

Harshavardhana Gowda

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Education

University of California

Ph.D. in Electrical and Computer Engineering *GPA: 3.83/4.0*

Davis, USA

Sep 2022 – May 2027

Indian Institute of Space Science and Technology

B.Tech in Avionics *GPA: 8.1/10*

India

Aug 2014 – May 2018

Publications

[Topology of surface electromyogram signals: hand gesture decoding on Riemannian manifolds](#)

*Harshavardhana T. Gowda**, Lee M. Miller.

Journal of Neural Engineering, 2024.

[Geometry of orofacial neuromuscular signals: speech articulation decoding using surface electromyography](#)

*Harshavardhana T. Gowda**, Zachary McNaughton, Lee M. Miller.

Under review at Journal of Neural Engineering.

[Upper limb surface electromyography - geometry, spectral characteristics, temporal evolution, biometric prospect, and demographic confounds](#)

*Harshavardhana T. Gowda**, Neha Kaul, Carlos Carrasco, Marcus A. Battraw, Safa Amer, Saniya Kotwal, Selen Lam, Zachary McNaughton, Ferdous Rahimi, Sana Shehabi, Jonathon S. Schofield, Lee M. Miller.

Under review at Journal of Neural Engineering.

Research Focus

University of California, Davis, USA

Graduate Researcher

Sep 2022 – May 2027

- My primary research focuses on developing *accessible* technologies with emphasis on speech and language modalities. I design brain-body-computer interfaces using multiple modalities such as audio, video, and electromyography. I work on designing efficient neural network architectures for seamless real-time interfaces that generalize well across idiosyncracies of individuals.

Major Projects

Hand gesture decoding using surface electromyography

[EMG geometry & other properties](#)

- We showed that the upperlimb electromyogram signals evince a data structure that is unlike images and audio and is defined by a set of orthogonal axes (instead of being sampled on 1D or 2D Euclidean grids). We proposed efficient neural network architectures to decode hand movements that generalize well across individuals.
- We collected data from **91 subjects** sampled from various age groups and BMI and demonstrated that the inherent geometric structure of EMG is unaffected by factors such as age, skin moisture, skin elasticity, BMI, forearm hair density, and subcutaneous fat in the arm.

Multimodal speech decoding using EMG, video, and residual audio

[EMG-Speech](#)

We are developing a multimodal approach to decode speech using EMG, video, and residual audio in

individuals who have lost the ability to speak intelligibly due to causes such as neuromuscular disease, stroke, trauma, and head/neck cancer surgery (e.g. laryngectomy) or treatment (e.g. radiotherapy toxicity to the speech articulators). In the first leg of the project, we have collected the data from **16 subjects** as they articulate various English language sentences.

Skills

Programming: Python, C, CUDA.

Frameworks: PyTorch, TensorFlow, Keras.

Professional Work Experience

Indian Space Research Organization

Satellite Design Engineer

India

Sep 2018 – June 2022

- Contributed to communication system design of Geosats including GSAT-20 and GISAT (EOS series).
- Contributed to power system design and electronics bus integration of human space mission crew module.
- Developed a software platform to aid the design of digital beamforming to allow coexistence of LTE and MSS. Tested the system in an anechoic chamber using S-band receive antenna. (*Member, Research Team - Novel Technologies*)
- Developed a platform for Digital Video Broadcasting - Satellite - Second Generation (DVB - S2) standard. Modeled RF satellite systems, communication signals, communication channels and impairments. Analyzed the performance of satellite transponder by measuring error vector magnitude for various modulation schemes. (*Member, Communication Systems Development Team*)
- Conducted failure mode, effects and criticality analysis, and worst-case circuit stress analysis for satellite electronics. Devised experimental investigation techniques to scrutinize fabrication and design errors when circuit performance does not conform to specifications in emulated space environment.

Awards & Achievements

Neuralstorm Fellowship, NSF NRT Award No. 2152260 and Ellis Fund, UC Davis, 2024
Dollars 66,551 for conducting research in neural engineering.

Department of Space Scholarship, Indian Space Research Organization, 2014
Dollars 10,000 to support undergraduate studies in space research.