Vijay Veerabadran

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Education

- **University of California, San Diego** — La Jolla, CA
  Ph.D. in Cognitive Science (UC-GPA: 3.93/4.00) — **09/2018 - 12/2023 (exp.)**
  - **Research directions**: Developing bio-inspired deep learning for computer vision, computational modeling of human vision, measuring similarity between human and machine visual perception.
- **SSN College of Engineering, Anna University** — Chennai, TN, India
  B.E in Computer Science and Engineering (GPA: 8.85/10.0) — **06/2013 - 04/2017**
  - **Final project:** Automated Video Captioning using deep convolutional networks and LSTMs

Work experience

- **Research Scientist Intern, Meta Reality Labs** — **06/2023 - present**
  Advisor: Michael Iuzzolino
  - Working on developing novel egocentric video-language pretraining methods for few-shot personalization using foundation models (Multimodal Large Language Models).
- **PhD candidate at de Sa Lab, UCSD** — **09/2018 - present**
  Advisor: Prof. Virginia de Sa
  - Leading a project developing bio-inspired recurrent convolutional networks (RCNNs) that zero-shot generalize to unseen harder instances of a given visual task purely by increasing the number of recurrent iterations at inference.
  - Currently working on (1) an extension of this RCNN with adaptive inference-time compute that learns a stopping criterion on a per-instance level and (2) increasing representational similarity between RCNNs and macaque visual representations obtained from single-cell neural recordings.
- **Research Intern at Meta AI, New York** — **06/2021 - 09/2021**
  Mentors: Yann Lecun, Yubei Chen, Stephane Deny
  - Led a project extending the self-supervised learning technique 'Barlow Twins' to learn representations for static images using spatio-temporal cues present in unlabeled naturalistic videos.
- **Research Intern at Google Brain, Mountain View** — **06/2020 - 06/2021**
  Mentors: Gamaleldin Elsayed, Michael Mozer, Jascha Sohl-Dickstein and Jonathon Shlens
  - Led a project to test whether subtle adversarial image manipulations that influence deep learning models may also influence human perception under unlimited-time viewing.
  - Designed and conducted a large-scale visual psychophyics study consisting of experiments performed on Mechanical Turk to quantitatively measure human perceptual susceptibility to adversarial images.
  - Paper summarizing our findings accepted at Nature Communications.
- **Research Intern at Qualcomm AI Research, San Diego** — **07/2019 - 09/2019**
  Mentors: Reza Pourreza, Amirhossein Habibian, Taco S. Cohen
  - Led a project to develop a novel video compression model based on rate-distortion theory using Generative Adversarial Networks aimed at enhancing perceptual quality of decoded videos compressed to very low bitrates.
  - Short paper summarizing our findings accepted at CLIC 2020, the 3rd Workshop and Challenge on Learned Image Compression.
- **Research Assistant at Serre Lab, Brown University** — **08/2017 - 08/2018**
  Advisors: Prof. Thomas Serre, Drew Linsley
  - Worked on inventing a novel convolutional recurrent unit called the horizontal Gated Recurrent Unit (hGRU, https://arxiv.org/pdf/1805.08315.pdf) and developing a novel synthetic image classification dataset called 'PathFinder'.
  - Worked on applying the hGRU model to the tasks of supervised object boundary detection and image classification.
  - Paper summarizing our findings accepted at NeurIPS 2018.

Select publications

- Subtle adversarial image manipulations in both human and machine perception
  Veerabadran, V., Goldman, J., Shankar, S., Cheung, B., Papernot, N., Kurakin, A., Goodfellow, I., Shlens, J., Sohl-Dickstein, J., Mozer, M. C., & Elsayed, G. F. [Nature Communications, 2023]. [Paper link]

- Adaptive recurrent vision performs zero-shot computation scaling to unseen difficulty levels
  Veerabadran, V., Ravishankar, S., Tang, Y., Raina, R., & de Sa, V. R. (2023) [NeurIPS 2023]

- Cortically motivated recurrence enables task extrapolation
  Veerabadran, V., Ravishankar, S., Tang, Y., Raina, R., & de Sa, V. R. [Vision Sciences Society 2023, COSYNE 2023]

- Bio-inspired divisive normalization improves object recognition performance in ANNs
  Veerabadran, V., Raina, R., & de Sa, V. R. [Vision Sciences Society 2022]

- Bio-inspired learnable divisive normalization for ANNs
  Veerabadran, V., Raina, R., & de Sa, V. R. [NeurIPS workshop on Shared Visual Representations in Human and Machine Intelligence, 2021.] [Paper link]

- Learning compact generalizable neural representations supporting perceptual grouping.
  Veerabadran, V., & de Sa, V. R. (2020). arXiv preprint arXiv:2006.11716. [Paper link]

- Adversarial Distortion for Learned Video Compression
  Veerabadran, V., Pourreza, R., Habibian, A., & Cohen, T. S. [IEEE/CVF Conference on Computer Vision and Pattern Recognition Workshops, 2020]. [Paper link]

- Learning long-range spatial dependencies with horizontal gated recurrent units
  Linsley, D., Kim, J., **Veerabadran, V.**, Windolf, C., & Serre, T. [NeurIPS 2018]. [Paper link]

Invited presentations

- Subtle adversarial image manipulations influence both human and machine perception. Center for Biological & Computational Learning (CBCL) at MIT, May 2022.

- Recurrent models in computer vision. CogML meeting at Google AI, India, April 2021.

- Horizontal connections for enhancing machine visual grouping. Neuromatch 2020, Virtual, October 2020.

- Neocognitron: A neural network model for a mechanism of visual pattern recognition. Seminar on Neurally Inspired Unsupervised Learning, UC San Diego, October 2018.

Honors & awards

- Received UCSD's Friends of International Center Fellowship award for pursuing graduate research and promoting international friendship, understanding, and cooperation through collaborations

- Financial grants awarded for supporting my Ph.D. research:
  (1) 2019 Kavli Symposium Inspired Proposal award for novel research at the intersection of AI and Neuroscience, (2) 2020 Kavli Symposium Inspired Proposal award, (3) Sony Research Award (09/2020-09/2021), (4) Sony Research Award (09/2021-09/2022)

- Received a travel award to attend the 2019 NeurIPS conference.

- Achieved a worldwide 96^{th} percentile as of December 2015 in Hackerrank, a competitive programming platform.

- Ranked 23rd highest scoring candidate (out of 16449 candidates) in the state of Tamil Nadu, IN during undergraduate study (2013 - 2017).

- Received merit scholarships from SSN College of Engineering during the academic years 2013-2014 and 2014-2015 for ranking 1st in the end-semester exams conducted by Anna University.

Coursework

• COGS 260 (Prof. Angela Yu). Toward a Computational Understanding of Natural Intelligence and Behavior: Models, Algorithms, and Theories
• CSE 250A (Prof. Lawrence Saul). Principles of AI: Probabilistic Reasoning and Decision-Making
• CSE 250B (Prof. Sanjoy Dasgupta). Machine Learning
• COGS 202 (Prof. Angela Yu). Computational modeling of Cognition
• CSE 254 (Prof. Sanjoy Dasgupta). Seminar: Neurally Inspired Unsupervised Learning

Programming Skills

- **Languages**: Python, Javascript, C++, Java **Frameworks**: PyTorch, TensorFlow, scipy, scikit-learn
  Github: https://github.com/vijayvee **Misc tools**: Kubernetes, Mechanical Turk, Google Cloud

Mentoring

- Srinivas Ravishankar (bio-inspired deep learning, computer vision) PhD student at the de Sa Lab, UCSD (2022 - present)
- Yuan Tang - Postbac research assistant (bio-inspired deep learning, computer vision & vision science) at the de Sa Lab, UCSD (2022 - 2023)
- Arman Ommid - Grad research assistant (bio-inspired deep learning, computer vision & vision science) at the de Sa Lab, UCSD (2022 - 2022)
- Ritik Raina - Undergraduate research assistant (computer vision, bio-inspired deep learning) at the de Sa Lab, UCSD (2021 - 2022)
- Noah Carniglia, Hongyi Pan - Undergraduate research assistant (computer vision) at the de Sa Lab, UCSD (2020 - 2020)
- Teaching Assistant @ UCSD for COGS 118B: Introduction to Machine Learning II (Unsupervised learning) (Fall 2018, Fall 2019)
- Teaching Assistant @ UCSD for COGS 189: EEG-based Brain-computer interfaces (Winter 2019)

Professional service

- Reviewing for NeurIPS (2023, 2022), CVPR (2023, 2022, 2021, 2020), ICCV (2023, 2021), ICLR (2023, 2022, 2021, 2019), CCN (2019), CogSci (2021, 2022), Neural Computation, PLOS Computational Biology.
- Student Volunteer @ NeurIPS 2019, ICML 2019

References

Available upon request.