Ruta Desai

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Positions

Staff Research Scientist, Fundamental AI Research (FAIR), Meta, USA Aug. 2023 - Vision and Language, Planning and Reasoning, Human-AI Collaboration.

Tech Lead Manager, Meta Reality Labs Research, USA Jan. 2021 – Aug. 2023
Embodied AI for Augmented Reality.

Research Scientist, Meta Reality Labs Research, USA Nov. 2018 – Jan. 2021
Contextual AI for Augmented Reality.

Research Interests

Vision and Language, Planning and Reasoning, Human-AI interaction, Personalization.

Education

Carnegie Mellon University, USA 2013 - 2018
Ph.D. in Robotics (GPA: 3.80/4.0) Advisors: Stelian Coros and Jim McCann
Thesis: Robot design for everyone– Computational tools that democratize robot design

Carnegie Mellon University, USA 2011 - 2012
Master of Science in Robotics (GPA: 3.83/4.0) Advisors: Hartmut Geyer and Chris Atkeson

National Institute of Technology (NIT) Surat, India 2007 - 2011
Bachelor of Technology in Electronics Engineering (GPA: 9.26/10)

Research Experience

Carnegie Mellon University, Pittsburgh, USA Graduate Research Assistant
Advisors: Stelian Coros and Jim McCann Fall 2015 – Fall 2018
Human-AI systems that enable casual users to design and build robots.

Autodesk Research, Toronto, Canada Research Intern
Advisors: Fraser Anderson, Justin Matejka, and Tovi Grossman Summer 2017
Data-driven, semantic, human-AI system for creating expressive robot behaviors.

Carnegie Mellon University, Pittsburgh, USA Graduate Research Assistant
Advisors: Jessica Hodgins and Hartmut Geyer Fall 2013 – Spring 2015
Bipedal lateral balance controller for flat and uneven surfaces like seesaw.

Disney Research, Pittsburgh, USA Research Intern
Advisor: Jessica Hodgins Spring 2013
Human motor skill acquisition and adaptation research using motion capture data.

Carnegie Mellon University, Pittsburgh, USA Graduate Research Assistant
Advisors: Hartmut Geyer and Chris Atkeson 2011 – 2012
Neural hypothesis of human leg placement during gait and its extension for prosthetic control.

Technische Universitat Ilmenau, Germany Research Intern
Advisor: Horst Michael Gross Summer 2010
Camera pose estimation approaches for effective 3D structure reconstruction.

Indian Institute of Science (IISc.), Bangalore, India Research Intern
Advisor: Debasish Ghose Summer 2009
Swarm optimization approaches for in-house swarm robots to enable search and localization.

Publications
Google Scholar

M. Chang, G. Chhablani, A. Clegg, M.D. Cote, **R. Desai**, M Hlavac,..., T. Yang "PARTNR: A Benchmark for Planning and Reasoning in Embodied Multi-agent Tasks", *Submitted to* International Conference on Learning Representations (ICLR), 2025.

A. Narcomey, N. Tsoi, **R. Desai**, and M. Vazquez "Learning Human Preferences Over Robot Behavior as Soft Planning Constraints", *Submitted to* International Conference on Autonomous Agents and Multiagent Systems (AAMAS), 2025.

M. Verghese*, B. Chen*, H. Eghbalzadeh, T. Nagarajan, **R. Desai**, "User-in-the-loop Evaluation of Multimodal LLMs for Activity Assistance", IEEE/CVF Winter Conference on Applications of Computer Vision (WACV), 2025 [PDF].

X. Puig*, E. Undersander*, A. Szot*, M. Cote*, R. Partsey*, J. Yang*, **R. Desai***, A. Clegg*,.., R. Mottaghi, A. Rai, "Habitat 3.0: A Co-Habitat for Humans, Avatars and Robots", International Conference on Learning Representations (ICLR), 2024 [PDF][Website].

Y.C. Liao, **R. Desai**, A.M. Pierce, K.E. Taylor, H. Benko, T.R. Jonker, A. Gupta, "A Meta-Bayesian Approach for Rapid Online Parametric Optimization for Wrist-based Interactions", ACM Conference on Human Factors in Computing Systems (CHI), 2024 [PDF].

D. Patel, H. Engbalzadeh, N. Kamra, M. L. Iuzzolino, U. Jain, **R. Desai**, "Pretrained Language Models as Visual Planners for Human Assistance", International Conference on Computer Vision (ICCV), 2023 [PDF][Code].

R. Hazra, B. Chen, A. Rai, N. Kamra, **R. Desai**, "EgoTV: Egocentric Task Verification from Natural Language Task Descriptions", International Conference on Computer Vision (ICCV), 2023 [PDF][Code].

A. Szot, U. Jain, Z. Kira, D. Batra, **R. Desai**, and A. Rai, "Adaptive Coordination in Social Embodied Rearrangement", International Conference on Machine Learning (ICML), 2023 [PDF].

T. Nagarajan, Sk Ramakrishnan, **R. Desai**, J. Hillis, and K. Grauman, "Egocentric Scene Context for Human-centric Environment Understanding from Video", Advances in Neural Information Processing Systems (Neurips), 2023 [PDF][Webpage].

W. Mao, **R. Desai**, M. Iuzzolino, and N. Kamra, "Action Dynamics Task Graphs for Learning Plannable Representations of Procedural Tasks", Thirty-Seventh AAAI Conference on Artificial Intelligence (AAAI) Workshop, 2023 [PDF].

E. Tekin, E. Barati, N. Kamra, and **R. Desai**, "Effective Baselines for Multiple Object Rearrangement Planning in Partially Observable Mapped Environments", Thirty-Seventh AAAI Conference on Artificial Intelligence (AAAI) Workshop, 2023 [PDF].

S. Datta, S. Dharur, V. Cartillier, **R. Desai**, M. Khanna, D. Batra, and D. Parikh, "Episodic Memory Question Answering", The Conference on Computer Vision and Pattern Recognition (CVPR), 2022 [PDF].

K. Pertsch, **R. Desai**, F. Meier, V. Kumar, D. Batra, and A. Rai, "Cross-Domain Imitation Learning via Semantic Skills", Conference on Robot Learning (CoRL), 2022 [PDF].

D. Yu, **R. Desai**, T. Zhang, H. Benko, T. Jonker, and A. Gupta, "Optimizing the Timing of Intelligent Suggestion in Virtual Reality", ACM User Interface Software and Technology Symposium (UIST), 2022 [PDF].

S. Tsutsui, **R. Desai**, and K. Ridgeway, "Self-supervised Representation Learning with Egocentric Video and Head-mounted IMU", EPIC workshop at International Conference on Computer Vision (ICCV), 2021 [PDF].

B. Newman, K. Carlberg, and **R. Desai**, "Optimal Assistance for Object-Rearrangement Tasks in Augmented Reality', Preprint, 2020 [arXiv].

N. Medathati, **R. Desai**, and J. Hillis, "Towards inferring cognitive state changes from pupil size variations in real world", ACM Symposium on Eye Tracking Research and Applications (ETRA), 2020 [PDF].

R. Desai, F. Anderson, J. Matejka, S. Coros, J. McCann, G. Fitzmaurice and T. Grossman, "Geppetto: Enabling Semantic Design of Expressive Robot Behaviours", ACM Conference on Human Factors in Computing Systems (CHI), 2019 [PDF]. ***Best Paper Award***

R. Desai, B. Li, Y. Yuan and S. Coros, "Interactive Co-Design of Form and Function for Legged Robots using the Adjoint Method", International Conference on Climbing and Walking

Robots (CLAWAR), 2018 [arXiv]. ***Best Paper Award***

R. Desai, J. McCann and S. Coros, "Assembly-aware Design of Printable Electromechanical Devices", ACM User Interface Software and Technology Symposium (UIST), 2018 [PDF].

M. Geilinger, R. Poranne, **R. Desai**, B. Thomaszewski and S. Coros, "Skaterbots: Optimization-based Design and Motion Synthesis for Robotic Creatures with Legs and Wheels", ACM Transaction on Graphics (ACM SIGGRAPH), 2018 [PDF].

R. Desai, M. Safonova, K. Muelling and S. Coros, "Automatic Design of Task-specific Robotic Arms", Workshop on Autonomous Robot Design, ICRA, 2018 [PDF].

R. Desai, Y. Yuan and S. Coros, "Computational Abstractions for Interactive Design of Robotic Devices", IEEE International Conference on Robotics and Automation (ICRA), 2017 [PDF].

M.Vasquez, E. Brockmeyer, **R. Desai**, S.E.Hudson and C.Harrison, "3D Printing Pneumatic Device Controls with Variable Activation Force Capabilities", ACM Conference on Human Factors in Computing Systems (CHI), 2015 [PDF].

R. Desai, J. K. Hodgins, "A Simple Model of Skill Acquisition in a Dynamic Balance Task", Dynamic Walking, 2015 [PDF].

R. Desai, H. Geyer and J. K. Hodgins, "Virtual Model Control for Dynamic Lateral Balance", IEEE International Conference on Humanoid Robots (Humanoids), 2014 [PDF].

R. Desai, H. Geyer, "Muscle-Reflex Control of Robust Swing Leg Placement", IEEE International Conference on Robotics and Automation (ICRA), 2013 [PDF].

S. Song, **R. Desai**, and H. Geyer, "Integration of an Adaptive Swing Control into a Neuromuscular Human Walking Model", 35th Annual International Conference of IEEE Engineering in Medicine and Biology Society (EMBS), 2013 [PDF].

R. Desai, H. Geyer, "Robust Swing Leg Placement under Large Disturbances", IEEE International Conference on Robotics and Biomimetics, 2012 [PDF].

Selected Patents

B. Newman, K. Carlberg, **R. Desai**, J. Hillis, "Optimal Assistance for Object-Rearrangement Tasks in Augmented Reality", US Patent No. US-2022-0114366-A1, 2022 [link].

F. Anderson, S. Coros, **R. Desai**, T. Grossman, J.F. Matejka, G. Fitzmaurice "Generative design techniques for robot behavior", US Patent No. US-2020-0034514-A1, 2020 [link].

R. Desai, H. Geyer, "Robust Swing Leg Controller under Large Disturbances", US Patent No. US-2015-0066156-A1, 2014 [link].

Honors and Awards

Best Paper Award, ACM CHI Conference (2019)
Best Paper Award, CLAWAR Conference (2018)
Dr. Kanako Muira Award for Women Researchers, IEEE Humanoids Conference (2014)
Siebel Scholarship, Outstanding CS students in CMU (2013)
Google Anita Borg Memorial Scholarship (2012)
German Academic Exchange Service (DAAD) WISE Scholarship (2010)
Indian National Association of Engineers (INAE) Fellowship (2010)
Dhirubhai Ambani Foundation (DAF) Undergraduate Scholarship (2006 - 2010)

Academic Service

Conference Committee and Workshops
Program Committee, AAAI 2025.
Organizer, CVPR Workshop on Causal and Object-centric Representations for Robotics (2024)
Conference Associate Chair, ACM CHI (2021, 2020)
Conference Program Committee, ACM UIST (2020, 2019)

Reviewer
IEEE CVPR, IEEE ICCV, ICLR, Neurips, ICML, ICLR, IEEE IROS, IEEE ICRA, ACM GI,

ACM UIST, ACM CHI, IEEE WHC, ACM TEI (2015 - 2024)

Teaching and Admissions
CMU RI Summer Scholar (Undergraduate Researchers) Selection Committee (2017)
Teaching Assistant for Biomechanics and Human Motor Control Graduate Course (2014)

Invited Talks

Guest Lecture in Generating Expressiveness in Intelligent Agents and Avatars, University of Florida (2022)
DUB Seminar, University of Washington (2020)
BID Seminar, University of California, Berkeley (2019)
GRASP Seminar, University of Pennsylvania (2019)

Mentoring

Intern Manager at Meta
Mrinal Verghese, PhD student at Carnegie Mellon University (Fall 2023)
Rishi Hazra, PhD student at Orebo University, Sweden (Fall 2022)
Dhruvesh Patel, PhD student at UMass Amherst (Summer 2022)
Andrew Szot, PhD student at Georgia Tech, co-mentor with Akshara Rai (Summer 2022)
Paul Schydlo, PhD student at Carnegie Mellon University (Fall 2021).
Satoshi Tsutsui, PhD student at Indiana University (Spring 2021).
Ben Newman, PhD student at Carnegie Mellon University (Fall 2019).

Intern Advisor at Carnegie Mellon University (CMU)
Beichen Li, Tshingua University (Summer 2017), later PhD at MIT EECS.
Shuangning Liu, Tshingua University (Summer 2016), later MS at CMU.

Outreach Activities

Volunteer, Women@SCS 2012-2016
Volunteering in Technights and Roadshows for school outreach at Carnegie Mellon.

Organizing Committee, OurCS 2015
Organizing a 3-day workshop for undergraduate women to encourage them in research with Women@SCS.

Founding member, CMU Laptop Rehab 2014-2015
Started a student organization which refurbishes old computers and donates them to schools in Pittsburgh and India.

Planning committee, Google Anita Borg Scholarship Alumni Community 2014-2015
Reaching out organizations working for Women in Tech and organizing activities to encourage girls in computer science.

Seminar committee, Robotics Institute 2013-2015
Publicizing department seminar. Co-organizing a student-run meta seminar series.

Charity Chair, Indian Graduate Student Association (IGSA) 2013-2014
Initiating community service activities for Indian graduate students at Carnegie Mellon.

Selected Press

Silicon Angle, Meta's Habitat 3.0 simulates real-world environments for intelligent AI robot training (2023).
Techcrunch, Embodied AI spins a pen and helps clean the living room in new research (2023).
Techcrunch, New toolkit makes it easy to drag and drop your own robot (2017).
ACM Communications, Robot Design For Dummies (2017).
EurekAlert, CMU's interactive tool helps novices and experts make custom robots (2017).
NSF ERC, Graduate Student Earns Prestigious Scholarships for Women - Ruta Desai (2012).
CMU SCS, Five SCS Students Named Siebel Scholars (2012).

Skills

Programming Languages: C++, Python, C, Embedded Microcontroller programming, HTML.
Platforms and Tools: Pytorch, Tensorflow, Matlab, Simulink, Mathematica, Visual Studio, Solidworks, OpenSCAD, Blender, Photoshop, Premiere.
HCI and Prototyping: User studies, Surveys, Interviews, Crowdsourcing, Arduino, 3D printing.