Srijith Nair

nair.203@osu.edu | *srijithnair96* | *Srijith Nair* | *0009-0006-3033-6615* | *srijith1996*

Objective

Ph.D. candidate in Electrical and Computer Engineering at NSF AI-EDGE institute at The Ohio State University specializing in federated and split learning, continual learning, and deep regularization. Seeking competitive research scientist roles that combine rigorous theoretical analysis with scalable implementation to advance large-scale distributed and collaborative AI systems.

Education

Aug 2020– present **PhD Candidate**, *Electrical and Computer Engineering*, The Ohio State University, CGPA: 4/4.
Research topics: Federated Continual Learning, Federated Split Learning, In-Context Learning

May 2024 **MS**, *Electrical and Computer Engineering*, The Ohio State University, CGPA: 4/4.
Research topics: Robust image denoising; Deep inverse problems; Deep regularization; AMP
MS Thesis: Robust Blind Image Denoising via Instance Normalization

May 2018 **BTech**, *Electronics and Communication Engineering*, NIT Trichy, India, CGPA 7.74/10.
Capstone Project: General Video Game Artifical Intelligence

Research Experience

May 2024– present **Graduate Research Associate**, *NSF AI-EDGE Institute*, The Ohio State University.
Advisor: Prof. Jia (Kevin) Liu
Research topics: Federated Split Learning; Continal Learning; In-Context Learning; Multi-objective Reinforcement Learning

- Designed, theoretically analyzed and implemented the FSL-SAGE algorithm which enables commodity clients to participate in Federated Learning of large models, while minimizing communication overhead by $2.5\times$. FSL-SAGE is the first provably convergent auxiliary model-based federated split learning method.
- Demonstrated efficiency of federated split learning and FSL-SAGE for LLMs on a cross-institution collaborative training testbed involving UW Madison, UT Austin, IIT Bombay and UMich.

Aug 2020 - Apr 2024 **Graduate Research Associate**, *Communication and Signal Processing*, The Ohio State University.
Advisor: Prof. Philip Schniter
Research topics: Image inverse problems; Deep regularization; Approximate Message Passing

- Developed unrolled inverse imaging methods using 1-layer spline networks, improving memory and training efficiency while retaining PSNR/SSIM performance compared to deep regularizers.
- Established looseness of state-of-the-art Lipschitz constraints for adversarial convexity of regularizers in image inverse problems and proposed an alternative monotone operator constraint. Gained hands-on experience with constrained training of deep regularizer networks using bilevel optimization in JAX.
- Established convergence of the symmetric and asymmetric PRS-ADMM algorithm for pseudo-contractive operators and under suitable damping.

Jul 2019 - Aug 2020 **Student Research Assistant**, *Department of ECE*, The Ohio State University.
Mentor: Prof. Wladimiro Villarroel
Research topic: Ground Penetrating Radars

- Studied the effectiveness of time-series signal processing methods for sub-surface anomaly detection in fly-ash deposition sites using GPRs.

May 2018 - Jul 2019 **Research Assistant**, *Electrical Communication Engineering*, Indian Institute of Science.
Advisor: Prof. Yogesh Simmhan, Malati Hegde, S.V.R. Anand
Research topic: Wireless sensor networks; IoT for air-quality monitoring

- Developed and deployed SATVAM, a wireless sensor network for air pollution monitoring in a cross-institution setup on resource-constrained devices using a 6LoWPAN/RPL stack.
- Developed ML algorithms to calibrate electrochemical gas sensors to detect O_3 and NO_2 in the atmosphere, reducing running costs by several orders of magnitude while allowing fine-grained spatial deployment of pollutant sensors. Our work is published in the proceedings of IEEE eScience 2019.
- Designed, implemented and tested CONETSI, a decentralized ad-hoc routing method for collecting network state information in wireless IoT networks, reducing channel contention and communication costs by several times. Our work is published in the proceedings of COMSNETS 2020.

May 2017 - Aug 2017 **Summer Research Intern**, *Computational Neuroscience Lab*, IIT Bombay.
Mentors: Prof. Rohit Manchanda, Mithun Padmakumar
Research topic:
- Conducted first-principles analysis of digitally recorded electrical activities (action potentials, standard transient depolarizations) in smooth muscle cells of rats using unsupervised learning and PCA.
- Investigated variations in activity among cells to characterize the structure of the smooth muscle and the underlying neurological mechanisms.

Publications

Conference Publications

[1] H. Liu, R. Wen, **S. Nair**, J. Liu, W. Lou, C. Zhang, W. Yeoh, Y. Vorobeychik, and N. Zhang. "EcoLoRA: Communication-Efficient Federated Fine-Tuning of Large Language Models". In: *The 2025 Conference on Empirical Methods in Natural Language Processing*. 2025. URL: https://arxiv.org/abs/2506.02001.

[2] **S. Nair**, M. Lin, P. Ju, A. Talebi, E. S. Bentley, and J. Liu. "FSL-SAGE: Accelerating Federated Split Learning via Smashed Activation Gradient Estimation". In: *Forty-second International Conference on Machine Learning*. 2025. URL: https://openreview.net/forum?id=HnwcrtoDd4.

[3] **S. Nair**, A. Sahu, S. Mantravadi, S. Anand, and M. Hegde. "CONETSI: On Demand Distributed Network State Information Collection using Opportunistic Exploration for Resource Constrained Networks". In: *2020 International Conference on COMmunication Systems & NETworkS (COMSNETS)*. 2020, pp. 491–498. DOI: 10.1109/COMSNETS48256.2020.9027403.

[4] Y. Simmhan, **S. Nair**, S. Monga, R. Sahu, K. Dixit, R. Sutaria, B. Mishra, A. Sharma, A. SVR, M. Hegde, R. Zele, and S. N. Tripathi. "SATVAM: Toward an IoT Cyber-Infrastructure for Low-Cost Urban Air Quality Monitoring". In: *2019 15th International Conference on eScience (eScience)*. 2019, pp. 57–66. DOI: 10.1109/eScience.2019.00014.

Journal Publications

[5] R. Sahu, A. Nagal, K. K. Dixit, H. Unnibhavi, S. Mantravadi, **S. Nair**, Y. Simmhan, B. Mishra, R. Zele, R. Sutaria, V. M. Motghare, P. Kar, and S. N. Tripathi. "Robust statistical calibration and characterization of portable low-cost air quality monitoring sensors to quantify real-time O_3 and NO_2 concentrations in diverse environments". In: *Atmospheric Measurement Techniques* 14.1 (2021), pp. 37–52. DOI: 10.5194/amt-14-37-2021. URL: https://amt.copernicus.org/articles/14/37/2021/.

Thesis and Preprints

[6] **S. S. Nair**. "Robust Blind Image Denoising via Instance Normalization". M.S. Thesis. The Ohio State University, 2024. URL: http://rave.ohiolink.edu/etdc/view?acc_num=osu1714849501121502.

[7] R. Ballamajalu, **S. Nair**, S. Chhabra, S. K. Monga, A. SVR, M. Hegde, Y. Simmhan, A. Sharma, C. M. Choudhary, R. Sutaria, R. Zele, and S. N. Tripathi. *Toward SATVAM: An IoT Network for Air Quality Monitoring*. 2018. arXiv: 1811.07847 [cs.NI]. URL: https://arxiv.org/abs/1811.07847.

Presentations

Poster Presentation

Jul 2025 **S. Nair**, M. Lin, P. Ju, A. Talebi, E. Bentley, J. Liu, "FSL-SAGE: Accelerating Federated Split Learning via Smashed Activation Gradient Estimation", *International Conference on Machine Learning, 2025*

Oct 2023 **S. Nair**, P. Schniter, "An Improved Spline-Based Learned Convex Regularizer for Image Recovery", *Asilomar conference on Signals, Systems and Computers, 2023*

Sept 2023 **S. Nair**, P. Schniter, "Convergent Deep Convex and Non-convex Deep Regularization", *ECE Kraus student poster competition, 2023*

Feb 2023 **S. Nair**, P. Schniter, "Deep regularization via Bi-level Optimization with Adversarial Regularization", *BASP Frontiers Conference, 2023*

Nov 2022 **S. Nair**, P. Schniter, "Deep Regularization via Bi-level Optimization", *Asilomar Conference on Signals, Systems and Computers, 2022*

Mar 2022 P. Kharwar, **S. Nair**, M. Muduli, A. Vedula, "Re-Braille: A cost-effective refreshable Braille display", *Show-OHI/O 2021 at The Ohio State University*

Oral Presentation Talks

Nov 2022 **S. Nair**, P. Schniter, "Deep Regularization via Bilevel Optimization", *Asilomar Conference on Signals, Systems and Computers*

Oct 2018 **S. Nair**, "Co-iOAM: An algorithm for optimal collection of network information in a WiSUN compliant IoT network using in-band techniques", *MS Ramaiah Institute of Technology, India*

Select Teaching Experience

Graduate Teaching Assistant

Aug – Dec 2024 **ECE 2050: Introduction to Discrete Signals and Systems**, *Instructors: Prof. Bradley Clymer & Prof. Gregg Chappman*, The Ohio State University.

Jan – May 2024 **ECE 5307: Introduction to Machine Learning**, *Instructor: Prof. Philip Schniter*, The Ohio State University.

Aug – Dec 2023 **ECE 5307: Introduction to Machine Learning**, *Instructor: Prof. Philip Schniter*, The Ohio State University.

Outreach Workshops

Jul 2019 **S. Nair**, S.V.R. Anand, "Advanced programming for IoT applications using the Contiki Operating System", *SRM University, India*: Delivered talk and demo of the Contiki OS for embedded devices to a group of researchers and PhD students.

Jun 2019 **S. Nair**, "A tutorial on MATLAB programming for Mathematics researchers", *IISc outreach, India*: Delivered a full day workshop on programming using MATLAB with applications to research in mathematics, to an audience of university-level professors in pure mathematics.

Jun 2019 **S. Nair**, "A tutorial on C programming for Physics researchers", *IISc outreach, India*: Delivered a full day workshop on programming using C for research in physics, to an audience of university-level professors in physics.

2013 **S.Nair**, Pranit Samarth, Satish Nair, "Three lessons on "How sensors work" to K-12 students", *TeachEngineering.org*: 1. *How sensors work* 2. *How does a sound sensor work* 3. *How does a color sensor work*

Reviewing Experience

IEEE ToN Transactions on Networking - 7 *manuscripts*

IEEE TMC Transactions on Mobile Computing - 1 *manuscript*

IEEE TPAMI Transactions on Pattern Analysis and Machine Intelligence - 1 *manuscript*

IEEE ToE Transactions on Education - 1 *manuscript*

Co-curricular Projects

Mar 2023 Smart refrigerator that keeps track of food inventory and suggests recipes using the Llama LLM, MakeOHI/O 2023 at OSU.

Oct 2022 Smart wearable Apple device software for interactive games for encouraging physical exercises, HackOHI/O 2022 at OSU.

Apr 2022 Pitching the idea for Re-Braille, ShowOHI/O 2022 at OSU.

Mar 2022 Re-Braille: Refreshable Braille Display for the blind, MakeOH/O 2022 at OSU.

Aug 2018 Profiling Energy consumption of Zolertia RE-Mote as part of SATVAM, IISc.

Jan – May 2018 Game-agnostic playing agents using enhanced MCTS and Evolutionary algorithms at NIT Trichy, India.

Sept – Oct 2017 Face image compression using Dictionary Learning, as part of Image Processing course, NIT Trichy.

Dec 2016 E-mail spam classifier in MATLAB as part of Machine Learning by Andrew Ng on Coursera.

Oct – Dec 2015 As part of Delta Force student organization at NIT Trichy, I developed BASH and Python scripts to automate user-database creation on Linux servers.

Feb 2015 Line Follower Robot using Atmega-8 as a team project for the Line Follower Bot competition organized by Robotics and Machine Intelligence Club, NIT Trichy.

Technical Skills

DL Libraries PyTorch, JAX, TensorFlow

Languages Python, Java, C/C++, Embedded C

Networking GRPC, 6LoWPAN, RPL

Web-Dev HTML, CSS, Javascript, PHP

Others Linux (BASH), Contiki-OS, Assembly

Achievements

2025 Recipient of Dr. Burn Lin Graduate Travel Grant for ICML 2025

2014 - 2018 Recipient of All India Rank under 2000 scholarship by AIEEE, India

2014 All India Rank of 1792 (99.84 percentile) in the IIT-JEE Mains entrance examination, 2014

2022 Won first place in Make OHI/O 2022 for designing a refreshable Braille display for the blind in a one-day hackathon

2016 A Grade in B-Certificate Examination National Cadet Corps, India

2016 Silver Medal in Best Cadet Competition National Cadet Corps, India

2011 Passed the Mumbai Science Teachers Association Science Talent Search Competition