

# ALAN KUNTZ

Assistant Professor, Kahlert School of Computing and Robotics Center, University of Utah

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## Education

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**University of North Carolina at Chapel Hill** **Chapel Hill, NC**

*PhD, Computer Science* *2019*

Thesis: “Integrating Optimization and Sampling for Robot Motion Planning with Applications in Healthcare”

Committee: Ron Alterovitz (Chair), Nancy M. Amato, Jessica Burgner-Kahrs, Parasara Sridhar Duggirala, Marc Niethammer

**University of North Carolina at Chapel Hill** **Chapel Hill, NC**

*MS, Computer Science* *2016*

**University of New Mexico** **Albuquerque, NM**

*BS, Computer Science with Mathematics Minor* *2014*

Institutional Honors: Cum Laude, Departmental Honors: Summa Cum Laude

## Experience

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**University of Utah** **Salt Lake City, UT**

*Assistant Professor, Kahlert School of Computing and Robotics Center* *2020-Present*

*Adjunct Assistant Professor, Department of Mechanical Engineering* *2022-Present*

**Vanderbilt University** **Nashville, TN**

*Postdoctoral Scholar* *2019*

**University of North Carolina at Chapel Hill** **Chapel Hill, NC**

*Graduate Research Assistant* *2014-2019*

**University of New Mexico** **Albuquerque, NM**

*Undergraduate Research Assistant* *2012-2014*

**Los Alamos National Laboratory** **Los Alamos, NM**

*Undergraduate Research Assistant* *2013*

**Albuquerque Ambulance Service** **Albuquerque, NM**

*Paramedic/EMT, EVO Field Instructor* *2008-2012*

## Patents

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1. Alan D. Kuntz and Daniel S. Drew, “Millimeter-Scale Continuum Robot with an Integrated Gripper,” United States Provisional Patent Application No. 63/553,431, 2024.
2. Alan D. Kuntz, Jacob J. Abbott, and Trevor J. Schwehr, “Magnetically Steerable Screw-Tip Cannula,” United States Patent Application 17/943,622, with international WO application, 2023.
3. Ron Alterovitz, Richard H. Feins, Bryan I. Hartley, Alan D. Kuntz, Erik Lamers, Arthur W. Mahoney, Andria A. Remirez, Philip J. Swaney, and Robert J. Webster III, “Methods, systems, and computer readable media for transoral lung access,” United States Patent No. 10,803,662, 2020.

## Funding

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### Active

1. Advanced Research Projects Agency for Health (ARPA-H) - “Transformative Autonomy at a Disruptively Less Invasive Scale in Surgical Robotics,” 2024-2027  
PI - Robert J. Webster III, Co-Is - Alan Kuntz (Utah site PI), Tucker Hermans, Daniel Brown, Brett Byram, Ipek Oguz, Jie Ying Wu, Richard Hendrick, Duke Herrell, Nicholas Kavoussi, Fabien Maldonado, Caleb Rucker, Axel Krieger, Ahmed Ghazi, Naren Nimagadda, Anton Deguet  
\$11,935,038, Utah share: \$3,079,629, Kuntz share: \$1,534,847

2. NSF - “Modeling, Control, and Motion Planning of Magnetic-screw Microrobots in Soft Tissue,” 2023-2026  
PI - Alan Kuntz, Co-PI Jake Abbott  
\$740,283, Kuntz share: \$377,161
3. NSF - “NRI: Liquid-Solid Metal for Embodied Intelligence in Semi-Soft, Human-Collaborative Robots,”  
2021-2025  
PI - Alan Kuntz, Co-PI Robert J. Webster III  
\$1,489,077, Kuntz share: \$607,359
4. State of Utah System of Higher Education - “Robotics Certificates and Graduate Degree Programs”,  
2022-2024  
PI - Mark Minor, Co-PIs - Jake Abbott, Edoardo Battaglia, Daniel Brown, Daniel Drew, Jacob George,  
Tucker Hermans, John Hollerbach, Alan Kuntz, Kam Leang, Tomasso Lenzi, Steve Mascaro, Sanford Meek,  
Haohan Zhang  
\$413,973
5. AHRQ R18 - “Reconfiguring the patient room as a fall protection strategy to increase patient stability during  
ambulation,” 2018-2024  
PIs - Janice Morse, Andrew Merryweather, Co-Is - Bob Wong, Bo Foreman, SP - Alan Kuntz  
\$1,990,321, Kuntz share: \$39,128 Added after award.
6. Intuitive Technology Research Grant - “Learning Safe Surgical Grasping and  
Manipulation from Video and Expert Demonstration with Safety-Aware Lifelong  
Learning,” 2020  
PI - Alan Kuntz, Co-Is - Tucker Hermans, Jake Abbott, John Stringham  
daVinci Research Kit Robot (equipment) and Clinical API

## Completed

1. NIH R44 - “Reopening the Central Airway with Needle-Size Tentacle Manipulators,” 2019-2021  
PI - Richard Hendrick Co-I Robert J. Webster III, Duke Herrell, Fabien Maldonado, Erin Gillaspie, Otis  
Rickman, SP - Alan Kuntz  
\$1,571,367, Kuntz share: \$22,705 Added after award.

## Journal Papers

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1. Samuel Schmidgall, Ji Woong Kim, Alan Kuntz, Ahmed Ezzat Ghazi, and Axel Krieger, “General-purpose  
foundation models for increased autonomy in robot-assisted surgery: challenges and opportunities”, *Nature  
Machine Intelligence*, 2024, in press.
2. Brian Y. Cho<sup>†</sup>, Daniel S. Esser, Jordan Thompson<sup>†</sup>, Bao Thach<sup>†</sup>, Robert J. Webster III, and Alan Kuntz,  
“Accounting for Hysteresis in the Forward Kinematics of Nonlinearly-Routed Tendon-Driven Continuum  
Robots via a Learned Deep Decoder Network”, *IEEE Robotics and Automation Letters (RA-L)*, Vol. 09, Issue  
11, pp. 9263-9270, 2024.
3. Nooshin Seddighi, Ying-Ching Chen, Andrew S Merryweather, K Bo Foreman, Alan Kuntz, Edoardo  
Battaglia, Haohan Zhang, Ellen Taylor, Bob Wong, and Peter C Fino, “The Impact of Design Factors on User  
Behavior in a Virtual Hospital Room to Explore Fall Prevention Strategies”, *HERD: Health Environments  
Research & Design Journal*, 0(0), April 2024.
4. Adam J. Sperry, Trevor J. Schwehr<sup>‡</sup>, Emma K. Pinegar<sup>†</sup>, Olivia B. Richards<sup>†</sup>, John D. Rolston, Matthew D.  
Alexander, Brittany Coats, Jake J. Abbott, and Alan Kuntz, “Screw-tip Soft Magnetically Steerable Needles,”  
*IEEE Transactions on Medical Robotics and Bionics*, vol. 6, no 1, pp. 4-17, February 2024.
5. Alan Kuntz, Maxwell Emerson, Tayfun Efe Ertop, Inbar Fried, Mengyu Fu, Janine Hoelscher, Margaret Rox,  
Jason Akulian, Erin A. Gillaspie, Yueh Z. Lee, Fabien Maldonado, Robert J. Webster III, and Ron Alterovitz,  
“Autonomous medical needle steering in vivo,” *Science Robotics*, vol. 8, no. 42, pp. eadf7614, September 2023.

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<sup>†</sup> denotes student of which I am the primary advisor, <sup>‡</sup> denotes student of which I am a co-advisor

6. Michael Bentley<sup>†</sup>, Caleb Rucker, Chakravarthy Reddy, Oren Salzman, and Alan Kuntz, “Safer Motion Planning of Steerable Needles via a Shaft-to-Tissue Force Model,” *Journal of Medical Robotics Research*, vol. 08, no. 01n02, pp. 2350003, June 2023.
7. Mengyu Fu, Alan Kuntz, Oren Salzman, and Ron Alterovitz, “Asymptotically Optimal Inspection Planning via Efficient Near-optimal Search on Sampled Roadmaps,” *International Journal of Robotics Research*, vol. 42, issue 4-5, pp. 150-175, June 2023.
8. Margaret Rox, Daniel S. Esser, Mariana E. Smith, Tayfun Efe Ertop, Maxwell Emerson, Fabien Maldonado, Erin A. Gillaspie, Alan Kuntz, and Robert J. Webster III, “Toward Continuum Robot Tentacles for Lung Interventions: Exploring Folding Support Disks,” *IEEE Robotics and Automation Letters*, vol. 8, no. 6, pp. 3494-3501, June 2023. (Presented at IROS 2023)
9. Michael Bentley<sup>†</sup>, Caleb Rucker, and Alan Kuntz, “Interactive-rate Supervisory Control for Arbitrarily-routed Multi-tendon Robots via Motion Planning,” *IEEE Access*, vol. 10, pp. 80999-81019, August 2022. [2022 IEEE Access Best Video Award Part 1](#)
10. Janine Hoelscher, Mengyu Fu, Inbar Fried, Maxwell Emerson, Tayfun Efe Ertop, Margaret Rox, Alan Kuntz, Jason A. Akulian, Robert J. Webster, III, and Ron Alterovitz, “Backward Planning for a Multi-Stage Steerable Needle Lung Robot,” *IEEE Robotics and Automation Letters*, vol. 6, no. 2, pp. 3987-3994, April 2021. (Presented at ICRA 2021)
11. Margaret F. Rox, Maxwell Emerson, Tayfun Efe Ertop, Inbar Fried, Mengyu Fu, Janine Hoelscher, Alan Kuntz, Josephine Granna, Jason Mitchell, Michael Lester, Fabien Maldonado, Erin A. Gillaspie, Jason A. Akulian, Ron Alterovitz, and Robert J. Webster, III, “Decoupling Steerability from Diameter: Helical Dovetail Laser Patterning for Steerable Needles,” *IEEE Access*, vol. 8, pp. 181411-181419, October 2020.
12. James M. Ferguson, E. Bryn Pitt, Alan Kuntz, Josephine Granna, Nicholas L. Kavoussi, Naren Nimmagadda, Eric J. Barth, S. Duke Herrell, III, and Robert J. Webster, III, “Comparing the Accuracy of the da Vinci Xi and da Vinci Si for Image Guidance and Automation,” *The International Journal of Medical Robotics and Computer Assisted Surgery*, e2149, August 2020.
13. Alan Kuntz, Armaan Sethi, Robert J. Webster III, and Ron Alterovitz, “Learning the Complete Shape of Concentric Tube Robots,” *IEEE Transactions on Medical Robotics and Bionics*, vol. 2, no. 2, pp. 140-147, May 2020.
14. James M. Ferguson, E. Bryn Pitt, Andria A. Ramirez, Michael A. Siebold, Alan Kuntz, Nicholas L. Kavoussi, Eric J. Barth, S. Duke Herrell, III, and Robert J. Webster, III, “Toward Practical and Accurate Touch-Based Image Guidance for Robotic Partial Nephrectomy,” *IEEE Transactions on Medical Robotics and Bionics*, vol. 2, no. 2, pp. 196-205, May 2020.
15. Nathan Sharp, Alan Kuntz, Cole Brubaker, Stephanie Amos, Wei Gao, Gautum Gupta, Charles R. Farrar, David D. Mascarenas, Aditya Mohite, “Crack Detection Sensor Layout and Bus Configuration Analysis,” *Smart Materials and Structures*, 23(5):055021, 2014.
16. Nathan Sharp, Alan Kuntz, Cole Brubaker, Stephanie Amos, Wei Gao, Gautum Gupta, Aditya Mohite, Charles R. Farrar, David D. Mascarenas, “A Bio-Inspired Asynchronous Skin System for Crack Detection Applications,” *Smart Materials and Structures*, 23(5):055020, 2014.

## Publications in Refereed Conference

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1. Britton Jordan<sup>†</sup>, Daniel S. Esser, Jeonghyeon Kim, Brian Y. Cho<sup>†</sup>, Robert J. Webster, III, and Alan Kuntz, “Exploring Modal Switch in Metamaterial-Based Robots”, *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2024, in press.
2. Yosuke Mizutani, Daniel Coimbra Salomao, Alex Crane, Matthias Bentert, Pål Grønås Drange, Felix Reidl, Alan Kuntz, and Blair D. Sullivan, “Leveraging Fixed-Parameter Tractability for Robot Inspection Planning”, *The 16th International Workshop on the Algorithmic Foundations of Robotics (WAFR)*, October 2024.

3. Emily McCabe, Margaret Rox, Maxwell Emerson, Tayfun Efe Ertop, Inbar Fried, Mengyu Fu, Janine Hoelscher, Fabien Maldonado, Erin Gillaspie, Jason Akulian, Yueh Lee, Alan Kuntz, Ron Alterovitz, and Robert J. Webster, III, “In Vivo Demonstration of a Bevel Tip Steerable Needle with an Integrated Fluid Channel”, *The Hamlyn Symposium on Medical Robotics*, June 2024.
4. Daniel Esser, Tayfun Efe Ertop, Emily McCabe, Fabien Maldonado, Erin Gillaspie, Alan Kuntz, and Robert J. Webster, III, “A Continuum Lung Stapler Leveraging Phase Changing Metal for Dexterity and Stiffness”, *The Hamlyn Symposium on Medical Robotics*, June 2024.
5. Jordan Thompson<sup>†</sup>, Brian Y. Cho<sup>†</sup>, Daniel S. Brown, and Alan Kuntz, “Modeling Kinematic Uncertainty of Tendon-Driven Continuum Robots via Mixture Density Networks,” *International Symposium on Medical Robotics (ISMR)*, 2024.
6. Zohre Karimi, Shing-Hei Ho<sup>†</sup>, Bao Thach<sup>†</sup>, Alan Kuntz, and Daniel S. Brown, “Reward Learning from Suboptimal Demonstrations with Applications in Surgical Electrocautery,” *International Symposium on Medical Robotics (ISMR)*, 2024. **Best Student Paper Award Finalist and Best Paper Award Finalist**
7. Bao Thach<sup>†</sup>, Tanner Watts<sup>†</sup>, Shing-Hei Ho<sup>†</sup>, Tucker Hermans, and Alan Kuntz, “DefGoalNet: Contextual Goal Learning from Demonstrations for Deformable Object Manipulation,” *IEEE International Conference on Robotics and Automation (ICRA)*, pp. 3145–3152, 2024.
8. Brian Y. Cho<sup>†</sup> and Alan Kuntz, “Efficient and Accurate Mapping of Subsurface Anatomy via Online Trajectory Optimization for Robot Assisted Surgery,” *IEEE International Conference on Robotics and Automation (ICRA)*, pp. 15478–15484, 2024.
9. Daniel S. Esser, Emily M. McCabe, Tayfun Efe Ertop, Alan Kuntz, and Robert J. Webster III, “Directional Stiffness Switching via Phase Changing Metallic Spines,” *IEEE International Conference on Soft Robotics (RoboSoft)*, 2024.
10. Emily M. McCabe, Daniel S. Esser, Tayfun Efe Ertop, Alan Kuntz, and Robert J. Webster III, “Combining Thermoelectrics and Low Melting Point Alloys to Create Reconfigurable Rigid-Compliant Manipulators,” *IEEE International Conference on Soft Robotics (RoboSoft)*, 2024.
11. Alexandra Leavitt<sup>†</sup>, Ryan Lam<sup>†</sup>, Nichols Crawford Taylor, Daniel S. Drew, and Alan Kuntz, “Toward a Millimeter-Scale Tendon-Driven Continuum Wrist with Integrated Gripper for Microsurgical Applications,” *The Hamlyn Symposium on Medical Robotics*, June 2023.
12. Mariana E. Smith, Daniel S. Esser, Margaret Rox, Alan Kuntz, and Robert J. Webster III, “A Radial Folding Mechanism to Enable Surgical Continuum Manipulators to Fit Through Smaller Ports,” *International Symposium on Medical Robotics (ISMR)*, April 2023.
13. Trevor J. Schwehr<sup>‡</sup>, Adam J. Sperry, John D. Rolston, Matthew D. Alexander, Jake J. Abbott, and Alan Kuntz, “Toward Targeted Therapy in the Brain by Leveraging Screw-Tip Soft Magnetically Steerable Needles,” *The Hamlyn Symposium on Medical Robotics*, June 2022.
14. Margaret Rox, Aidan Copinga<sup>†</sup>, Robert P. Naftel, Robert J. Webster, III, and Alan Kuntz, “Optimizing Continuum Robot Tendon Routing for Minimally Invasive Brain Surgery,” *The Hamlyn Symposium on Medical Robotics*, June 2022.
15. Bao Thach<sup>†</sup>, Brian Y. Cho<sup>†</sup>, Alan Kuntz, and Tucker Hermans, “Learning Visual Shape Control of Novel 3D Deformable Objects from Partial-View Point Clouds,” *IEEE International Conference on Robotics and Automation (ICRA)*, pp. 8274-8281, 2022.
16. Brian Y. Cho<sup>†</sup>, Tucker Hermans, and Alan Kuntz, “Planning Sensing Sequences for Subsurface 3D Tumor Mapping,” *International Symposium on Medical Robotics (ISMR)*, 2021.
17. Yixuan Huang, Michael Bentley<sup>†</sup>, Tucker Hermans, and Alan Kuntz, “Toward Learning Context-Dependent Tasks from Demonstration for Tendon-Driven Surgical Robots,” *International Symposium on Medical Robotics (ISMR)*, 2021. **Best Student Paper Award Finalist and Best Paper Award Finalist**

18. Inbar Fried, Janine Hoelscher, Mengyu Fu, Maxwell Emerson, Tayfun Efe Ertop, Margaret Rox, Josephine Granna, Alan Kuntz, Jason A. Akulian, Robert J. Webster, III, and Ron Alterovitz, "Design Considerations for a Steerable Needle Robot to Maximize Reachable Lung Volume," *IEEE International Conference on Robotics and Automation (ICRA)*, pp. 1418-1425, 2021.
19. Sarvenaz Chaeibakhsh<sup>†</sup>, Roya Sabbagh Novin, Tucker Hermans, Andrew Merryweather, and Alan Kuntz, "Optimizing Hospital Room Layout to Reduce the Risk of Patient Falls," *The International Conference on Operations Research and Enterprise Systems (ICORES)*, pp. 36-48, February 2021.
20. Maxwell Emerson, James M. Ferguson, Tayfun Efe Ertop, Margaret F. Rox, Josephine Granna, Michael Lester, Fabien Maldonado, Erin A. Gillaspie, Ron Alterovitz, Robert J. Webster, III, and Alan Kuntz, "A Recurrent Neural Network Approach to Roll Estimation for Needle Steering," *International Symposium on Experimental Robotics (ISER)*, pp. 334-342, 2020.
21. Tayfun Efe Ertop, Maxwell Emerson, Margaret F. Rox, Josephine Granna, Fabien Maldonado, Erin Gillaspie, Michael Lester, Alan Kuntz, D. Caleb Rucker, Mengyu Fu, Janine Hoelscher, Inbar Fried, Ron Alterovitz, and Robert J. Webster, III, "Steerable Needle Trajectory Following in the Lung: Torsional Deadband Compensation and Full Pose Estimation with 5DOF Feedback for Needles Passing Through Flexible Endoscopes", *ASME Dynamic Systems and Control Conference*, October 2020. **Best Student Paper Award Finalist**
22. Haonan Chen, Hao Tan, Alan Kuntz, Mohit Bansal, and Ron Alterovitz, "Enabling Robots to Understand Incomplete Natural Language Instructions Using Commonsense Reasoning," *IEEE International Conference on Robotics and Automation (ICRA)*, pp. 1963-1969, Paris, France, June 2020.
23. Alan Kuntz, Mengyu Fu, and Ron Alterovitz, "Planning High-Quality Motions for Concentric Tube Robots in Point Clouds via Parallel Sampling and Optimization," *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, pp. 2205-2212, Macau, China, November 2019.
24. Sherdil Niyaz, Alan Kuntz, Oren Salzman, Ron Alterovitz, and Siddhartha S. Srinivasa, "Optimizing Motion-Planning Problem Setup via Bounded Evaluation with Application to Following Surgical Trajectories," *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, pp. 1355-1362, Macau, China, November 2019.
25. Alan Kuntz, Armaan Sethi, and Ron Alterovitz, "Estimating the Complete Shape of Concentric Tube Robots via Learning," *The Hamlyn Symposium on Medical Robotics*, pp. 43-44, London, United Kingdom, June 2019.
26. Mengyu Fu, Alan Kuntz, Oren Salzman, and Ron Alterovitz, "Toward Asymptotically-Optimal Inspection Planning via Efficient Near-Optimal Graph Search," *Robotics: Science and Systems (RSS)*, Freiburg im Breisgau, Germany, June 2019.
27. Sherdil Niyaz, Alan Kuntz, Oren Salzman, Ron Alterovitz, and Siddhartha S. Srinivasa, "Following Surgical Trajectories with Concentric Tube Robots via Nearest-Neighbor Graphs," *International Symposium on Experimental Robotics (ISER)*, Buenos Aires, Argentina, November 2018.
28. Mengyu Fu, Alan Kuntz, Robert J. Webster III, and Ron Alterovitz, "Safe Motion Planning for Steerable Needles Using Cost Maps Automatically Extracted from Pulmonary Images," *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, pp. 4942-4949, Madrid, Spain, October 2018.
29. Patrick Anderson, Tayfun Ertop, Alan Kuntz, Fabien Maldonado, Ron Alterovitz, and Robert J. Webster III, "Sand Blasting Inside a Patient: A CRISP Robot for Spraying Powder inside the Chest Cavity to Preclude Lung Collapse," *The Hamlyn Symposium on Medical Robotics*, pp. 121-122, London, United Kingdom, June 2018.
30. Alan Kuntz, Chris Bowen, Cenk Baykal, Arthur W. Mahoney, Patrick L. Anderson, Fabien Maldonado, Robert J. Webster III, and Ron Alterovitz, "Kinematic Design Optimization of a Parallel Surgical Robot to Maximize Anatomical Visibility via Motion Planning," *IEEE International Conference on Robotics and Automation (ICRA)*, pp. 926-933, Brisbane, Australia, May 2018.

31. Alan Kuntz, Chris Bowen, and Ron Alterovitz, “Fast Anytime Motion Planning in Point Clouds by Interleaving Sampling and Interior Point Optimization,” *Proc. International Symposium on Robotics Research (ISRR)*, Puerto Varas, Chile, December 2017.
32. Alan Kuntz, Arthur W. Mahoney, Nicolas E. Peckman, Patrick L. Anderson, Fabien Maldonado, Robert J. Webster III, and Ron Alterovitz, “Motion Planning for Continuum Reconfigurable Incisionless Surgical Parallel Robots,” *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, pp. 6463-6469, Vancouver, BC, Canada, September 2017.
33. Alan Kuntz, Philip J. Swaney, Arthur Mahoney, Richard H. Feins, Yueh Z. Lee, Robert J. Webster III, and Ron Alterovitz, “Toward Transoral Peripheral Lung Access: Steering Bronchoscope-Deployed Needles through Porcine Lung Tissue,” *The Hamlyn Symposium on Medical Robotics*, pp. 9-10, London, United Kingdom, June 2016.
34. Alan Kuntz, Luis G. Torres, Richard H. Feins, Robert J. Webster III, and Ron Alterovitz, “Motion Planning for a Three-Stage Multilumen Transoral Lung Access System,” *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, pp. 3255-3261, Hamburg, Germany, September 2015.
35. Luis G. Torres, Alan Kuntz, Hunter B. Gilbert, Philip J. Swaney, Richard J. Hendrick, Robert J. Webster III, and Ron Alterovitz, “A Motion Planning Approach to Automatic Obstacle Avoidance during Concentric Tube Robot Teleoperation,” *IEEE International Conference on Robotics and Automation (ICRA)*, pp. 2361-2367, Seattle, WA, USA, May 2015.
36. Nathan Sharp, Alan Kuntz, Cole Brubaker, Stephanie Amos, Wei Gao, Gautum Gupta, Aditya Mohite, Charles Farrar, David Mascarenas, “An Asynchronous Sensor Skin for Structural Health Monitoring Applications,” *Conference on Sensors and Smart Structures Technologies for Civil, Mechanical, and Aerospace Systems*, San Diego, CA, USA, March 2014.

## Publications in Workshops and Non-Refereed Conferences

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1. Nooshin Seddighi, Ying-Ching Chen, Andrew Merryweather, K. Bo Foreman, Alan Kuntz, Edoardo Battaglia, Haohan Zhang, Ellen Taylor, Bob Wong, and Peter C. Fino. “The impact of design factors on user behavior in a virtual reality hospital room for enhanced fall prevention strategies,” *American Society of Biomechanics Annual Meeting*, August 2023.
2. Nooshin Seddighi, Ying-Ching Chen, Andrew Merryweather, K. Bo Foreman, Alan Kuntz, Edoardo Battaglia, Haohan Zhang, Bob Wong, Ellen Taylor, and Peter C. Fino. “The impact of design factors on user behavior in a virtual reality hospital room for enhanced fall prevention strategies,” *Rocky Mountain American Society of Biomechanics Regional Meeting*, April 2023.
3. Bao Thach<sup>†</sup>, Alan Kuntz, and Tucker Hermans “DeformerNet: A Deep Learning Approach to 3D Deformable Object Manipulation,” *RSS Workshop on Deformable Object Simulation in Robotics (DO-Sim)*, 2021. **Best Paper Award Honorable Mention**
4. Margaret F. Rox, Maxwell Emerson, Tayfun Efe Ertop, Mengyu Fu, Inbar Fried, Janine Hoelscher, Alan Kuntz, Josephine Granna, Jason Mitchell, Michael Lester, Fabien Maldonado, Erin Gillaspie, Jason Akulian, Ron Alterovitz, and Robert J. Webster, III, “An Aiming Device for Steerable Needles”. *IEEE/ASME International Conference on Advanced Intelligent Mechatronics*, 2020.
5. Maxwell Emerson, Tayfun Efe Ertop, Margaret F. Rox, Mengyu Fu, Inbar Fried, Janine Hoelscher, Alan Kuntz, Josephine Granna, Jason Mitchell, Michael Lester, Fabien Maldonado, Erin Gillaspie, Jason Akulian, Ron Alterovitz, and Robert J. Webster, III, “A New Sheath for Highly Curved Steerable Needles”. *IEEE/ASME International Conference on Advanced Intelligent Mechatronics*, 2020.
6. Stephanie Amack, Margaret Rox, Jason Mitchell, Maxwell Emerson, Alan Kuntz, Ron Alterovitz, Robert J. Webster III, “A New Approach to Homing and Tool Changes in Needle-Like Surgical Robots,” *SPIE Medical Imaging*, vol. 10951, San Diego, CA, USA, February, 2019.



7. Alan Kuntz, Cole Brubaker, Stephanie Amos, Nathan Sharp, Wei Gao, Gautum Gupta, Aditya Mohite, Charles R. Farrar, David D. Mascarenas, “Endowing Structures with a Nociceptive Sense Enabled by a Graphene-Oxide Sensing Skin,” *Structural Health Monitoring, Volume 5*, ser. Conference Proceedings of the Society for Experimental Mechanics Series, pp. 117-123, Orlando, FL, USA, February, 2014.
8. Kasra Manavi, Alan Kuntz, Lydia Tapia, “Geometrical Insights into the Process of Antibody Aggregation” In *Proceedings of the AAAI Workshop on Artificial Intelligence and Robotics Methods in Computational Biology (AIRMCB)*, pp. 26-31, Bellevue, WA, USA, July 2013.

## Invited Presentations

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1. “Reducing Invasiveness and Increasing Autonomy: Building the Medical Robots of the Future,” *The Bookout Center Annual Symposium for Robotics, Imaging, and Digital Surgery*, Houston Methodist, October 2024.
2. “Learning Surgical Subtasks from Large-Scale Simulation and Small-Scale Demonstrations,” Machine Learning with the da Vinci Research Kit Workshop, *International Symposium on Medical Robotics*, June 2024.
3. “Building the Surgical Systems of the Future: Reducing Invasiveness and Increasing Autonomy,” The Third Holistic Forum of Medical Robotic Junior Professors: From Rehabilitation to Surgical Robots, *International Symposium on Medical Robotics*, June 2024.
4. “Automating Transendoscopic Robotic Interventions,” Translational Research in Medical Robotics Workshop, *IEEE International Conference on Robotics and Automation (ICRA)*, May 2024.
5. “The Future of Surgical Robotics: Vision, Challenges, and the Science to Meet Them,” Workshop on Vision and Challenges for Medical Robotics: Surgical Robots, *National Science Foundation Robotics Principle Investigator Meeting*, April 2024.
6. “The Cutting Edge of Surgery: Medical Robots Improving Precision, Efficiency, and Accessibility,” *Utah Data Science Day*, University of Utah, January 2024.
7. “Deformable Tissue and Deformable Robots: Algorithmic and Mechanical Solutions to Leverage Robots in Surgical and Interventional Medicine,” *Laboratory for Computational Sensing and Robotics (LCSR) Seminar*, Johns Hopkins University, November 2023.
8. “Deformable Robots and Deformable Tissue: Novel Mechanical and Algorithmic Solutions Enabling Robots in Surgical and Interventional Medicine,” *Technion Robotics Seminar (TRS)*, Technion – Israel Institute of Technology, June 2023.
9. “The Cutting Edge of Surgery: Robots Improving Precision, Efficiency, and Accessibility,” Keynote, Guest Faculty Speaker, *Computer Science Graduate Student Association Student Conference*, University of New Mexico, April 2023.
10. “Autonomously Manipulating Deformable Tissue and Novel Micro-Scale Continuum Robots,” The Holistic Forum of Medical Robotics Junior Professors, *International Symposium on Medical Robotics (ISMR)*, April 2023.
11. “Deformable Objects and Continuum Robots: Novel Mechanical and Algorithmic Solutions to Leverage Robots in Surgical and Interventional Medicine,” *Vanderbilt Institute for Surgery and Engineering Seminar*, Vanderbilt University, March 2023.
12. “Continuum Robots and Deformable Object Manipulation: Novel Mechanical and Algorithmic Solutions to Leverage Robots in Surgical and Interventional Medicine,” *Contextual Robotics Institute Seminar*, University of California, San Diego, February 2023.
13. “Tentacle-Like Continuum Robots and Sub-Task Automation,” *Artificial Intelligence and Machine Learning Symposium 10.0*, Idaho National Laboratory, January 2023.
14. “Motion Planning for Continuum Robots,” *RBE 522: Continuum Robotics*, Worcester Polytechnic Institute, Guest Lecture, October 2022.

15. "Large-Scale Simulation for Calibration-Free Sim to Real Transfer of Deformable Object Manipulation," 2nd Workshop on Representing and Manipulating Deformable Objects, *IEEE International Conference on Robotics and Automation (ICRA)*, May 2022.
16. "Motion Planning in Human-Centric Environments... Such as INSIDE Humans", *ME 686: Human-Robot Systems*, University of Tennessee, Guest Lecture, April 2022.
17. "Deformable Robots and Deformable Tissues," Surgical Robotics: The Next Generation, *International Symposium on Medical Robotics (ISMR)*, April 2022.
18. "Artificial Intelligence in Robot Assisted Surgery," *Utah Informatics Initiative (UI2) and Tanner Humanities Center Artificial Intelligence & Society Symposium*, September 2021.
19. "Targeted Therapy Delivery in the Lung: Semi-Autonomous Transbronchoscopic Needle Steering," Autonomous System in Medicine: Current Challenges in Design, Modeling, Perception, Control and Applications, *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, October 2020.
20. "A Continuum Robot for Lung Tumor Biopsy," Robot Guru II Workshop, *Robotics Science and Systems*, Ann Arbor, MI, USA, May 2016.

## Media Attention

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1. "The Needle's Edge: Autonomous Robotic Surgery and Its Implications for Medicine" October 2023, *Forbes*, <https://www.forbes.com/sites/williamhaseltine/2023/10/06/the-needles-edge-autonomous-robotic-surgery-and-its-implications-for-medicine>
2. "Award-winning tentacle robots help create less invasive surgeries" February 2023, <https://www.cs.utah.edu/award-winning-tentacle-robots-help-create-less-invasive-surgeries/>
3. "Robot guides needle into lungs more accurately than human doctors" New Scientist magazine, December 2022, <https://www.newscientist.com/article/2350891-robot-guides-needle-into-lungs-more-accurately-than-human-doctors/>

## Published External Tutorials

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1. "Introduction to Motion Planning for Continuum Robots - Part 1," *Open Continuum Robotics Project*, June 23 2023, <https://www.cs.toronto.edu/jbk/opencontinuumrobotics/101/2023/06/23/intro-mp-part1.html>
2. "Introduction to Motion Planning for Continuum Robots - Part 2," *Open Continuum Robotics Project*, June 28 2023, <https://www.cs.toronto.edu/jbk/opencontinuumrobotics/101/2023/06/28/intro-mp-part2.html>

## Teaching Experience

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### Courses Taught

1. CS 6956, Medical Robotics, University of Utah, Spring 2024, 14 students.
2. CS 4300, Artificial Intelligence, University of Utah, Fall 2023, 154 students. **Top 15% Course Evaluation Scores in the College of Engineering**
3. CS 6370 / ME EN 6225, Motion Planning, University of Utah, Spring 2023, 43 students. **Top 15% Course Evaluation Scores in the College of Engineering**
4. CS 7939 / ME EN 6892 / ECE 6868, Robotics Seminar, University of Utah, Spring 2023, 31 students.
5. CS 4300, Artificial Intelligence, University of Utah, Fall 2022, 116 students. **Top 15% Course Evaluation Scores in the College of Engineering**
6. CS 4300, Artificial Intelligence, University of Utah, Spring 2022, 127 students. **Top 15% Course Evaluation Scores in the College of Engineering**
7. CS 6956, Medical Robotics, University of Utah, Fall 2021, 8 students.



8. CS 4300, Artificial Intelligence, University of Utah, Spring 2021, 122 students. **Top 15% Course Evaluation Scores in the College of Engineering**
9. CS 6370 / ME EN 6225, Motion Planning, University of Utah, Fall 2020, 21 students.
10. CS 4300, Artificial Intelligence, University of Utah, Spring 2020, 118 students. **Top 15% Course Evaluation Scores in the College of Engineering**

### Students Advising

1. Brian Cho, PhD student, Computing: Robotics
2. Bao Thach, PhD student, Computing: Robotics
3. Emma Pinegar, PhD student, Robotics
4. Jordan Thompson, PhD student, Computing: Robotics
5. Tanner Watts, PhD student, Robotics
6. Britton Jordan, PhD student, Robotics
7. Joe Liechty, PhD student, Robotics
8. Shing-Hei Ho, MS student, Robotics
9. Alexandra Leavitt, BS student, Computer Engineering and Computer Science
10. Ryan Lam, BS/MS student, Computer Science
11. Ronnie Koe, BS student, Computer Science
12. Zachary Wallace, BS student, Computer Science
13. Simon Padgen, BS student, Computer Science

### Students Graduated

1. Michael Bentley, PhD student, Computing: Robotics
2. Sarvenaz Chaeibakhsh, PhD student (co-advised), Mechanical Engineering: Robotics
3. Rahul Thomas Benny, MS student, Computing: Robotics
4. Tanner Watts, BS student, Computer Science
5. Britton Jordan, BS student, Computer Science
6. Shing-Hei Ho, BS student, Computer Science
7. Olivia Richards, BS student, Mechanical Engineering
8. Aidan Copinga, BS student, Applied Mathematics
9. Jiawen Song, BS student, Computer Science
10. Qianlang Chen, BS student, Computer Science
11. Trevor Schwehr, BS student, Mechanical Engineering
12. Laura Brannan, BS student, Computer Science

### Committee Membership

1. Nicholas Posselli, PhD Mechanical Engineering

2. Akansha Kalra, PhD Computer Science
3. Siyeon Kim, PhD Computing: Robotics
4. Yixuan Huang, PhD Computing: Robotics
5. Griffin Tabor, PhD Computing: Robotics
6. Xiwen Li, PhD Computer Science
7. Nate Luttmer, PhD Mechanical Engineering
8. Nate Baum, PhD Mechanical Engineering
9. Martin Matak, PhD Computing: Robotics
10. Adam Conkey, PhD Computing: Robotics
11. Ashkan Pourkand, PhD Computing: Robotics
12. Eric Lang, PhD Computing: Human-Centered Computing
13. Adam Sperry, PhD Mechanical Engineering: Robotics
14. Margaret Rox, PhD Mechanical Engineering, Vanderbilt University
15. Maxwell Emerson, PhD Mechanical Engineering, Vanderbilt University
16. Nathan Olsen, MS-Thesis Mechanical Engineering
17. Matthew Goodell, MS-Thesis Mechanical Engineering
18. Elena Pradhan, MS-Thesis Mechanical Engineering
19. Rebecca Eileen Miles, MS-Project Computing: Robotics
20. Sharath Chandan Reddy Patlolla, MS-Project Computer Science

## Honors and Awards

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1. 2024 University of Utah Kahlert School of Computing Outstanding Teaching Award
2. Best Paper Award Finalist and Best Student Paper Award Finalist, International Symposium on Medical Robotics (ISMR), 2024
3. 2022 IEEE Access Best Video Award Part 1
4. Best Paper Award Finalist and Best Student Paper Award Finalist, International Symposium on Medical Robotics (ISMR), 2021
5. Best Paper Award Honorable Mention, Robotics: Science and Systems (RSS) Workshop on Deformable Object Simulation in Robotics (DO-Sim), 2021
6. Best Student Paper Award Finalist, ASME Dynamic Systems and Control Conference, October 2020
7. Thomas S. Kenan III Graduate Fellow, Awarded to 10 exceptional graduate students in UNC's College of Arts and Sciences, 2018
8. Timothy L. Quigg Student Inventor of the Year, Awarded to the student who has demonstrated the highest inventive skills and entrepreneurship in UNC CS, 2018
9. NSF Graduate Research Fellowship–Honorable Mention, 2016
10. Finalist (One of Three Males Nationally)–Computing Research Association Outstanding Undergraduate Researcher, 2014

11. Honorable Mention (One of Forty-One Males Nationally)–Computing Research Association Outstanding Undergraduate Researcher, 2013
12. Van Dyke Software Engineering Scholarship (Full Tuition Award), an award given to high achieving undergraduates in Computer Science at UNM, 2012–2014

## Professional and Service Activities

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1. Organizer and Instructor, Upskilling Faculty in AI Program, University of Utah, 2024.
2. Organizer, Workshop on Vision and Challenges for Medical Robotics: Surgical Robots, National Science Foundation Robotics Principle Investigator Meeting, 2024.
3. Organizing as Editor the 2023 Hamlyn Symposium Special Section in the IEEE Transactions on Medical Robotics and Bionics (TMRB) journal, 2024.
4. Associate Editor, *IEEE Robotics and Automation Letters*, 2020–present.
5. Program Committee Member, *Workshop on the Algorithmic Foundations of Robotics (WAFR)*, 2020, 2022, 2024.
6. Ad Hoc Proposal Reviewer, NSF, 2024.
7. Session Chair, *WAFR*, 2024.
8. Session Co-Chair, *ICRA*, 2024.
9. Faculty Mentor, Los Alamos Dynamics Summer School (LADSS), Los Alamos National Laboratory, 2023.
10. Proposal Reviewer, Department of Energy Office of Science, Funding for Accelerated, Inclusive Research (FAIR), 2023.
11. Member of the AI and Autonomous Function group of the IDEAL collaboration robotics colloquium, a group which has been formed in alliance with the Royal College of Surgeons of England and with the UK's National Institute for Health Research in order to develop comprehensive guidelines on how surgical robots should be evaluated. 2021-2023
12. Session Co-Chair, *International Symposium on Medical Robotics (ISMR)*, 2022.
13. Panelist, NSF - CISE, 2021.
14. Session Co-Chair, *IRROS* 2020.
15. Program Committee Member, *Workshop on Machine Learning in Planning and Control of Robot Motion (MLPC)*, ICRA 2020.
16. Program Committee Member, *Robotics: Science and Systems (RSS)*, 2020.
17. Associate Editor, *IEEE International Conference on Robotics and Automation (ICRA)*, 2020.
18. Rowland Hall High School FIRST Robotics Team Mentor, 2020.
19. Panel Member on advice for continuing robotics education targeted at undergraduate and community college students, Robot Guru II Workshop, *Robotics Science and Systems*, Ann Arbor, MI, May 2016.
20. Computer Science Student Association Officer—a representative for the graduate student body at UNC CS. Personally organized initiatives including a first year graduate student mentorship program and represented the graduate students at faculty meetings, 2017–2018

21. Reviewer for: Science Robotics, International Journal of Robotics Research (IJRR), IEEE Transactions on Robotics (T-RO), IEEE Robotics and Automation Letters (RA-L), IEEE Transactions on Medical Robotics and Bionics (TMRB), IEEE Transactions on Biomedical Engineering, International Journal of Computer Assisted Radiology and Surgery (IJCARS), IEEE Transactions on Control Systems Technology, Journal of Medical Robotics Research (JMRR), International Symposium on Experimental Robotics (ISER), Robotics: Science and Systems Conference (RSS), Workshop on the Algorithmic Foundations of Robotics (WAFR), IEEE International Conference on Robotics and Automation (ICRA), IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), Robotics and Autonomous Systems, ACM/IEEE International Conference on Human Robot Interaction, Computer-Aided Design, Simulation: Transactions of the Society for Modeling and Simulation International, PLOS ONE, and others.

## **Outreach Involving Computer Science and Robotics Demonstrations/Presentations**

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1. University of Utah Refugees Exploring the Foundations of Undergraduate Education in Science (REFUGES) Program, 2024
2. University of Utah Engineering Day, 2022, 2023
3. Rowland Hall High School 2020, 2021, 2022
4. UNC Science Expos in 2015, 2016, and 2018
5. UNC Department of Computer Science 50<sup>th</sup> Anniversary
6. UNC Department of Computer Science Open House for 6<sup>th</sup>-12<sup>th</sup> grade students 2015–2018
7. Southwestern Indian Polytechnique Institute
8. Albuquerque Institute of Math and Science
9. New Mexico Supercomputing Challenge
10. Dennis Chavez Elementary School