Bilal Riaz

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Bilal Riaz

I am a PhD candidate in Electrical and Computer Engineering, specializing in machine learning and applied optimization. With a robust background in these areas, I am actively seeking research positions where I can leverage my skills in optimization algorithms, machine learning and data science to address real-world challenges.

Education

University of Delaware
PhD in Electrical and Computer Engineering *2019-2025(expected)*
Thesis Title: *Applications of Computational Optimal Transport in Machine Learning and Signal Processing*
Advisor: Prof. Austin J. Brockmeier

University of Delaware
Master of Science in Electrical and Computer Engineering *2019-2022*
Thesis Title: *On Spectral Clustering, Informativeness and Seriation*
Advisor: Prof. Austin J. Brockmeier

University of Science and Technology of China
Master of Science in Control Engineering *2015-2018*
Thesis Title: *Preparation of Quantum gates with Control Theoretic Methods*
Advisor: Prof. Cong Shuang

Pakistan Institute of Engineering and Applied Sciences
Bachelor of Science in Electrical Engineering *2010-2014*
Thesis Title: *Modelling and Control of Self-Balancing Bicycle*
Advisor: Prof. Muhammad Abid

Work and Research Experience

Department of Electrical and Computer Engineering, University of Delaware
Research Assistant *2023-25*
Developed techniques to employ optimal transport between continuous distributions for dataset-alignment in a project funded by the Office of Naval Research.

Department of Electrical and Computer Engineering, University of Delaware
PhD Student *2019-2025*
- Focused on applications of computational optimal transport in machine learning and signal processing.
  1. Developed algorithms for support subset selection using optimal transport and applied them to various machine learning tasks, including PU learning, semi-supervised learning, point cloud registration, and color transfer which resulted in a TMLR paper.
  2. Applied optimal transport to align bags of normalized signal spectra via monotonic mappings which resulted in a paper submitted to IEEE Open Journal of Signal Processing.
  3. Extended support subset selection to Monge mappings for aligning datasets in neural network latent spaces. Paper for this work is under preparation
- Also worked on the role of informativeness in seriation and spectral clustering..

Department of Electrical and Computer Engineering, University of Delaware
Research Assistant *summer 2020*
Worked on computational simulations for the dispersion of odor plume in aquatic environments in a project funded by the Office of Naval Research.

Huawei Pakistan
Project Controller *2018-2019*
Worked on the management to oversee the projects related to 3G/4G deployment and upgradation.

Department of Automation, University of Science and Technology of China
Master's Thesis Student *2015-2018*

Worked on Lyapunov-method and optimal-control approaches for the computational design of quantum gates at systems engineering lab, which resulting in two conference papers and one journal publication.

Publications

[1] **Bilal Riaz**, Yuksel Karahan, and Austin J. Brockmeier. "Partial Optimal Transport for Support Subset Selection". In: *Transactions on Machine Learning Research* (2023).

[2] Yuksel Karahan, **Bilal Riaz**, and Austin J Brockmeier. "Kernel Landmarks: An Empirical Statistical Approach to Detect Covariate Shift". In: *NeurIPS 2021 Workshop on Distribution Shifts: Connecting Methods and Applications*. 2021.

[3] **Bilal Riaz**, Cong Shuang, and Shahid Qamar. "Optimal Control Methods for Quantum Gate Preparation: a comparative study". In: *Quantum Information Processing* 18 (2019), pp. 1–26.

[4] **Bilal Riaz**, Cong Shuang, and Shahid Qamar. "Lyapunov based Control for one qubit Quantum gates in Coherence vector formulation". In: *2018 37th Chinese Control Conference (CCC)*. IEEE. 2018, pp. 8116–8121.

[5] Shahid Qamar, Cong Shuang, and **Bilal Riaz**. "Lyapunov-based feedback control of two-level stochastic open quantum systems". In: *2017 IEEE International Conference on Cybernetics and Intelligent Systems (CIS) and IEEE Conference on Robotics, Automation and Mechatronics (RAM)*. IEEE. 2017, pp. 48–53.

[6] **Bilal Riaz** and Austin J. Brockmeier. "Neural Optimal Transport for Subset Alignment". (*in preparation*).

[7] Yuksel Karahan, **Bilal Riaz**, Hau Phan, Matthew S. Emigh, and Austin J. Brockmeier. "Finding Landmarks of Covariate Shift with Kernel Landmark Sliced Wasserstein Distance". (submitted to TMLR).

[8] **Bilal Riaz**, Austin J. Meek, and Austin J. Brockmeier. "Optimal Transport with Frequency Warping for Bags of Spectra". (submitted to *IEEE Open Journal of Signal Processing*).

[9] Yuksel Karahan, **Bilal Riaz**, Matthew S. Emigh, and Austin J. Brockmeier. "Distributional Landmark for Detecting Multi-Mode Discrepancies". (*in preparation*).

Computational Skills

Numerical Computing: Experienced in Python-based libraries such as NumPy, SciPy and JAX. Working knowledge of MATLAB.
Machine Learning Frameworks: Skilled in PyTorch, JAX and Scikit-Learn, with some experience with TensorFlow. Ability to move across frameworks such as PyTorch, Tensorflow and JAX for Machine learning. Ability to incorporate Pytorch and JAX based automatic differentiation for large-scale data-driven optimization pipelines.
Miscellaneous: Working Knowldge of C++ and skilled in LaTeX typesetting.

Recommendations

Prof. Austin J. Brockmeier: PhD Advisor
Department of Electrical and Computer Engineering, University of Delaware

Prof. Xiang-Gen Xia: Dissertation Committee Member
Department of Electrical and Computer Engineering, University of Delaware

Prof. David Hong: Dissertation Committee Member
Department of Electrical and Computer Engineering, University of Delaware