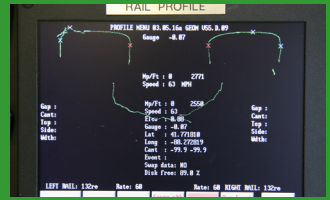


2017 RAIL INFRASTRUCTURE AND VEHICLE INSPECTION TECHNOLOGY CONFERENCE



20-21 JUNE 2017
UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN
URBANA, IL

PROGRAM

Gold Level Sponsor:



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Members of the Railroad Community,

The Rail Transportation and Engineering Center (RailTEC) at the University of Illinois at Urbana-Champaign is pleased to host the 2017 Rail Infrastructure and Vehicle Inspection Technology (RIVIT) Conference.

Our primary objective in organizing the 2017 RIVIT Conference is to facilitate the transfer of knowledge, as well as, to further communication and collaboration on the effectiveness of existing technologies and the development and implementation of new and emerging technologies with the potential to be applied to rail transportation.

The vitality of the conference program benefits from the excellent input provided by representatives from the railroads, engineering firms, rolling stock manufacturers, and supply firms who participate in the RIVIT Technical Planning Committee. This group considers topics of particular interest to the railroad industry, reviews the submitted abstracts, and selects presentations based on their quality, timeliness, and relevance. The goal is coverage of the broad array of current and emerging subjects of interest to railroads. An important criterion is innovative new ideas and results with potential to benefit and improve railroad practice. The RIVIT Technical Planning Committee has strived to achieve the proper balance with this year's selection of presentations in the following topic areas:

- Infrastructure
- Analytics
- Rolling Stock

RIVIT provides a forum for attendees to meet with colleagues, clients, regulators, researchers, and other members of the railroad community. It is also an excellent opportunity to renew old acquaintances and make new contacts in the ever-changing railroad arena. We are hopeful that you will enjoy the technical presentations, research discussions, keynote presentation, and technical tour.

On behalf of RailTEC at the University of Illinois we would like to extend a warm welcome to all conference attendees. We thank all of you for choosing to attend and hope you have a rewarding conference experience.

Sincerely,

Christopher P. L. Barkan

University of Illinois at Urbana-Champaign
Professor and George Krambles Faculty
Fellow, Executive Director of RailTEC, Director -
National University Rail (NURail) Center

Timothy Gress

University of Illinois at Urbana-Champaign
Managing Director - RailTEC

C. Tyler Dick

University of Illinois at Urbana-Champaign
Senior Research Engineer, Director of
Education

Jim Lundgren

Senior Assistant Vice President, TTCI (retired)

J. Riley Edwards

University of Illinois at Urbana-Champaign
Research Scientist and Senior Lecturer

Conference at a Glance

TUESDAY, JUNE 20TH, 2017

Registration Open (Yeh Center Lobby - 1st Floor)	7:00am
Welcome - Plenary Session - Panel (Yeh Center 1310)	8:00am
Luncheon (ECE Building - Room 3002)	11:50am
Keynote Speaker: John Cech <i>Chief - Engineering Systems Maintenance and Planning, BNSF Railway</i>	
Presentation Sessions (Yeh Center 2311, 2312)	1:25pm
Tours depart	3:20pm
Reception & Dinner University of Illinois Memorial Stadium (see page 14 for details)	6:00pm

WEDNESDAY, JUNE 21ST, 2017

Registration Open (Yeh Center Lobby - 2nd floor)	7:30am
Presentation Sessions (Yeh Center 2311, 2312, 2310)	8:00am
Luncheon (ECE Building - Room 3002)	11:45am
Presentation Sessions (Yeh Center 2311, 2312, 2310)	3:05pm
Adjourn	4:45pm

Conference Schedule

TUESDAY - 20 JUNE 2017

1310 Yeh Center		
AM	WELCOME, PLENARY & PANEL Practical use of UAS Technology / PANEL: UAS Technology Challenges & Opportunities	
2311 Yeh Center		2312 Yeh Center
PM	INFRASTRUCTURE Autonomous Inspection Technologies & Inspection Solutions	
	TOURS (see page 6)	TOURS (see page 6)
	DINNER - UIUC MEMORIAL STADIUM (see page 14)	DINNER - UIUC MEMORIAL STADIUM (see page 14)

WEDNESDAY - 21 JUNE 2017

	2311 Yeh Center	2312 Yeh Center	2310 YEH CENTER
AM	INFRASTRUCTURE Track Inspection Vehicles; More Autonomy, More Data, More Information	ANALYTICS Data -Driven Inspections: Imaging & Machine Learning	
	INFRASTRUCTURE Bridge & Structural Inspection Advances	ANALYTICS Future Inspection with Artificial Intelligence & Augmented Reality	INFRASTRUCTURE <i>Rail Flaw & Rail Weld Defect Detection</i>
PM	INFRASTRUCTURE Ballast/Geotech	ANALYTICS Data-Driven Inspections: Collection & Management	INFRASTRUCTURE <i>Advancements in Crosstie Automated Inspection & Evaluation</i>
	INFRASTRUCTURE Substructure Monitoring & Evaluation	ROLLING STOCK Wayside Systems: Running Gear	

Welcome & Introduction

Location: 1310 Yeh Center

8:00

Safety Briefing

Tyler Dick (University of Illinois at Urbana-Champaign)
Senior Research Engineer, Director of Education RailTEC

UIUC College of Engineering Welcome

Jennifer Bernhard (University of Illinois at Urbana-Champaign)
Associate Dean for Research, Professor of Electrical and Computer Engineering

Introduction / Welcome

Chris Barkan (University of Illinois at Urbana-Champaign)
Professor and George Krambles Faculty Fellow, Executive Director of RailTEC,

Agenda and Plan for the Day

Tyler Dick (University of Illinois at Urbana-Champaign)
Senior Research Engineer, Director of Education RailTEC

PLENARY: Practical Use of UAS Technology

Moderator: Tyler Dick (UIUC)

Location: 1310 Yeh Center

8:25

BNSF UAS Operations History and Current State with the Use of UAS in Railway

Mike Mischke (BNSF)

8:50

Use of Drone Photogrammetry in the Rail Industry

Paul Spaur (Pix4D)

9:15

Small Unmanned Aircraft for Rail Infrastructure Inspection

Dennis Wierzbicki (Unmanned Experts)

9:40

Evaluating the Integrity of Railway Corridor Using Remote Sensing

El Hachemi Bouali (Michigan Tech University)

10:05

UAV-Based Visual Data Analytics for Inspection and Maintenance of Infrastructure Assets

Mani Golparvar-Fard (University of Illinois at Urbana-Champaign)

10:30

BREAK - YEH CENTER LOBBY - 1ST FLOOR

PANEL: UAS Technology Challenges & Opportunities

Moderator: Tyler Dick (UIUC)

Location: 1310 Yeh Center

11:00

PANEL: UAS Technology Challenges & Opportunities

Cam Stuart (Federal Railroad Administration)

Mike Mischke (BNSF)

Paul Spaur (Pix4D)

Dennis Wierzbicki (Unmanned Experts)

El Hachemi Bouali (Michigan Tech University)

Mani Golparvar-Fard (University of Illinois at Urbana-Champaign)

11:50

LUNCH - ELECTRICAL & COMPUTER ENGINEERING BUILDING - ROOM 3002

KEYNOTE SPEAKER: **JOHN CECH**

CHIEF - ENGINEERING SYSTEMS MAINTENANCE AND PLANNING, BNSF RAILWAY

Infrastructure: Autonomous Inspection Technologies & Inspection Solutions

Moderator: Todd Euston (GREX)
Location: 1310 Yeh Center

- 1:25** **Track Condition and Asset Mapping Using Automated Inspection Technologies**
Lariza Stewart (GREX)
- 1:50** **Switch Point Inspection Gauges to Prevent Wheel Climb Derailments**
Allan Zarembski (University of Delaware)
- 2:15** **Defects Detections of Railway Track Based On Time-Frequency Analysis By Using Bogie Acceleration Measurements**
Xiukun Wei (Beijing Jiaotong University)
- 2:40** **Survival Analysis at Multiple Scales for Track Geometry Deterioration Modeling**
Negin Alemazkoo (University of Illinois at Urbana-Champaign)
- 3:05** **BREAK - YEH CENTER LOBBY - 1ST FLOOR**
- 3:20** **Tours depart Yeh Center**
- 5:35** Bus departs Yeh Center for Reception/Dinner
- 6:00** **RECEPTION & DINNER - MEMORIAL STADIUM**
- Reception at University of Illinois - Memorial Stadium
1402 South 1st Street, Champaign, IL. See page 14 for parking information and directions. Enter Stadium at Gate 16 on the West Side, take elevators to the 3rd floor to the Colonnades Club.
- 7:00** **Group Photo**

TOUR INFORMATION

(Attendees will have their choice to attend one of these options)

1. Research and Innovation Laboratory (RAIL)

RAIL currently houses multiple testing frames which provide the ability to conduct experiments on railway infrastructure and mechanical components including crossties and fastening systems. The cornerstone of RAIL is the Track Loading System which provides researchers the ability to perform static and dynamic experimentation on railway superstructure and rolling stock mechanical components and full-depth track substructures.

2. University of Illinois - Research Laboratories

Opportunities to learn more about the College of Engineering cutting edge research and laboratory capabilities. Meet with top researchers during stops at laboratories that are relevant to the scope of RIVIT. Stops will include the Computer Vision and Robotics Laboratory, the Newmark Structural Engineering Laboratory and the Nano Sensor Lab.

3. Blue Waters Supercomputer

Up-close look at the Blue Waters Supercomputer and other supercomputers in the machine room including a tour of the building infrastructure that houses the power and cooling systems that keep Blue Waters running. Visitors are welcome to take photographs.

3:05 BREAK - YEH CENTER LOBBY - 1ST FLOOR

3:20 Tours depart Yeh Center

5:35 Bus departs Yeh Center for Reception/Dinner

6:00 RECEPTION & DINNER - MEMORIAL STADIUM

Reception at University of Illinois - Memorial Stadium
1402 South 1st Street, Champaign, IL. See page 14 for parking information and directions. Enter Stadium at Gate 16 on the West Side, take elevators to the 3rd floor to the Colonnades Club.

7:00 Group Photo

IMPORTANT REQUIREMENTS FOR RESEARCH AND INNOVATION LABORATORY (RAIL) TOUR:

Non-US Citizens:

A portion of the technical tour takes place on the US Army Corps of Engineers facility that houses the new RailTEC Research and Innovation Laboratory. All non-US Citizens that submitted their passports by the requested deadline (10 June 2017) MUST bring their passport on the day of this tour (Tuesday 20 June 2017) or you cannot participate in RAIL tour.

US Citizens:

You MUST bring a state ID (driver's license) on the day of the tour in order to access RailTEC's Research and Innovation Laboratory (Tuesday 20 June 2017).

Wednesday, June 21st - AM Concurrent Sessions

Infrastructure: Track Inspection Vehicles; More Autonomy, More Data, More Information

Moderator: Ian Weiner (CN)
Location: 2311 Yeh Center

8:00 FRA Autonomous Track Geometry Measurement Technology Development – Demonstration in Revenue Freight Service
 Cam Stuart (Federal Railroad Administration)

8:25 Track Gage Restraint Testing: Identifying Compromised Lateral Strength Under Load
 Andrea Berry-Morris (Holland LP)

8:50 Absolute Track Geometry, What is it and How Does it Help Me?
 Jack Vogelaar (Fugro)

9:15 The Impact of Rail Defects on Track and Vehicle Response
 Mohammad Fesharaki (Florida International University)

9:40 BREAK - YEH CENTER LOBBY - 2ND FLOOR

Analytics: Data -Driven Inspections: Imaging & Machine Learning

Moderator: Bryan Schlake (Penn State Altoona)
Location: 2312 Yeh Center

8:00 Train Inspection Systems at Union Pacific Railroad: Overview, Benefits and Future Path
 Tom Bartlett (Union Pacific Railroad)

8:25 Railcar Imaging and Inspection Portal
 Felix Krupczynski (Duos Technologies)

8:50 Application of Image Digitization for Train Motion Monitoring
 Chia-Ming Chang & Ching Lung Liao (National Taiwan University)

9:15 A Machine Learning Approach for Predicting Arrival Times of Freight Traffic on US Railroads
 William Barbour (University of Illinois at Urbana-Champaign)

9:40 BREAK - YEH CENTER LOBBY - 2ND FLOOR

9:40 BREAK - YEH CENTER LOBBY - 2ND FLOOR

Infrastructure: Bridge & Structural Inspection Advances	Analytics: Future Inspection with Artificial Intelligence & Augmented Reality	Infrastructure: Rail Flaw & Rail Weld Defect Detection
<p>Moderator: Marcus Dersch (UIUC) Location: 2311 Yeh Center</p>	<p>Moderators: Gary Carr (FRA) Location: 2312 Yeh Center</p>	<p>Moderators: Matt Witte (AAR) Location: 2310 Yeh Center</p>
<p>10:05 Total Reference-free Displacement of Bridges under Train Crossings Fernando Moreu (University New Mexico)</p> <p>10:30 Remote Monitoring of Bridges Struck by Barges and Motor Vehicles John Orsak (SENSR Monitoring Technology)</p>	<p>10:05 Future Track Inspection Utilizing Artificial Intelligence Gary Carr (Federal Railroad Administration)</p> <p>10:30 The Dawn of Augmented Reality in Track Maintenance Robert Grant (NxGen Rail Services)</p>	<p>10:05 Liquid Metal Assisted Cracking in Rail Welds David Workman (EWI)</p> <p>10:30 An Alternative Method for On-Site Rail Defect Detection During Replacement Pasi Lautala (Michigan Tech University)</p>
<p>10:55 Reference-Free Displacement Estimation with Wireless Smart Sensors for Railroad Bridge Performance Evaluation Bill Spencer, Jr. (University of Illinois at Urbana-Champaign)</p>	<p>10:55 New Augmented Reality for Change Detection of Railroad Infrastructure Fernando Moreu (University New Mexico)</p>	<p>10:55 Trends in Automatic Switch Inspection Frank Brennecke (Mermec)</p>
<p>11:20 <i>No presentation scheduled</i></p>	<p>11:20 Artificial-Intelligence-Aided Railway Risk Analysis Xiang Liu (Rutgers University)</p>	<p>11:20 Dual Mode Sensor for Broken Rail Detection Robert Knox (Epsilon Lambda Electronics Corp)</p>
<p>11:45 LUNCH – ECE BUILDING - ROOM 3002</p>		
<p>11:45 LUNCH – ECE BUILDING - ROOM 3002</p>		
<p>11:45 LUNCH – ECE BUILDING - ROOM 3002</p>		

Wednesday, June 21st - PM Concurrent Sessions

Infrastructure: Ballast/Geotech		Analytics: Data-Driven Inspections: Collection & Management		Infrastructure: Advancements in Crosstie Automated Inspection and Evaluation	
Moderator: Hamed Kashani (Hyground) Location: 2311 Yeh Center		Moderator: Allan Zarembski (U of Delaware) Location: 2312 Yeh Center		Moderator: Cam Stuart (FRA) Location: 2310 Yeh Center	
1:00	Characterization of Fouled Ballast Track Demonstration with Multiple Technologies Radim Bruzek (Ensco) Asger Eriksen (Zetca)	1:00	Alstom Healthhub™: Power of “Digitization” Synthesized in a Tailored Interface for Railway Operations Nicolas Flix (Alstom)	1:00	Smart Prestressing System for Concrete Crossties Bassem Andrawes (University of Illinois at Urbana-Champaign)
1:25	Condition Monitoring of In-Service Railway Ballast Using Machine Vision Erol Tutumluer (University of Illinois at Urbana-Champaign)	1:25	Optimization of Ultrasonic Rail-Defect Inspection for Improving Railway Transportation Safety and Efficiency Alexander Lovett (University of Illinois at Urbana-Champaign)	1:25	Tie Program Efficiency Gains with Technology Solutions Jeb Belcher (Georgetown Rail Equipment Co.)
1:50	Monitoring Critical London Tube Tunnels With Wireless Tilt Meters Paul Thurlow (Keller Getec)	1:50	The Utilization of Emerging Technologies for Track Maintenance Planning on the Canadian National Asger Eriksen (Zetca) Dan Colwell (Canadian National)	1:50	X-Ray Inspection of New Crossties Michael Liesenfelt (Georgetown Rail Equipment Co.)
2:15	Real Time Monitoring of Specialty Geotechnical Construction Techniques on the Rail Phillip Gallet (Hayward Baker)	2:15	Proactive Improvement of Conditions for Safe Rail Operations David Mangold (University of Akron)	2:15	<i>No presentation scheduled</i>
2:40	BREAK - YEH CENTER LOBBY - 2ND FLOOR	2:40	BREAK - YEH CENTER LOBBY - 2ND FLOOR	2:40	BREAK - YEH CENTER LOBBY - 2ND FLOOR

Infrastructure: Substructure Monitoring & Evaluation

Moderator: Yu Qian (UIUC)
Location: 2311 Yeh Center

3:05 Trackbed Inspection Technologies
Hamed Faghihi Kashani (HyGround)

3:30 Predicting Railroad Ballast Permeability through Laboratory Testing and Image Analysis
Erol Tutumluer (University of Illinois at Urbana-Champaign)

3:55 Nondestructive Concrete Crossie Support Condition Back-Calculator
Marcus Dersch (University of Illinois at Urbana-Champaign)

4:20 Monitoring Track Performance with Multiple Instrumentation Systems
Stephen Wilk (University of Illinois at Urbana-Champaign)

4:45

ADJOURN

Rolling Stock: Wayside Systems: Running Gear

Moderator: Jim Lundgren (Senior Assistant Vice President, TTCI (retired))
Location: 2312 Yeh Center

3:05 Using Coefficient of Friction to Identify Contaminated Railroad Wheels
Pasi Lautala (Michigan Tech University)

3:30 Accelerating Machine Vision Inspection of Truck Components
Matthew Witte (TTCI)

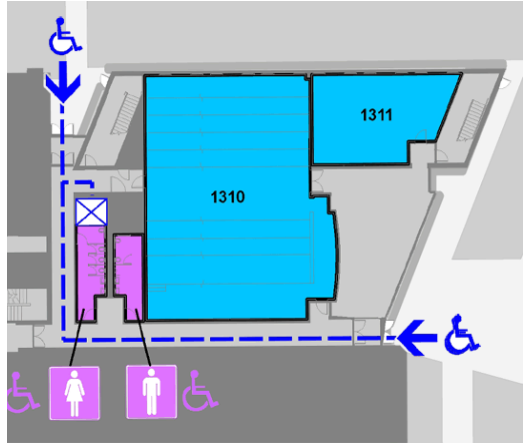
3:55 Sensor Fusion of Wayside Visible and Thermal Imagery for Rail Car Wheel and Bearing Damage Detection
Pasi Lautala (Michigan Tech University)

4:20 Development of Automated Railcar and Track Inspection - UIUC's Story
John Hart (University of Illinois at Urbana-Champaign)

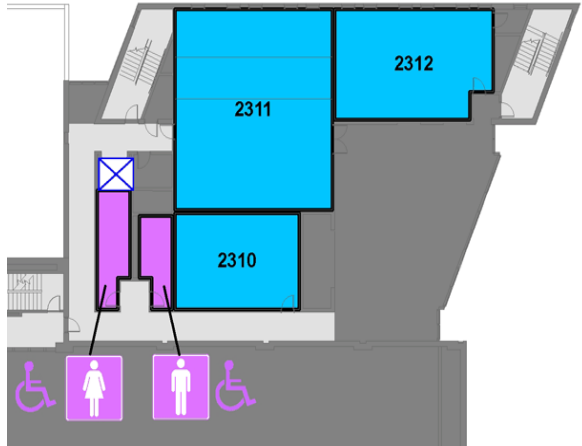
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ADJOURN

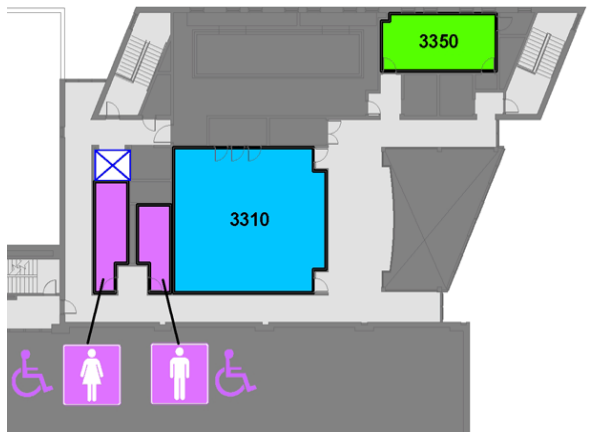
1ST
FLOOR



2ND
FLOOR



3RD
FLOOR





① Newmark Lab & Yeh Center

② ECE Building

③ Parking Garage

④ Hampton Inn

⑤ Illini Union Hotel

⑥ B-1 Permit Parking

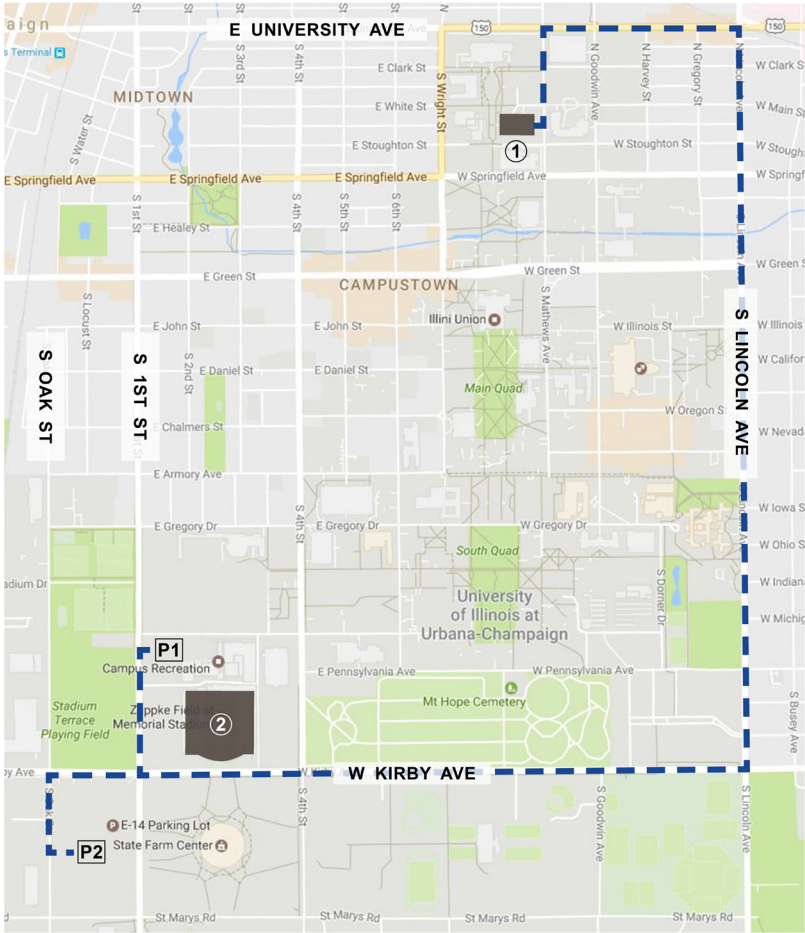
⑦ Main Quad

⑧ Bardeen Quad

⑨ North Quad

Parking: Parking on campus is extremely limited. There are metered spots on North Mathews Avenue. Additionally, there is a Parking Garage (at 1201 W. University Ave, Urbana, IL 61801 (3 on above map) that accepts credit cards via paybyphone. Please reference the meter for payment instructions..

Memorial Stadium Dinner Map - Tuesday 20 June - 6pm



<http://tinyurl.com/rivit17>

1: Yeh Student Center - Newmark Civil Engineering Laboratory, 205 N. Mathews Ave, Urbana, IL 61801

2: Memorial Stadium - (Dinner in the Colonnades on 3rd Floor - Enter Stadium at Gate 16 on the West side) - 1402 South 1st Street, Champaign, IL 61820

Bus Transportation to Memorial Stadium will be provided to and from the Yeh Student Center. If you wish to drive there are 2 parking options:

P1: Parking Option 1 - Campus Recreation (metered spots, require payment until 9:00pm)
201 East Peabody Drive, Champaign, IL 61820

P2: Parking Option 2 - State Farm Center Parking - Lot E14 (free parking)
1700 South Oak Street, Champaign, IL 61820

Important Information

Parking: Parking on campus is extremely limited. There are metered spots on North Mathews Avenue. Additionally, there is a Parking Garage at 1201 W. University Ave, Urbana, IL 61801 that accepts credit cards via paybyphone. Please reference the meter for payment instructions.

Attire: The recommended dress for the conference is “business casual”.

Conference Contacts:

Emma Ehrenhart: 217-300-1340, RIVIT-CON@illinois.edu, (conference registrar)

LB Frye: 217-300-1340, RIVIT-CON@illinois.edu, (conference registrar)

Wifi



- Choose the “IllinoisNet_Guest” wireless network.
- Open an internet browser and the University of Illinois Wireless page should load.
- Select the “Register a temporary guest account” link below the Log In
- Fill out the registration form, accept the terms of use, and click Register. The University is legally required to collect your information before providing you with network access.
- Click the Log In button at the bottom of your confirmation page.
- For help with the Illinois wireless network, please contact the Help Desk at 217-244-7000.

Note: Wifi Registration forms are valid for a 24 hour period. A new registration form will need to be completed to gain access after the 24 hour period has expired.

Conference Whova App

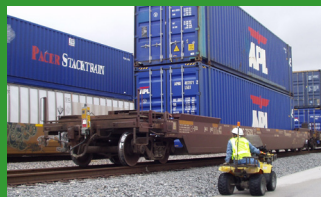
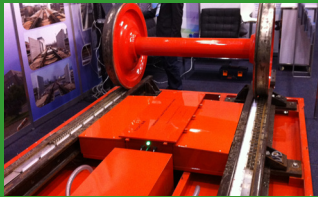


Try using the mobile app! Here you can network with other attendees, create your own agenda of sessions to attend, and keep up to date with conference events. Feel free to download Whova, the official free event application for the conference from the app store or Google Play and search for “RIVIT 2017.”

Smoke-free Campus



The University of Illinois at Urbana-Champaign is a smoke free campus. Please visit: <http://www.campusrec.illinois.edu/Smoke-Free/> for additional information and to view the Smoke-Free campus map.



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(SEE PAGE 15 FOR DETAILS)