

## EDUCATION

- Cornell University**, Ithaca, USA Aug 2017 – Expected Jun 2022  
Doctor of Philosophy, Mechanical Engineering  
Research Area: Human-Robot Interaction  
Thesis Committee: Prof. Guy Hoffman (Chair), Prof. Hadas Kress-Gazit, Prof. Mark Campbell  
GPA: 4/4  
Academic Year 2019-20 at Ben-Gurion University of the Negev (BGU), Israel
- Indian Institute of Technology-Madras**, Chennai, India Jul 2015 – May 2017  
Master of Technology, Mechanical Engineering  
Specialization: Mechanical Design  
CGPA: 9.07/10  
Winter Semester 2016-17 at Rheinisch-Westfälische Technische Hochschule (RWTH) Aachen, Germany
- Indian Institute of Technology-Bombay**, Mumbai, India Jul 2010 – Apr 2014  
Bachelor of Technology, Mechanical Engineering  
Minor: Aerospace Engineering  
CGPA: 8.78/10

## PUBLICATIONS/PRESENTATIONS

### Book Chapters

1. G. Hoffman, **A. Kshirsagar** and M. Law. “Human-Robot Interaction Challenges in the Workplace.” *The Psychology of Technology: Social Science Research in the Age of Big Data*, edited by Sandra Matz, APA, 2022 (in-press)

### Journal Articles

1. T. Faibish\*, **A. Kshirsagar\***, G. Hoffman and Y. Edan. “Human Preferences for Robot Eye Gaze in Human-to-Robot Handovers.” *International Journal of Social Robotics*, 2022 (\*co-first author)
2. **A. Kshirsagar**, G. Hoffman and A. Biess. “Evaluating Guided Policy Search for Human-Robot Handovers.” *IEEE Robotics and Automation Letters* 6 (2): 3933-3940, 2021 (The contents of this paper were also selected by ICRA'21 Program Committee for presentation at the Conference)
3. **A. Kshirsagar**, M. Lim, S. Christian and G. Hoffman. “Robot Gaze Behaviors in Human-to-Robot Handovers.” *IEEE Robotics and Automation Letters* 5(4):6552-6558, 2020 (The contents of this paper were also selected by IROS'20 Program Committee for presentation at the Conference)
4. **A. Kshirsagar** and A. Guha. “Design optimization of rocker bogie system and development of look-up table for reconfigurable wheels for a planetary rover.” *International Journal of Vehicle Structures and Systems*, 2016
5. S. Loharkar, **A. Kshirsagar** and R. Pant. “Design and Fabrication of a portable semi-rigid airship.” *Annual Technical Volume of Aerospace Engineering Division Board, Institution of Engineers (India)*, 2015-16

### Conference Proceedings

1. **A. Kshirsagar**, H. Kress-Gazit and G. Hoffman. “Specifying and Synthesizing Human-Robot Handovers.” *IEEE/RSJ International Conference on Intelligent Systems and Robots (IROS)*, Macau, 4-8 November 2019
2. **A. Kshirsagar**, B. Dreyfuss, G. Ishai, O. Heffetz and G. Hoffman. “Monetary-Incentive Competition between Humans and Robots: Experimental Results.” *ACM/IEEE International Conference on Human-Robot Interaction (HRI)*, Daegu, South Korea, 11-14 March 2019
3. **A. Kshirsagar**, R. Pant and K. Bodi. “Dynamic simulation of breakaway aerostat with emergency deflation valves.” *16<sup>th</sup> AIAA Aviation Technology, Integration and Operations Conference*, AIAA Aviation, Washington D.C., USA, 13-17 June 2016
4. **A. Kshirsagar**, D. Harursampath and B. R. Gupta. “VAM applied to Dimensional Reduction of Non-linear Multifunctional Film Fabric Laminates.” *12th International Conference of Numerical Analysis and Applied Mathematics*, Rhodes, Greece, 22-28 September 2014

5. **A. Kshirsagar**, A. Tejwani, V. Singh, G. Bhat, N. Singh, A. Yadav, A. Berlia, K. Saboo, U. Patil and S. Prasad. "Mechatronic Design, Fabrication and Analysis of a Small-Size Humanoid Robot-Parinat.", *International Conference on Design, Manufacturing and Mechatronics*, Pune, India, April 2014

#### **Workshops/Late-breaking Reports**

1. **A. Kshirsagar** and G. Hoffman. "Empowering Robots for Object Handovers." *ACM/IEEE International Conference on Human-Robot Interaction (HRI) - Pioneers Workshop*, Online, 7 March 2022
2. **A. Kshirsagar**, H. Kress-Gazit and G. Hoffman. "Human-Robot Handovers with Signal Temporal Logic Specifications." *IEEE International Conference on Robot and Human Interactive Communication*, New Delhi, India, 14-18 October 2019 (Best Late Breaking Report Award)
3. **A. Kshirsagar**, V. Sharma and R.S. Pant. "Design and Development of a Dismantable Semi Rigid Remotely Controlled Airship." *10th International Airship Convention and Exhibition*, Friedrichshafen, Germany, 16-18 April 2015
4. A. Rajagopal, P. Bende, S. Yadav, R. Agarwal and A. Sathawane, **A. Kshirsagar**, M.C. Hemanth, N. Kumar, P. Gatkine. "Design, Modelling and Control of a 6 Degrees of Freedom Robotic Arm with specific applications in Planetary Exploration Missions." *65th International Astronautical Congress*, Toronto, Canada, 29 September-3 October 2014

## **RESEARCH EXPERIENCE**

---

### **Graduate Research Assistant, Cornell University, USA**

Aug 2017 – Present

#### — *Bimanual Human-Human and Human-Robot handovers*

PI: Prof. Guy Hoffman (Cornell)

Developing human motion models and robot controllers for bimanual handovers in a shelving task

#### — *Gaze Behaviours in Human-Human and Human-Robot Handovers*

PI: Prof. Guy Hoffman (Cornell), Prof. Yael Edan (BGU)

Investigated the gaze behaviors of receivers in human-to-human and human-to-robot handovers

#### — *Specifying and Synthesizing Human-Robot Handovers*

PIs: Prof. Guy Hoffman (Cornell), Prof. Hadas-Kress Gazit (Cornell)

Proposed a robot controller for human-robot handovers with formal specifications written in STL

#### — *Interactive Fabrication with Augmented Reality and a Robotic 3D Printer*

PIs: Dr. Huaishu Peng (Cornell), Prof. François Guimbretière (Cornell), Prof. Guy Hoffman (Cornell)

Conducted a user study of an interactive fabrication system with an augmented reality CAD editor and a robotic arm 3D printer

#### — *Economic Decision Making with a Robot*

PIs: Prof. Guy Hoffman (Cornell), Prof. Ori Heffetz (Cornell and HUJI)

Conducted user studies of human decision making in the presence of robots when there are monetary rewards at stake

### **Visiting Doctoral Researcher, BGU, Israel**

Oct 2019 – Aug 2020

#### — *Guided Policy Search for Human-Robot Handovers*

PIs: Dr. Armin Biess (BGU-Israel), Prof. Guy Hoffman (Cornell)

Evaluated controllers learnt with Guided Policy Search for human-robot handovers in MuJoCo and with physical Franka-Emika Panda robot

### **Master's thesis, RWTH Aachen, Germany and IIT Madras, India**

Aug 2016 – May 2017

#### — *iGPS based motion control of robotic manipulator using Robot Operating System (ROS)*

PIs: Univ.-Prof. Burkhard Corves (RWTH), Dr. Sourav Rakshit (IITM)

Devised algorithms for accurate control of robotic manipulators using indoor GPS (iGPS) feedback and tested them in Gazebo and on physical UR-5 robot

### **Visiting Student Researcher, University of California Berkeley, USA**

May 2016 – Jul 2016

#### — *Robotic manipulation of deformable objects*

PI: Prof. Masayoshi Tomizuka (UCB)

Developed simulation of 1-D deformable object manipulation tasks by industrial robots FANUC LRmate200iD, using Remote Application Programming Interface (API) between V-REP and MATLAB

### **Junior Research Fellow, IIT Bombay, India**

Sep 2014 – Jun 2015

#### — *Trajectory simulation of breakaway aerostat*

PI: Prof. Rajkumar Pant (IITB)

Developed MATLAB simulations of ascent and descent trajectory of a tethered aerostat after accidental tether breakage, to predict performance of payload recovery device

- *Design and development of a dismantle-able semi rigid airship*  
 PI: Prof. Rajkumar Pant (IITB)  
 Built a prototype of remotely controlled semi-rigid airship with a dismantle-able frame to provide structural strength and ability to mount propulsion units on off-gondola locations  
**B.Tech. Project, IIT Bombay, India** Aug 2013 – Apr 2014
- *Design Optimization and Motion Dynamics of Mobility System for Mars Rover*  
 PI: Prof. Anirban Guha (IITB)  
 Analysed the effect of wheel dimensions on mobility performance of rocker bogie system and devised look-up tables for autonomous reconfiguration of wheel dimensions  
**Summer Research Internship, IISc Bangalore, India** May 2013 – Jul 2013
- *VAM based modelling of Film-Fabric Laminates*  
 PI: Prof. Dineshkumar Harursampath (IISc)  
 Developed asymptotically correct constitutive model of multi-layered film-fabric laminates with potential application in reliable design of High-Altitude Airship envelopes  
**Student Investigator, IIT Bombay, India** Jan 2012 – Nov 2013
- *Design of Fabric Cutting Machine for Mat-making Handlooms*  
 PI: Prof. Suhas Joshi (IITB)  
 Designed and tested various prototypes of human powered as well as electric fabric cutting machine to increase the productivity of mat-making handlooms operated by visually challenged people

## STUDENT TEAM PROJECTS

- Mars Rover Team, IIT Bombay, India** Feb 2013 – May 2014
  - Led the 10-member Mechanical sub-system
  - Designed and manufactured rover's mobility system as well as robotic arm to accomplish various mission objectives like astronaut assistance, sample collection, equipment servicing and terrain traversing
  - Participated in Arkaroola Mars Robot Challenge-2014, a 14-day expedition organized by Mars Society Australia and Saber Astronautics in Arkaroola Wilderness Sanctuary, Australia
- 'Parinat' – Bipedal Robot Team, IIT Bombay, India** Sep 2012 – May 2014
  - Led the 12-member Mechanical sub-system
  - Conceptualized and built a small size humanoid robot with 12 degrees of freedom

## TEACHING/MENTORING EXPERIENCE

### Teaching Assistant

- *Mechanical Synthesis, Cornell University* Jan 2021 – May 2021  
 Instructor: Prof. Guy Hoffman  
 Taught two topics in the course, supervised team of 15 UG teaching assistants, helped in preparing assignments and demonstration kits, assisted in grading
- *Human-Robot Interaction: Algorithms and Experiments, Cornell University* Aug 2018 – Dec 2018  
 Instructor: Prof. Guy Hoffman  
 Helped prepare assignments and exams, held office hours, graded assignments

### Training in Teaching

- *Course Design Workshop, Center for Teaching Innovation, Cornell University* Jan 2021 – May 2021
- *Theatre Techniques in Teaching, Cornell University* Jan 2018 – May 2018

### Mentored Students in Research

- |  |                     |
|--|---------------------|
| Tair Faibish (MSc, Industrial Engineering, BGU)            | Jan 2020 – Dec 2021 |
| Rahul Kumar Ravi (MS, Mechanical Engineering, Cornell)     | Jan 2021 – Dec 2021 |
| Jordana Socher (BS, Computer Science, Cornell)             | Mar 2021 – Dec 2021 |
| David Bruk-Rodriguez (BS, Biomedical Engineering, Cornell) | Mar 2021 – Dec 2021 |
| Raphael Fortuna (BS, Electrical Engineering, Cornell)      | Sep 2021 – Dec 2021 |
| Sophie Keller (BS, Computer Science, Cornell)              | Sep 2021 – Dec 2021 |
| Cole Dawson (BS, Mechanical Engineering, Cornell)          | Mar 2021 – May 2021 |
| Mohammad Ali Moghaddasi (BS, Mechanical, Cornell)          | Mar 2021 – May 2021 |
| Melanie Lim (MEng, Systems Engineering, Cornell)           | Apr 2019 – Apr 2020 |
| Shemar Christian (BS, Mechanical Engineering, Cornell)     | Apr 2019 – Apr 2020 |
| Julie Katz (MPS, Information Science, Cornell)             | Feb 2019 – May 2019 |
| Song Ye (MPS, Information Science, Cornell)                | Feb 2019 – May 2019 |
| Lucia Gomez (BS, Computer Science, Cornell)                | Sep 2018 – Dec 2018 |

## SERVICE

### Peer-Review

IEEE/RSJ International Conference on Intelligent Robots and Systems	2021
IEEE Transactions on Instrumentation & Measurement	2021
IEEE RAS/EMBS International Conference for Biomedical Robotics and Biomechatronics	2020
ACM/IEEE International Conference on Human-Robot Interaction (Late Breaking Report)	2020
Robotics: Science and Systems (RSS) Pioneers	2019

### Volunteering

Board Member, Society for Promotion of Indian Classical Music and Culture Among Youth (SPICMACAY) - Cornell Chapter, USA	Aug 2018 – Present
Leadership Team Member, Science and Research Opportunities in India (Sci-ROI), USA	Jan 2021 – Present
Volunteer, Group for Rural Activities IIT Bombay, India	Aug 2011 – Apr 2013

## TECHNICAL SKILLS

Programming	Robot Operating System, Python, C++, MATLAB, Mathematica, Arduino
Robots	Kinova Gen3, Kinova Jaco2, Franka-Emika Panda, Sawyer, UR-5, WidowX Mark III
CAD packages	Solidworks, Autodesk Inventor, AutoCAD
Simulation tools	MuJoCo, Gazebo, V-REP, Autodesk Nastran, Ansys, Autodesk Simulation
Documentation	LaTeX
Languages	English (Fluent), Hindi (Fluent), Marathi (Native), Sanskrit (Beginner)

## KEY AWARDS/SCHOLARSHIPS

— Postdoctoral Networking Tour in AI Fellowship by ‘German Academic Exchange Service (DAAD)’	2022
— Research Academic Internship Scholarship by ‘Israeli Council for Higher Education’	2019
— IIT Master Sandwich Scholarship by ‘German Academic Exchange Service (DAAD)’	2016
— S.N. Bose Scholarship by ‘Indo-US Science and Technology forum’	2016
— Gandhian Young Technological Innovation Award by ‘Society for Research and Initiatives for Sustainable Technologies and Institutions, India’	2013
— Institute Technical Special Mention, awarded to 12 out of 7000 students, for notable contribution in robotics activities at IIT Bombay	2012
— Top 1% in National Standard Examination in Physics, Chemistry and Astronomy	2010
— KVPY (Kishore Vaigyanik Protsahan Yojana or Young Scientist Initiative) fellowship, initiated by Department of Science and Technology, Govt. of India	2010
— National Talent Search Scholarship by NCERT, Govt. of India, awarded to top 750 students in the country on the basis of 3 tier examination	2008

## RELEVANT COURSES

Robotics	<ul style="list-style-type: none"><li>Human-Robot Interaction</li><li>Mechatronic Systems</li></ul>	<ul style="list-style-type: none"><li>Formal Methods for Robotics</li><li>Mechanics and Control of Robot Manipulators</li></ul>
Mechanical Engineering	<ul style="list-style-type: none"><li>Product Design</li><li>Machine Design</li></ul>	<ul style="list-style-type: none"><li>Micro-Electro-Mechanical Systems</li><li>Kinematics and Dynamics of Machines</li></ul>
EE/CS	<ul style="list-style-type: none"><li>Computer Vision</li><li>Artificial Intelligence</li></ul>	<ul style="list-style-type: none"><li>Machine Learning for Intelligent Systems</li><li>Advanced Machine Learning</li></ul>
Aerospace Engineering	<ul style="list-style-type: none"><li>Spaceflight Mechanics</li><li>Aircraft Design</li></ul>	<ul style="list-style-type: none"><li>Aerospace Propulsion</li><li>Spaceflight Navigation and Guidance</li></ul>
Mathematics	<ul style="list-style-type: none"><li>Differential Equations</li><li>Linear Algebra</li></ul>	<ul style="list-style-type: none"><li>Numerical Analysis</li><li>Data Interpretation and Analysis</li></ul>