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 [Paper link]

- Cortically motivated recurrence enables task extrapolation
  Veerabadran, V., Ravishankar, S., Tang, Y., Raina, R., & de Sa, V. R. | VSS 2023, COSYNE 2023 [Paper link]

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

- Bio-inspired learnable divisive normalization for ANNs
  Veerabadran, V., Raina, R., & de Sa, V. R. | SVRHM (NeurIPS workshop) 2021 [Paper link]

- Learning compact generalizable neural representations supporting perceptual grouping.
  Veerabadran, V., & de Sa, V. R. (2020). | CoRR abs/2006.11716 (2020) [Paper link]

- Adversarial Distortion for Learned Video Compression
  Veerabadran, V., Pourreza, R., Habibian, A., & Cohen, T. S. | CLIC (CVPR workshop) 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 96th 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.