

# LOKESH BOOMINATHAN

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## EDUCATION

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- Ph.D.** in Electrical and Computer Engineering, Rice University, Houston, TX Aug 2021 - Expected Dec 2023
- M.S.** in Electrical and Computer Engineering, Rice University, Houston, TX Aug 2018 - Aug 2021
- B.Tech.** in Electronics and Communication Engineering, NIT Calicut, India July 2011 - June 2015

## RESEARCH EXPERIENCE

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**Lab for the Algorithmic Brain (LAB)** - Rice University, Houston, TX 2021 - Present  
*Ph.D. candidate, Advisor: Dr. Xaq Pitkow*

- 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.

**Lab for the Algorithmic Brain (LAB)** - Rice University, Houston, TX 2018 - 2021  
*M.S. candidate, Advisor: Dr. Xaq Pitkow*

- 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 2017 - 2018  
*Research Assistant, Advisors: Dr. Kaushik Mitra and Dr. Shanti Bhattacharya*

- 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 2015 - 2016  
*Research Assistant, Advisor: Dr. Venkatesh Babu*

- 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.

## RELEVANT SKILLS

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<b>Programming</b>	Python, MATLAB, Mathematica, LaTeX, Shell
<b>Tools</b>	PyTorch, NumPy, Matplotlib, Illustrator

## PUBLICATIONS

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- **Boominathan L**, Pitkow X., “Phase transitions in when feedback is useful” in 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” in British Machine Vision Conference (**BMVC**) 2018.
- **Boominathan L**, Kruthiventi SS, Babu RV, “CrowdNet: A Deep Convolutional Network for Dense Crowd Counting” in ACM Multimedia Conference (**ACM MM**) 2016.
- **Boominathan L**, Srinivas S, Babu RV, “Compensating for Large In-Plane Rotations in Natural Images” in the Indian Conference on Computer Vision, Graphics and Image Processing (**ICVGIP**) 2016.

## POSTER PRESENTATION

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

## CO-CURRICULAR ACTIVITIES

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- Teaching Assistant for Rice University course ELEC 589: Neural Computation (Spring 2021, and 2022).
- Attended summer school on Methods in Computational Neuroscience at the Marine Biological Laboratory in Woods Hole, MA (Summer 2021).