Ali Lotfi Rezaabad

Deep Learning · Natural Language Processing

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Education

The University of Texas at Austin, ECE Department — *Texas, USA*

Ph.D. Student in Deep Learning and Information Theory — *Aug. 2017 - PRESENT*

- variational inference, generative models, statistical learning, unsupervised representation learning, spiking neural networks,

Sharif University of Technology, EE Department — *Tehran, Iran*

M.Sc. in Electrical Engineering, Communication Systems — *Aug. 2014 - June 2016*

- optimization, millimeter wave cellular networks, wireless communication systems, cell planning,

Shahid Bahonar University of Technology, EE Department — *Kerman, Iran*

B.Sc. in Electrical Engineering, Communication Systems — *Aug. 2010 - June 2014*

- MIMO wireless communication, Space-Time Block Codes (STBC)

Skills

High-level languages Python(Expert), MatLab(Expert), C++(Fluent)

Frameworks PyTorch, Tensorflow, Gensim, SciPy, NumPy, MatPlotLib, Scikit-learning

Graduate Coursework

Natural language processing, **D**eep probabilistic modeling, **L**arge-scale optimization, **I**nformation theory, **C**ombinatorics & **G**raph theory, **S**tatistical models for big data, **P**robability & stochastic process, **S**tochastic process, **A**dvanced communication systems, **A**daptive filters

Selected Projects

Natural Language Processing — *PyTorch, Gensim, NumPy, SciPy*

- **Neural Networks for Sentiment Analysis**; implementation of feedforward (deep averaging) NNs, LSTM, and bi-directional LSTM networks with using various dimensional GloVe vectors for sentiment analysis task.
- **Sequential CRF for Named Entity Recognition**; implementation of a CRF sequence tagger based on Viterbi algorithm for NER task.
- **Classification for Person Name Detection**; exploring and reinforcing different feature extraction methods for person name detection
- **Spiking Language Modeling**; proposing a novel framework to train spiking neural networks for language modeling tasks.

Generative Models — *Tensorflow, PyTorch, NumPy*

- **Variational Auto-encoders (VAEs)**; studying and implementation of well-known VAE frameworks, *e.g.*, β-VAE, Info-VAE, Adversarial-VAE, Factor-VAE, MMD-VAE, Wasserstein-VAE, Pixel-CNN VAE.
- **Generative Adversarial Networks (GANs)**; studying different dual representation for GANs, Info-GAN, f-GAN and Wasserstein-GAN.
- **Text Generation**; implementation of conventional and spiking LSTM networks for generating new texts, word-level and character-level.
- **Pixel RNN**; implementation of Pixel RNN and Pixel CNN for image generation.

Entropy and Mutual Information Estimation with Deep Networks — *Tensorflow*

- **Mutual Information Neural Estimation (MINE)**; studying and implementation of MINE algorithm.
- **Variational Info-Bottleneck**; studying and implementation of variational info-bottleneck.
- **Info-Regularizer**; mitigating the overfitting of deep neural networks using information-theoretic regularizer.

Inference — *Tensorflow, PyTorch*

- **Stein Inference**; studying the theory and implementation of Stein variational gradient descent.
- **Semi-Implicit Variational Inference**; studying the theory of semi-implicit variational inference; with input as implicit random variable and a parametric variational posterior distribution.

Large scale online learning — *NumPy, SciPy*

- **Gauss-Newton algorithm**; relaxing Newton algorithm using Jacobian approximation.
- **large scale online learning**; implementation of (link) for online classification.

Optimization — *NumPy*

- **ADAM**; (ADAptive Moment estimation) for large scale convex and non-convex optimizations.
- **AdaGrad**; Adaptive Subgradient Methods for large scale non-convex optimization.

Reinforcement Learning *MatLab*

- **Q-learning scheduling for wireless networks**; proposing a new method for device-to-device wireless resource allocation for LTE networks based on multi agent reinforcement learning.

5G Wireless Networks *MatLab*

- **5G Cell Planning**; proposing a cost-effective framework for the planning of the next generation of cellular networks (5G)
- the results have been published in IEEE Transaction on Vehicular Technology

- Most of the codes are shared on my github repository (**link**).

Experiences

The University of Texas at Austin *Texas, USA*

Research Assistant *Aug. 2017 - PRESENT*

- Ongoing work on the intersection of information theory and generative models (adversarial networks and variational autoencoders)
- Ongoing work on Stein variational gradient descent and statistical inference.
- Ongoing work on unsupervised deep basis pursuit for reconstruction of high-resolution dynamic MRI.
- training of spiking neural networks

Sharif University of Technology *Tehran, Iran*

Research Assistant *Aug. 2014 - June 2017*

- Reinforcement learning applications to 5G wireless communications
- Proposed a framework for 5G wireless network infrastructure planning (the results are published on IEEE transaction of vehicular technology)

The University of Texas at Austin *Texas, USA*

Teaching Assistant *Aug. 2017- June 2018*

- Probability and stochastic process
- Linear systems design & analysis

Publications

Ali Lotfi Rezaabad, and Sriram Vishwanath, "InfoMax-VAE: Learning Representation by Maximizing Mutual Information in Variational Autoencoder ", *Under review by AISTATS 2020.*

Ali Lotfi Rezaabad, Murat Kocaoglu, and Sriram Vishwanath, " Long Short-Term Memory Spiking Networks and Their Applications", *Under review by AISTATS 2020.*

Ali Lotfi Rezaabad, H. Beyranvand, J. A. Salehi, and M. Maier, "Ultra-Dense 5G Small Cell Deployment for Fiber and Wireless Backhaul-Aware Infrastructures", *in IEEE Transactions on Vehicular Technology*, vol. 67, no. 12, pp. 12231-12243, Dec. 2018.

Ali Lotfi Rezaabad, S. Talebi and A. Chizari, "Two quasi orthogonal space-time block codes with better performance and low complexity decoder," *2016 10th International Symposium on Communication Systems, Networks and Digital Signal Processing (CSNDSP)*, Prague, 2016, pp. 1-5.

V. AmiriKooshki, M. A. SadatHosseini, **Ali Lotfi Rezaabad** and S. Talebi, "Performance enhancement of the Golden code by utilizing the ORIOL antenna," *2016 8th International Symposium on Telecommunications (IST)*, Tehran, 2016, pp. 288-292.

Honors

2016 **Honored Alumnus,** Class of 2016, Sharif University of Technology *Tehran, Iran*

2014 **Ranked 5th,** among more than **42000** participators in M.Sc National Entrance University Exam *Iran*

2014 **Ranked 1st,** among **120** students, class of 2010, Shahid Bahonar University of Kerman *Kerman, Iran*