

Ali Lotfi Rezaabad

CONTRASTIVE LEARNING · DOMAIN ADAPTATION · FEW-SHOT LEARNING · ADVERSARIAL TRAINING

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Education

The University of Texas at Austin, ECE Department

PH.D. STUDENT IN DEEP LEARNING AND INFORMATION THEORY

Texas, USA

Aug. 2017 - Fall 2022

- Contrastive Representation Learning, Domain Adaptation, Generative Models, Adversarial Training

Sharif University of Technology, EE Department

M.SC. IN ELECTRICAL ENGINEERING, COMMUNICATION SYSTEMS

Tehran, Iran

Aug. 2014 - June 2016

- Optimization, Millimeter Wave Cellular Networks, Wireless Communication Systems

University of Kerman, EE Department

B.SC. IN ELECTRICAL ENGINEERING, COMMUNICATION SYSTEMS

Kerman, Iran

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, Deep probabilistic modeling, Large-scale optimization, Information theory, Combinatorics & Graph theory, Statistical models for big data, Probability & stochastic process, Stochastic process, Advanced communication systems, Adaptive filters

Selected Projects

Domain Adaptation

PyTorch

- Knowledge Distillation**; proposing a domain adaption method for self-supervised contrastive learning, where the knowledge from the source domain distills into the model for the target samples.
- Few-Shot Training**; proposing the first method to transfer the source knowledge to the target with few available samples for unsupervised representation learning.

Robust Adversarial Training

PyTorch

- Robust Neural Networks**; proposing a new method for jointly training a provably robust classifier and detector, specifically by introducing an additional "abstain/detection" into a classifier.
- Verifiable Robust Networks**; proposing the first method to extend certification techniques by considering detection while providing provable verification.

Hyperbolic Variational Inference

PyTorch

- Hyperbolic Graph Embedding**; demonstrating that the inclusion of variational inference objective in conjunction with a hyperbolic embedding in latent space is able to capture tree-like hierarchical representation and improve quantitative metrics on downstream tasks.
- Semi-Implicit Variational Inference**; demonstrating that the semi-implicit variational inference provably reduces the mutual information between the input and latent representation.
- Enhanced Semi-Implicit Variational Inference**; proposing to correct the objective function with an additional mutual information term and providing a computationally tractable approach for estimating it.
- Hyperbolic Adversarially Learned Inference**; Ongoing project on applying hyperbolic geometry to generative adversarial networks.

Natural Language Processing

PyTorch, Gensim, NumPy, SciPy

- Neural Networks for Sentiment Analysis**; implementation of feedforward (deep averaging) NNs, LSTM, and bi-directional LSTM networks by 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

Generative Models

Tensorflow, PyTorch, NumPy

- Variational Auto-encoders (VAEs)**; the study 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)**; the study and implementation of MINE algorithm.
- **Variational Info-Bottleneck**; the study 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.

- Check my [github](#) page for the codes.

Experiences

Robert Bosch LLC

Pennsylvania, USA

MACHINE LEARNING RESEARCH INTERNSHIP

June. 2021 - Aug. 2021

- Recurrent latent variables modeling for data acquired from electric car engine
- Proposing a domain adaptation method to robustly modeling recurrent latent variables for the real-world scenario (under heavy noise from the environment)

Robert Bosch LLC

Pennsylvania, USA

MACHINE LEARNING RESEARCH INTERNSHIP

June. 2020 - Aug. 2020

- Proposed a robust adversarial training with an abstain option to improve adversarial training performance on clean images. The results are filed as an inventory report.
- Proposed verifiable adversarially trained network based on interval bound propagation. The resulting paper has been accepted at ICLR 2021 ([link](#)).

UT Dell Medical School

Texas, USA

MACHINE LEARNING SCIENTIST

Jan. 2020 - June 2020

- Proposed a machine learning-based approach for phenotyping pediatric patients with Asthma. The results are published at machine learning conference for healthcare (MLHC) 2020 ([link](#)).

The University of Texas at Austin

Texas, USA

RESEARCH ASSISTANT

Aug. 2017 - PRESENT

- Ongoing work on extracting hierarchical representations from high dimensional datasets
- Ongoing work on the intersection of information theory and generative models (adversarial networks and variational autoencoders)

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 & stochastic process/ Linear systems design & analysis

Patent

F. Sheikholeslami, Z. Kolter, **A. Lotfi Rezaabad** "Method and System for Probably Robust Classification With Detection of Adversarial Examples", *US Patent App. 17/035,203, 2022.* ([link](#)).

Publications

A. Lotfi Rezaabad, S. Kumar, S. Vishwanath, and J. Tamir, "Few-Max: Few-Shot Domain Adaptation for Unsupervised Contrastive Representation Learning", *Preprint. Under review.* ([link](#))

A. Lotfi Rezaabad, R. Kalantari, S. Vishwanath, M. Zhou, and J. Tamir, "Hyperbolic Graph Embedding with Enhanced Semi-Implicit Variational Inference", *Proceedings of The 24th International Conference on Artificial Intelligence and Statistics, AISTATS 2021.* ([link](#))

F. Sheikholeslami, **A. Lotfi Rezaabad**, and Z. Kolter, "Provably robust classification of adversarial examples with detection", *The Ninth International Conference on Learning Representations, ICLR 2021.* ([link](#))

A. Lotfi Rezaabad, R. Peters, M. Sitter, A. Shende, and S. Vishwanath “Phenotyping Patients with Asthma: Preprocessing, and Clustering Algorithms” *2020 Proceedings of the 4th Machine Learning for Healthcare Conference*, August 7-8, Michigan, USA. ([link](#))

A. Lotfi Rezaabad and Sriram Vishwanath, “Long Short-Term Memory Spiking Networks and Their Applications”, *International Conference on Neuromorphic Systems 2020 (ICONS 2020)*. Association for Computing Machinery, New York, NY, USA, Article 3, 1–9. ([link](#))

Ali Lotfi Rezaabad, and Sriram Vishwanath, “InfoMax-VAE: Learning Representation by Maximizing Mutual Information in Variational Autoencoder ”, *IEEE International Symposium on Information Theory (ISIT)*, CA, USA, 2020, pp. 2729-2734. ([link](#))

A. 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. ([link](#))

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

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

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