  Session IIIB: Big Data: Applications and Case Studies:
Session Chairman: **Anne Canby**, OneRail

**Jeff Fries and Emilio Barcelos**, Senior Data Scientist, Alstom, “Leveraging Track Circuit Data to Improve Railroad Operations”


**Nathan Wall and Greg Phillips**, RailInc. “Sequence Modeling as a Probabilistic Approach to Identifying Wheel Degradation”

**Darel Mesher**, Chief Technology Officer, Tetra Tech TAS, “Artificial Intelligence Enabled Autonomous Real-Time Track Inspection – RailAI”

**Arthur Bilheri and Antonio Merheb** MRS Logistica and **Joshua Doran** Visiostack, “The Use of Big Data to Address Curve Problems”

5:30 Day 1 sessions end

6:30 – 8:00 Cocktail Reception: Audion, STAR Campus, University of Delaware

**Day 2: Thursday, December 16, 2021**

8:00 Introduction to Day Two: **Nii Attoh-Okine**, University of Delaware

**8:20- 10:10 Session IIIC: Applications and Case Studies:**

Session Chairman: **Nii Attoh-Okine**; University of Delaware

**Neil Curran**, BNSF, “THOR- Big Data Lessons from Developing an Optical Inspection System


**Xiang Liu and Asim Zaman**, Rutgers University, "Artificial Intelligence Aided Railroad Trespassing Detection and Data Analytics”.

**J. Riley Edwards, Arthur de Oliveira Lima, Ian Germoglio Barbosa** University of Illinois Urbana-Champaign

**Richard Fox-Ivey and John Laurent**, Pavemetrics, “Use of Laser Triangulation and Deep Convolutional Neural Networks (DCNNs) for Railway Track Condition Change Detection”

10:10 – 10:40 Break

**10:40- 12:40 Session IV: Big Data Analysis Theory and Techniques**

Session Chairman: **Mehdi Ahmadian**

**Hai Huang** and **Saharnaz Nazari**, Penn State Altoona, “Track Substructure Performance Monitoring using Data Collected from Smartgrid”
Faeze Ghofrani, Penn State, “Inspection Technologies for Reliable Railway Transportation Systems”
Allan M Zarembski and Kenza Soufiane, University of Delaware, “The Effect of Adjacent Tie Condition on Wood Cross-tie Life”
Michael Palese, University of Delaware, Tong Qiu and Te Pei, Penn State University,”Artificial Intelligence for Advance Landslide Warning along Railroad Tracks”

12:40 Concluding Remarks
Allan M. Zarembski, Professor, Director, Railroad Research and Safety Program, University of Delaware
Anne Canby, Chair of the Railroad Advisory Board at University of Delaware

1:00 PM Program Ends

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Modern Railways are making increasing use of new generation track inspection and operating technology to obtain more and more data on the condition of the track and equipment. This extensive amount of data, which includes data of increasing complexity as well as volume, has led to a condition known as “Big Data”, where the volume of data is such that traditional analysis techniques are no longer viable to efficiently make use of all of this large volume of data. Thus, important information is often buried in this “mountain” of data. Since railways need to convert this data into useable information to help them plan their capital maintenance programs, there is a need for the application of new and improved analysis techniques to make this conversion from data into information. One such area of improved data analysis is the use of “Big Data” statistical analysis techniques.

The 2021 conference is intended to expand on previous years’ conferences and introduce these new and emerging analysis techniques and to show how they can be applied to the large volume of inspection data collected by railways to improve their planning of the critical capital and maintenance programs. This year’s conference focuses on the railway’s specific needs and practical applications to date of “Big Data” analytics to include both infrastructure and rolling stock maintenance planning.