# *Ruta Desai*

website: http://www.cs.cmu.edu/~rutad/ Email: rutadesai@fb.com


**Current Position**

**Research Scientist, Facebook Reality Labs** October 2018 – Present
Contextual and adaptive interaction for augmented reality.

**Education**

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

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

**Research Experience**

**Carnegie Mellon University** Graduate Research Assistant
Advisors: Stelian Coros and Jim McCann Fall 2015 – Fall 2018
Developing computational tools that enable casual users to design and build robots.

**Autodesk Research, Toronto** Research Intern
Advisors: Fraser Anderson, Justin Matejka, and Tovi Grossman Summer 2017
Developed data-driven semantic design tool for creating expressive robot behaviors.

**Carnegie Mellon University** Graduate Research Assistant
Advisors: Jessica Hodgins and Hartmut Geyer Fall 2013 – Spring 2015
Developed a controller which could explain human lateral balance on flat ground and uneven surfaces like seesaw. Compared with optimal controllers in presence of delay and noise.

**Disney Research, Pittsburgh** Research Intern
Advisor: Jessica Hodgins Spring 2013
Motion capture studies and analysis of human subjects learning to balance on a dynamic balance platform for understanding human skill acquisition and adaptation.

**Carnegie Mellon University** Graduate Research Assistant
Advisors: Hartmut Geyer and Chris Atkeson 2011 – 2012
Proposed a neural hypothesis of leg placement in human motor control during gait. Extended the hypothesis as a robust control structure for automated balance recovery for artificial legs.

**Technische Universitat Ilmenau, Germany** Research Intern
Advisor: Horst Michael Gross Summer 2010
Explored various approaches for correction of camera poses for effective working of 3D structure reconstruction using Extended Kalman Filter (EKF) and RANSAC.

**Indian Institute of Science (IISc.), Bangalore, India** Research Intern
Advisor: Debasish Ghose Summer 2009
Improved temporal efficiency of a multimodal function optimization algorithm called Glow-worm Swarm Optimization (GSO) on in-house swarm robots for source localization.

**Projects**

**Bayesian Optimization with Neural Network Kernel** Fall 2016
Integrated DeepNets as a kernel in Bayesian Optimization framework for layout optimization.

**Personalized Fountains that Create 3D Shapes Out of Water** Spring 2015
Computational design of water fountains fabricated with 3D printing.

**Nonlinear Control Techniques for Tracking in Underactuated Systems** Fall 2013
Formulated hierarchical sliding mode control, input-output linearization for tracking mocap.

**Bootstrapping Image Classification with Sample Evaluation** Fall 2012
Explored co-training and mutual constraints for semi-supervised image classification.

**Inverse Dynamics on Motion Capture Data** Spring 2012
Developed inverse dynamics pipeline to estimate joint torques in human walking and running.

**Quadratic Programming based Push Recovery in Humanoids** Fall 2011
Used model predictive control with trajectory optimization for simplified robot model.

**Visual Hull based 3D Reconstruction for Virtual World** Fall 2011
Used an image based 3-D object shape reconstruction method for a simple physics-based game.

**Intelligent Gaming Interface for Dyslexic Children** Bachelor Thesis: 2010 – 2011
Automated game difficulty level selection using bio-feedback of player's EEG signals.

**GramHaat : An E-commerce Interface for Farmers** Microsoft Imagine Cup 2009
Developed an E-commerce site and phone app as a transparent interface between the farmers and consumers.

## Publications

**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].

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

**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 preprint].

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].

**Patents**

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

**Honors and Awards**

Dr. Kanako Muira Award, Humanoids 2014
Siebel Scholar, Class of 2013
Google Anita Borg Memorial Scholarship, 2012
Bharat Petroleum Corporation Scholarship for Higher studies, 2011–2012
K.C.Mahindra Overseas Loan Scholarship, 2011–2012
American Alumni Association Scholarship, 2011
German Academic Exchange Service (DAAD) WISE Scholarship, 2010
Indian National Association of Engineers (INAE) Fellowship, 2010
Dhirubhai Ambani Foundation (DAF) Undergraduate Scholarship, 2006–2010
National Merit Scholarship, 2004–2006

**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.

**Skills**

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

**Graduate Course Work**

| | |
|---|---|
| Machine Learning | Computer Vision |
| Adaptive Control & Reinforcement Learning | Dynamic Optimization |
| Mathematical Fundamentals for Robotics | Nonlinear Control |
| Computational Aspects of Fabrication | Kinematics, Dynamics and Control |
| Topics in Deep Learning | Computer Graphics Seminar |
| Biomechanics and Human Motor Control | Human Motion Modeling and Analysis |

**Academic Service**

ACM UIST Program Committee (2019).
CMU RI Summer Scholar (Undergraduate Researchers) Selection Committee (2017).
Reviewer for IEEE IROS, IEEE ICRA, ACM GI, ACM UIST, ACM CHI, IEEE WHC (2015-19).
Teaching Assistant for Biomechanics and Human Motor Control Graduate Course (2014).

**Mentoring**

Beichen Li, Tshingua University (Summer 2017), now PhD at MIT EECS.
Shuangning Liu, Tshingua University (Summer 2016), now MS at CMU.

**Invited Talks**

GRASP Seminar, University of Pennsylvania (2019).

**Selected Press**

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).