

CHENGBO AI

Assistant professor

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EDUCATION

- 2013 **Ph.D.**, Civil and Environmental Engineering *Georgia Institute of Technology, Atlanta, GA*
- Advisor: Dr. James Tsai
 - Dissertation: “A Sensing Methodology for an Intelligent Traffic Sign Inventory and Condition Assessment Using GPS/GIS, Computer Vision, and Mobile LiDAR Technologies.”
- 2007 **B.S.**, Electrical and Computer Engineering *Peking University, Beijing, China*
- Advisor: Dr. Xiaohui Duan
 - Thesis: “Design and Implementation of Raw GPS Data Acquisition Using USB 2.0 Protocol.”

WORK EXPERIENCE

- 2017-Present Assistant Professor University of Massachusetts Amherst, MA
- 2014-2017 Research Engineer I *Georgia Institute of Technology, Atlanta, GA*
- 2013-2014 Post-Doctoral Fellow *Georgia Institute of Technology, Atlanta, GA*
- 2007-2013 Graduate Research Assistant *Georgia Institute of Technology, Atlanta, GA*
- 2005-2007 Undergraduate Research Assistant Peking University, Beijing, China

RESEARCH INTERESTS

Transportation Asset and Infrastructure Management
Pavement Preservation and Pavement Management System
Geometry Design and Roadway Safety
Workzone Safety and Mobility
Remote Sensing and Spatial Analysis
Underground Utility Tunnel Management

PATENTS

- 2017 Tsai, Y. and **Ai, C.** “An Automated Superelevation Measurement Method for Horizontal Curve Safety Assessment Using a Low-Cost Mobile Device.” *U.S. Patent Provisional Application GTRC7520.*
- 2014 **Ai, C.**, Tsai, Y., Wang, Z., and Yezzi, A. “Systems and Methods for Identifying Traffic Control Devices and Testing the Retroreflectivity of the Same.” *U.S. Patent Application PCT/US15/23146.* Patent Pending.

PUBLICATIONS

Journal Articles (* Corresponding author)

- 2017 Tsai, Y. and **Ai, C.***. “An Automated Superelevation Measurement Method for Horizontal Curve Safety Assessment Using Low-Cost Mobile Device.” *Journal of Transportation Research Record*. (Accepted)
- 2016 **Ai, C.*** and Tsai, Y. “An Automated Sidewalk Assessment Method for the Americans with Disabilities Act Compliance Using 3-D Mobile LiDAR.” *Journal of Transportation Research Record* Vol. 2542, 25-32.
- 2016 **Ai, C.*** and Tsai, Y. “Automated Traffic Sign Retroreflectivity Condition Assessment Using Mobile LiDAR and Computer Vision.” *Transportation Research Part C - Emerging Technologies*, 63, 96-113.
- 2015 **Ai, C.*** and Tsai, Y. “Critical Assessment of an Enhanced Traffic Sign Detection Method Using Mobile LiDAR and INS Technologies.” *Journal of Transportation Engineering*, 141(5), 04014096.
- 2015 **Ai, C.*** and Tsai, Y. “Automatic Horizontal Curve Identification and Measurement Method Using GPS Data.” *Journal of Transportation Engineering*, 141(2), 04014078.
- 2015 **Ai, C.*** and Tsai, Y. “Geometry Preserving Active Polygon (GPAP)-Incorporated Sign Detection Algorithm.” *Journal of Computing in Civil Engineering*, 29(6), 04014092.
- 2013 Tsai, Y., **Ai, C.***, Wang Z., and Pitts, E. “A Mobile Cross Slope Measurement Method Using LiDAR Technology.” *Journal of Transportation Research Record*, Vol. 2367, 53-62.
- 2012 Tsai, Y., Wu, Y.*, **Ai, C.** and Pitts, E. “Critical Assessment of Measuring Concrete Joint Faulting Using 3-D Continuous Pavement Profile Data.” *Journal of Transportation Engineering*, 138(11), 1291-1296.
- 2012 Tsai, Y.*, Dusanter, T., Wu, Y., **Ai, C.** and Caitucoli, Q. “Automatic Truck Processing Time Extraction at Marine Container Terminal Gates Using Low Frame Rate Images.” *Journal of Intelligent Transportation Systems: Technology, Planning, and Operations*, 16(4), 211-225.
- 2012 **Ai, C.** and Tsai, Y.* “Hybrid Active Contour Incorporated Sign Detection Algorithm.” *Journal of Computing in Civil Engineering*, 26(1), 28-36.

Journal Articles (Under Review) (* Corresponding author)

- 2017 **Ai, C.** and Qiu, S.* “Automated Crack Propagation Measurement for Asphalt Pavement Tensile Strength Lab Testing.” *Submitted to International Journal of Pavement Engineering*.
- 2017 Tsai, Y., Pranav, C. P.*, **Ai, C.**, Turpeau, M. D., and Adams, E. D. “An Enhanced Proactive High-Friction Surface Treatment (HFST) Site-Selection Method.” *Submitted to Journal of Transportation Research Record*.
- 2017 Tsai, Y., Wu, Y., Pranav, C. P.*, and **Ai, C.** “Identification of Site Characteristics for Proactive High Friction Surface Treatment Site-Selection Using Sensor-Based, Detailed, Location-

Referenced Curve Characteristics Data.” *Submitted to Journal of Transportation Research Record.*

- 2017 **Ai, C.**, Wang, W., and Wang, C., Braham, A. F., and Qiu, S. * “Continuous, Unambiguous Pavement Crack Width Measurement Using Laplace’s Equation.” *Submitted to Computer-Aided Civil and Infrastructure Engineering.*

Refereed Conference Articles (* Corresponding author)

- 2017 Tsai, Y. and **Ai, C.** * . “An Automated Superelevation Measurement Method for Horizontal Curve Safety Assessment Using Low-Cost Mobile Device.” *96th Transportation Research Board Annual Meeting, Washington DC.*
- 2016 **Ai, C.** * and Tsai, Y. “An Automated Sidewalk Assessment Method for the Americans with Disabilities Act Compliance Using 3-D Mobile LiDAR.” *95th Transportation Research Board Annual Meeting, Washington DC.*
- 2015 **Ai, C.** * and Tsai, Y. “Automatic Awareness of Traffic Sign Condition Changes Using Multi-Temporal Sensing Data.” *94th Transportation Research Board Annual Meeting, Washington DC.*
- 2014 **Ai, C.** * and Tsai, Y. “An Automatic Horizontal Curve Radii Measurement Method for Roadway Safety Using GPS Data.” *93rd Transportation Research Board Annual Meeting, Washington DC.*
- 2013 Tsai, Y., **Ai, C.** *, Wang Z., and Pitts, E. “A Mobile Cross Slope Measurement Method Using LiDAR Technology.” *92nd Transportation Research Board Annual Meeting, Washington DC.*
- 2012 **Ai, C.** * and Tsai, Y. “Critical Assessment of Automatic Traffic Sign Detection Using Three-Dimensional LiDAR Point Cloud Data.” *91st Transportation Research Board Annual Meeting, Washington DC.*
- 2011 Tsai, Y., Wu, Y. * and **Ai, C.** “Feasibility Study of Measuring Concrete Joint Faulting Using 3-D Continuous Pavement Profile Data.” *90th Transportation Research Board Annual Meeting, Washington DC.*
- 2010 **Ai, C.** * and Tsai, Y. “Partial Differential Equation (PDE) Incorporated Multi-Feature Traffic Sign Detection.” *89th Transportation Research Board Annual Meeting, Washington DC. (Best Paper Awards by AISIM5 and invited to present in TRB)*
- 2010 Tsai, Y. *, **Ai, C.**, Wu, Y., and Siplon, P. (2010). “Simulating Port Logistics Operations Using 3-D Visualization Technology.” *International Conference on Civil and Building Engineering (ICCBE), Nottingham, UK.*

Non-Refereed Conference Articles

- 2014 Wang, Z. and **Ai, C.** “Using GPS/GIS for Managing Pavement Investigation Data and Supporting Decision Making.” *Georgia Geospatial Conference 2014, Athens, GA*
- 2012 **Ai, C.** and Tsai, Y. “An Enhanced Automatic Traffic Sign Detection Algorithm Using SVM-based Color Segmentation for Real World Lighting Adaptation.” *8th Annual Interuniversity Symposium on Infrastructure Management, Atlanta, GA*

- 2012 Tsai, Y., Wang, Z., Li, F., and Ai, C. “A Sensor-Based and Spatially Enabled Roadway Asset Management System.” *9th National Conference on Transportation Asset Management*, San Diego, CA.
- 2010 Tsai, Y., Ai, C., and Ellington, B. “Critical Assessment of Using Image Sign Detection Algorithms for Roadway Sign Asset Inventory.” *Conference of NDE/NDT for Highways and Bridges: Structural Materials Technology (SMT)*, New York, NY.

Technical Reports (* Primary author)

- 2017 “Curve Identification for High Friction Surface Treatment (HFST) Installation Recommendation.” *Final Report, Georgia Department of Transportation 15-05.* *
- 2016 “Developing Georgia’s High Friction Surface Treatment (HFST) Program - HFST Site Characteristics (HFST-SC) Data Collection and Analysis.” *Final Report, Georgia Department of Transportation 15-04.* *
- 2016 “Delta TechOps Parking Lot Traffic and Employee Safety Improvement Study.” *Final Report, Delta TechOps RG274.* *
- 2016 “Implementation of Automatic Sign Inventory and Pavement Condition Evaluation on Georgia’s Interstate Highways.” *Final Report, Georgia Department of Transportation 15-11.* *
- 2015 “Development of an Asphalt Pavement Raveling Detection Algorithm Using Emerging 3D Laser Technology and Macrotecture Analysis.” *Final Report, National Academy of Science NCHRP IDEA-163.*
- 2015 “Study of Georgia’s Pavement Deterioration/Life and Potential Risks of Delayed Pavement Resurfacing and Rehabilitation.” *Final Report, Georgia Department of Transportation 14-05.*
- 2015 “A Remote Sensing and GIS-Enabled Highway Asset Management System.” *Final Report, Georgia Department of Transportation 10-08.* *
- 2014 “Remote Sensing and GIS-enabled Asset Management System (RS-GAMS): Phase 2.” *Final Report, USDOT RITA National Consortia on Remote Sensing in Transportation RITARS-11-H-GAT.* *
- 2013 “Remote Sensing and GIS-enabled Asset Management System (RS-GAMS): Phase 1.” *Final Report, USDOT RITA National Consortia on Remote Sensing in Transportation, DTOS59-10-H-0003.* *
- 2012 “Developing Sensing Methodology for Intelligent and Reliable Work Zone Hazard Awareness.” *Final Report, National Academy of Science NCHRP IDEA-139.*
- 2010 “Maximizing Port and Transportation System Productivity by Exploring Alternative Port Operation Strategies.” *Final Report, USDOT GTI/UTC 09-03.*
- 2009 “Using Image Pattern Recognition Algorithms for Processing Video Log Images to Enhance Roadway Infrastructure Data Collection.” *Final Report, National Academy of Science NCHRP IDEA-121.* *
- 2009 “Exploring Methods for GDOT’s Comprehensive Maintenance Quality Control-Feasibility Study.” *Final Report, Georgia Department of Transportation.* *

RESEARCH PROPOSALS

- 2017 Georgia Department of Transportation, “Critical Assessment of HFST’s Long-term Performance in Georgia under Different Roadway Conditions,” with Yichang Tsai and Zhaohua Wang, \$490,000 (*Awarded*)
- 2016 Georgia Department of Transportation, “Critical Assessment of Driver Behavior before and after HFST Application,” with Yichang Tsai and Yiching Wu, \$150,000 (*Awarded*)
- 2015 Delta TechOps, “Delta TechOps Parking Lot Traffic and Employee Safety Improvement Study,” with Yichang Tsai, \$19,840 (*Awarded*)
- 2015 United States Department of Transportation, “Study of Visual Scene and Drivers’ Misperception on a Curve to Support Proactive Countermeasure Application,” with Yichang Tsai and Zhaohua Wang, \$125,000 (*Not awarded*)
- 2013 National Center for Transportation Systems Productivity and Management, “A Next-Generation Mobile Traffic Sign Retroreflectivity Condition Evaluation Method Using LiDAR Technology for Improving Nighttime Roadway Safety” with Yichang Tsai and Zhaohua Wang, \$225,749 (*Not awarded*)

TEACHING EXPERIENCE

- 2016-2017 **Co-Instructor** (w/ Dr. James Tsai) *Georgia Institute of Technology, Atlanta, GA*
- ECE2811/3811/4811 – Vertically Integrated Projects (VIP) Program - Smart City Infrastructure (Undergraduate Level)
- 2015-2017 **Co-Instructor** (w/ Dr. James Tsai) *Georgia Institute of Technology, Atlanta, GA*
- CEE6621- GIS in Transportation (Graduate Level)
- 2013-2016 **Graduate Research Committee** *Georgia Institute of Technology, Atlanta, GA*
- Sean Gann (Master, CEE) (2015 Summer), “Critical Assessment of Concrete Joint Faulting Using Emerging 3D Technology.”
 - Yipu Zhao (Ph.D., ECE) (2014 Spring- 2016 Spring), “3-D Reconstruction and Roadway Asset Change Detection Using Computer Vision and Mobile LiDAR.”
 - Russell Aziz (Master, CEE) (2013 Fall), “Automatic Traffic Sign Tracking and Traffic Sign Surface Reconstruction Using Video Log Image Sequence and Stereo Vision.”
- 2009-2010 **Graduate Teaching Assistant** *Georgia Institute of Technology, Atlanta, GA*
- CEE4100 - Construction Management (Undergraduate Level)
 - CEE8813 - Spatial Analysis (Graduate Level)
- 2009-2010 **Undergraduate Mentor** *Georgia Institute of Technology, Savannah, GA*
National Science Foundation – Collaborative Research Experiences in Advanced Technology and Engineering (NSF-CREATE) Program
- Keyma Williams (Undergraduate, CEE) (2009 Summer), “Critical Assessment of Waterway Activity Detection Algorithms.”
 - Justin Brown (Undergraduate, ME) (2010 Summer), “Critical Assessment of the Accuracy in Crack Measurement Using Continuous Scanning Laser.”

2006-2007 **Student Instructor**
▪ EECS04713830 - Embedded System

Peking University, Beijing, China

PROFESSIONAL SERVICES

Conference/Workshop Organization Committees

2017 **Co-Chair**, Workshop Organization Committee of the 4th International Conference on Transportation Information and Safety (ICTIS), Banff, Alberta, Canada.

Technical Committee Service

2012-Present **Member**, TRB Committee on Signing and Marking Materials (AHD55)

2016-Present **Member**, TRB Committee on Accessible Transportation and Mobility (ABE60)

Journal Review Service

2011-Present **Reviewer**, ASCE Journal of Computing in Civil Engineering

2012-Present **Reviewer**, Journal of Transportation Research Record

2014-Present **Reviewer**, Computer-Aided Civil, and Infrastructure Engineering

2014-Present **Reviewer**, Transportation Research Part C- Emerging Technologies

2014-Present **Reviewer**, IEEE Sensors Journal

2015-Present **Reviewer**, ASCE Journal of Infrastructure Systems

2015-Present **Reviewer**, ASCE Journal of Transportation Engineering

2015-Present **Reviewer**, Applied Optics

2015-Present **Reviewer**, Optics Express

2016-Present **Reviewer**, IEEE Intelligent Transportation System Magazine

HONORS AND AWARDS

2009 **Best Paper**, 5th Annual Interuniversity Symposium on Infrastructure Management, Iowa City, IA

2006 **Runner-up**, Intel Cup - Embedded System Design Invitation Contest, Shanghai, China

2005-2007 **Undergraduate Scholarship**, Sino-Capital Education Foundation, Beijing, China

SKILLS

LANGUAGE MATLAB, C++/C, C#

DATABASE MySQL, Oracle, Microsoft Access

SOFTWARE ArcGIS, Quick Terrain Modeler, ProVal, ME-PDG, VISSim, FlexSim, CarSim, Trimble Trident Analyst, Applanix PosPac MMS, AutoCAD, 3DS Max

OFFICE Microsoft Office (Word, Excel, PowerPoint, Project, and Visio), LaTeX