Bharat Runwal

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Education

Indian Institue of Technology, Delhi *2018-2022*
B.Tech in Electrical Engineering (Power and Automation)

Publications

- **Bharat Runwal**, Vivek Dahiya, Sandeep Kumar, **Robustifying GNN via Weighted Laplacian**, Accepted to *IEEE International Conference on Signal Processing and Communications (SPCOM)*, 2022 **(Best Student Paper Award)**
- Diganta Misra*, **Bharat Runwal***, Tianlong Chen, Zhangyang Wang, Irina Rish, **APP: Anytime Progressive Pruning**, Accepted to *Dynamic Neural Network Workshop (DyNN)*, ICML, 2022 and *Sparsity in Neural Networks Workshop (SNN),* 2022.
- Arunava Das, **Bharat Runwal**, Oktay Cetinkaya, Ozgur B. Akan, **Received Signal Modeling and BER Analysis for Molecular SISO Communications**, Accepted to ACM NanoCom 2022.

* Equal Contribution

Research Experience

MISN, IIT Delhi, India
Undergraduate Researcher| Supervisor: Prof. Sandeep Kumar
Robustifying Graph Neural Networks via Weighted Laplacian: April 2021-November 2021

- Proposed two robust graph structural learning framework for poisoning targeted and non-targeted attacks
- We show efficacy of our proposed method on the cora and citeseer datasets both in accuracy (improved 4-5 % at higher perturbations) and computational efficiency($\sim 3\times$ speedup at same number of epochs)

Internet Of Everything (IoE) Group, University of Cambridge June 2021- October 2021
Research Intern | Collaborators: *Arunava Das, Dr. Oktay Cetinkaya, Prof. Ozgur B. Akan*
Received Signal Modeling and BER Analysis for Molecular SISO Communications:

- Proposed a PSO based SISO model for estimation of number of particles received at the receiver.
- Our method achieved state-of-the-art performance for estimating number of molecules with RMSE error compared to other proposed works($\sim$15 times better).

HPI Potsdam, Germany Oct 2020- May 2021
Research Intern | Supervisor: Prof. Gerad De Melo
Graph-based Sense Embedding Induction:

- Proposed a novel graph based approach to obtain sense embeddings based on relational constraints
- The method is based on the deconflation approach with additional constraint satisfaction enforcement
- Our proposed method provides competitive performance to the other methods on Simlex-999 and Simverb-3500 datasets across different part of speeches

Work experience

AlphaICs, Bangalore June 2021- August 2021
Research Intern | Supervisor: Sooraj KC

- Worked on Quantization of models using Quantization Aware Training for Object Detection and classification
- Performed Quantization analysis layer by layer to locate the degradation layers explicitly
- Worked on Zero Shot quantization framework which uses the batch normalization statistics to generate the distilled dataset

Omdena June 2021- August 2021
Junior Machine Learning Engineer

- Worked with RenewSenses LTD, an Israeli company developing assistive technologies for people with visual impairment in their experience of catching a bus
- Mainly Contributed in team for Bus Detection and Tracking , where the goal was to track the "front of the bus" in the real time video
- For the efficient inference on cpu, used opencv tracker(MOOSE) at the tradeoff between accuracy and speed

Zevi.Ai May 2021-June 2021

NLP intern

- Worked on building a vernacular search engine for e-commerce applications with features like price tag detection from query, autocomplete and spell check
- Used DistillBert/XLM-R(Multilingual) from Huggingface library for getting the contextual embeddings for preprocessed query
- Used Faiss library for faster indexing and efficient similarity search for large number of dense embeddings of dataset

Projects

Weighted Signed Graph Attention Networks| *Course Project* November 2021

- Enhanced the learned embeddings of the network nodes by adapting the loss function of the SiGAT Model to the weighted signed graphs
- The learned embeddings shows better inter class seperability in the embeddings space

Visual Sudoku Solver | *Course Project* May 2021

- Trained a Conditional GAN on a given set of character images, with single labeled example from each class
- Using the labeled data generated from CGAN, naively solved the given Sudoku Puzzle using RRN(Recurrent Relational Network)
- Explored joint optimization i.e. using the constraints of Sudoku to improve the conditioning of GAN

Generating Summaries & Sentiment prediction of Financial news| *Self Project* June 2020

- Used Google PEGASUS model from Huggingface for abstractive summarization, with preprocessing of the newspaper articles
- Used FinBERT(Financial BERT) model for sentiment prediction of generated summaries and got ROGUE-1 score of 40.6
- Used various preprocessing like: Extracting Cardinal or price entity for getting the information about stock prices

Anomaly Detection in Time series Data of S&P500 | *Self Project* May 2020

- Used LSTM Autoencoder to detect anomalies related to sudden change in close price of S&P500(stock market index)
- Dataset was obtained from Kaggle which was from 1986-2020, used 30 timesteps and set Anomaly threshold of 0.65

Academic Achievements

- Selected to attend and participate for Research Week With Google 2022 by Google Research India
- Among the top 50 students(out of 800 students) to get a Department Change, in first year
- Awarded B-83 Merit award at IIT-D for academic year 2021-22

Technical Skills

Languages: Python, Java, C++, JS , MATLAB
Frameworks: Pytorch, Tensorflow, Keras, Flask, FastAPI
Utilities: OpenAIGym, OpenCV, Git, Docker, AWS, LATEX, Linux shell utilities

Teaching Experience

- Teaching Assistant for Advanced Machine learning (Spring 2022)
- Academic Mentor of Introduction to Electrical Engineering (Fall 2019)

Relevant courses

Computer Science: Deep learning, Machine learning, Computer Vision, Natural Language Processing , Meta Learning, Data Mining , Social Network Analysis, Data Structures and Algorithms
Mathematics: Probability and Stochastic Processes, Introduction to Linear Algebra and Differential Equations, Introduction to Calculus.
Electrical: Optimization Theory, Signals and System, Circuit Theory, Digital Electronics, Embedded Systems, Control Engineering, Communication engineering
MOOC/Online: CS224W(Machine Learning with Graphs), CS231n(Visual recognition), CS224n(Natural Language Processing with Deep Learning)(Stanford), GAN specialization, Deep learning specialization(Coursera)