DANIEL RAKITA

CURRICULUM VITAE, APRIL 2023

Assistant Professor
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RESEARCH INTERESTS

My research focuses on two main areas: (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 interfaces and systems** that can be used to perform critical tasks deemed unsuitable, undesirable, understaffed, or unsafe for people, such as full-time homecare, home assistance, telenursing, robot surgery, disaster relief, large-scale manufacturing, nuclear materials handling, and space 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

[A12]	**Best Paper Award Winner**, ACM/IEEE Conference on Human-Robot Interaction (HRI)	2023
[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. MOTIONBENCHMAKER: A Tool to Generate and Benchmark Motion Planning Datasets. *Robotics and Automation Letters* (RA-L). In *Proceedings International Conference on Robotics and Automation* (ICRA).

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] Pejsa, 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

2023

[C19] Patel, V., **Rakita, D.**, and Dollar, A. 2023. An Analysis of Unified Manipulation with Robot Arms and Dexterous Hands via Optimization-based Motion Synthesis. *International Conference on Robotics and Automation* (ICRA).

[C18] Wang, Y., Praveena, P., **Rakita, D.**, and Gleicher, M. 2023. RangedIK: An Optimization-Based Robot Motion Generation Method for Ranged-Goal Tasks. *International Conference on Robotics and Automation* (ICRA).

[C17] Schoen, A., Sullivan, D., Zhang, Z., **Rakita, D.**, and Mutlu, M. 2023. Lively: Enabling Multimodal, Lifelike, and Extensible Real-time Robot Motion. *International Conference on Human-Robot Interaction* (HRI). ACM/IEEE. *[Best Paper Award Winner]*

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
Advised by Michael Gleicher and Bilge Mutlu   2015-2022

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

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

Instructor, CPSC 485/585 Applied Planning and Optimization. Yale University.   Spring 2023

Instructor, 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

Cornell University. *Intuitive Robot Shared-Control Interfaces via Real-time Motion Planning and Optimization* — 2022

Workshop on Bimanual Manipulation, ICRA 2022. *Generating Accurate, Feasible, and Coordinated Bimanual Robot Motions in Real-time* — 2022

KavrakiLab, Rice University. *Methods and Applications for Generating Accurate and Feasible Robot-arm Motions in Real-time.* — 2021

Talking-Robotics Series, *Methods and Applications for Generating Accurate and Feasible Robot-arm Motions in Real-time.* [video link] — 2021

Northwestern University. *Methods and Applications for Generating Accurate and Feasible Robot-arm Motions in Real-time* — 2020

AI and Its Alternatives for Shared Autonomy in Assistive and Collaborative Robotics Workshop, RSS 2019. *Robust Human-Arm to Robot-Arm Motion Remapping in Real-time for Effective Shared-Control Telemanipulation Methods* — 2019

UW-Madison Computer Science Student Symposium. *Effective Methods for Robot Telemanipulation.* — 2019

Naval Research Lab. *Effective Methods for Robot Teleoperation.* — 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