

SARAH BOELTER

Ph.D. Candidate in Computer Science

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FAA Second Class Medical Certificate

PROFESSIONAL PROFILE

Sarah Boelter is a Ph.D. Candidate and National Science Foundation CSGrad4US Fellow in Computer Science advised by Dr. Maria Gini at the University of Minnesota and Dr. Brian Glass at NASA Ames Research Center. Prior to beginning her doctoral studies, she worked as a software engineer in the aerospace industry. Her current research focuses on machine learning, field robotics, and planetary science, with an emphasis on autonomous decision-making for subsurface sampling in planetary environments. Her post-Ph.D. career interests include payload system intelligence, planetary robotics, subsurface anomaly detection, and Arctic and planetary-analog fieldwork.

EDUCATION

Ph.D in Computer Science <i>University of Minnesota</i>	May 2027 (Expected) <i>Minneapolis, Minnesota</i>
M.S. in Computer Science <i>University of Minnesota</i>	May 2024 <i>Minneapolis, Minnesota</i>
B.S. in Computer Science <i>University of Alaska Anchorage</i>	May 2019 <i>Anchorage, Alaska</i>

SKILLS

Programming Languages: Python, C++, PLEXIL, Java

Operating Systems: MacOS, Windows, Linux

Frameworks: React.js, Angular, ROS, ASP.NET 5

Tools: NumPy, Git, LaTeX, SciPy, Pandas

Areas of Expertise: AI and Machine Learning, Robotics, Time Series Fault Detection, Software Engineering

RESEARCH EXPERIENCE

NASA Ames Research Center **May 2023 – Present**
Graduate Student Intern (ELO) *Moffett Field, CA*

- Evaluated and implemented grassman metrics for subspace distance evaluation for fault and anomaly detection on TRIDENT Drill in lab environment. Trained imitation learning models on fault and anomaly detection scores for autonomous operation with validation over 90%.
- Evaluated change point detection algorithms for fault and anomaly detection on TRIDENT Drill. Implemented best performing methods on drill hardware for state and anomaly estimation and coordinated validation testing in lab with positive results. Coordinated pre-field equipment testing at NASA Ames Research Center, and coordinated successful method validation in a planetary analog field environment at Houghton Crater in the Canadian Arctic and Lake Untersee in the Antarctic.
- Utilized change point detection scores for fault and anomaly estimation to train imitation learning models for autonomous operation, validating their effectiveness with 90% decision accuracy.
- Led lab testing in May 2025 and September 2025 with the TRIDENT drill with team of graduate and undergraduate students at the University of Minnesota. Duties included coordinating lab space, handling logistics, drilling material creation, planning and executing exercises for data collection, leading method implementation onto drill hardware, and supervising two masters student research capstones on AI ensemble methods for percussive anomaly and fault detection using acoustic data.
- Assisted in person with field testing in Bishop Tuff (2023), Houghton Crater (2024) and remotely at Houghton Crater (2025), and Lake Untersee (2026). Duties included assisting with planning of research objectives and fieldwork logistics, execution of shallow drilling tasks, recording data, and analyzing faults.

NASA Marshall Space Flight Center **Jan 2026 – Present**
Pathways Intern *Huntsville, AL*

- Pathways intern with the Advanced Concepts Office at Marshall Space Flight Center supporting early-phase analyses and feasibility evaluations of space systems for planning purposes. Duties include supporting algorithm evaluation of large trade-spaces.

PROFESSIONAL EXPERIENCE

Lockheed Martin **Jun 2020 – Jan 2026**
Software Engineer *Trumbull, CT*

- Maintained, and supported Legacy and NextGen IETM software and full-stack software applications for aircraft, using Angular, ASP.NET 5, React, SQL, and Tableau. Implemented XML data parsing and XSL transformations in compliance with S1000D standards, collaborated with SMEs to enhance usability and documentation, and delivered on-time, compliant software solutions to customers.

Northern Aviation Services **Dec 2017 – Feb 2020**
System Analyst *Anchorage, AK*

- Developed a scalable web application to replace a legacy aircraft maintenance work order tracker using ASP.NET, Entity Framework, C#. Collaborated with database teams and analysts to meet company requirements, and documented and presented project milestones.

AWARDS

Fellowships

EM Graduate Fellowship at Los Alamos National Lab (Declined)	2025
National Science Foundation CSGRAD4US Fellowship (Three years at \$37,000/year)	2022

Scholarships

Alaska Performance Scholarship (Full tuition at University of Alaska for four years)	2015
ALA Girls Nation Scholarship (\$1,500)	2015

Other Awards

University of Alaska Dean's List	2015
University of Alaska Chancellor's List	2019

PROFESSIONAL DEVELOPMENT

Academic Leadership for Women in Engineering (ALWE)

Society of Women Engineers professional development program to provide female academics in engineering with tangible skills and knowledge needed to pursue, acquire and gainfully maintain institutional leadership positions at a university.

ETH Zürich Robotics Summer School

Summer robotics program in Epeisses, Switzerland with lectures and tutorials focusing on applications of ROS fundamentals in a field environment. Lectures and hands-on work focused on state estimation, localization and mapping, trajectory optimization, path planning, exploration, and camera modeling and geometry.

4th IceCOMM Ice Core Early Career Researchers Workshop (ICECREW)

Scientific writing and peer review workshop with the NSF Center for Oldest Ice Exploration (NSF COLDEX). Workshop focus was on making figures to communicate results, responding to peer reviews, how to structure papers, and deciding on journals and authorship.

Grad Cohort for Inclusion, Diversity, Equity, Accessibility, and Leadership Skills (IDEALS)

Event hosted by the Computing Research Association - Widening Participation for participants to engage with senior computing researchers and professionals who share valuable insights on navigating graduate school, developing research topics, preparing for careers, and balancing work and life.

IEEE ICRA 2025 Doctoral Consortium

Received feedback on thesis topic research, and received advice and mentorship in career management from prominent members in the robotics and automation community.

L'SPACE NASA Proposal Writing and Evaluation Experience Academy

Worked with team of undergraduate and graduate students to propose a solution in the area of TX10 Autonomous Systems. Implemented NASA proposal review standards in assessment phase of program.

FIELDWORK SUPPORT

NASA Ames DIG in Antarctica

Remotely supported fieldwork conducted at Lake Untersee in Antarctica with TRIDENT Drill. Assisted with planning exercises and scientific objectives, remote software support and updates via starlink, processing data and analyzing faults through the duration of the field exercise

NASA Ames DIG at Houghton Crater

Supported fieldwork conducted at a Houghton Crater Analog Field site on Devon Island in Nunavut, Canada with TRIDENT Drill. Assisted with planning exercise, execution of shallow drilling tasks, recording data, and analyzing faults while on Devon Island.

NASA Ames DIG and NASA Goddard Instrument Field Team (GIFT) at Bishop Tuff

Supported fieldwork with NASA Ames DIG and the Goddard Institute Field Team (GIFT) in the Bishop Tuff. Assisted with TRIDENT drill execution of shallow drilling tasks, recording data, and collecting samples while at Bishop Tuff.

CERTIFICATIONS

USGS Basic Defense Against Wild Animals (DAWA) Course

Course focusing on wild animal habitat and behavior, how to avoid hostile encounters, proper firearms education, safety and an ability to shoot effectively with multiple types of firearms under simulated defensive field conditions.

Survival Swimming

19-lesson course with emphasis focused on elements of conditional acclimatization (both flat water and surf), breath control, basic locomotion, buoyancy positions, stroke instruction/refinement, and the development of sound "real world" analysis and decision making when faced with operational water survival implications.

First Aid and CPR

American Red Cross Adult and Pediatric First Aid/CPR/AED Course.

Shotokan Karate - Shodan

First Degree Black Belt in Shotokan Karate awarded by ISKF.

RELEVANT COURSEWORK

Intelligent Agents • Machine Learning • Advanced Algorithms • Mineral and Rock Physics • Animation and Planning in Games

VOLUNTEER WORK

Milspouse Coders - Chapter Leader

2020 - Present

Volunteered with Milspouse Coders to help empower military spouses to find challenging and fulfilling careers in technology through organized events, networking, meetings, and presentations.

Pillars Student Residency Program - Student Resident

2022-2023

Spent time with senior-living residents at the Pillars of Prospect Park assisting them in using everyday technology and explaining technological advances to help them stay connected.

Rotex Alaska - Mentor

2011 - 2019

Mentored incoming exchange students to the United States from over 30 countries for their 12 month experience. Led workshops and breakout sessions for incoming and outgoing exchange students outlining what to expect, culture shock, and navigating interpersonal situations abroad.

FIRST Robotics - Volunteer

2013 - 2014

First Robotics Participant in 2013. Transitioned to volunteering for meets in 2014 including setup, tear down, and as event staff member.

STUDENT CLUBS

University of Minnesota Nordic Ski Team
University of Minnesota Figure Skating Club
Army Women's Crew

ORGANIZATIONS

IEEE Computer Society Member
ROTEX Alaska
Society of Women Engineers

LANGUAGES

English: Native Speaker
German: Fluent
Mandarin Chinese: Elementary

PUBLICATIONS AND ABSTRACTS

- [14] **S. Boelter**, G. Brown, T. Stucky, E. Temesgen, M. Gini, B. Glass. (2026). Planetary Drill Fault and Anomaly Detection Demonstrated in Arctic and Antarctic Environments. *In Preparation*.
- [13] **S. Boelter**, G. Brown, E. Temesgen, L. Weber, T. Stucky, B. Glass, M. Gini. (2026). Model-Free Subsurface Anomaly Detection using Subspace Analysis Techniques for Sparse Telemetry for Extraterrestrial Drilling Robots. *Proceedings IEEE International Conference on Robotics and Automation (ICRA)*. June 2026. Accepted.
- [12] B. Glass, **S. Boelter**, C. Fortuin, T. Stucky, C. Stoker. (2025). Planetary Drill Automation Tests at Analog Sites. In *AGU Annual Meeting*. December 2025, New Orleans, USA.
- [11] **S. Boelter**, G. Brown, T. Stucky, E. Forberger, G. Wilson, M. Gini, B. Glass. (2025). Diagnostics for Drilling Fault Prediction in Planetary Drills. *9th International Symposium on Ice Drilling Technology*. September 2025, Potsdam, Germany.
- [10] **S. Boelter** and L. Weber, R. Lenz, B. Glass, M. Gini. (2025). Fault Prediction in Planetary Drilling using Subspace Analysis Techniques. *Intelligent Autonomous Systems 19, Proc. 19th Int'l Conf IAS-19*. July 2025, Genoa, Italy.
- [9] E. Forberger, **S. Boelter**, B. Glass, M. Gini. (2025). Vibration-Based Autonomous Fault Detection for Extraterrestrial Drills. *RSS 2025 Workshop on Resource Constrained Robotics*. June 2025, Los Angeles, USA.
- [8] **S. Boelter**. (2025). Planetary Drilling Autonomy. *2025 IEEE ICRA Doctoral Consortium*. May 2025, Atlanta, USA.
- [7] B. Glass, **S. Boelter**, V. Vendiola, C. Fortuin, T. Stucky, C. Stoker. (2025). Planetary Analog Drill Automation Tests at Houghton Crater. *Lunar Surface Innovation Consortium (LSIC) Spring Meeting*. May 2025, Laurel, USA.
- [6] E. Temesgen, M. Jerez, G. Brown, G. Wilson, S. Divakarla, **S. Boelter**, O. Nelson, R. McPherson, M. Gini. (2025). Geofenced Unmanned Aerial Robotic Defender for Deer Detection and Deterrence (GUARD). *2025 IEEE ICRA Workshop on Novel Approaches for Precision Agriculture and Forestry with Autonomous Robots*. May 2025, Atlanta, USA.
- [5] **S. Boelter**, E. Temesgen, G. Brown, M. Jerez, E. Forberger, B. Glass, M. Gini. (2025). A Concept for Planetary Drilling Autonomy. *2025 IEEE ICRA Workshop on Field Robotics*. May 2025, Atlanta, USA.
- [4] E. Temesgen, **S. Boelter**, M. Gini. (2024). Hierarchical and Heterogeneous MARL for Coordinated Multi-Robot Box-Pushing Environment. *AAAI 2025 CMASDL Workshop*. December 2024, Philadelphia, USA.
- [3] B. Glass, T. Stucky, T. Stevenson, **S. Boelter**, D. Bergman, C. Stoker, I. King. (2024). Automation and AI Technology Development for Planetary Drilling. *Committee on Space Research Scientific Assembly*. July 2024, Busan, Korea.
- [2] **S. Boelter**, E. Temesgen, B. Glass, M. Gini. (2024). Understanding Drill Data for Autonomous Application. *23rd International Conference on Autonomous Agents and Multi-Agent Systems MASSpace Workshop*. July 2024, Auckland, New Zealand.
- [1] B. Glass, C. Stoker, H. Battah, **S. Boelter**, C. Fortuin, I. King, T. Stevenson and T. Stucky. (2024). TRIDENT Drill Validation at Mars and Lunar Analog Field Sites. *55th Lunar and Planetary Science Conference*. March 2024, Woodlands, USA.

PRESENTATIONS AND POSTERS

- [6] **S. Boelter**, E. Forberger, L. Weber, B. Glass, M. Gini. (2025). Autonomy and Arctic Analog Testing for Planetary Drills. *4th Ice Core Community Meeting*. May 2025, Minneapolis, USA.
- [5] **S. Boelter** and S. Shi, L. Polluck. (2024). Congressional Showcase to House and Senate AI Caucuses on NSF Investments Fostering an AI-ready workforce: Computer and Information Science and Engineering Graduate Fellowship Program Presenter. *National Science Foundation Artificial Intelligence Education Hill Event*. September 2024, Washington D.C., USA.
- [4] **S. Boelter**, B. Glass, M. Gini. (2024). Understanding Drill Data for Autonomous Application. *Minnesota Space Grant Symposium*. March 2024, Minneapolis, USA.

- [3] **S. Boelter**, B. Glass, M. Gini. (2024).Autonomy in High-Risk Scenarios. *Computer Science and Engineering Research Showcase*. November 2023, Minneapolis, USA.
- [2] **S. Boelter**, B. Glass, M. Gini. (2024).Autonomy in High-Risk Scenarios. *Minnesota Robotics Institute Research Showcase*. November 2023, Minneapolis, USA.
- [1] A. Sylvester, E. Temesgen, N. Etori, **S. Boelter**, L. Lowmanstone, M. Gini. (2023).Developing a Patient-Centered Solution Towards Bodily Autonomy by Addressing Technology Accessibility. *ICRA Roboethics Competition*. May 2023, London, UK.