Arindam Ghosh

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EDUCATION:

Carnegie Mellon University, Pittsburgh, USA — Jan 2019 – Dec 2019
- MS, Electrical and Computer Engineering (finished the coursework in two semesters; normally takes three).
- Focus: Machine Learning, Deep Learning, Speech Recognition, NLP, Probabilistic Graphical Models, Advanced Probability and Statistics.

National Institute of Technology Durgapur, Durgapur, India — Jul 2009 – May 2013
- BTech, Electronics and Communication Engineering

EXPERIENCE:

3M/Solventum Health, Pittsburgh, USA
Research Scientist (Machine Learning for Speech and NLU) — Jun 2020 – present
- Focus: Self-supervised learning (SSL) for speech; transducer (RNN-T) based ASR models; end-to-end speaker/role-prediction ASR; confidence calibration of neural networks; low-resource low-footprint wake-word detection; summarization of doctor-patient conversations.

Carnegie Mellon University, Pittsburgh, USA
Research Assistant (Prof. Ian Lane) — Jan 2020 – May 2020
- Focus: Benchmarking performance of Kaldi and wav2letter recipes on the SwitchBoard corpus.

Research Assistant (Prof. Osman Yagan) — May 2019 – Aug 2019
- Focus: Time-series Forecasting for Personalized Product Promotions (ThaiBev Restaurants). Used ARIMA and LSTM based models for prediction of expected revenue from different coupons for a user.

Centre for Development of Telecommunication, Bangalore, India — Aug 2013 – Dec 2018
Senior Research Engineer
- Focus: Prediction of Wireless Network Coverage under Spatially Correlated Interference. Proposed the mixture-based mathematical framework for modeling correlated interference, and applied it to derive the outage probability of MRC receivers. Both works were published in the journal *IEEE Comm. Letters*

PROJECTS:

Automatic Speech Recognition using Seq2Seq model trained with DAgger — Guide: Prof. Matt Gormley
- Implemented a Seq2Seq model trained with the Maximum Likelihood Estimation and different decoding policies of 'All Model', 'All Oracle' and 'Scheduled Sampling' for automatically transcribing audio recordings to text.
- Achieved 16% decrease in the Character Error Rate using a sampling rate of $\beta = 0.75$ on TIMIT dataset.

Topic Modeling using LDA and collapsed Gibbs Sampling — Guide: Prof. Matt Gormley
- Implemented a Gaussian Latent Dirichlet Allocation model for topic modeling using collapsed Gibbs MCMC method. Used GloVe word embeddings and t-distribution as the full conditional distribution.

Constituency Parsing using LSTM-CRF and Belief Propagation — Guide: Prof. Matt Gormley
- Implemented a CRF belief propagation algorithm on top of LSTM based constituency and POS tagging.
- Achieved 12% accuracy gain with LSTM-CRF (over vanilla LSTM) when trained on 49K Penn Treebank samples.

Question Generation and Answering System — Guide: Prof. Alan Black
- Built a system capable of generating grammatically correct and meaningful questions from any given English article, and also, if given a question about the article, capable of answering the question intelligently.
- Used tools such as spaCy, NLTK, Stanford CoreNLP, Neural Coref, WordNet for tokenization, POS tagging, NER tagging, Constituency/dependency parsing, synonym and antonym resolution etc.

Text-to-Speech Generation: Prosody Control in End-to-End models — Guide: Prof. Florian Metze
- Implemented sleepiness-embedding extraction module and use it as an inductive bias to generate sleepy speech using Tacotron-1 based end-to-end TTS model. Dataset: LJSpeech and Duesseldorf Sleepy Language Corpus (SLEEP).

SKILLS:

Programming: Python, C++, Java, Matlab, Mathematica
ML/DL Tools: PyTorch, Tensorflow, Kaldi, Espnet, SRILM

PAPERS:

Machine Learning:

- **A. Ghosh**, T. Schaaf, and M. Gormley. "Adafocal: Calibration-aware adaptive focal loss." Advances in Neural Information Processing Systems 35 (2022): 1583-1595.
- **A. Ghosh**, M. Fuhs, D. Bagchi, B. Farahani, M. Woszczyna, (2022) Low-resource Low-footprint Wake-word Detection using Knowledge Distillation. Proc. Interspeech 2022, 3739-3743, doi: 10.21437/Interspeech.2022-529.
- L. Zhang, R. Negrinho, **A. Ghosh**, V. Jagannathan, H. Hassanzadeh, T. Schaaf, and M. R. Gormley. "Leveraging Pretrained Models for Automatic Summarization of Doctor-Patient Conversations." In Findings of the Association for Computational Linguistics: EMNLP 2021, pp. 3693-3712. 2021.

Wireless Communication:

- **A. Ghosh**, "Mixture-Based Modeling of Spatially Correlated Interference in a Poisson Field of Interferers," in IEEE Communication Letters, Nov. 2017.
- **A. Ghosh** and H. S. Dhillon, "Performance Analysis of MRC Under Spatially Correlated Interference Using Mixture-Based Method," in IEEE Communication Letters, Nov. 2018.
- **A. Ghosh**, G. Ghatak, and A. Chandra, "SEP of dual-ring star-QAM over FSO channels with atmospheric turbulence," IEEE International Conference SPCOM, 2014.
- **A. Ghosh**, J-W. Lee, and H-S. Cho, "Throughput and Energy Efficiency of a Cooperative Hybrid ARQ Protocol for Underwater Acoustic Sensor Networks," Sensors 13, no. 11, Nov 2013.