William W. Barbour

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EDUCATION

Vanderbilt University (VU) GPA: 3.90
- Ph.D. Civil and Environmental Engineering (May 2020, expected)
- Research student at the Institute for Software Integrated Systems

The University of Illinois at Urbana-Champaign (UIUC) GPA: 3.66
- M.S. Civil Engineering, Sustainable and Resilient Infrastructure Systems (May 2017)

The University of Tennessee, Knoxville (UTK) GPA: 3.98
- B.S. Biosystems Engineering, with Honors (May 2015)

Katholieke Universiteit Leuven, Belgium
- Environmental Engineering study abroad program organized by Texas A&M University (Summer 2013)

EXPERIENCE

Network Modeling and Analytics Intern, CSX Transportation **Summer 2016**
- Led integration of GIS referencing with network simulation tools. Investigated the delay and predictability of freight train arrivals into terminals.

Graduate Research Assistant, Institute for Software Integrated Systems, VU **01/2018 – Present**
- Developing next generation real-time freight rail movement planner using data-driven methods and large-scale optimization.
- Developing simulation tools for novel railroad signaling strategies possible with positive train control.
- Implementing machine learning techniques to detect electric motor failure modes.

Graduate Research Assistant, Civil and Environmental Engineering, UIUC **06/2015 – 12/2017**
- Developed machine learning models for prediction of estimated time of arrival (ETA) of freight trains, using historical data mining and real-time network traffic state information.

Utilities Engineering Intern, Oak Ridge National Laboratory **Summer 2014**
- Conducted engineering studies on fiber optic communication, water, and electric utility infrastructure to support sustainable capital expansion of Oak Ridge National Laboratory.

Undergraduate Research Assistant, Biosystems Engineering Lab, UTK **09/2011 – 05/2015**
- Designed and built specialized multi-sensor platforms for underwater and river-bank video mapping based on canoes, kayaks and snorkels. Developed techniques for spatial referencing and cataloging of rich sensor data.
- Conducted terrain impact studies of wheeled vehicles in cooperation with the US Army Corps of Engineers.

Consultant, Hawaii Department of Land and Natural Resources **04/2014 – 05/2014**
- Utilized aquatic multi-sensor platforms and geospatial data analytics for assessment of urban waterways.

HONORS AND AWARDS

Dwight D. Eisenhower Transportation Fellowship, USDOT	2018
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Student of the Year Award, Roadway Safety Institute	2016
Invited Participant at ThinkChicago: Chicago Ideas Week	2016
Civil and Environmental Engineering Graduate Fellowship, University of Illinois	2015–2016
College of Agricultural Sciences and Natural Resources Outstanding Senior Award	2014
Department of Biosystems Engineering and Soil Science Outstanding Senior Award	2014
William Harris III Undergraduate Research Award	2015
Research award in College Agricultural Sciences and Natural Resources	2013

Tau Beta Pi Engineering Honor Society 2013–present
University of Tennessee Chancellor's Honors Program 2011–2015
University of Tennessee Haslam Scholar (one of 15 students annually) 2011

TEACHING

Graduate Mentor, Mentoring Undergraduate Students in Engineering (UIUC) 2016 – 2017

- Mentored undergraduate engineering students in semester-long research projects. Taught skills such as database management, data visualization, and basic machine learning techniques.

Instructor, UNHO 102: Humanity and the Environment (UTK) Spring 2013

- Designed and led 1-hour seminar course taken by freshman honors students, focused on anthropogenic environmental impacts and sustainable energy.

Teaching Assistant, BSE 451: Electronic Systems (UTK) Spring 2015

- Prepared lab materials and exercises and assisted students with completion.
- Delivered abbreviated lectures to supplement laboratory exercises.

Teaching Assistant, HSP 195: Leadership Program (UTK) Summer 2013

- Assisted in program planning for entering freshman Haslam Scholars.
- Presented on general undergraduate research at the University of Tennessee. Led kayaking lesson, relating to personal stream mapping research with kayak sensor platform.

PUBLICATIONS

- W. Barbour, J. C. Martinez Mori, S. Kuppa, D. Work. "Estimating Arrival Times for US Freight Rail Traffic." Submitted to *Transportation Research Part C: Emerging Technologies,* 2017.
- J. C. Martinez Mori, W. Barbour, S. Kuppa, D. Work. "Predicting Delay Occurrence at Freight Rail Sidings." In *Proceedings of Transportation Research Board Annual Meeting, 2018* (to appear).
- W. Barbour, S. Kuppa, D. Work. "Supporting automated operations with improved arrival time predictions on US freight railroads." Extended abstract of *IRTL Conference on Integrated Transportation*, Stockholm, Sweden, 2016.
- W. Barbour, P. Ayers. "Multi-Pass Rut Volume and Applied Power Study." *Pursuit Journal of Undergraduate Research*, Volume 5: Issue 1, Article 5, 2014.

PRESENTATIONS

- W. Barbour, D. Work. "Prediction of arrival times of freight traffic on US railroads using support vector regression." INFORMS Annual Meeting, Houston, TX, 2017.
- W. Barbour, S. Kuppa, D. Work. "Prediction of arrival times of freight traffic on US railroads using machine learning regression." Rail Infrastructure and Vehicle Inspection Technology Conference 2017, University of Illinois at Urbana-Champaign.
- W. Barbour. "Prediction of arrival times of freight traffic on US railroads using machine learning regression." Presentation at National University Rail Center, University of Illinois at Urbana-Champaign, 2017.
- W. Barbour, S. Kuppa, D. Work. "A machine learning framework for predicting arrival times of freight traffic on US railroads." Workshop on Data Quality in an Era of Big Data, University of Indiana, 2016.
- W. Barbour, D. Work. "Insights from machine learning techniques on data-driven prediction of train arrival times." Presentation to CSX Transportation Operations Research, Network Modeling, and Analytics, 2016.

- W. Barbour, J. McMillan, E. Moore. “Design of a Mobile Shade and Cooling Structure for Grazing Dairy Herds.” Exhibition of Undergraduate Research and Creative Achievement, 2015.
- W. Barbour, P. Ayers. “Integration of Continual Water Parameter Measurement with Existing Aquatic Habitat and Streambank Mapping Systems.” Honors Undergraduate Research Symposium, 2015.
- W. Barbour. “Design of an Underwater Video and GPS Mapping System for the Exploration of Streambed Aquatic Populations.” Exhibition of Undergraduate Research and Creative Achievement, 2013.
- W. Barbour, P. Ayers. “Multi-Pass Rut Volume and Applied Power Study.” Honors Undergraduate Research Symposium, 2013.

ACTIVITIES AND SERVICE

- Reviewer, Transportation Research Board Annual Meeting 2018
- Reviewer, Transportation Research Board Annual Meeting 2017
- American Society of Agricultural and Biological Engineers, Southeastern Region
    - Parliamentarian, 2014–2015
- American Society of Agricultural and Biological Engineers, University of Tennessee chapter
    - President, 2013–2014; Treasurer, 2014–2015; Scribe, 2012–2013
- Founding member and Vice President of Finance and Fundraising of Net Impact, University of Tennessee chapter
- Alternative Spring Break trip leader, Spring 2014
    - Planned and led week-long service trip to Charleston, SC, involving twenty undergraduate students in environmental conservation-focused volunteer work
- Alternative Spring Break participant, Spring 2013
    - Attended week-long service trip to Miami, FL, concerning aquatic habitat restoration
- Student speaker for new faculty orientation at the University of Tennessee, Summer 2014
- Chair of Haslam Scholars Program Recruitment Committee, 2013–2014
- College of Agricultural Sciences and Natural Resources study abroad ambassador, 2013–2015
- Selection committee for Director of Chancellor’s Honors and Haslam Scholars Program, Spring 2012
- Volunteer at Knoxville Botanical Gardens and Arboretum, 2012–2015
- Volunteer at Ijams Nature Center, 2014–2015
- Volunteer at Ronald McDonald House (Knoxville, TN), 2013–2015

SKILLS

- Advanced Python language experience
- C, C++, and MATLAB language experience
- SQL database systems and query language
- Applied machine learning techniques and algorithm tuning
- Data mining and visualization techniques
- Mathematical programming (AMPL, CPLEX, Gurobi)
- Microsoft Excel, Word, PowerPoint, Access
- Engineering design, including AutoCAD and AutoDesk Inventor
- Embedded systems (Arduino and Raspberry Pi) and electronic circuit design
- Fabrication in wood, metal, and plastic (laser cutting, 3D printing)

- Project leadership, organization, and execution
- Field work training and experience
- Industrial safety training from US DOE
- Technical report authorship and review

REFERENCES

- Daniel Work, Ph.D.
    - Associate Professor, Civil and Environmental Engineering, Vanderbilt University
    - Institute for Software Integrated Systems
    - Jacobs Hall 293; 400 24TH Ave. S, Nashville, TN 37240
    - (615) 322-3150; dan.work@vanderbilt.edu
- Christopher Barkan, Ph.D.
    - Professor, Civil and Environmental Engineering, University of Illinois at Urbana-Champaign
    - Executive Director of RailTEC, Director of National University Rail Center
    - 205 North Mathews Ave.; Office 1245; Urbana, IL 61801
    - (217) 244-6338; cbarkan@illinois.edu
- Shankara Kuppa, Ph.D.
    - Director of Big Data and Analytics Group, CSX Transportation
    - Shankara_Kuppa@csx.com
- Paul Ayers, Ph.D., P.E.
    - Professor, Biosystems Engineering and Soil Science, University of Tennessee, Knoxville
    - 2506 E.J. Chapman Dr.; Office 314; Knoxville, TN 37996
    - (865) 974-4942; pdayers@utk.edu
- Daniel Yoder, Ph.D.
    - Professor, Biosystems Engineering and Soil Science, University of Tennessee, Knoxville
    - 2506 E.J. Chapman Dr.; Office 317; Knoxville, TN 37996
    - (865) 974-7116; dyoder@utk.edu
- **Writing sample available upon request**