

DANIEL RAKITA

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RESEARCH INTERESTS

My research consists of two primary threads: (1) formulating **robot motion synthesis algorithms** that allow robots to smoothly, safely, and accurately move around even complex or cluttered environments in **real-time**; and (2) designing and validating **robot control interfaces** that are **intuitive and easy to use**, even for novice users with no expertise in robotics.

EDUCATION

Ph.D. in Computer Science , University of Wisconsin-Madison Advisors: Michael Gleicher and Bilge Mutlu	2015-2022
Masters of Computer Science , University of Wisconsin-Madison	2015-2017
Undergraduate work in computer science , University of Wisconsin-Madison	2013-2015
Bachelor of Music in Performance , Indiana University-Bloomington Jacobs School of Music	2008-2012

AWARDS & HONORS

[A11] Outstanding Graduate-Student Research Award , UW-Madison	2022
[A10] Outstanding Reviewer Award , Selected by IROS Conference Paper Review Board, Top 4 of 3,942	2021
[A9] Cisco Graduate Student Fellowship Recipient , UW-Madison	2021
[A8] Three Minute Thesis Competition Finalist , UW-Madison	2021
[A7] Best Paper Award Finalist , ACM/IEEE Conference on Human-Robot Interaction (HRI)	2020
[A6] Microsoft PhD Fellowship Recipient	2019

[A5]	Best Paper Award Winner , ACM/IEEE Conference on Human-Robot Interaction (HRI), Top 4 of 206 papers	2018
[A4]	NSF Graduate Research Fellowship Program Honorable Mention	2017
[A3]	HRI Pioneer , accepted to the selective workshop held at HRI 2017	2017
[A2]	Best Paper Award Nominee , IEEE Symposium on Robot and Human Interactive Communication (RO-MAN)	2017
[A1]	ACM SIGGRAPH Student Research Competition 1st Place	2015

JOURNAL ARTICLES

2022

- [J6] Chamzas, C., Quintero, C., Kingston, Z., Orthey, A., **Rakita, D.**, Gleicher, M., Toussaint, M., Kavraki, L. 2022. MOTIONBENCHMARKER: A Tool to Generate and Benchmark Motion Planning Datasets. *Robotics and Automation Letters (RA-L)*. In *Proceedings International Conference on Robotics and Automation (ICRA)*. [To Appear]

2021

- [J5] **Rakita, D.**, Mutlu, B., Gleicher, M. 2021. Single Query Path Planning using Sample Efficient Probability Informed Trees. *Robotics and Automation Letters (RA-L)*. In *Proceedings International Conference on Robotics and Automation (ICRA)*.

2020

- [J4] **Rakita, D.**, Mutlu, B., Gleicher, M. 2020. An Analysis of RelaxedIK: An Optimization-Based Framework for Generating Accurate and Feasible Robot Arm Motions. *Autonomous Robotics (AURO)*.

2019

- [J3] **Rakita, D.**, Mutlu, B., Gleicher, M., and Hiatt, L. 2019. Shared-Control-Based Bimanual Robot Manipulation. *Science Robotics*.

2018

- [J2] Bodden, C., **Rakita, D.**, Mutlu, B., and Gleicher, M. 2018. A Flexible Optimization-Based Method for Synthesizing Intent-Expressive Robot Arm Motion. *The International Journal of Robotics Research (IJRR)*. SAGE.

2016

- [J1] Pejisa, T., **Rakita, D.**, Mutlu, B., & Gleicher, M. 2016. Authoring directed gaze for full-body motion capture. *ACM Transactions on Graphics*, 35(6), 1–11. Proceedings *SIGGRAPH ASIA* 2016, December 2016.

REFEREED FULL CONFERENCE PAPERS

2022

- [C16] **Rakita, D.**, Mutlu, B., and Gleicher, M. 2022. Proxima: An Approach for Time or Accuracy Budgeted Collision Proximity Queries. *Robotics: Science and Systems* (RSS).

2021

- [C15] **Rakita, D.**, Shi, H., Mutlu, B., and Gleicher, M. 2021. CollisionIK: A Per-Instant Pose Optimization Method for Generating Robot Motions with Environment Collision Avoidance. *International Conference on Robotics and Automation* (ICRA).
- [C14] **Rakita, D.**, Mutlu, B., and Gleicher, M. 2021. Strobe: An Acceleration Meta-algorithm for Optimizing Robot Paths using Concurrent Interleaved Sub-Epoch Pods. *International Conference on Robotics and Automation* (ICRA).


2020

- [C13] **Rakita, D.**, Mutlu, B., and Gleicher, M. 2020. Effects of Onset Latency and Robot Speed Delays on Mimicry-Control Teleoperation. *International Conference on Human-Robot Interaction* (HRI). ACM/IEEE (Acceptance rate 24%)
- [C12] Praveena, P., **Rakita, D.**, Mutlu, B., and Gleicher, M. 2020. Supporting Perception of Weight through Motion-induced Sensory Conflicts in Robot Teleoperation. *International Conference on Human-Robot Interaction* (HRI). ACM/IEEE. (Acceptance rate 24%) **[Best Paper Nominee]**

2019

- [C11] **Rakita, D.**, Mutlu, B., and Gleicher, M. 2019. Remote Telemanipulation with Adapting Viewpoints in Visually Complex Environments. *Robotics: Science and Systems* (RSS).
- [C10] **Rakita, D.**, Mutlu, B., and Gleicher, M. 2019. Stampede: A Discrete-Optimization Method for Solving Pathwise-Inverse Kinematics. *International Conference on Robotics and Automation* (ICRA).
- [C9] Praveena, P., **Rakita, D.**, Mutlu, B., and Gleicher, M. 2019. User-Guided Offline Synthesis of Robot Arm Motion from 6- DoF Paths. *International Conference on Robotics and Automation* (ICRA).


2018

- [C8] **Rakita, D.**, Mutlu, B., and Gleicher, M. 2018. RelaxedIK: Real-time Synthesis of Accurate and Feasible Robot Arm Motion. *Robotics: Science and Systems* (RSS). **[Invited to Special Issue]**
- [C7] **Rakita, D.**, Mutlu, B., and Gleicher, M. 2018. An Autonomous Dynamic Camera Method for Effective Remote Teleoperation. *International Conference on Human-Robot Interaction* (HRI). ACM/IEEE. (Acceptance rate 23%)  **[Best Paper Award Winner]**
- [C6] **Rakita, D.**, Mutlu, B., Gleicher, M., and Hiatt, L. 2018. Shared Dynamic Curves: A Shared-Control Telemanipulation Method for Motor Task Training. *International Conference on Human-Robot Interaction* (HRI). ACM/IEEE. (Acceptance rate 23%)

2017

- [C5] **Rakita, D.**, Mutlu, B., and Gleicher, M. 2017. A Motion Retargeting Method for Effective Mimicry-based Teleoperation of Robot Arms. *International Conference on Human-Robot Interaction* (HRI). ACM/IEEE. (Acceptance rate 50/211)
- [C4] Liu, O., **Rakita, D.**, Mutlu, B., and Gleicher, M. 2017. Understanding Human-Robot Interaction in Virtual Reality. *RO-MAN 2017-The IEEE International Symposium on Robot and Human Interactive Communication*. IEEE.
- [C3] Subramani, G., **Rakita, D.**, Wang H., Zinn, M., Gleicher, M. 2017. Recognizing Actions during Tactile Manipulations through Force Sensing. *International Conference on Intelligent Robots and Systems* (IROS). IEEE/RSJ.

2016

- [C2] **Rakita, D.**, Mutlu, B., and Gleicher, M. 2016. Motion Synopsis for Robot Arm Trajectories. *RO-MAN 2016-The 25th IEEE International Symposium on Robot and Human Interactive Communication*. IEEE. (Acceptance rate 44%)
- [C1] Bodden, C., **Rakita, D.**, Mutlu, B., and Gleicher, M. 2016. Evaluating Intent-Expressive Robot Arm Motion. *RO-MAN 2016-The 25th IEEE International Symposium on Robot and Human Interactive Communication*. IEEE. (Acceptance rate 44%)  **[Best Paper Nominee]**

REFEREED SHORT CONFERENCE PAPERS

2017

- [S2] **Rakita, D.** 2017. Methods for Effective Mimicry-based Teleoperation of Robot Arms. *International Conference on Human-Robot Interaction (HRI) Pioneers Workshop*.

2015

- [S1] **Rakita, D.**, Pejsa, T., Mutlu, B., and Gleicher, M. 2015. Inferring Gaze Shifts from Captured Body Motion. SIGGRAPH 2015 Poster Proceedings 77, 77:1. **[1st Place – ACM Student Research Competition]**



THESES

2022

- [T2] **Rakita, D.** 2022. On the Formulation, Characterization, and Application of Per-instant Pose Optimization as a Motion Generation Paradigm in Robotics. University of Wisconsin-Madison Department of Computer Sciences, PhD Dissertation.

2017

- [T1] **Rakita, D.**, Mutlu, B., and Gleicher, M. 2017. Relaxed-IK Solver: A Framework for Robot Arm Importance-based Inverse Kinematics. University of Wisconsin-Madison Department of Computer Sciences, Masters Tech Report.

FUNDING

Cisco Graduate Student Fellowship, one year PhD tuition and stipend 2021-2022

Microsoft PhD Fellowship, \$84,000 for tuition, stipend, and travel funds 2019-2020

WORK AND RESEARCH EXPERIENCE

Assistant Professor, Yale University, Department of Computer Science 2022 - Current

Graduate Researcher, University of Wisconsin-Madison Visual Computing Lab and Human-Computer Interaction Lab 2015-2022
Advised by Michael Gleicher and Bilge Mutlu

NREIP Researcher, Naval Research Lab, Washington, D.C., 2018, 2019
Advised by Laura Hiatt

Undergraduate Researcher , University of Wisconsin-Madison Visual Computing Lab and Human-Computer Interaction Lab	2014-2015
IT / System Administrator , Icecube Neutrino Observatory, University of Wisconsin-Madison	2013-2015

TEACHING EXPERIENCE

Lecturer , CPSC 685 Topics on Robot Motion Generation. Yale University.	Fall 2022
Guest Lecturer , CS/ Psych 770 Human-Computer Interaction. University of Wisconsin-Madison.	Spring 2020
Guest Lecturer , CS559 Introduction to Computer Graphics, University of Wisconsin-Madison.	Spring 2019

SELECTED ADVISING EXPERIENCE

Haochen Shi , undergraduate mentee working on inverse kinematics and motion optimization algorithms. University of Wisconsin-Madison (now a graduate student at Stanford)	2020-2021
Olivia Hughes , undergraduate mentee working on human-robot interaction design and visualization. University of Wisconsin-Madison (now a graduate student at Georgia Tech)	2019-2020
Ziyad AlGhunaim , undergraduate mentee working on camera viewpoint optimization to incur depth perception cues. University of Wisconsin-Madison (now a software engineer at Google)	2019-2020
Oliver Liu , undergraduate mentee working on understanding human-robot interaction in virtual reality. University of Wisconsin-Madison (went on to USC for graduate school)	2016-2017

ACADEMIC SERVICE

Session Chair , ICRA session Optimization-Based Motion Planning	2021
Review Editor , Frontiers in Robotics and AI	2021-Current
Reviewer (>100 papers) , ICRA, IROS, RSS, RA-L, TRO, HRI, CHI, SIGGRAPH, Transactions on Mechatronics, Frontiers, Humanoids	2017-Current

INVITED TALKS

Workshop on Bimanual Manipulation , ICRA 2022. <i>Generating Accurate, Feasible, and Coordinated Bimanual Robot Motions in Real-time</i>	2022
KavrakiLab , Rice University. <i>Methods and Applications for Generating Accurate and Feasible Robot-arm Motions in Real-time.</i>	2021
Talking-Robotics Series , <i>Methods and Applications for Generating Accurate and Feasible Robot-arm Motions in Real-time.</i> [video link]	2021
Northwestern University . <i>Methods and Applications for Generating Accurate and Feasible Robot-arm Motions in Real-time</i>	2020
AI and Its Alternatives for Shared Autonomy in Assistive and Collaborative Robotics Workshop , RSS 2019. <i>Robust Human-Arm to Robot-Arm Motion Remapping in Real-time for Effective Shared-Control Telemanipulation Methods</i>	2019
UW-Madison Computer Science Student Symposium . <i>Effective Methods for Robot Telemanipulation.</i>	2019
Naval Research Lab . <i>Effective Methods for Robot Teleoperation.</i>	2017

SELECTED MEDIA COVERAGE

- Techcrunch**, This robot learns its two-handed moves from human dexterity
- Tech Xplore**, Shared control allows a robot to use two hands working together to complete tasks
- Cosmos**, The Science of Everything, Breaking: robot makes breakfast
- Milwaukee Journal Sentinel**, UW team designs robot hands that work together

TECHNICAL SKILLS

- Programming:** Rust, Python, C++, C, C#, Java, OpenGL, ROS, MATLAB, JavaScript, HTML, CSS, WebGL
- Software:** Blender, 3dsMax, Unity, MotionBuilder, Photoshop, Illustrator, Premier Pro, After Effects, Maya, MudBox, Office