John-Paul Ore

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Research Interests and Approach

My research interests span software engineering and field robotics, especially applying program analysis to robotics problems to make systems safer and more reliable while remaining practical and economically efficient.

Education

University of Nebraska ..... Lincoln, NE, USA

2019 **Doctor of Philosophy in Computer Science** (Expected May '19)
"Dimensional Analysis for Robot Software without Developer Annotations"
Advisors: Sebastian Elbaum and Carrick Detweiler

2014 **Master of Science in Computer Science**
"Autonomous Aerial Water Sampling" **Award: Outstanding Master's Thesis**
Advisors: Carrick Detweiler and Matt Dwyer

University of Chicago ..... Chicago, IL, USA

1996 **Bachelor of Arts in Philosophy**

Refereed Conference Publications

10. Sayali Kate, John-Paul Ore, Xiangyu Zhang, Sebastian Elbaum, and Zhaogui Xu. "Phys: Probabilistic Physical Unit Assignment and Inconsistency Detection." In: *Foundations of Software Engineering*. ESEC/FSE'18. 2018. pp. 563–573. https://dl.acm.org/citation.cfm?id=3236035 (**Artifact:** https://zenodo.org/record/1310129)

9. John-Paul Ore, Sebastian Elbaum, Carrick Detweiler, and Lambros Karkazis. "Assessing the Type Annotation Burden." In: *Automated Software Engineering*. ASE'18. 2018 pp. 190–201. https://dl.acm.org/citation.cfm?doid=3238147.3238173

8. John-Paul Ore, Carrick Detweiler, and Sebastian Elbaum. "Dimensional Inconsistencies in Code and ROS Messages: A Study of 5.9M Lines of Code." In: *International Conference on Intelligent Robots and Systems*. IROS'17. 2017. pp. 712–718. https://doi.acm.org/10.1145/3092703.3098219.

7. John-Paul Ore, Carrick Detweiler, and Sebastian Elbaum. "Phriky-Units: a Lightweight, Annotation-Free Physical Unit Inconsistency Detection Tool (Tool Paper)." In: *International Symposium on Software Testing and Analysis*. ISSTA'17. 2017. pp. 352–355. https://doi.acm.org/10.1145/3092703.3098219 **Award: Best Tool Demonstration**

6. John-Paul Ore, Carrick Detweiler, and Sebastian Elbaum. "Lightweight Detection of Physical Unit Inconsistencies without Program Annotations." In: *International Symposium on Software Testing and Analysis*. ISSTA'17. 2017. pp .341–351. https://doi.acm.org/10.1145/3092703.3092722

5. John-Paul Ore and Carrick Detweiler. "Sensing Water Properties at Precise Depths from the Air." In: *Field and Service Robotics*. FSR'17. 2017. pp. 205–220. https://doi.org/10.1007/978-3-319-67361-5_14

4. David Anthony, Elizabeth Basha, Jared Ostdiek, John-Paul Ore, and Carrick Detweiler. "Surface Classification for Sensor Deployment from UAV Landings." In: *International Conference on Robotics and Automation*. ICRA'15. 2015. pp. 3464–3470. https://doi.org/10.1109/ICRA.2015.7139678

3. Jacob Palmer, Nicholas Yuen, John-Paul Ore, Carrick Detweiler, and Elizabeth Basha. "On Air-to-Water Radio Communication between UAVs and Water Sensor Networks." In: *International Conference on Robotics and Automation*. ICRA'15 2015. pp. 5311–5317. https://doi.org/10.1109/ICRA.2015.7139940

2. David Anthony, John-Paul Ore, Elizabeth Basha, and Carrick Detweiler. "Controlled Sensor Network Installation with Unmanned Aerial Vehicles." In: *Embedded Networked Sensor Systems*. SenSys'14. 2014. pp. 348–349. https://doi.org/10.1145/2668332.2668358

1. John-Paul Ore, Sebastian Elbaum, Amy Burgin, Baoliang Zhao, and Carrick Detweiler. "Autonomous Aerial Water Sampling." In: *Field and Service Robotics*. FSR'13. 2013. pp. 137–151.

Refereed Journal Publications

5. John-Paul Ore, Carrick Detweiler, and Sebastian Elbaum. "Assessing the Type Annotation Burden." In: *ACM Transactions of Software Engineering and Methodology*. (In preparation.)

4. John-Paul Ore and Carrick Detweiler. "Sensing Water Properties at Precise Depths from the Air." In: *Journal of Field Robotics*. 2018. pp. 1–17. https://doi.org/10.1002/rob.21807

3. Michaella Chung, Carrick Detweiler, Michael Hamilton, Jim Higgins, John-Paul Ore, and Sally Thompson. "Obtaining the Thermal Structure of Lakes from the Air." In: *Water*. 2016. pp. 6467–6778. https://www.mdpi.com/2073-4441/7/11/6467

2. Carrick Detweiler, John-Paul Ore, David Anthony, Sebastian Elbaum, Amy Burgin, and Aaron Lorenz. "Bringing Unmanned Aerial Systems Closer to the Environment." In: *Cambridge Journal of Environmental Practice*. 2015. pp. 188–200. https://doi.org/10.1017/S1466046615000174

1. John-Paul Ore, Carrick Detweiler, Amy Burgin, and Sebastian Elbaum. "Autonomous Aerial Water Sampling." In: *Journal of Field Robotics*. 2015. pp. 1095–1113. https://doi.org/10.1002/rob.21591

Refereed Workshop

3. John-Paul Ore, Carrick Detweiler, and Sebastian Elbaum. "Towards Code-Aware Robotic Simulation." In: *Proceedings of the 1st International Workshop on Robotics Software Engineering*, RoSE'18. 2018. pp. 40–43. https://doi.org/10.1145/3196558.3196566

2. John-Paul Ore, Amy Burgin, Valerie Schoepfer, Carrick Detweiler. "Towards Monitoring Saline Wetlands with Micro UAVs." In: *Robot Science and Systems Workshop on Robotic Monitoring*, RSS'14. 2014.

1. John-Paul Ore, Sebastian Elbaum, Baoliang Zhao, and Carrick Detweiler. "Towards Autonomous Aerial Water Sampling." In: *Robot Science and Systems Workshop on Robotic Monitoring*, RSS'13. 2013.

Patents

2017 Aerial Water Sampler *#US9606028B2*

Mentoring and Teaching

Graduate Teaching Assistant . . . . . Lincoln, NE, USA

2018 **GTA for SOFT 260: Software Engineering II (2 sections)**
Guide weekly lab for 46 students. Grade homework assignments and provide one-on-one tutoring. Manage five undergraduate teaching assistants.

Mentor . . . . . Lincoln, NE, USA

2016–18 **Mentor undergraduates Becca Horzewski and Lambros Karkazis.**
Guide undergraduate research experience leading to co-authorship of conference paper at *Automated Software Engineering '18*.

Tools and Dataset

PHRIKY `https://github.com/unl-nimbus-lab/phriky-units`
PHRIKY is a static analysis tool that detects physical unit inconsistencies in `C++` code written with the Robot Operating System (ROS). PHRIKY has an 87% TP rate in an evaluation on 213 open-sourced systems.

PHYS `https://unl-nimbus-lab.github.io/phys`
PHYS performs abstract type inference to detect inconsistencies in ROS `C++` code. PHYS builds a probabilistic graphical model to represent the connections between uncertain evidence from variable names and dataflow and then uses belief propagation to determine the most likely physical unit type. PHYS has an 85% TP rate in our evaluation.

Dataset: `https://unl-nimbus-lab.github.io/phys/docs/data.html`
The first publicly available dataset of physical unit inconsistencies.

Honors and Awards

2018 ACM SIGSOFT Travel Grant ($300)
2017 **Best Tool Demonstration** PHRIKY (ISSTA'17)
2014 **Outstanding Master's Thesis Award** UNL Computer Science and Engineering
2014–18 Othmer Fellowship ($8000 per annum)
2013 RSS'13 Travel Grant ($500)

Industrial Employment

Current Rutledge . . . . . Seattle, WA, USA

2006–11 **Video Production Assistant, Grip, and Webmaster**

Samadhi Yoga Center . . . . . Seattle, WA, USA

2003–06 **Webmaster**

Electronic Evidence Discovery . . . . . Seattle, WA, USA

2002–03 **Manager** Technical Analysis Group
1999–02 **Analyst** Technical Analysis Group

Deloitte Consulting . . . . . Chicago, IL, USA

1997–98 **Consultant** Requirements Gathering and Testing
1996–97 **Analyst** UI Development for a claims processing system

Selected Talks

2018 *"Phys: Probabilistic Physical Unit Assignment and Inconsistency Detection"* (FSE)
2018 *"Assessing the Type Annotation Burden"* (ASE)
2018 *"Towards Code-Aware Robotic Simulation"* at Workshop on Robotic Software Engineering (RoSE, part of ICSE)
2017 *"Sensing Water Properties at Precise Depths from the Air"* (FSR)
2017 *"Detecting Bugs in Robotic Systems"* at Workshop on Testing Embedded and Cyber-Physical Systems (TECPS, part of ISSTA)
2017 *"Lightweight Detection of Physical Unit Inconsistencies without Program Annotations"* (ISSTA)
2017 *"Phriky-Units: a Lightweight, Annotation-Free Physical Unit Inconsistency Detection Tool (Tool Paper)"* (ISSTA Tool-Track)
2017 *"Dimensional Inconsistencies in Code and ROS Messages: a Study of 5.9M Lines of Code"* (IROS)
2016 *"Flying Robots"* Bright Lights Summer Camp, Lincoln Public Schools
2015 *"Bringing Aerial Robots Closer:Sensing, Sampling, and Safety"* Nebraska Agricultural Technologies Association Conference (NEATA)
2014 *"Towards Monitoring Saline Wetlands with Micro UAVs"* (RSS Workshop on Environmental Monitoring)
2013 *"Autonomous Aerial Water Sampling"* (FSR)
2013 *"Toward Autonomous Aerial Water Sampling"* (RSS Workshop on Environmental Monitoring)

Service

2018–19 Program Committee for *Workshop on Robotic Software Engineering* (RoSE, part of ICSE)
2018 Reviewer: *IEEE Robotics and Automation Letters*
2018 Reviewer: *International Conference on Formal Methods and Models for System Design*
2015–18 Reviewer: *Journal of Field Robotics*
2014–18 Reviewer: *International Conference on Robotics and Automation*
2018 Reviewer: *International Journal of Mining Reclamation and Environment*
2017 Reviewer: *Journal of Software Testing, Verification and Reliability*
2017 Reviewer: *Field and Service Robotics*
2017 Reviewer: *Limnology and Oceanography: Methods*
2016 Faculty Search Committee Graduate Student Representative - UNL CSE
2014–16 Bright Lights Robotics Summer Camp Counsellor

MEMBERSHIPS

ACM-W, ACM, ACM-SIGSOFT, IEEE

CERTIFICATIONS

Certified Remote UAS Drone Pilot under FAA Part 107.