AKSHAY SUJATHA RAVINDRAN

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RESEARCH INTERESTS

Explainable Deep Learning in Neuroscience | Computational Neuroscience | Brain-Machine Interfaces | Machine Learning | Mindfulness | Mobile Brain-Body Imaging | Neuroaesthetics

EDUCATION

Ph.D. Electrical & Computer Engineering - Advisor: Dr. Jose Luis Contreras-Vidal — Fall 2016-Present
University of Houston, Houston, TX

Bachelor of Technology, Electrical and Electronics Engineering — 2015
University of Kerala, Kerala, India

RESEARCH EXPERIENCE

Laboratory for Non-Invasive Brain-Machine Interfaces — Fall 2016–Present
Electrical & Computer Engineering, University of Houston
Supervisor: Jose L. Contreras-Vidal, Ph.D.

1. Performed systematic analysis of explainable deep learning using simulated and real EEG — 2020 - 21
2. Nahual: developed a real-time BCI-GAN model to generate immersive digital art — 2020 - 21
3. Early detection of the loss of balance in exoskeleton users from EEG — 2019 - 20
4. Identified periodic spectral changes associated with guided online Isha Kriya meditation — 2019 - 20
5. Developed control strategies for combining FES with robot-assisted gait rehabilitation — 2018 - 19
6. Assaying EEG activity in natural real world settings — 2017 - Present

Computational Medicine Lab — Spring 2019
Electrical & Computer Engineering, University of Houston
Supervisor: Rose T. Faghih, Ph.D.

1. Point process characterization of heartbeat dynamics

Healthcare Technology Innovation Centre — July 2015–July 2016
Dept. of Electrical & Computer Engineering, Indian Institute of Technology, Madras
Supervisors: Preejith SP, MS; Mohanasankar Sivaprakasam, Ph.D.

1. Estimating blood oxygen saturation using custom wearable device — Fall 2015 - Spring 2016
2. Cuffless blood pressure measurement using pulse transit — Spring 2016
3. Decoding hand movements from muscle activity using neural networks — Fall 2015

FELLOWSHIPS & AWARDS

Graduate Tuition Fellowship	2016-Present
BCI society student award	2021
Cullen Graduate Student Success Fellowship (UH)	2020
Brain-Computer Interface Designers Hackathon Winner (IGS-BOA conference)	2019
Seed Funding for Advanced Computing (UH)	2017
Center for Advanced Computing and Data Science Fellow (UH)	2017
99.9 percentile National Merit Certificate for Science (AISSCE, India)	2009

PUBLICATIONS

Book Chapters

1. Nakagome S, Craik A, **Ravindran AS**, He Y, Cruz-Garza JG, and Contreras-Vidal JL. Springer Handbook of Neuroengineering. In: ed. by Thakor NV. Springer Nature. Chap. Deep learning methods for EEG neural classification. *In Press*.

Publications

1. Paek AY, Brantley JA, **Ravindran AS**, et al. A roadmap towards standards for neurally controlled end effectors. IEEE open journal of engineering in medicine and biology 2021;2. *10.1109/OJEMB.2021.3059161*.

2. Cruz-Garza JG, **Ravindran AS**, Kopteva AE, Rivera Garza C, and Contreras-Vidal JL. Characterization of the stages of creative writing with mobile EEG using generalized partial directed coherence. Frontiers in human neuroscience 2020;14:533. *DOI: 10.3389/fnhum.2020.577651*.

3. **Ravindran AS**, Cestari M, Malaya C, et al. Interpretable deep learning models for single trial prediction of balance loss. 2020 IEEE International Conference on Systems, Man, and Cybernetics (SMC) 2020:268–73. *DOI: 10.1109/SMC42975.2020.9283206*.

4. Nakagome S, Luu TP, He Y, **Ravindran AS**, and Contreras-Vidal JL. An empirical comparison of neural networks and machine learning algorithms for EEG gait decoding. Scientific Reports 2020;10:1–17. *DOI: 10.1038/s41598-020-60932-4*.

5. **Ravindran AS**, Nakagome S, Wickramasuriya DS, Contreras-Vidal JL, and Faghih RT. Emotion recognition by point process characterization of heartbeat dynamics. IEEE Healthcare Innovations and Point of Care Technologies 2019:13–6. *DOI: 10.1109/HI-POCT45284.2019.8962886*.

6. **Ravindran AS**, Mobiny A, Cruz-Garza JG, Paek A, Kopteva A, and Vidal JLC. Assaying neural activity of children during video game play in public spaces: a deep learning approach. Journal of neural engineering 2019;16:036028. *DOI: 10.1088/1741-2552/ab1876*.

7. Preejith S, **Ravindran AS**, Hajare R, Joseph J, and Sivaprakasam M. A wrist worn SpO_2 monitor with custom finger probe for motion artifact removal. 2016 38th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC) 2016:5777–80. *DOI: 10.1109/EMBC.2016.7592040*.

Under Preparation / Review

1. **Ravindran AS**, Cestari M, Malaya C, et al. Decoding neural activity preceding balance loss with and without lower-limb exoskeletons for gait rehabilitation. In: Scientific Reports, 2021. *In preparation*.

2. **Ravindran AS**, Upadhyay P, Susheela AT, Contreras-Vidal JL, and Subramaniam B. A longitudinal study of the periodic EEG changes associated with Isha Kriya meditation. In: Frontiers in Psychology, 2021. *In review*.

Publically Contributed Data

1. Cruz-Garza JG, Hendry MF, **Ravindran AS**, et al. Mobile brain-body imaging and audio-visual data of theatrical actors during rehearsal and performances. Scientific data. 2021. *In preparation*.

2. **Ravindran AS**, Cruz-Garza JG, Kopteva A, et al. Multi-modal mobile brain-body imaging (MoBI) dataset for assaying neural and head movement responses associated with creative video game play in children. IEEE Dataport. 2017. DOI: `10.21227/H23W880`. URL: `http://dx.doi.org/10.21227/H23W88`.

TEACHING EXPERIENCE

Guest Lecturer/ Teaching Assistant at University of Houston, TX — Spring 2021
Neurohumanities (ECE 6397)

Summer EEG Bootcamp Lead at University of Houston, TX — Summer 2020
BRAIN Center Summer workshop series

MENTORSHIP

University of Houston

1. Vidisha Ganesh (Undergrad Trainee, Rice University) — Spring 2021-Present
2. Anjana Ganesh (Undergrad Trainee, UT Austin) — Summer 2020-Present
3. Brett Velasquez (Research Assistant) — Spring 2021-Present
4. Adriana Lopez Cajigas (Undergraduate Trainee, UH) — Spring 2021-Present
5. Karthikeya Gullpalli (High school Trainee, Carnegie Vanguard High School) — Fall 2020-Present
6. Dhivya Venkatraghavan (High school Trainee, Seven Lakes High School) — Spring 2021-Present
7. Adhithi Venkatraghavan (High school Trainee, Seven Lakes High School) — Spring 2021-Present
8. Lakshya Gupta (High school Trainee, Tompkins High School) — Summer 2020-Present
9. Lakshya Gupta (High school Trainee, Tompkins High School) — Summer 2020-Present
10. Anika Patel (High school Trainee, Dulles High School) — Fall 2019-Fall 2020
11. José Angel Pérez Alonso (International Trainee, UDEM) — Summer 2020
12. Chase Philip (Undergrad Trainee, UH) — Summer 2020
13. Christian Alacorn (Undergrad Trainee, UH) — Summer 2020
14. Devika Dileep (Undergrad Trainee, ASU) — Summer 2020
15. Yuchien Lin (Undergrad Trainee, UH) — Summer 2020
16. Jeana Joo (High school Trainee, Klein Cain High School) — Summer 2020
17. Rhea Phatak (High school Trainee, DeBakey High School for Health Professions) — Summer 2020
18. Lanvy Vu (Undergrad Trainee, UH) — Fall 2017
19. Mominah Shaik (Undergrad Trainee, UH) — Fall 2017

Healthcare Technology Innovation Center, IIT-Madras, India

Deeksha Karanjgaokar, Priyanka Vinod, Ashwin R, Santhana Bharathi N, S Rahul, V Poornima — Summer 2016

LEADERSHIP

Treasurer: BRAIN Student Group (UH) — 2021-Present
President: BRAIN Student Group (UH) — 2020-21
Secretary: IEEE EMB Chapter Houston Section — 2020-21
Vice President: Graduate and Professional Student Association (UH) — 2018-20
Student Representative: IEEE Section Travancore HUB (R10, Kerala Section) — 2014-15
Chairman: IEEE Student Branch (R10, Kerala Section) — 2014-15

PROFESSIONAL SERVICE

1. **Ad hoc reviewer**
   IEEE Transactions on Human-Machine System, Neural Networks, Physiological Measurement, Brain Sciences, Journal of Physiology, IEEE EMBC, International Graphonomics conference 2019

2. **President (2020-2021) BRAIN Student Group, UH**
   Organized 11 technical workshops specializing in EEG during summer 2020. Personally handled two of the workshops. In addition, organized various networking events.
3. **Vice President (2020-2021) IEEE EMB, Houston Chapter**
   Coordinated a panel discussion on career transition for Ph.D. students. Later in collaboration with the NSF IUCRC BRAIN Center, multiple virtual lab tours of ASU and UH labs that do research in various areas of neurotechnology were facilitated.
4. **Vice-President (2018-present) Graduate and Professional Student Association, UH**
   Organized over 15 academic and networking events during the term and won the outstanding educational program as well as the outstanding collaboration award for 2019
5. **Graduate AdHoc committee member (2018-19) Graduate School, UH**
   Drafting the graduate bill of rights for the university.
6. **Graduate Panelist**
   Graduate Orientation (Fall 2019); UH National Society of Black Engineers Student Interaction (Spring 2020)

SOFTWARE PROFICIENCY

1. **Languages**: Matlab, Python (Advanced); R, C, C++ (Basic)
2. **Toolboxes**: EEGLab, FieldTrip, SEREEGA, Keras, Tensorflow, FOOOF (Advanced); Pytorch, MNE (Intermediate); visbrain, SIMEEG, Brainstorm (Basic)
3. **Development Environments/ Other Softwares**: Spyder, Microsoft Office, Inkscape, LaTeX (Advanced); Arduino, Adobe Illustrator, Anaconda, Github (Intermediate); Labview, Adobe Premier, IAR workbench, Altium designer (Basic)

PROFESSIONAL AFFILIATIONS

Institute of Electrical and Electronics Engineers (IEEE)	2012-Present
Brain Computer Interface Society	2020-Present
Building Reliable Advances and Innovation in Neurotechnology Center	2019-Present
Graduate and Professional Student Association	2018-20
Toastmaster Internationals	2017-18

MEDIA COVERAGE

Videos

1. Neurapod podcast | Neuralink Pros and Cons w/ Akshay Ravindran| Youtube — Feb 2021
2. Self-Conscience/Physical Memory | Kinetic, neurofeedback art installation| Vimeo — May 2020
3. The Nahual Project | Your Brain on Art | Youtube — Nov 2019

LANGUAGES

Proficiency in conversational English, Hindi, Malayalam and Tamil

SCIENCE COMMUNICATION & OUTREACH

- **K12 students lab tour** — **Spring 2017-present**
  STEAM outreach–introduce K12 students to the state of the art research related to non-invasive brain-machine interface systems
  University of Houston, Houston, TX
- NAHUAL Project — Fall 2019
  STEAM outreach–art science demonstration at the intersection of neuro-engineering, artificial intelligence and visual art
  Midtown Arts and Theater Center Houston, Houston, TX

- UTHealth Stomp Out Stroke Festival — Summer 2017-2019
  Demonstration of brain imaging devices and rehabilitation robotics to the general public and people affected by stroke
  Discovery Green, Houston, TX
- Girls in Engineering — Spring 2019
  STEAM outreach–Chevron outreach event for inspiring girls to choose STEM career
  University of Houston, Houston, TX
- Your Brain on Wine: The Exquisite Corpse — Spring 2019
  STEAM outreach–demonstrating neuroimaging during wine tasting
  Hilton College of Hotel and Restaurant Management, University of Houston, TX
- Your Brain on Art: The Exquisite Corpse — Summer 2017, 2019
  STEAM outreach–demonstrating neuroimaging during collaborative art creation by children
  Children's Museum of Houston, Houston, TX
- Brain on Art workshop — Summer 2018
  Workshop and performance on music, improvisation, and technology
  University of Houston, Houston, TX
- Your Brain on Music: : The Exquisite Corpse — Summer 2018
  Demonstrated neuroimaging technology and visualize EEG during live music presentation
  Houston Health Museum, Houston, TX
- National Geography Documentary: The Exquisite Corpse — December 2017
  STEAM outreach–demonstrating neuroimaging during painting, music, and dance performance
  University of Houston, TX
- Your Brain on Music — Spring 2017
  STEAM outreach–demonstrating neuroimaging during music improvisation
  Houston Community College Spring Branch Performing Arts Center, Houston, TX
- Your Brain on Art Appreciation — Spring 2017
  STEAM outreach–demonstrating neuroimaging during art appreciation; over 100 people reached
  Indianapolis Museum of Art, Indianapolis