Holly Dinkel

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Education

University of Illinois, Urbana-Champaign   *Urbana, IL*

PH.D. CANDIDATE IN AEROSPACE ENGINEERING | NASA SPACE TECHNOLOGY GRADUATE RESEARCH FELLOW   *May 2024*

- Graduate Researcher studying problems in robotic perception, tracking, and manipulation
- Founder and leader of the NASA-funded Representing and Manipulating Deformable Linear Objects research group, comprising 15 members
- Mavis Future Faculty Scholar, Department of Education Graduate Assistant in Areas of National Need Fellow, Illinois Space Grant Consortium Graduate Fellow, Space Cooperation Delegate in the Stanford U.S.-Russia Forum (5% international acceptance rate), Amelia Earhart Fellowship Finalist, Department of State Critical Language Scholarship Recipient (Russian Language)

Stanford University   *Stanford, CA*

M.S. AERONAUTICS AND ASTRONAUTICS   *June 2020*

- Stanford Technology Ventures Program Threshold Ventures Fellow (12 accepted from 80 Stanford graduate student in engineering applicants)

University of Missouri   *Columbia, MO*

B.S. CHEMICAL ENGINEERING, B.A. MUSIC   *May 2017*

- Graduated *Magna Cum Laude* with University Honors (one of three chemical engineering graduates to earn this distinction)
- Department of Energy Nuclear Energy University Programs Scholar (two-time recipient), Honors College Sophomore Scholar (awarded to three sophomores in the honors college), Honors College Junior Scholar (awarded to two juniors in the honors college), Engineering Excellence Award, Curator's Scholar, and Pell Grant recipient

St. Joseph Central High School   *St. Joseph, MO*

HIGH SCHOOL DIPLOMA   *May 2012*

- Class Valedictorian (Rank: 1 / 354), International Baccalaureate Diploma Recipient

Research Experience

NASA Johnson Space Center | Dexterous Robotics Laboratory   *Houston, TX*

VISITING RESEARCH TECHNOLOGIST   *June 2022 - August 2022, 40 hrs/week*

- Developed wire recognition from camera imagery using Mask R-CNN and wire pointcloud segmentation for a ZED-mini camera for NASA's Valkyrie humanoid robot
- Developed a wire tip grasp planning algorithm for robotic manipulation in wire assembly tasks
- Performed wire recognition and grasp planning experiments using a Sawyer 7DOF robotic manipulator with a wrist-mounted ZED-mini camera

University of Illinois at Urbana-Champaign | Coordinated Science Laboratory   *Urbana, IL*

ROBOTICS GRADUATE STUDENT RESEARCHER   *August 2020 - May 2021, 20 hrs/week*

- Developing autonomy for a robot team comprising multiple universal robots robotic manipulators and a mobile robot collaborating to manipulate, assemble, and transport small objects for collaborative autonomous assembly applications
- Used ROS to communicate with robotic mobile base, robotic manipulators, and two-finger Robotiq Hand-e gripper

NASA Ames Research Center | Intelligent Robotics Group   *Mountain View, CA*

ASTROBEE ROBOT FLIGHT SOFTWARE INTERN   *June 2020 - August 2020, 40 hrs/week*

- Developed object perception, segmentation, and reconstruction capability using deep learning methods to enable NASA's Astrobee free-flying robot to inspect and complete the shape of non-rigid objects
- Built, labeled, and iterated on custom training data sets including common ethernet-connected device networks in order to perform cable and device topology mapping
- Used PyTorch and OpenCV on Google Colaboratory to develop learning models

NASA Ames Research Center (KBR Wyle, Inc.) | Intelligent Systems Division   *Mountain View, CA*

DISTRIBUTED SPACECRAFT AUTONOMY INTERN   *March 2020 - June 2020, 30 hrs/week*

- Developed scalability study for modeling and simulation of a distributed autonomous spacecraft architecture for lunar Positioning, Navigation and Timing services
- Implemented spacecraft orbit propagation simulation to generate realistic measurements among PNT assets including line of sight, satellite attitude, noise, and signal variation considerations
- Built a tool for assessing localization accuracy considering hardware selection and operational choices, asset locations, and access to ground truth measurements

Stanford University | Assistive Robotic Manipulation Laboratory   *Stanford, CA*

GRADUATE STUDENT RESEARCHER   *January 2020 - August 2020, 6 hrs/week*

- Studying fast motion planning for catching flying objects using Python and simulating a Franka Emika Panda manipulator using ROS and Gazebo

Stanford University | Autonomous Systems Laboratory
Stanford, CA

GRADUATE STUDENT RESEARCHER
September - December 2020, 15 hrs/week

- Implemented full autonomy software stack in Python - including control, trajectory optimization, motion planning, computer vision, localization and filtering, and reinforcement learning - for autonomous control of a Turtlebot mobile robot

Stanford University | Robotic Exploration Laboratory
Stanford, CA

GRADUATE STUDENT RESEARCHER
September - December 2020, 10 hrs/week

- Used KiCAD to design the main flight computer for PyCubed-1, a PocketQube satellite demonstrating three-axis attitude control using a magnetorquer rather than a reaction wheel

Argonne National Laboratory | Analytical Chemistry Laboratory
Lemont, IL

DOE SCIENCE UNDERGRADUATE LABORATORY INTERN
January 2016 - August 2016, 40 hrs/week

- Studied the dissolution of Scandium, Yttrium, and Titanium in hydrochloric, sulfuric, and hydrogen fluoride acids to optimize a novel separation process for the production of electron linear accelerator-produced therapeutic and diagnostic medical radioisotopes
- Prepared scientific methods, results, and further studies of scandium medical radioisotope research for inclusion in U.S. patent No. 10344355, "Process for the separation and purification of scandium medical isotopes"
- Collected and analyzed radioactive decay data using Matlab for a project seeking to manufacture a Neptunium tracer for nuclear forensics use in the Argonne Analytical Chemistry Laboratory

Fermi National Accelerator Laboratory | Accelerator Division
Batavia, IL

LEE TENG FELLOW IN ACCELERATOR PHYSICS
May 2015 - August 2015, 40 hrs/week

- Developed a Matlab script to extract position, momentum, global time, and particle data group identification (PDGid) data for each particle tracked in G4Beamline, a particle tracking simulation software
- Used G4Beamline data to collaborate on the design of a hadron monitor for the Long Baseline Neutrino Facility, comprising the world's highest-intensity neutrino beam. G4Beamline data enabled definition of the electric field and calculation of the number of electron-ion pairs within the monitor, as well as prediction of the spatial arrangement of the neutrino beam cross section incident on the monitor

University of Missouri | Department of Chemical Engineering
Columbia, MO

HONORS UNDERGRADUATE RESEARCHER
August 2013 - August 2016, 6 hrs/week

- Simulated irradiation and isotopic depletion of small samples of uranium and thorium using OrigenARP and the TRITON sequence in the Oak Ridge National Laboratory-developed SCALE package to assess the risks involved with utilizing thorium as a fuel source in accelerator-driven, portable-power systems
- Assisted a graduate student with irradiation of lithium-intercalated graphite and radioactivity detection for advanced beta-voltaic battery research using the cyclotron at the University of Missouri Research Reactor (MURR)

Engineering Experience

NASA Marshall Space Flight Center (Bastion Technologies Inc.) | Mission Assurance Directorate
Huntsville, AL

PROBABILISTIC RISK ASSESSMENT (PRA) ANALYST
May 2017 - August 2018, 40 hrs/week

- Developed fault tree analyses in SAPHIRE for loss of mission and loss of crew scenarios for NASA's Space Launch System (SLS) rocket
- Maintained and developed system-level PRAs using SAPHIRE and Excel for the upper Reaction Control System (RCS); core, booster, and upper stage thrust vector control systems; and the SLS interface with exploration ground systems
- Awarded a Bastion contract-wide on-the-spot award for identifying an upper stage reaction control system design in violation of NASA's single-fault-tolerance requirement and presenting the risks of this design to the SLS chief safety officer
- Recruited and mentored a Bastion full-time employee and a NASA Pathways summer intern in PRA and supported their developments of the interim cryogenic propulsion stage RCS PRA and the exploration upper stage RCS PRA, respectively
- Supported presentation of the integrated SLS PRA model to the SLS engineering review board
- Collaborated with a NASA reliability engineer to collect historical space shuttle hydrazine leak data and fit statistical distributions to this data in R for use in SLS risk and uncertainty quantification

Teaching Experience

University of Illinois at Urbana-Champaign | Various
Urbana, IL

UNDERGRADUATE RESEARCH MENTOR
January 2021 - Present, 5 hrs/week

- Responsible for mentoring undergraduate research through the Illinois Space Grant Consortium Undergraduate Research Opportunity Program (UROP), Undergraduate Research Apprenticeship Program (URAP), Promoting Undergraduate Research in Engineering (PURE) program, AE 597: Graduate Indpendent Study, AE 497: Undergraduate Research, ECE 397: Undergraduate Research, and AE 298: Undergraduate Research Mentoring.

Stanford University | Department of Aeronautics and Astronautics
Stanford, CA

GLOBAL POSITIONING SYSTEM (AA 115Q) COURSE DEVELOPMENT ASSISTANT
December 2019 - March 2020, 10 hrs/week

- Responsible for building course projects involving using a sextant for celestial navigation and determining the accuracy of global positioning system measurements in the presence of interference

Stanford University | Athletic Academic Resource Center *Stanford, CA*

Academic Skills Tutor *September 2019 - June 2020, 6 hrs/week*

- Facilitated undergraduate group tutorial sessions for Dynamics, Probabilistic Analysis, Introduction to Optimization, Mechanics of Materials, and Introduction to Single-Variable Calculus

Stanford University | Schwab Learning Center *Stanford, CA*

Academic Skills Tutor *January 2019 - June 2020, 5 hrs/week*

- Provided individual tutoring to ensure academic success for students with attention-deficit hyperactivity disorder, dyslexia, and other learning disabilities for Dynamics and Physics: Light and Heat

University of Missouri | Community Music Program *Columbia, MO*

Community Music Program Clarinet Instructor *August 2016 - May 2017, 5 hrs/week*

- Coached clarinet performance techniques to middle- and high-school music students, stressing the importance of performance as a learning tool through encouraging every student to participate in a public recital each semester

Skills

Software	PyTorch, ROS, Gazebo, KiCAD, Git
Programming	Python, Julia, Matlab
Languages	English (native), Mandarin Chinese (B2), Russian (B1)

Outreach and Community Activities

Stanford Orchestras *Stanford, CA*

Clarinetist, Bassoonist *September 2018 - March 2020*

- Principal clarinet in Stanford Symphony Orchestra, the university's largest orchestra, performing three concert cycles per year with guest artists Rob Kapilow, Lynn Harrell, and Nitin Sawhney
- Bassoonist in Stanford Summer Symphony
- Founding clarinetist for the Stanford University Ragtime Ensemble, a group performing free concerts on the Stanford University campus and at the San Francisco Botanical Garden
- Founding clarinetist of the Stanford Wind Kwyntet, a student woodwind quintet offering free chamber music concerts on the university campus throughout the year
- Developed skills in teamwork, communication, self–motivation and discipline to maintain the high caliber of musicianship of Stanford music department ensembles

Future Problem Solving Program *Melbourne, FL*

Global Issues Problem Solving Evaulator *October 2016 - Present*

- Evaluated the feasibility and originality of solutions to future scenarios analyzed by interdisciplinary problem-solving students in an international writing competition to teach K12 students how to think creatively about the future

Publications and Presentations

[1] **H. Dinkel** and J. Cornelius. *"Vela: A Data-Driven Proposal for Joint Collaboration in Space Exploration"*. In *Proceedings of the International Astronautical Federation (IAF) International Astronautical Congress (IAC)*, September 2022.

[2] T. Chen, Z. Huang, J. Motes, J. Geng, Q.M. Ta, **H. Dinkel**, H. Abdul-Rashid, J. Myers, Y.J. Mun, W.C. Lin, Y.Y. Huang, S. Liu, M. Morales, N. Amato, K. Driggs-Campbell, and T. Bretl. *"Insights from an Industrial Collaborative Assembly Project: Lessons in Research and Collaboration"*. In *Proceedings of the Workshop on Collaborative Robots and Work of the Future at the International Conference on Robotics and Automation*, May 2022.

[3] **H. Dinkel**, J. Xiang, H. Zhao, B. Coltin, T. Smith, and T. Bretl. *"Wire Point Cloud Instance Segmentation from RGBD Imagery with Mask R-CNN"*. In *Proceedings of the Workshop on Representing and Manipulating Deformable Objects at the International Conference on Robotics and Automation*, May 2022.

[4] **H. Dinkel**, H. Zhao, J. Xiang, B. Coltin, T. Smith, and T. Bretl. *"Benchmarking Wire Instance Segmentation with Mask R-CNN"*. In *Under Submission*, February 2022.

[5] J. Cornelius, **H. Dinkel**, and A. Kurgan. *"Development of a Private Space Sector in the U.S. and Russia"*. In *Proceedings of the International Astronautical Federation (IAF) Global Space Exploration (GLEx) Conference*, June 2021.

[6] J. Cornelius and **H. Dinkel**. *"U.S. and Russian Strategies in the Privatization of Space"*. In *Under Submission*, September 2022.

[7] **H. Dinkel**, T. Bretl, B. Coltin, T. Smith, and M. Moreira. *"Conditional Variational Autoencoders on Astrobee RGB-D Imagery"*. In *National Aeronautics and Space Administration Summer Intern Poster Symposium*, August 2020.

[8] **H. Dinkel** and K. Hashemi. *"Ground Asset Placement Optimization for Lunar Positioning, Navigation, and Timing"*. In *National Aeronautics and Space Administration Summer Intern Poster Symposium*, June 2020.

[9] **H. Dinkel** and F. Hark. *"An Assessment of Launch Failures from 1989 - Present"*. In *Reliability, Availability, and Maintainability (RAM) X Training Summit*, October 2017.

[10] **H. Dinkel**, M. Bennett, M. A. Brown, and D. Rotsch. *"Separations and Chromatography Studies of Yttrium-90 for Radiolabeling Pharmaceuticals"*. In *Argonne National Laboratory Summer Research Symposium*, August 2016.

[11] K. Yonehara, R. Abrams, **H. Dinkel**, B. Freemire, and R. Johnson. *"Gas Filled RF Resonator Hadron Beam Monitor for Intense Neutrino Beam Experiments"*. In *Proceedings of the 7th International Conference on Particle Accelerator Physics*, May 2016.

[12] **H. Dinkel** and K. Yonehara. *"Pressurized Gas Hadron Monitor for the Long Baseline Neutrino Facility"*. In *Fermi National Accelerator Laboratory Summer Research Symposium*, August 2015.

[13] **H. Dinkel**. *"Modeling Burnup and Actinide Production of Thorium and Urandium Fuel Sources for Nuclear Power Systems"*. In *Undergraduate Research and Creative Achievements Forum*, April 2015.