

EDUCATION

- **Purdue University, West Lafayette, IN** August 2019 – July 2022
 - M.S. (Thesis [8]) in Electrical and Computer Engineering (3.83/4.0)
- **National Institute of Technology Karnataka (NITK), Surathkal, India** July 2011 – May 2015
 - B.Tech in Electrical and Electronics Engineering (8.28/10)

RESEARCH EXPERIENCE

- **Research Scientist, AIML Resident - Siri Speech, Apple, Cambridge, MA** July 2022 – Present
 - *Federated Learning for Automatic Speech Recognition*: Enabling federated learning for large-scale end-to-end ASR models under practical constraints that include data heterogeneity, differential privacy, distribution shift, etc. [1, 2, 3].
 - *Improving Semi-supervised ASR Learning via Private User Feedback*: Improving the performance using semi-supervised learning and fine-tuning setup that utilizes differentially private user-feedback signals for large-scale ASR models.
- **Graduate Research Assistant - Purdue University, West Lafayette, IN** August 2019 – June 2022
 - *Learning from Partially-observed Multimodal Data*: Learning robust multimodal representations given missing modalities in datasets by extending the generative modeling formulation of VAEs to a multimodal probabilistic model. [report].
 - *Low-rank Gradient Subspaces in Federated Learning*: Providing empirical evidence for low-rank of gradient subspaces and exploiting it for *gradient compression* using projection scalars termed “Look-back Gradient Multiplier” [5].
 - *Generalized and Distributed Private Representation Learning*: Developing a generalized and distributable representation learning architecture that learns private representations while obfuscating known sensitive variables [6, 10].
 - *Document Similarity using Clustered Vector Spaces*: Clustering documents by leveraging explainable techniques including TF-IDF, clustering, and cosine similarity thus curating data for personalization of campaigns for groups [report].
 - *Two Time-scale Hybrid Federated Learning*: Studying device-to-device communication in large-scale federated learning and developing algorithms with asynchronous communication for improving fault-tolerant and convergence [7, 9, 11].
 - *Link Prediction in Social Learning Networks*: Using *graph neural network* based link prediction in social learning networks for connection recommendations using both graph neural representations and explicit network metrics.
- **Applied Scientist Intern - Zillow Group, Seattle, WA** May 2021 – August 2021
 - *Unsupervised Multimodal Representation Learning*: Learning *unsupervised multimodal representations* using vision transformers by leveraging the unlabeled documents and weakly labeled image dataset to learn unified representations used for *downstream few-shot learning* on tasks such as token sequence classification, image attribute localization, etc.
- **Research Scientist - Foundation AI, Los Angeles, CA** Sept 2018 – Aug 2019
 - *Computer Vision (CV) for Document Analysis*
 - Development of novel CV methods for document analysis and OCR using *GANs, CNNs and graph convolutions*.
 - Developed *key-value pair extraction* NLP model leveraging link prediction techniques on unstructured documents.
- **Data Scientist - Practo, Bangalore, India** June 2015 – Aug 2018
 - *Computer Vision (CV) for Medical AI*
 - Developed CV models for diagnosing *lung-cancer, brain tumor, and diabetic retinopathy* using radiology images.
 - Developed novel NLP algorithm using *LSTM and attention* for massive (*90,000-class*) classification task [12].
 - Developed *semi-supervised text classifier* for highlighting important phrases in clinical documents [code/demo].
 - Scalable FSM-based solution for *faster search and intelligent suggestions* reliant on data-driven adaptive ranking [13].
- **Research Intern - DRDO, Bangalore, India** May 2013 - June 2013
 - *Through-the-barrier Imaging RADAR*: Implemented a through-the-barrier RADAR on FPGA using an algorithm that leverages *micro-doppler effect* of human heartbeats and step-frequency radar signals to reduce the effect of noise.

GRADUATE COURSES

- *Machine Learning*: Generative Models (ECE695); Computer Vision (ECE595CV); Machine Learning I (ECE595); Artificial Intelligence (ECE570); Computational Methods and Models (ECE608); DIP (ECE637); Graph Networks (ECE695)
- *Mathematics*: Random Variables (ECE600); Linear Algebra & Its Applications (MA511); Real Analysis (MA504);
- *Optimization*: Introduction to Convex Optimization (AAE561); Optimization Methods (ECE508)

PROGRAMMING SKILLS

- *Advanced*: Over 7 years of experience in Python (including ML/Deep Learning using PyTorch, Tensorflow).
- *Intermediate*: Over 2 years of experience in C, C++, JavaScript, PHP, MATLAB.
- *Beginner*: Over 6 months of experience in Java, Scala, Lua.

PUBLICATIONS*

- [1] **S. S. Azam***, M. Pelikan*, V. Feldman, K. Talwar, J. Silovsky, and T. Likhomanenko*, “Federated Learning for Speech Recognition: Revisiting Current Trends Towards Large-Scale ASR,” in *International Workshop on Federated Learning in the Age of Foundation Models in Conjunction with NeurIPS 2023*, 2023 [Oral].
- [2] **S. S. Azam**, T. Likhomanenko, M. Pelikan, and J. Silovsky, “Importance of Smoothness Induced by Optimizers in FL4ASR: Towards Understanding Federated Learning for End-to-End ASR,” in *IEEE Automatic Speech Recognition and Understanding Workshop (ASRU)*, 2023.
- [3] M. Pelikan, **S. S. Azam**, V. Feldman, J. Silovsky, K. Talwar, T. Likhomanenko, *et al.*, “Federated Learning with Differential Privacy for End-to-End Speech Recognition,” *arXiv preprint arXiv:2310.00098*, 2023.
- [4] Z. Zhou, **S. S. Azam**, C. G. Brinton, and D. I. Inouye, “Efficient Federated Domain Translation,” in *International Conference on Learning Representations (ICLR)*, 2023.
- [5] **S. S. Azam**, S. Hosseinalipour, Q. Qiu, and C. G. Brinton, “Recycling Model Updates in Federated Learning: Are Gradient Subspaces Low-Rank?,” in *International Conference on Learning Representations (ICLR)*, 2022.
- [6] **S. S. Azam**, T. Kim, S. Hosseinalipour, C. Joe-Wong, S. Bagchi, and C. G. Brinton, “Can we Generalize and Distribute Private Representation Learning?,” in *International Conference on Artificial Intelligence and Statistics (AISTATS)*, 2022.
- [7] S. Hosseinalipour, **S. S. Azam**, C. G. Brinton, N. Michelusi, V. Aggarwal, D. J. Love, and H. Dai, “Multi-Stage Hybrid Federated Learning Over Large-Scale D2D-Enabled Fog Networks,” *IEEE Transactions on Networking (TON)*, 2022.
- [8] **S. S. Azam**, “Towards Privacy and Communication Efficiency in Distributed Representation Learning,” *Purdue University Graduate School. Thesis.*, 2022.
- [9] F. P. C. Lin, S. Hosseinalipour, **S. S. Azam**, C. G. Brinton, and N. Michelusi, “Semi-Decentralized Federated Learning With Cooperative D2D Local Model Aggregations,” *IEEE Journal on Selected Areas in Communications (JSAC)*, 2021.
- [10] **S. S. Azam**, T. Kim, S. Hosseinalipour, C. Joe-Wong, S. Bagchi, and C. Brinton, “A Generalized and Distributable Generative Model for Private Representation Learning,” in *NeurIPS 2021 Workshop on Deep Generative Models*, 2021.
- [11] F. P. C. Lin, S. Hosseinalipour, **S. S. Azam**, C. G. Brinton, and N. Michelusi, “Federated Learning Beyond the Star: Local D2D Model Consensus with Global Cluster Sampling,” in *IEEE Global Communications Conference*, 2021.
- [12] **S. S. Azam**, M. Raju, V. Pagidimarri, and V. C. Kasivajjala, “CASCADENET: An LSTM Based Deep Learning Model for Automated ICD-10 Coding,” in *Advances in Information and Communication*, Springer, 2020.
- [13] **S. S. Azam**, M. Raju, V. Pagidimarri, and V. Kasivajjala, “Q-Map: Clinical Concept Mining from Clinical Documents,” *International Journal of Computer and Information Engineering (IJCIE)*, 2018.

AWARDS & ACHIEVEMENTS

- *Invited Reviewer*: AAAI, AISTATS, ICLR, IEEE Transactions on Signal Processing, IEEE INFOCOM, NeurIPS.
- *Apple AIML Resident*, 2022: Selected as 1 of 10 AIML Residents at Apple for the year 2022.
- *PairML Notes*, <https://notes.pairml.com>: Author and developer of the educational blog with > 27k users per year.
- *Medical Contextual Highlighter*, *Winner Practo Hackathon 2017*: Developed a semi-supervised deep learning-based contextual highlighter using open-source PubMed dataset to make in-context prediction.
- *Kaggle, Data Science Bowl 2017*: Developed a 3D convolutional classifier for detecting malignant lung nodules.
- *HackerEarth, IndiaHacks 2017*: Ranked 18. Built ML solutions for HERE maps and Hotstar.
- *Young Leader, Indian School of Business (ISB), 2015*: 1 of 2 students selected as ISB Young Leader (ISB-YLP).
- *Academic Scholarships*: Received scholarships for academic excellence for undergraduate and high-school studies including the Indian Air Force-BA scholarship and KVS scholarship for high school and undergraduate college (2009-2015).
- *Finisar Malaysia Funded Internship, 2014*: 1 of 3 students selected for Finisar Malaysia internship during junior year.
- *Coach, University Women’s Basketball Team, 2015*: Coached women’s basketball team in senior year to several podiums.

*Equal contribution.