ESHA SINGH

Contact Information

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Education

Ph.D. in Computer Science University of California - San Diego — Sep 2022 - Present
- Advisor: Yi-An Ma

M.S. in Computer Science University of Minnesota - Twin Cities — Sep 2019 - May 2021
B.Eng. Birla Institute of Technology (BITS), Pilani - India — Aug 2014 - Jun 2018

Selected Conference & Journal Publications

Esha Singh, D. Wu, C. Yang, R. Yu, Y. Ma, "Divide and Learn: Multi-Objective Combinatorial Optimization at Scale" - Preprint 2026.

T. Liang, Esha Singh, R. Parhi, A. Cloninger, Y. Wang, "The Inductive Bias of Convolutional Neural Networks: Locality and Weight Sharing Reshape Implicit Regularization" - Preprint 2026.

Esha Singh, S. Sabach, Y. Wang, "MoXCo: How I learned to stop exploring and love my local minima?" - CPAL 2025 (PMLR), NeurIPS 2023 (M3L).

D. Qiao, K. Zhang, Esha Singh, D. Soudry, Y. Wang , "Stable Minima Cannot Overfit in Univariate ReLU Networks: Generalization by Large Step Sizes" - NeurIPS 2024 ***(Spotlight)***.

Esha Singh, A. Bompelli, R. Wan, J. Bian, S. Pakhomov, R. Zhang, "A conversational agent system for dietary supplements use" - Springer Nature, BMC 2022.

Esha Singh, A. Bompelli, A. Wang, A. Yang, S. Pakhomov, R. Zhang, "A Prototype Conversational Agent for Dietary Supplements" - IEEE ICHI 2020.

A. Bompelli, Y. Wang, R. Wan, Esha Singh, R. Zhang, "Social Determinants of Health In the Era of Artificial Intelligence with Electronic Health Records: A Scoping Review" - (SPJ, AAAS 2021).

Workshop Publications

Esha Singh, D. Wu, C. Yang, R. Yu, Y. Ma, "Subproblem Bandits for Scalable Discrete Multi-Objective Combinatorial Optimization" - TILOS Industry day Workshop.

Esha Singh, S. Bergsma, N. Dey, J. Hestness, G. Gray , "Empirical Upper Bounds for Unstructured Sparsity in Compute-Efficient Language Modeling" - NeurIPS 2024, Compression Workshop.

R. Fizel, Esha Singh, M. Michalowski, M. Gini, S. Pakhomov, "Everyday Living Artificial Intelligence Hub" - (NAACL 2021).

Industry Experience

Amazon Alexa+ AI *(Bellevue, WA)* — June - Sept 2025
Applied Scientist II Intern
- Temporally aligned multi-modality video generation using latent diffusion models for ambient sounds; Project Blog.

Cerebras Systems *(Sunnyvale, CA)* — June - Sept 2024
Research Scientist Intern
- Research on compute efficient unstructured sparsity methods for language models.
- Developing theory on trust region for sparsity for training LLMs.
- Research to improve interpretability & routing in compute optimal Mixture-of-Experts.

TILOS, S2ML & STL Labs, UCSD *(San Diego, CA)* Sept 2022 - Present
Graduate Student Researcher

- Research on understanding feature learning emergence of In-context learning in LLMs.
- Optimize hardware-software co-design via preference guided multi-objective combinatorial optimization.
- Chip placement using diffusion for multi-objective optimization problems.
- Research and development of new optimization algorithms for deep neural networks using proximal gradient methods with applications in quantization & non-parametric regression.
- Developing systematic LoRA-based vulnerabilities in SecAlign++ (SOTA LLM defense training recipe).

Armorblox Inc. (now Cisco) *(Cupertino, CA)* July 2021 - Sept 2022
Machine Learning Engineer

- Designed ML algorithms for detection of IT credential phishing attacks that improved F1 score by 15% in production.
- Built ML pipeline to predict email account compromise based on large-scale user activity data ($\geq$ 2M user logins).
- Implemented online training & inference micro-services at scale for detecting phishing incidents in emails.

Image Sensing Systems *(Minneapolis, MN)* Jan 2016 - May 2016
Research Scientist Intern

- Developed & optimized deep neural networks for object detection over real-time traffic data using YOLO model variants, resulting in faster inference time ($\uparrow$ 30%) & increased precision of the production model ($\uparrow$ 2%).

GLOVEX & Zhang Labs, UMN *(Minneapolis, MN)* Dec 2019 - Aug 2021
Graduate Student Researcher

- Research in establishing robustness of Deep Learning (DL) networks and achieving single image denoising using deep image priors. Thesis dissertation; UMN Digital Conservacy, 2021.
- Conducted Research in NLU & Conversational agents, developing a Q&A agent for answering user-queries around Dietary supplements.

Technical Skills

- **Languages:** Python, SQL, Golang, C++, Java.
- **Frameworks:** TensorFlow, Pytorch, Jax, Keras, PySpark, Cassandra, MLFlow, AWS.

Awards, Service & Teaching

Winner: NAB Challenge 2020, for Conversational AI-agent in the Media/Radio industry.
Reviewer: ICML 2026, ICLR 2026-2025, SLLM 2025 & ICLR FM-Wild 2025.
Reviewer: Amazon Berlin ML Workshop 2025.
Volunteer: NEURIPS 2023, 2024.
Reviewer: HSSCOMMS, Springer Nature 2023.
Mentor: Student program - ERSP (2022-23).
Mentor: Undergraduate students - NAB challenge & Zhang lab.
Teaching Assistant: CSE101, CSE165B, CS165A, CS181.