

SHANKA SUBHRA MONDAL

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🏠: <https://shanka123.github.io/>

EDUCATION

Princeton University

PhD in Electrical & Computer Engineering
Anticipated graduation date - June 2025

2019 - Present
Advisor – Jonathan D. Cohen

MA in Electrical & Computer Engineering GPA: 3.91/4

2022

Indian Institute of Technology, Kharagpur

Bachelors Degree in Electronics & Electrical Communication Engineering
Minor: Computer Science & Engineering

2015 - 2019
Overall CGPA: 9.51/10

RESEARCH EXPERIENCE

Princeton University

Graduate Researcher | Advisor: Jonathan D. Cohen
Developing neural network models inspired by mechanisms in the human brain that can support systematic generalization in abstract reasoning

2021 - Present

Microsoft Research, New York

Research Intern | Advisor: Ida Momennejad

Finetuned GPT-4 to function as specialized prefrontal cortex modules for general purpose planning applications; Studied transfer generalization in multi step reasoning tasks of different LLM-based reasoning agents

Summer 2024

Microsoft Research, New York

Research Intern | Advisor: Ida Momennejad

Developed a black box agentic and modular architecture using GPT-4 inspired from specialized prefrontal cortex modules in the human brain to improve planning performance

Summer 2023

Princeton University

Graduate Researcher | Advisor: Sebastian Seung

Studied semantic segmentation in electron microscopy images, error detection in neuron segmentation

2019 - 2021

Princeton University

Graduate Researcher | Advisor: Tom Griffiths

Developed deep neural network models with improved generalization performance, robustness to adversarial attacks

2019 - 2021

Indian Institute of Technology, Kharagpur

Undergraduate Researcher | Advisor: Debdoot Sheet

Developed a multi-task deep learning framework to predict tool and phase information from surgical videos

2018 - 2019

Adobe Research, Bangalore, India

Research Intern | Advisors: Subrata Mitra, Ramanuja Simha

Developed a reinforcement learning based scheduler to optimize resource utilization and application performance

Summer 2018

Indian Statistical Institute, Kolkata

Summer Intern, Machine Intelligence Unit | Advisor: Sushmita Mitra

Implemented spikeprop and spike timing dependent plasticity algorithm for neural networks

Summer 2017

SELECTED PUBLICATIONS

Mondal, S.S.*, Webb, T.W.*, Momennejad, I. (2024). Improving Planning with Large Language Models: A Modular Agentic Architecture. *Under Review*.

Mondal, S.S., Cohen, J.D., Webb, T.W. (2024). Slot Abstractors: Toward Scalable Abstract Visual Reasoning. *In Proceedings of the 41st International Conference on Machine Learning (ICML)*.

Mondal, S.S.*, Webb, T.W.*, Cohen, J.D. (2023). Systematic Visual Reasoning through Object-Centric Relational Abstraction. *Advances in Neural Information Processing Systems (NeurIPS)*.

Mondal, S.S., Frankland, S.M., Webb, T.W., Cohen, J.D. (2023). Determinantal point process attention over grid cell code supports out of distribution generalization. *eLife*. <https://doi.org/10.7554/eLife.89911.3>

Mondal, S.S.*, Webb, T.W.*, Cohen, J.D. (2023). Learning to reason over visual objects. *In Proceedings of the 11th International Conference on Learning Representations (ICLR)*.

Mondal, S.S.*, Sheoran, N.*, Mitra, S. (2021). Scheduling of time-varying workloads using reinforcement learning. *In Proceedings of the 35th AAAI Conference on Artificial Intelligence*.

Mitra, S., Sheoran, N., Simha, R., **Mondal, S.S.**, Dhake, N., Nehra, R. (2020). Self-learning scheduler for application orchestration on shared compute cluster. *US Patent*.

Mitra, S., **Mondal, S.S.**, Sheoran, N., Dhake, N., Nehra, R., Simha, R. (2019). Deepplace: Learning to place applications in multi-tenant clusters. *In Proceedings of the 10th ACM SIGOPS Asia-Pacific Workshop on Systems*.

Nandy, A., **Mondal, S.S.** (2019). Kinship verification using deep siamese convolutional neural network. *In proceedings of the 14th IEEE International Conference on Automatic Face and Gesture Recognition (FG) Workshop*.

Mondal, S.S., Sathish, R., Sheet, D. (2018). Multitask learning of temporal connectionism in convolutional networks using a joint distribution loss function to simultaneously identify tools and phase in surgical videos. *In Proceedings of the 5th MedImage Workshop at 11th Indian Conference on Computer Vision, Graphics and Image Processing (ICVGIP)*.

* equal contribution

CONFERENCE AND WORKSHOP PRESENTATIONS

- Slot Abstractors: Toward Scalable Abstract Visual Reasoning. Poster presented at the 41st International Conference on Machine Learning (ICML), 2024.
- Systematic Visual Reasoning through Object-Centric Relational Abstraction. Talk and poster presented at the 37th Conference on Neural Information Processing Systems (NeurIPS), 2023.
- Learning to reason over visual objects. Talk and poster presented at the 11th International Conference on Learning Representations (ICLR), 2023.
- Scheduling of time-varying workloads using reinforcement learning. Talk and poster presented at the 35th AAAI Conference on Artificial Intelligence, 2021.
- Multitask learning of temporal connectionism in convolutional networks using a joint distribution loss function to simultaneously identify tools and phase in surgical videos. Talk and poster presented at the 5th MedImage Workshop of 11th Indian Conference on Computer Vision, Graphics and Image Processing (ICVGIP), 2018.
- Surgical Workflow Analysis Challenge. Solution was presented at the International Conference on Medical Image Computing and Computer Assisted Interventions (MICCAI), 2018 for winning competition.

- Investment Ranking Challenge. Presented 3rd ranked solution at IEEE Data Science Workshop 2018.

AWARDS AND HONORS

- **NeurIPS Scholar Award** *2023*
- **School of Engineering and Applied Sciences (SEAS) Travel Grant** *2023, 2024*
- **Electrical and Computer Engineering (ECE) Spring & Fall Travel Grant** *2023*
- **Travel grant** to attend Applied Machine Learning Days, EPFL *2019*
- **Karl Storz Endoscopic Workflow Award, MICCAI** *2018*
- **Goralal Syngal Memorial Scholarship, IIT Kharagpur** *2017 - 2018*

SERVICE

- **Teaching Assistant**, Princeton University, Department of Statistics and Machine Learning
 - Modern Data Science Methods, Spring 2023 & 2024
 - Designed and graded final project, problem sets
 - Taught precept classes
 - Held office hours
- **Reviewer**
 - Neural Information Processing Systems (NeurIPS)
 - International Conference on Learning Representations (ICLR)

SKILLS AND KNOWLEDGE

Courses, * indicates a lab component

Computer Vision, Large scale Data Optimization, Biomedical Imaging, Mathematical Foundations of Reinforcement Learning, Matrix Algebra, Probability and Stochastic Processes, Programming and Data Structures*, Algorithms*, Network Theory*, Intelligent Game Design, Signals and Systems, Economic Analysis, Digital Signal Processing*, Computer Architecture, Operating Systems, Digital Image Processing, Neural Networks, Artificial Intelligence, Machine Intelligence and Expert Systems, Deep learning, Advanced Machine Learning, Pattern Recognition.

Technical Expertise Languages: Python, C/C++, MATLAB, C#, Java, Verilog HDL.

Software & Tools: Pytorch, Tensorflow, Keras, MxNet, Scikit-Learn, Matplotlib, Xilinx, Simulink, Arduino, Unity 3D, Pspice, Android Studio, SolidWorks.