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

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

Department of Electrical and Computer Engineering, University of Delaware
Graduate Student *2019-2024*

- During my PhD I focused on the applications computational optimal transport in machine learning and signal processing. Below is the list of projects I worked on during my PhD
  1. In the first project, I worked on algorithms for support subset-selection using optimal transport. I applied my algorithms to a variety of machine learning problems such as PU-learning, semi-supervised learning, point-cloud registration and color transfer.
  2. In the second work, I am working on the application of optimal transport to align bags of normalized signal spectra with monotonic mappings.
  3. In the third work, we extend the support subset selection to Monge mappings and use it to align the datasets in neural-network latent spaces.
- Previously I worked on optimal control and Lyapunov method based approaches for quantum gate preparation. Additionally, I worked on applications of informativeness in seriation and spectral clustering.

Department of Electrical and Computer Engineering, University of Delaware
Research Assistant *2020*
During summer 2020 I worked on a project funded by the office of naval research, where I worked on the development of computational simulations for the dispersion of odor plume in aquatic environments.

Department of Electrical and Computer Engineering, University of Delaware
Research Assistant *2023-24*
During the academic year 2023-24 I worked on a project funded by the office of naval research, where I worked on the development of techniques to employ Wasserstein distances between continuous distributions for data-set alignment.

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". (submitted to TMLR).

Computational Skills

Numerical Computing: Experienced in Python-based libraries such as NumPy and SciPy. Working knowledge of MATLAB and C++. Interested in incorporating PyTorch and JAX based automatic differentiation for large-scale data-driven optimization pipelines.
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.
Miscellaneous: Skilled in LaTeX typesetting.

Languages

English: Fluent
Urdu: Native

Professional Memberships

Student member of IEEE and SIAM.