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Education

- **Purdue University** West Lafayette, IN
  Ph.D in Electrical and Computer Engineering *August 2019 – Present*
- **National Institute of Technology Karnataka (NITK)** Surathkal, India
  B.Tech in Electrical and Electronics Engineering *July 2011 – May 2015*

Publications

- Azam, S.S., Kim, T., Hosseinalipour, S., Brinton, C., Joe-Wong, C. and Bagchi, S., 2020. **Towards Generalized and Distributed Privacy-Preserving Representation Learning.** *Under Review, AAAI 2021.*
- Hosseinalipour, S., Azam, S.S., Brinton, C.G., Michelusi, N., Aggarwal, V., Love, D.J. and Dai, H., 2020. **Multi-Stage Hybrid Federated Learning over Large-Scale Wireless Fog Networks.** *Under Review, IEEE/ACM TON.*
- Azam, S.S., Raju, M., Pagidimarri, V. and Kasivajjala, V.C., 2019. **CASCADENET: An LSTM-Based Deep Learning Model for Automated ICD-10 Coding** *In Future of Information and Communication Conference, 2019.*
- Azam, S.S., Raju, M., Pagidimarri, V. and Kasivajjala, V., 2018. **Q-Map: Clinical Concept Mining from Clinical Documents** *In International Journal of Computer and Information Engineering, 12(9).*

Graduate Research Experience

- **Conjugate/Orthogonal Gradient Descent for Distributed Learning**
  Graduate Research Assistant, Purdue University, West Lafayette, IN *Fall 2020*
  - **Sponsor**: Independent Research Work towards Ph.D. Dissertation
  - **Abstract**: Developing a novel way of ensuring the maximum efficiency parallelization of federated learning by leveraging conjugate directions and orthogonal projections. Apart from increase in convergence speed, the methodology could prove benefitial in protection against adversarial attacks by reducing sensitivity to noisy input data.
  - **Publication**: Under progress.
- **Two Time-scale Hybrid Federated Learning**
  Graduate Research Assistant, Purdue University, West Lafayette, IN *Summer 2020*
  - **Sponsor**: Independent Research Work towards Ph.D. Dissertation
  - **Abstract**: Study the effect of device-to-device communication and delayed federated aggregation under the effect of homogeneous and heterogeneous data distribution over network nodes. Proposed the methodology to optimize for minimum possible communication and energy cost across all nodes in a federated setting.
  - **Publication**: Under progress.
- **Multi-Stage Hybrid Federated Learning**
  Graduate Research Assistant, Purdue University, West Lafayette, IN *Spring 2020*
  - **Sponsor**: Independent Research Work towards Ph.D. Dissertation
  - **Abstract**: Developed of a novel multi-stage hybrid architecture to overcome the drawbacks of conventional star topology federated networks. Further propose the novel estimation mechanism for device-to-device communication rounds in near-geographical node clusters to reduce the communication and power requirements.
  - **Publication**: Hosseinalipour, S., Azam, S.S., et. al. , 2020. *Multi-Stage Hybrid Federated Learning over Large-Scale Wireless Fog Networks.* Under Review, IEEE/ACM TON.
- **Exclusion-Inclusion Generative Adversarial Nets (EIGANs)**
  Graduate Research Assistant, Purdue University, West Lafayette, IN *Fall 2019*
  - **Sponsor**: Grant under Northrop Grumman Cybersecurity Research Consortium (NGCRC)
  - **Abstract**: Developed of a novel multi-agent architecture motivated by generative adversarial learning for training an encoder that learns representations that are private yet informative. Further extended it to the very first distributed private representation learning architecture for application in distributed networks with resource contraints.
  - **Publication**: Azam, S.S., Kim, T., et al., 2020. *Towards Generalized and Distributed Privacy-Preserving Representation Learning.* Under Review, AAAI 2021.

Industry Research Experience

- **Foundation AI** — Los Angeles, CA
  Research Scientist — *September 2018 - August 2019*
  - **CASCADENET: A Hierarchical LSTM Architecture for Automated ICD-10 Coding**: Developed a novel hierarchical neural network architecture for classification of medical diagnosis text among massively categorical ICD-10 codes (approx. 93k classes) using 100k training examples incorporating distributed word embedding (Word2Vec).
  - **Document Analysis and Optical Character Recognition**: OCR pipeline for privacy-oriented offline deployments: image processing such as, orientation and alignment correction by characterizing hough transform of processed images and background/noise removal by applying adaptive/median filtering, scene text detection using EAST and Mask R-CNN, binarisation using cGANs, character recognition using CNNs.
  - **Secure Containerization**: Standardization of deployment and development platform using containerization and distribution of tasks over services running on containerized micro-service architecture with API interfaces and secure communications by a docker SSL layer (dynamically manages updates in SSL certificates).
  - **Publication**: Azam, S.S., Raju, M., Pagidimarri, V. and Kasivajjala, V.C., 2019. *CASCADENET: An LSTM-Based Deep Learning Model for Automated ICD-10 Coding* In Future of Information and Communication Conference, 2019.
- **Practo** — Bangalore, India
  Data Scientist, Senior Software Engineer, Software Engineer — *June 2015 - August 2018*
  - **Concept Mining and Automated Coding from Clinical Documents**: Developed methods such as Q-Map and CASCADENET for automated coding ICD-10 (International Code for Diseases), CPT (Current Procedural Terminology) of clinical documents, which plays a vital role in subsequent tools including but not limited to insurance claims, disease trend and epidemic outbreak characterization.
  - **Practo Search**: Scalable system for faster search and intelligent suggestions reliant on data driven adaptive ranking algorithm for personalized search results. Extending system support to allow multi-language and accent-agnostic search using language modelling and knowledge source graphs.
  - **Text Preprocessing and Adaptive Stopwords Filtering**: NLP based text preprocessing for noisy channels such as HTML, RTF etc. and stop-word removal by thresholding KL Divergence and Inverse Document Frequency.
  - **Practo Discovery**: Web server level Url Discovery and Redirection System for preventing web traffic overload on Application Servers and protection against DDoS attacks.
  - **Publication**: Azam, S.S., Raju, M., Pagidimarri, V. and Kasivajjala, V., 2018. *Q-Map: Clinical Concept Mining from Clinical Documents* In International Journal of Computer and Information Engineering, 12(9).
- **Simple Wealth** — Bangalore, India
  Machine Learning Intern — *December 2015*
  - **Smart Offers Recommendation**: Fetching media, by implementing scraping tools for websites and classification for personalized offer recommendations based on popularity, user interests and geolocation by leveraging concepts of logistic regression, support vector machines and decision trees.

Graduate Projects

- **Information-sensitivity based Optimization for Sparsification**
  Ongoing Course Project; AAE561 Convex Optimization, Purdue University — *Fall 2020*
  - **Abstract**: Developing a sparsification technique on large neural networks by leveraging the information about senstivity of model parameters w.r.t network output. The project aims to utilize properties derived on a L-Lipschitz continuous classification function using techniques such as first and second order Taylor approximations.
- **Link Prediction in Large Scale Social Networks**
  Course Project; ECE695 Stucture and Dynamics of Large-scale Networks, Purdue University — *Fall 2019*
  - **Abstract**: Prediction of link formation in large scale networks using network characterizations derived using unsupervised network centrality metrics as well as supervised deep neural networks using Graph convolutions.

Undergraduate Projects

- **Application of Machine Learning in Image Segmentation**
  Major Project; Advised by Dr. Ashvini Chaturvedi — *July 2014 - May 2015*
  - **Abstract**: Analysis of algorithms (k-mean clustering and morphological edge detection) for isolation of object boundaries images and enhancing techniques to perform better on noisy images by employing classical image processing techniques supported by statistical estimations.

- **Touch Screen Remote Control for Motor Speed Control**
  Mini Project; Advised by Dr. K Manjunatha Sharma *January 2014 - May 2014*
  - **Abstract**: Implementation of Touchscreen remote control with radio frequency communication for developing multi-level speed controller of AC motor
- **Node Deployment Techniques for Object Tracking**
  Mini Project; Advised by Dr. Ashvini Chaturvedi *January 2014 - May 2014*
  - **Abstract**: Comparison of effectiveness of random node deployment techniques based on Poisson and Normal Distribution for detecting intrusion in a restricted area
- **Application of Object Tracking Algorithm in a Video**
  Mini Project; Advised by Dr. Ashvini Chaturvedi *July 2013 - December 2013*
  - **Abstract**: Conception and implementation of algorithm for tracking trajectory of an object in a video using image processing techniques such as frequency domain analysis and 2D-DFT.
- **Speech Recognition System**
  Mini Project; Advised by Dr. K Manjunatha Sharma *July 2013 - December 2013*
  - **Abstract**: Basic speech recognition system using total energy algorithm and zero-crossing algorithm to control speed operation of AC motor.

Competitions and Projects

- **Machine Learning Medium**: Author of Machine Learning Medium (https://machinelearningmedium.com), an educational website, deployed and maintained on github pages using Jekyll and hosted on CloudFlare.
- **Medical Contextual Highlighter, Winner Practo Hackathon 2017**: Developed a semi-supervised deep learning based contextual highlighter using open-source PubMed dataset.
- **Kaggle, Data Science Bowl 2017**: Among top 13% in Kaggle Data Science Bowl, 2017. Developed a machine learning classifier based on ResNet using 3D convolution for classification of malignancy of lung nodules from 3D CT Scans.
- **Kaggle, Quora Questions Pairs**: Among top 16% in Kaggle Quora Question Pairs Challenge. Developed a LSTM, XGBoost transfer learning model for pairing of similar questions on Quora, a QnA website.
- **HackerEarth, IndiaHacks 2017**: Secured rank 18 among several thousand participants at IndiaHacks Challenge, 2017 organized by HackerEarth for solving real world classification problems of HERE maps and Hotstar.

Awards And Achievements

- **Young Leader, ISB**: One of two students selected for ISB Young Leaders Program (ISB-YLP) in Senior Year B.Tech
- **Finisar Malaysia Funded Internship**: One of three students selected for Finisar Malaysia Funded Internship during Junior year
- **Highest Campus Placement, Electrical Engineering, NITK Class of 2015**: Highest campus placement among students of my major subject (class of 110)
- **Academic Scholarships**: Selected to receive various Scholarships for Academic Excellence for Undergraduate and High-school Studies including Indian Air Force-BA Scholarship and KVS Scholarship for AISSE and AISSCE Certificate CBSE Examinations

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*References available on request.