Sum(Mahdi) Qezlou

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Webpage
Github Linkedin

Education

2018–present **PhD, Physcis & Astronomy**, *University of California, Riverside.*
Machine learning and *Bayesian statistics* in Astrophysics.

2018–2019 **M.Sc, Physcis & Astronomy**, *University of California, Riverside.*

2013-2018 : **B.Sc in Physics** , *Sharif University of Technology, SUT.*

Skills

Programming: `Git`, `Python`, `C`, `MPI` parallel computing, cloud computing, `TensorFlow`, `PyTorch`

ML & stat Bayesian statistics, Gaussian Process, Deep Learning (CNN, NLP), Visualizing bigdata

Visualization: `matplotlib`, `Blender`, `Unity`

Experience:

Project leaderships:

July 2023 – present **Deep Learning**, *self-supervising (GPT-like) methods for inference.*
Developing autoregressive language models, akin to GPT-3, to effectively capture the astrophysical parameter sensitivity present in observed data. The objective is to integrate key components like attention layers, with a specific focus on transformers, to autonomously learn the underlying correlations within the data. This technique helps uncover the underlying patterns in a low-quality data. *Publication* Qezlou et. al. in prep

May 2023 – present **Deep Learning**, *AI assisted super-resolution techniques help model the unresolved physics in the cosmological simulations.* .
Using deep learning techniques (e.g. Generative Adversarial Networks, GAN), we model the detail physics in large cosmological simulations. The direct calculation of these rates is computationally prohibitive; therefore, deep learning techniques assist in approximating these quantities. We expect a potential order of magnitude improvement in our estimations compared to the traditional approaches. *Publication* Qezlou et. al. in prep

Apr,2022 – Jun 2023 **Statistical modeling**, *Enhancing Bayesian inference by combining cosmological probes.*.
Using a fully Bayesian approach, we achieve a tenfold improvement in parameter constraints by jointly analyzing multiple datasets while accounting for systematics and missing data. *Publication* : Qezlou et. al. 2023 *Github* : `lila`

Jan,2020 – Dec,2021 **Computer graphics, Gaussian Process**, *Detecting galaxy clusters in 3D maps of gas in the universe.*
Leveraging image-recognition techniques, we detect progenitors of massive galaxies in large-scale 3D gas maps of the universe. Hyper-parameter optimization involves generating terabytes of simulated data. Additionally, a Gaussian Process model is being developed to infer the physical properties of these structures. *Publication :* Qezlou et. al. 2021, `Github` LyTomo_Watershed

2018 – 2019 **Python, C, MPI parallel computing**, *Fast python package for post-processing extremely large simulations,* .
Collaborating with the author, I maintain this widely used `python/C` package to generate $\sim$ `TBs` of data from large simulations. I improved the scalability of the code to hundreds computational nodes through MPI parallelism. *Publication :* *Qezlou et. al. 2021* `Github` `fake_spectra`

Relevant courses

UCR Machine Learning, Probabilistic model in AI

Coursera Deep Learning specialization

Mentoring Experience

2020–2021 **CASSI Summer research program for undergraduates at Carnegie observatory** , *Teaching* `Python`, `MPI` *parallel computing and visualizations to* $\sim$ *40 students.*

2018-2023 **UCR**, *Mentoring Undergraduate Students*, Computational and Machine learning projects.