LOKESH BOOMINATHAN

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EDUCATION

Rice University *Expected May 2024*
Ph.D. in Electrical and Computer Engineering. GPA: 4/4
Advised by Dr. Xaq Pitkow
Key Coursework: Interactive Machine Learning, Learning From Sensor Data, Data and Systems

Rice University *August 2018 - August 2021*
Master of Science in Electrical and Computer Engineering. GPA: 4/4
Advised by Dr. Xaq Pitkow
Key Coursework: Statistical Signal Processing, Network Science, Neural Computation, Machine Learning, Random Processes

National Institute of Technology, Calicut *July 2011 - June 2015*
Bachelor of Technology in Electronics and Communication Engineering. GPA: 8/10
Key Coursework: Compressive Sensing, Medical Image Processing, Digital Image Processing

RESEARCH EXPERIENCE

Lab for the Algorithmic Brain (LAB) - Rice University, Houston, TX
Advised by Dr. Xaq Pitkow

Ph.D. candidate (2021 - Present)

- Developing **reinforcement learning** based models to capture the behavior of mice performing an **auditory foraging task**.
- **Quantifying** the **trade-off** between **attention cost** and **task performance**, based on pupil dilation and hit rate during foraging.

MS candidate (2018 - 2021)

- Defined a new class of **dynamic optimization tasks** that more accurately captures the **cost structure appropriate for inference computations in the brain**.
- The resultant optimization, solved using **LQG control theory**, provides nontrivial predictions for **neural computations** as a **function of feedforward and feedback architectural features and task structure**.

Computational Imaging Lab - IIT Madras, India
Advised by Dr. Kaushik Mitra and Dr. Shanti Bhattacharya

Research Assistant (2017 - 2018)

- Developed **deep learning based phase retrieval algorithm** for Fourier Ptychographic Microscopy.
- The developed algorithm is **faster** and requires a **lower number of acquisitions** in comparison to traditional phase retrieval algorithms.

Video Analytics Lab (VAL) - Indian Institute of Science Bangalore, India
Advised by Dr. Venkatesh Babu

Research Assistant (2015 - 2016)

- Developed **deep neural networks** for **estimating crowd density from static images** of highly dense crowds. The developed algorithm outperformed the state-of-the-art methods.
- Developed an algorithm using **deep neural networks and Bayesian optimization** to compensate for large in-plane rotations present in photographs. The algorithm is task agnostic and can be used for improving the **rotation invariance of any computer vision system**.

SKILLS

Software	Python, Mathematica, MATLAB
Tools	Adobe Illustrator, LaTeX

PUBLICATIONS/PREPRINTS

- **Boominathan L**, Pitkow X. "Phase transitions in when feedback is useful". Conference on Neural Information Processing Systems (**NeurIPS**) 2022.
- **Boominathan L**, Maniparambil M, Gupta H, Baburajan R, Mitra K. "Phase retrieval for Fourier Ptychography under varying amount of measurements". British Machine Vision Conference (**BMVC**) 2018.
- **Boominathan L**, Kruthiventi SS, Babu RV. "CrowdNet: A Deep Convolutional Network for Dense Crowd Counting". ACM Multimedia Conference (**ACMMM**) 2016.
- **Boominathan L**, Srinivas S, Babu RV. "Compensating for Large In-Plane Rotations in Natural Images". Indian Conference on Computer Vision, Graphics and Image Processing (**ICVGIP**) 2016.

OTHER POSTER PRESENTATIONS

- **Boominathan L**, Schrater P, Pitkow X. "Inference as control". Computational and Systems Neuroscience (**Cosyne**) 2021
- **Boominathan L**, Pitkow X. "Towards a Unified Theory of Information Processing in Resource-constrained Brain Circuits". GCC Theoretical and Computational Neuroscience (**TCN**) Annual Conference, 2020
- **Boominathan L**, Maniparambil M, Gupta H, Baburajan R, Mitra K. "Phase retrieval for Fourier Ptychography under varying amount of measurements". Computational Cameras and Displays (**CCD**) **workshop**, **CVPR**, 2018

CO-CURRICULAR ACTIVITIES

- Teaching Assistant for Rice University course **ELEC 589, Neural Computation** (Spring 2021, and 2022).
- Attended **Methods in Computational Neuroscience Course** at the **Marine Biological Laboratory** in Woods Hole, MA. Course project on "Value of information in foraging", advised by Gregory Wayne from DeepMind (Summer 2021).