

RAHUL GOEL

211 Richmond Dr, Millbrae, CA-94030, rahulg@alum.mit.edu, Ph. 7139699776

EDUCATION

University of Houston (UH), Houston, TX	2012 - 2017
• Ph.D. in Kinesiology (Neuroscience, Biomechanics & Space Life Science tracks) (GPA: 3.9/4)	
International Space University Southern Hemisphere Summer School, Adelaide, Australia	Jan-Feb 2012
International Graduate Summer School in Aeronautics and Astronautics, Beijing, China	Jul 2011
Massachusetts Institute of Technology (MIT), Cambridge, MA	2008 - 2010
• Master of Science in Aeronautics & Astronautics (GPA: 4.9/5)	
Indian Institute of Technology (IIT) Bombay, Mumbai, India	2004 - 2008
• Bachelor of Technology in Aerospace Engineering (GPA: 9.5/10)	

PROFESSIONAL & RESEARCH EXPERIENCE

Stanford School of Medicine (Post-doc. @ Dept. of Radiology), Palo Alto, CA Sep 2019 – present

- Assisting in a few studies focusing on passive sensing of affective and physiological biomarkers derived from existing devices, and subtle interventions to reduce stress. Most of these studies are in collaboration with Stanford's HCI group.

Baylor College of Medicine (Post-doc. @ Dept. of Neuroscience), Houston, TX Mar 2018 – Aug 2019

- Worked on a real-time fMRI-based neuro-feedback system for PTSD therapy using machine learning and VR.
- Assisted in designing somato-visual integration fMRI experiments to investigate responses from deep layers of brainstem.
- Assisted in analyses of fMRI data characterizing hemodynamic response function after acute brain injury, like concussion.
- Developed an algorithm to detect risky movements of the upper body for patients who underwent sternotomy.
- Analyzed the effect of workstation type on fatigue, stress, sleep and physical activity in federal office workers.
- Assisted in data collection & analysis of a phase II clinical trial to evaluate the efficacy of a custom ankle-foot orthosis device in elderly individuals with high risk of falls. Helped to quantitatively assess physical activity level using a chest-worn IMU.
- Assisted in developing a decision tree algorithm to distinguish wear and non-wear times for a chest-worn wearable.

K-Motion Interactive, Inc. (Part-time Technical Consultant), (Remote Work) Jan – July 2018

- Developed a Kalman filter-based sensor fusion algorithm for orientation estimation using MARG sensors for golf training.

University of Houston (Research Asst. @ Dept. of Health and Human Performance), Houston, TX Aug 2012 - Dec 2017

- Dissertation:** Investigated sensorimotor mechanisms underlying posture control using TMS and EEG. Also used machine learning to identify a behavioral parameter that best predicts cortical activation during challenging posture tasks.
- Modeled differences in joint motor control performance in rapid goal-directed aiming between upper and lower limbs.

NASA Johnson Space Center (Research Intern @ Neurosciences Lab), Houston, TX June 2014 – Aug 2016

- Evaluated the effects of galvanic stimulation of the vestibular system (GVS) on balance and locomotion. GVS is pursued as a training modality to enhance adaptability to aid recovery after spaceflight or in clinical populations.
- Developed a test for assessing somatosensory dependence during posture control. The information regarding an individual's reliance on somatosensory information can be used to design efficient individualized training protocols to enable re-adaptation more rapidly after spaceflight or in clinical populations.
- Evaluated the effects of standing, locomotion exercise and artificial gravity during bedrest on neuro-vestibular function.
- Analyzed pre- and post-flight data from astronauts to better understand central reorganizations due to microgravity.

Airbus Defense and Space (Practical Trainee), Friedrichshafen, Germany Dec 2010 – Nov 2011

- Designed the model of a short arm human centrifuge (SAHC) for ISS in SolidWorks and carried out its structural analysis. Analyzed microgravity disturbance and suggested designs for an auto-balancing and vibration isolation systems.

MIT (Research Asst. @ Dept. of Aeronautics and Astronautics), Cambridge, MA Sept 2008 – Nov 2010

- MS Thesis:** Designed an improved helmet liner for protection against blast induced trauma. Performed Finite Element Modeling using ABAQUS for helmet liner having channels filled with fluids or other materials. Designed experiments for evaluating different filler materials for mitigating impact loads to reduce loading on the head.
- Modeled the effects of a countermeasure to maximally stimulate antigravity muscles and bones on a human centrifuge.

SKILLS / TOOLS

Biomedical research, neuromodulation, non-invasive stimulation (TMS, GVS), non-invasive brain monitoring (fMRI, EEG), ECG, EMG, Force & Motion sensors (e.g., IMUs), wearables, MATLAB, C++, Python, signal processing, machine learning, statistics, experimental design, digital health, human-computer interaction (HCI), user experience research.

PUBLICATIONS

PEER-REVIEWED JOURNAL PAPERS (in preparation or under revision)

1. Wang, C., **Goel, R.**, Noun, M., Ghanta, R. K., Najafi, B., “Wearable Flexible-sensor based Biomarker to Characterize Chest Abduction During Sit-to-Stand Transitions”, revision submitted to IEEE Transactions on Neural System and Rehabilitation Engineering in Oct 2019.
2. Floren, A., **Goel, R.**, Tse, T., Naylor, B., Ress, D., “Decoding behavioral performance accurately from fMRI data obtained in a realistic virtual environment” (Working title-in preparation).

PEER-REVIEWED JOURNAL PAPERS (published; 9 as a first author)

1. **Goel, R.**, Nakagome, S., Rao, N., Paloski, W. H., Contreras-Vidal, J. L., Parikh, P. J., “Fronto-parietal Brain Areas Contribute to Online Control of Posture during a Continuous Balance Task”, *Neuroscience*, Vol. 413, pp. 135-153, Aug 2019.
2. Wang, C., **Goel, R.**, Zhang, Q., Lepow, B., Najafi, B., “Daily Use of Bilateral Custom-Made Ankle-Foot Orthoses for Fall Prevention in Older Adults: A Randomized Controlled Trial”, *Journal of the American Geriatrics Society*, Vol. 67, pp. 1656-1661, Aug 2019.
3. Wang, C., **Goel, R.**, Rahemi, H., Zhang, Q., Lepow, B., Najafi, B., “Effectiveness of Daily Use of Bilateral Custom-Made Ankle-Foot Orthoses on Balance, Fear of Falling, and Physical Activity in Older Adults: A Randomized Controlled Trial”, *Gerontology*, Vol. 65, No. 3, pp. 299-307, May 2019.
4. **Goel, R.**, Rosenberg, M. J., Cohen, H. S., Bloomberg, J. J., Mulavara, A. P., “Calibrating balance perturbation using electrical stimulation of the vestibular system”, *Journal of Neuroscience Methods*, Vol. 311, pp. 193-199, Jan 2019.
5. **Goel, R.**, Ozdemir, R. A., Wood, S., Reschke, M., Paloski, W. H., “Critical Role of Somatosensation in Postural Control Following Spaceflight: Vestibularly Deficient Astronauts Are Not Able to Maintain Upright Stance During Compromised Somatosensation”, *Frontiers in Physiology*, Vol. 9, No. 1680, Nov 2018.
6. **Goel, R.**, Ozdemir, R. A., Nakagome, S., Contreras-Vidal, J. L., Paloski, W. H., Parikh, P. J., “Effects of speed and direction of perturbation on electroencephalographic and balance responses”, *Experimental Brain Research*, Vol. 236, No. 7, July 2018.
7. **Goel, R.**, DeDios, Y., Gadd, N., Caldwell, E., Peters, B., Reschke, M., Bloomberg, J. J., Oddsson, L. I. E., and Mulavara, A. P., “Assessing somatosensory utilization during unipedal postural control”, *Frontiers in Systems Neuroscience*, Vol. 11, No. 21, April 2017.
8. **Goel, R.**, and Paloski, W. H., “Motor control performance during rapid voluntary limb movements”, *Journal of Motor Behavior*, Vol. 48, No. 4, pp. 348-56, July 2016.
9. **Goel, R.**, Kofman, I., Jeevarajan, J., DeDios, Y., Cohen, H., Bloomberg, J., and Mulavara, A. P., “Using low levels of stochastic galvanic vestibular stimulation to improve balance function”, *PLOS One*, Vol. 10, No. 8, Aug 2015.
10. Mulavara, A.P., Kofman, I., DeDios, Y.E., Miller, C., Peters, B.T., **Goel, R.**, Galvan, R., and Bloomberg, J.J., “Using low levels of stochastic vestibular stimulation to improve locomotor stability”, *Frontiers in System Neuroscience*, Vol. 9, No. 117, Aug 2015.
11. Clément, G., Bareille, M. P., **Goel, R.**, Linnarsson, D., Mulder, E., Paloski, W. H., Rittweger, J., Wuyts, F. L., and Zange, J., “Effects of five days of bed rest with intermittent centrifugation on neurovestibular function”, *Journal of Musculoskeletal and Neuronal Interactions*, Vol. 15, No. 1, pp. 60-68, Mar 2015.
12. **Goel, R.**, Kulkarni, M. D., Pandya, K. S., and Naik, N. K., “Stress wave micro-macro attenuation in ceramic plates made of tiles during ballistic impact”, *International Journal of Mechanical Sciences*, Vol. 83, pp. 30—37, June 2014.
13. Schimizza, B., Son, S., **Goel, R.**, Vechart, A., and Young, L. R., “An experimental and numerical study of blast-induced shock wave mitigation in sandwich structures”, *Applied Acoustics*, Vol. 74, No.1, pp. 1-9, Jan 2013.
14. Christou, G., Young, L. R., **Goel, R.**, Vechart, A., and Jerusalem, A., “Shock attenuation of PMMA sandwich panels filled with soda-lime glass beads: a fluid-solid interaction continuum model simulation”, *International Journal of Impact Engineering*, Vol. 47, pp. 48-59, Sept 2012.
15. **Goel, R.**, Kaderka, J., and Newman, D., “Modeling the benefits of artificial gravity countermeasure coupled with exercise and vibration”, *Acta Astronautica*, Vol. 70, pp. 43-51, Jan 2012.
16. Gupta, N. K., **Goel, R.**, and Ananthkrishnan, N., “Design/Development of Mini/Micro Air Vehicles through Modelling and Simulation: Case of an autonomous quadrotor”, *Aerospace Avionics and Related Technology, Defense Science Journal*, Vol. 61, No. 4, pp. 337-345, July 2011.
17. Kulkarni, M. D., **Goel, R.**, and Naik, N. K., “Effect of back pressure on impact and compression after impact characteristics of composites”, *Composite Structures*, Vol. 93, No. 2, Jan 2011.
18. Stewart, D., Young, L. R., **Goel, R.**, Christou, G., and Gilchrist, M. D., “Evaluating the performance of helmet lining incorporating fluid channels”, *Journal of ASTM International*, Vol. 7, No. 10, Nov 2010.
19. Naik, N. K., **Goel, R.**, and Kulkarni, M. D., “Stress wave attenuation in ceramic plates”, *Journal of Applied Physics*. Vol. 103, No. 10, May 2008.

PEER-REVIEWED CONFERENCE PAPERS

1. Derewa, C.S., Singh, J., Josan, P.K., Raviprasad, S., Srivastava, P., **Goel, R.**, Sharma, M., "Indian Space University – An initiative to nurture "Brahmanuats" for future human spaceflight", International Astronautical Congress, Oct 12-16, 2015, Jerusalem, Israel.
2. <many co-authors>, **Goel, R.**, et al., "Reach2020: Tele-reach for the Global South", Project Report at International Space University's Southern Hemisphere Space Studies Program, Adelaide, Australia, Feb 2012. (It was a class project with ~40 students. Paper was presented by Ferrete, E., at 63rd International Astronautical Congress, Naples, Italy, 1 - 5 Oct, 2012).
3. **Goel, R.**, Vechart, A., Christou, G., and Young, L. R., "Development of a Helmet Liner for Protection against Blast Induced Trauma", IMPLAST 2010, SEM Fall Conference, 12 – 14 Oct, 2010, Providence, RI.
4. **Goel, R.**, Kaderka, J., and Newman, D., "Modeling the Benefits of Artificial Gravity Countermeasure Coupled with Exercise and Vibration", 61st International Astronautical Congress, 27 Sept – 1 Oct, 2010, Prague, Czech Rep.
5. Cunio, P. M., Babuscia, A., Bailey, Z. J., Chaurasia, H., **Goel, R.**, Golkar, A. A., Selva, D., Timmons, E., Cohanin, B. E., Hoffman, J. A., and Miller, D. W., "Initial Development of an Earth-Based Prototype for a Lunar Hopper Autonomous Exploration System", AIAA Space 2009 Conference, Pasadena, 14 - 17 Sept, 2009, California.
6. **Goel, R.**, Gupta, N. K., and Ananthkrishnan, N., "Modeling, Simulation and Flight Testing of an Autonomous Quadrotor", IISc Centenary International Conference and Exhibition on Aerospace Engineering, 18 - 22 May, 2009, Bangalore, India.
7. **Goel, R.**, Kulkarni, M. D., and Naik, N. K., "Stress Wave Attenuation in Ceramic Plates", 16th International Conference on Composite Materials, 8 - 13 July, 2007, Kyoto, Japan.

PODIUM PRESENTATIONS (unrefereed)

8. Mulavara, A.P., Peters, B., DeDios, Y.E., Gadd, N.E., Caldwell, E.E., Batson, C.D., **Goel, R.**, Oddsson, L.I., Kreutzberg, G., Zanello, S., Clarke, T., Waddington, G., Oman, C. M., Cohen, H.S., Wood, S., Seidler, R.D., Reschke, M., and Bloomberg, J.J., "Behavioral, Brain Imaging and Genomic Measures to Predict Functional Outcomes Post – Bed Rest and Spaceflight", 2018 Human Research Program Investigators' Workshop, Jan 22-25, 2018, Houston, TX.
9. Mulavara, A.P., Peters, B., DeDios, Y.E., Gadd, N.E., Caldwell, E.E., Batson, C.D., **Goel, R.**, Oddsson, L.I., Kreutzberg, G., Zanello, S., Clarke, T., Oman, C. M., Cohen, H.S., Wood, S., Seidler, R.D., Reschke, M., and Bloomberg, J.J., "Behavioral, Brain Imaging and Genomic Measures to Predict Functional Outcomes Post – Bed Rest and Spaceflight", 2017 Human Research Program Investigators' Workshop, Jan 23-26, 2017, Houston, TX.
10. Mulavara, A.P., DeDios, Y.E., Gadd, N.E., Caldwell, E.E., Batson, C.D., **Goel, R.**, Seidler, R.D., Oddsson, L.I., Zanello, S., Clarke, T., Peters, B., Cohen, H.S., Reschke, M., Wood, S., and Bloomberg, J.J., "Behavioral, Brain Imaging and Genomic Measures to Predict Functional Outcomes Post – Bed Rest and Spaceflight", 2016 Human Research Program Investigators' Workshop, Feb 8-11, 2016, Houston, TX.
11. Bloomberg, J.J., Peters, B.T., Mulavara, A.P., Caldwell, E.E., Batson, C.D., DeDios Y.E., Gadd, N.E., **Goel, R.**, Wood, S.J., Cohen, H.S., Oddsson, L.I., and Seidler, R.D., "Predictive Measures of Locomotor Performance on an Unstable Walking Surface", 2016 Human Research Program Investigators' Workshop, Feb 8-11, 2016, Houston, TX.
12. **Goel, R.**, Kofman, I., DeDios, Y., Jeevarajan, J., Stepanyan, V., Nair, M., Congdon, S., Fregia, M., Cohen, H., Bloomberg, J., and Mulavara, A. P., "Estimation of an Optimal Stimulus Amplitude for Using Vestibular Stochastic Stimulation to Improve Balance Function", 86th Annual Scientific Meeting of the Aerospace Medical Association, May 10-14, 2015, Lake Buena Vista, FL.
13. Mulavara, A. P., Kofman, I., DeDios, Y., Galvan, R., **Goel, R.**, Miller, C., Peters, B., Cohen, H.S., Jeevarajan, J., Reschke, M., Wood, S., Bergquist, F., Seidler, R. D., and Bloomberg, J. J., "Improving Sensorimotor Adaptation Following Long-Duration Spaceflight by Enhancing Vestibular Information Transfer", 2015 Human Research Program Investigators' Workshop, Jan 13-15, 2015, Houston, TX.
14. **Goel, R.**, Kofman, I., DeDios, Y., Jeevarajan, J., Stepanyan, V., Nair, M., Congdon, S., Fregia, M., Cohen, H., Bloomberg, J., and Mulavara, A. P., "Determine Optimal Stimulus Amplitude for Using Vestibular Stochastic Stimulation to Improve Balance Function", 2nd International Space Conference, 8-9 Jan 2015, Noida, India.
15. Young, L. R., and **Goel, R.**, "Helmet Lining Incorporating Channels", F27 Snow Skiing ASTM Meeting, July 13-14, 2010, Burlington, VT.
16. Son, S., Young, L., Christou, G., **Goel, R.**, and Alley, M., "Blast Mitigation for Protection against Blast Induced Trauma, DHS Blast Mitigation Workshop, April 30, 2009, Kingston, RI.

POSTER PRESENTATIONS (unrefereed)

1. Qureshi, A., **Goel, R.**, Kim, J. H., de la Rosa, N., Himmelbach, M., Hagber, G., Scheffler, D., Ress, D., "Somatosensory Responses in the Deep Layers of Superior Colliculus", Neuroscience 2019, 19-24 Oct, 2019, Chicago, IL.
2. Tse, T., **Goel, R.**, Floren, A., Salas, R., Naylor, B., Ress, D., "Decoding Stress Levels obtained from fMRI data in a Virtual Reality Environment", Neuroscience 2019, 19-24 Oct., 2019, Chicago, IL.
3. Qureshi, A, **Goel, R.**, Taylor, A., Kim, J. H., de la Rosa, N., Himmelbach, Hagberg, G., M., Scheffler, K., Ress, D., "Somatosensory Responses in the Deep Layers of Superior Colliculus", CRCNS PI Meeting, 2-4 Sept, 2019, Austin, TX.

4. Wang, C., **Goel, R.**, Lepow, B., Najafi, B., "Long-term Effects of Custom-made Ankle-foot Orthoses (AFO) on Balance in Older Adults –One Year Prospective Randomized Controlled Trial", GCMAS 2019, 26-29 Mar, 2019, Frisco, TX.
5. **Goel, R.**, Nakagome, S., Ozdemir, R. A., Rao, N., Contreras-Vidal, J.L., Parikh, P.J., "Role of Supplementary Motor Area in Postural Control", Neuroscience 2017, 11-15 Nov, 2017, Washington DC.
6. Nakagome, S., **Goel, R.**, Parikh, P.J., Contreras-Vidal, J.L., "Modulation of fronto-parietal networks during adjustments to challenging postural conditions", Neuroscience 2017, 11-15 Nov, 2017, Washington DC.
7. **Goel, R.**, Rosenberg, M. J., DeDios, Y. E., Cohen, H.S., Bloomberg, J. J., Mulavara, A. P., "Estimation of Optimal Amplitude for Balance Training using Electrical Stimulation of the Vestibular System", 2017 Human Research Program Investigators' Workshop, Jan 23-26, 2017, Houston, TX.
8. **Goel, R.**, Rosenberg, M. J., DeDios, Y. E., Cohen, H.S., Bloomberg, J. J., Mulavara, A. P., "Estimation of Optimal Amplitude for Balance Training using Electrical Stimulation of the Vestibular System", Neuroscience 2016, 12-16 Nov, 2016, San Diego, CA.
9. Mulavara, A.P., Peters, B., DeDios, Y.E., Gadd, N.E., Caldwell, E.E., Batson, C.D., **Goel, R.**, Kreutzberg, G., Koppelmans, V., Cassidy, K., Ruitenber, M., Seidler, R.D., Oddsson, L.I., Zanello, S., Clarke, T., Oman, C.M., Cohen, H.S., Reschke, M., Wood, S., and Bloomberg, J.J., "Developing Personalized Sensorimotor Adaptability Countermeasures for Spaceflight" 39th Annual Midwinter Meeting of the Association for Research in Otolaryngology, Feb 20–24, 2016, San Diego, CA. USA.
10. **Goel, R.**, DeDios, Y., Gadd, N., Bloomberg, J., Oddsson, L.I.E., and Mulavara, A. P., "Development of a Reliable Protocol to test Proprioceptive Dependency in Postural Control", 2016 Human Research Program Investigators' Workshop, Feb 8-11, 2016, Houston, TX.
11. Madansingh, S., **Goel, R.**, Kabbaligere, R., and Paloski, W. H., "Running in circles: A novel approach to artificial gravity", 36th Annual International Gravitational Physiology Meeting, June 7 – 12, 2015, Ljubljana, Slovenia.
12. **Goel, R.**, Kofman, I., DeDios, Y., Jeevarajan, J., Stepanyan, V., Nair, M., Congdon, S., Fregia, M., Cohen, H., Bloomberg, J., and Mulavara, A. P., "Optimal Stimulus Amplitude for Vestibular Stochastic Stimulation to Improve Balance Function", 2015 Human Research Program Investigators' Workshop, Jan 13-15, 2015, Houston, TX.

AWARDS AND RECOGNITION

- Research award from the Department of Health and Human Performance, University of Houston, Apr 2017
- Scholarship from American Society of Indian Engineers Houston, Nov 2013, 2014
- Scholarship from American Society of Engineers of Indian Origin, Sep 2014
- Graduate Fellowship for the outstanding incoming student, College of Liberal Arts and Social Sciences, University of Houston Fall 2012-Spring 2013
- Silver Medal - **Awarded by the then President of India (Smt. Pratibha Patil)** for the most outstanding student in the graduating batch of Aerospace engineering in college, Aug 2008

SERVICE TO PROFESSION

- Review Editor: Frontiers in Human Neuroscience (section: Motor Neuroscience) (since Mar 2017), Frontiers in Neuroscience (section: Neuroprosthetics) (since Oct 2017), Frontiers in Psychology and Frontiers in Sports and Active Living (section: Movement Science and Sport Psychology) (since Oct 2017)
- Editorial Board Member: Open Science Journal (since Oct 2017)
- Reviewed **88** manuscripts multiple times submitted to the following **26** journals: ACM IMWUT, Clinical Biomechanics, Frontiers in Aging Neuroscience, Frontiers in Behavioral Neuroscience, Frontiers in Computational Neuroscience, Frontiers in Human Neuroscience, Frontiers in NeuroRobotics, Frontiers in Neuroscience, Frontiers in Physiology, Frontiers in Psychology, Gait & Posture, Gerontology, Journal of Alzheimer's Disease, Journal of Arthroplasty, Journal of Behavioral Robotics, Journal of Biomechanics, Journal of Low-Frequency Noise Vibration and Active Control, Journal of Motor Behavior, Journal of Neurophysiology, Journal of Rehabilitation Medicine, Motor Control, Nature Scientific Reports, Neural Networks, PeerJ, PLOS One, Sensors.
- Reviewer of posters related to artificial gravity. NASA HRP Investigator's Workshop (Jan 22-25, 2018, 2019 Galveston, TX)
- Reviewed ~70 conference abstracts. Aerospace Medical Association (Nov 16, 2017, Washington, DC)
- Panelist, Humans in Space Panel, Comicpalooza July 2016, Houston
- Judge, Mars Rover competition for middle and elementary school children held every year at UH in January (2013-2016)
- Panelist, Developing Regions, and Space Applications, Space Generation Fusion Forum, Apr 2012, Colorado Springs, CO

LINKS

- LinkedIn: <https://www.linkedin.com/in/rahulgoel20/>
- Stanford Webpage: <https://med.stanford.edu/profiles/rahul-goel>
- Google Scholar: https://scholar.google.com/citations?hl=en&user=jUX8L7gAAAAJ&view_op=list_works&sortby=pubdate