

# Daniel J. Szafir

## University of Colorado Boulder

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Homepage: <http://danszafir.com>

ATLAS Institute &  
Department of Computer Science  
1111 Engineering Drive  
Boulder, CO 80309  
☎ 1-303-735-7892  
✉ [daniel.szafir@colorado.edu](mailto:daniel.szafir@colorado.edu)

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### Research Mission

My goal is to build knowledge of how we can design novel sensing, interactive, and robotic technologies that enable new forms of human assistance.

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### Research Interests

Human-Robot Interaction  
Assistive Free-Flying Robots  
Head-Mounted Displays (HMDs)  
User-Centered Design

Human-Computer Interaction  
Brain-Computer Interfaces (BCIs)  
Virtual and Augmented Reality  
Wearable Robots/Exoskeletons

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### Employment

- 2015 – Present **Assistant Professor**  
University of Colorado Boulder  
*Rostered:* ATLAS Institute  
*Tenure Home:* Department of Computer Science  
*Affiliate Appointments:* Department of Information Science, Research and Engineering Center for Unmanned Vehicles (RECUV), Center for Neuroscience, the Culture, Language, and Social Practice (CLASP) program
- 2010 – 2015 **Graduate Research Fellow**  
Department of Computer Sciences, University of Wisconsin–Madison
- 2013 – 2015 **Research Intern**  
NASA Ames Research Center, Mountain View, California
- 2007, 2009 **Software Development Intern**  
International Business Machines (IBM), Inc., Essex Junction, Vermont
- 2008 **Software Development Intern**  
Tybrin Corporation, Nashua, New Hampshire

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### Education

- 2012 – 2015 **Ph.D. in Computer Science**  
University of Wisconsin–Madison  
*Dissertation:* “Human Interaction with Assistive Free-Flying Robots”  
*Committee:* Bilge Mutlu (co-chair), Terrence Fong (co-chair), John Lee, Kevin Ponto, & Tom Ristenpart
- 2010 – 2012 **Master of Science in Computer Science**  
University of Wisconsin–Madison
- 2006 – 2010 **Bachelor’s Degrees, Computer Science & History**  
Boston College  
*Thesis:* “Non-Invasive BCI through EEG: An Exploration of the Utilization of Electroencephalography to Create Thought-Based Brain-Computer Interfaces.”

## Publications

### Journal Articles

- J.1. Daniel Szafir**, Bilge Mutlu, and Terrence Fong. Designing Planning and Control Interfaces to Support User Collaboration with Flying Robots. (In Press). *International Journal of Robotics Research Special Issue on Human-Robot Interaction (IJRR '17)*, 2017.

Impact factor: 2.50

### Refereed Full Conference Papers

- C.1. Daniel Szafir**, Bilge Mutlu, and Terrence Fong. “Designing Mechanisms for Communicating Directionality in Flying Robots.” In *Proceedings of the 2015 ACM/IEEE International Conference on Human-Robot Interaction (HRI '15)*, Portland, Oregon, 2015.

ACCEPTANCE RATE: 25%

- C.2. Allison Sauppé, Daniel Szafir**, Chien-Ming Huang, and Bilge Mutlu. “From 9 to 90: Engaging Learners of All Ages.” In *Proceedings of the 2015 ACM Special Interest Group on Computer Science Education (SIGCSE '15)*, Kansas City, Missouri, 2015.

ACCEPTANCE RATE: 36%

- C.3. Daniel Szafir**, Bilge Mutlu, and Terrence Fong. “Communication of Intent in Assistive Free Flyers.” In *Proceedings of the 2014 ACM/IEEE International Conference on Human-Robot Interaction (HRI '14)*, Bielefeld, Germany, 2014.

ACCEPTANCE RATE: 24%

- C.4. Daniel Szafir** and Bilge Mutlu. “ARTFuL: Adaptive Review Technology for Flipped Learning.” In *Proceedings of the 2013 ACM Annual Conference on Human Factors in Computing Systems (CHI '13)*, Paris, France, 2013.

ACCEPTANCE RATE: 20%

- C.5. Kevin Ponto, Ross Tredinnick, Aaron Bartholomew, Carrie Roy, Daniel Szafir**, Daniel Greenheck, and Joe Kohlmann. “SculptUp: A Rapid, Immersive 3D Modeling Environment.” In *Proceedings of the 2013 IEEE Symposium on 3D User Interfaces (3DUI '13)*, Orlando, Florida, 2013.

- C.6. Daniel Szafir** and Bilge Mutlu. “Pay Attention! Designing Adaptive Agents that Monitor and Improve User Engagement.” In *Proceedings of the 2012 ACM Annual Conference on Human Factors in Computing Systems (CHI '12)*, Austin, Texas, 2012.

ACCEPTANCE RATE: 23%

- C.7. Daniel Szafir** and Robert Signorile. “An Exploration of the Utilization of Electroencephalography and Neural Nets to Control Robots” In *Proceedings of the 2011 IFIP TC 13 International Conference on Human-Computer Interaction (INTERACT 2011)*, Lisbon, Portugal, 2011.

ACCEPTANCE RATE: 22%

### Workshop Papers

- W.1. Daniel Szafir**. “A Cognitive Basis for Human Interaction with Aerial Robots.” *Robotics: Science and Systems (RSS'16) Workshop on Human-Robot Interaction for Small and Personal Unmanned Aerial Vehicles*, Ann Arbor, Michigan, 2016.

- W.2. Steve McGuire, P. Michael Furlong, Christoffer Heckman, Simon Julier, Daniel Szafir**, and Nisar Ahmed. “Teamwork Across the Stars: Machine Learning to Overcome the Brittleness of Autonomy.” *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2016) Workshop on Human-Robot Collaboration: Towards Co-Adaptive Learning Through Semi-Autonomy and Shared Control*. Daejeon, Korea, 2016.

**W.3.** Danielle Albers Szaafir and **Daniel Szaafir**. “Cognitive Load in Visualization: Myths and Misconceptions.” *Creation, Curation, Critique and Conditioning of Principles and Guidelines in Visualization (C4PGV’16)*. Baltimore, Maryland, 2016.

**W.4.** **Daniel Szaafir** and Kevin Ponto. “Panoramic Imagery of Physical Locations Inside Immersive Environments.” *Midwest Graphics Conference (Midgraph 2012)*, Chicago, Illinois, 2012.

## Refereed Abstracts

**A.1.** Steven Johnson, Xiang Zhi Tan, **Daniel Szaafir**, and Bilge Mutlu. “Using At-A-Glance Displays to Enhance Student Attention.” *McPherson Eye Research Institute (MERI) Symposium*, Madison, Wisconsin, 2014.

**A.2.** **Daniel Szaafir**, and Robert Signorile. “Non-Invasive BCI through EEG.” *New England Undergraduate Computing Symposium (NEUCS)*, Boston, Massachusetts, 2010.

## Conference Demonstrations

**De.1.** Kevin Ponto, Ross Tredinnick, Aaron Bartholomew, Carrie Roy, **Daniel Szaafir**, Daniel Greenheck, and Joe Kohlmann. “SculptUp: A Rapid, Immersive 3D Modeling Environment.” *2013 IEEE Symposium on 3D User Interfaces (3DUI ’13) Contest*, Orlando, Florida, 2013.

## Doctoral Consortiums

**D.1.** **Daniel Szaafir**. “Human Interaction with Assistive Free-Flyers.” In *Doctoral Consortium Extended Abstracts 2014 ACM Annual Conference on Human Factors in Computing Systems (CHI ’14)*, Toronto, Canada, 2014. ACCEPTANCE RATE: 25%

**D.2.** **Daniel Szaafir**. “Human Interaction with Assistive Free-Flyers.” *2014 ACM/IEEE International Conference on Human-Robot Interaction Pioneers Workshop (HRI ’14)*, Bielefeld, Germany, 2014. ACCEPTANCE RATE: 36%

## Theses

**T.1.** **Daniel Szaafir**. “Non-Invasive BCI through EEG: An Exploration of the Utilization of Electroencephalography to Create Thought-Based Brain-Computer Interfaces.” *Bachelor’s Honor’s Thesis*, Boston College, 2010.

**T.2.** **Daniel Szaafir**. “Human Interaction with Assistive Free-Flying Robots.” *Doctoral Dissertation*, University of Wisconsin–Madison, 2015.

## Invited Talks

**Daniel Szaafir**. “Human Interaction at CU Boulder.” *NASA Intelligent Robotics Group (IRG) Symposium*, NASA Ames Research Center, Mountain View, California, 2016.

**Daniel Szaafir**. “Leveraging Cognitive Engineering for Human-Robot Interaction.” *Institute of Cognitive Science (ICS) Colloquium Series*, University of Colorado Boulder, Boulder, Colorado, 2016.

**Daniel Szaafir**. “Design Principles for Effective Human-Robot Collaboration.” *Aerospace Ventures (ASV) Day*, University of Colorado Boulder, Boulder, Colorado, 2016.

**Daniel Szaafir**. “Human Interaction with Small Flying Robots.” *Human-Centered Computing (HCC) Seminar Series*, University of Colorado Boulder, Boulder, Colorado, 2016.

**Daniel Szaafir**. “Human Interaction with Small Flying Robots.” *Robotics, Controls, and Dynamic Systems (RCDS) Seminar Series*, University of Colorado Boulder, Boulder, Colorado, 2015.

**Daniel Szaafir**. “Unlocking the Assistive Potential of Emerging Technologies.” *Computer Science Speaker Series*, University of Iowa, Iowa City, Iowa, 2015.

**Daniel Szafr.** “Unlocking the Assistive Potential of Emerging Technologies.” *Software Engineering Colloquium*, Arizona State University, Tempe, Arizona, 2015.

**Daniel Szafr.** “Unlocking the Assistive Potential of Emerging Technologies.” *Computer Science Colloquium*, University of Colorado Boulder, Boulder, Colorado, 2015.

## Patents

**P.1.** Bilge Mutlu and **Daniel Szafr.** “Teaching System for Improving Information Retention Based on Brain-State Monitoring.” U.S. Patent Application # *US 13/437,699*, Publication # *US 20130260361 A1*, 2012.

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## Research Grants & Gifts

### Federal Grants

National Science Foundation Research Initiation Initiative (NSF-CISE-CRII)  
*Leveraging Implicit Human Cues to Design Effective Behaviors for Collaborative Robots*

**Investigator:** Daniel Szafr (PI)

**Period:** 2016–2018

**Amount:** \$174,300

National Aeronautics and Space Administration Early Career Faculty (ECF) Award NNX16AR58G  
*Developing Principles for Effective Human Collaboration with Free-Flying Robots*

**Investigator:** Daniel Szafr (PI)

**Period:** 2016–2019

**Amount:** \$359,389

### Corporate and Foundation Gifts & Grants

Intel Research Award 1553595  
*Fusing Robotics and Consumer Devices for New Multimedia*

**Investigator:** Daniel Szafr (PI)

**Period:** 2016–2017

**Amount:** \$126,993

### University Grants

University of Colorado Boulder Innovative Seed Grant Program  
*FieldView: Using Mobile Devices to Blend Data Collection and Analysis for Field Research*

**Investigators:** Danielle Albers Szafr (PI) and Daniel Szafr (Co-I)

**Period:** 2016–2017

**Amount:** \$30,000

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## Selected Press Coverage

**Daily Camera (US).** “CU Student Meredith Burgess brings Tech to Pole Dance.” 2016.

**Wisconsin State Journal (US).** “Science Festival Mixes Learning, Fun.” 2013.

**New Scientist (UK).** “Mind-reading robot teachers keep students focused.” 2012.

**Discovery News (US).** “Mind-reading robot teachers head to class.” 2012.

**Engadget (US).** “Mind-reading robotic teachers are more... Anyone? Anyone? Attention-grabbing.” 2012.

**La Repubblica (Italy).** “U.S.: Robot teacher seeks out distracted students.” 2012.

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## Teaching

### University of Colorado Boulder

- Spring 2016 & 2017 **CSCI 7000-008 / ATLS 5519 Human-Robot Interaction**  
I designed and taught a graduate-level course that introduces students to the field of human-robot interaction (HRI). The course involves three key components: (1) a principles component that develops an understanding of the fundamental concepts of HRI through lectures and discussions of seminal and modern HRI research, (2) a methods component that helps students build a “tool-box” of essential qualitative and quantitative research methods, and (3) a project component in which students use their knowledge of HRI principles and methods to conduct a complete research inquiry, which encompasses posing a novel HRI research question, designing an empirical experiment, collecting and analyzing data, and reporting their findings.  
*Overall Instructor Evaluation: 5.2/6.0*
- Fall 2015 & 2016 **CSCI 4830/7000-007 / ATLS 4519/5519 Introduction to Virtual Reality**  
I designed and taught a combined undergraduate/graduate course to introduce students to the field of virtual reality. The course involves two key components: (1) developing an understanding of the fundamental principles of virtual reality such as presence, immersion, and engagement and (2) building technical skills for developing virtual reality applications using modern methods and tools, including WebGL and Unity. The course offers students an entry-level introduction to virtual reality using a combination of lectures, hands-on exercises, and team project assignments.  
*Overall Instructor Evaluation: 5.8/6.0*

### University of Wisconsin–Madison

- Summer 2011 **CS302 Introduction to Programming**  
Taught summer section (88 students) of an introductory programming course in Java. Responsible for all aspects of course including lectures, exams, assignments and supervision of TA graders.  
*Teaching Evaluation: 4.19/5.00 (47 responses)*
- 2010 – 2012 **CS302 Introduction to Programming**  
Taught four semester-long sections (~22 students/section) of an introductory programming course in Java. Responsible for preparing and presenting lectures, grading, and shared development of assignments and exams with other instructors.  
Received two awards for excellence in undergraduate education.  
*Teaching Evaluation: 4.84/5.00 (65 responses)*

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## Advising & Mentoring

### Ph.D. Student Advisees

- 2016 – Present **Madhur Atreya**  
*ATLAS Institute, University of Colorado Boulder*  
Co-advising with Mark Gross (CS/ATLAS)
- 2016 – Present **Hooman Hedayat**  
*Department of Computer Science, University of Colorado Boulder*
- 2016 – Present **Michael Iuzzolino**  
*Department of Computer Science, University of Colorado Boulder*  
Co-advising with Danielle Albers Szafir (Information Sciences)

### M.S. Student Advisees

- 2016 – Present **Bo “Bryan” Cao**  
*Department of Computer Science, University of Colorado Boulder*

- 2016 – Present **Jordan Peters**  
*Department of Computer Science, University of Colorado Boulder*
- 2016 – Present **Rohit Raje**  
*Department of Computer Science, University of Colorado Boulder*
- 2016 – Present **Michael Walker**  
*Department of Computer Science, University of Colorado Boulder*

### Undergraduate Advisees

- 2016 **Brandon Barrett**  
*Department of Computer Science, University of Colorado Boulder*
- 2016 – Present **Catherine Diaz**  
*Department of Computer Science, University of Colorado Boulder*

### Thesis Committee Member

- 2016 **Christine Fanchiang**  
*Ph.D. Thesis, Adviser: David M. Klaus*  
*Dissertation Title: A Quantitative Human Spacecraft Design Evaluation Model for Assessing Crew Accommodation and Utilization*  
*Department of Aerospace Engineering Sciences, University of Colorado Boulder*

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## Professional Activities & Service

### Program Committee Work

- 2017 **Program Committee Member RSS**  
*Robotics: Science and Systems (RSS) 2017.*
- 2017 **Videos and Demonstrations Tracks Co-Chair HRI**  
*ACM/IEEE International Conference on Human-Robot Interaction (HRI) 2017.*
- 2016 **Associate Chair, Program Committee CHI**  
*ACM Conference on Human Factors in Computing (CHI) 2017.*
- 2016 **Associate Editor, Program Committee RO-MAN**  
*IEEE International Symposium on Robot and Human Interactive Communication (RO-MAN) 2016.*
- 2016 **Associate Editor, Program Committee ARSO**  
*IEEE Workshop on Advanced Robotics and its Social Impacts (ARSO) 2016.*
- 2017 **Workshop Program Committee Member RSS Workshops**  
*Robotics: Science and Systems (RSS) Workshop on Human-Robot Interaction for Small and Personal Unmanned Aerial Vehicles 2016.*
- 2015 **Panel Chair, Program Committee HRI Pioneers**  
*ACM/IEEE International Conference on Human-Robot Interaction (HRI) 2015.*
- 2014 **Program Committee Member Utilizing EEG Input in Intelligent Tutoring Systems Workshop**  
*AAAI 12th International Conference on Intelligent Tutoring Systems (ITS) 2014.*

### Referee Service

#### Funding Agency Panelist

- 2016 **National Science Foundation (NSF)**

2016 **National Aeronautics and Space Administration (NASA)**

**Funding Agency External Reviewer**

2016 **National Science Foundation (NSF)**

**Journal Articles**

2016 **Reviewer** *International Journal of Robotics Research (IJRR)*

2016 **Reviewer** *ACM Transactions on Computer-Human Interaction (TOCHI)*

2016 **Reviewer** *ACM Transactions on Interactive Intelligent Systems (TIIS)*

2015 **Reviewer** *IEEE Transactions on Human-Machine Systems (THMS)*

**Conference Proceedings**

2017 **Reviewer** *IEEE International Conference on Robotics and Automation (ICRA)*

2016 **Reviewer** *ACM/SIGCHI Symposium on User Interface and Software Technology (UIST)*

2016 **Reviewer** *ACM SIGCHI Designing Interactive Systems (DIS)*

2012–2017 **Reviewer** *ACM/IEEE International Conference on Human-Robot Interaction (HRI)*

2012–2017 **Reviewer** *ACM SIGCHI Conference on Human Factors in Computing Systems (CHI)*

**University Service**

2016–2017 **Faculty Search Committee**  
Department of Computer Science, University of Colorado Boulder

2016–2017 **Faculty Search Committee**  
ATLAS Institute, University of Colorado Boulder

2016 **Faculty Inclusive Excellence Team**  
BOLD Center, University of Colorado Boulder

2016 **Undergraduate Program Committee**  
Department of Computer Science, University of Colorado Boulder

2016–Present **CU Boulder Human-Computer Interaction Consortium (HCIC) Committee**  
University of Colorado Boulder

2016 **Computer Science Department Video**  
Led creation of promotional video highlighting the Computer Science Department at the University of Colorado Boulder

2015–2016 **Graduate Program Committee**  
ATLAS Institute, University of Colorado Boulder

2015–2016 **Graduate Program Committee**  
Department of Computer Science, University of Colorado Boulder

**External Research Service**

2016 **Public Safety Communications Research (PSCR) User Interface R&D Working Group**  
National Institute of Standards and Technology (NIST) and the National Telecommunications and Information Administration (NTIA)

## Volunteering & Outreach

- 2014 **Student Volunteer** *ACM/IEEE International Conference on Human-Robot Interaction (HRI)*
- 2013 – 2014 **Grandparents University**, University of Wisconsin-Madison  
Taught two sessions (~20 students/session) of a “Social Robotics” major to grandparents and grandchildren. Course used hands-on activities, multi-media presentations, and programming of Lego Mindstorms robots to teach concepts in programming and robotics to young and senior students.
- 2014 **National Robotics Week**, University of Wisconsin-Madison  
Prepared robot demonstrations to engage the broader UW–Madison community and disseminate research to the public regarding how robotics technology impacts society.
- 2014 **Computer Sciences Department 50th anniversary**, University of Wisconsin-Madison  
Prepared robot demonstrations as part of celebration for the 50th anniversary of Computer Sciences Department at the University of Wisconsin–Madison.

## Professional and Academic Memberships

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|------------------------------|---|
| ACM Student Member           | Alpha Sigma Nu Jesuit Honor Society               |
| IEEE Student Member          | Phi Alpha Theta National Historical Honor Society |
| Phi Beta Kappa Honor Society | Golden Key International Honor Society            |

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## Honors and Awards

- 2017 Forbes 30 Under 30: Science, *Named to the Forbes 30 Under 30 list of top innovators*
- 2014 Doctoral Consortium, *ACM Conference on Human Factors in Computing Systems (CHI)*
- 2014 HRI Pioneer, *ACM/IEEE Conference on Human-Robot Interaction (HRI)*
- 2013 Google Glass Research Award Grant
- 2012 NASA National Space Technology Research Fellow (NSTRF)
- 2012 NSF Graduate Research Fellowship Program Honorable Mention (NSF GRFP)
- 2011 Outstanding Graduate Student Instructor Award
- 2011 Honored Student Instructor Award
- 2010 Boston College Computer Science Accenture Award
- 2010 Inducted into the Order of the Cross and Crown