Asad Hussain

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potatoasad

Education

2019-Present **PhD Physics**, *The University of Texas At Austin*.
Thesis | *"Ringdown of Black Holes beyond General Relativity and their imprints on LIGO Data"*
Advisor: Dr. Aaron Zimmerman
Relevant Courses: Foundations Of Data Science *(Gradient Descent proofs, Neural Networks, etc.)*

2014-2018 **Bachelor Of Science, Physics**, *LUMS*.
Relevant Courses: Applied Stochastic Processes, Quantitative Finance *(Ito Calculus, Options pricing)*

Relevant Experience

2020-Present **Graduate Research Assistant**, ***Center for Gravitational Physics***, **UT Austin**, TX.
- Created a novel statistical technique to alleviate catastrophic biases with state-of-the-art hypothesis testing methods
- Performed Bayesian Inference on Stochastic Time Series data and implemented a new inference procedure (in `stan` & `pymc3`) to to perform time series analysis on data from detected black holes.
- Expertise in popular Python frameworks (PyTorch, JAX, NumPy, SciPy, Pandas, TensorFlow, etc...), e.g. implemented a Wave-U-Net neural network architecture for sound source separation

March 2022 **Visiting Researcher**, ***Center for Computational Astrophysics (CCA)***, **Flatiron Institute**, NY.
- Worked with collaborators to compute the effect of a constrained parameter space on a population analysis.

Publications

2023 ***Hierarchical Bayesian models with truncated parameters: Biases and Solutions***, *Asad Hussain & Aaron Zimmerman (In prep.)*.

2022 ***Approach to computing spectral shifts for black holes beyond Kerr***, *Asad Hussain & Aaron Zimmerman*, Phys. Rev. D 106, 104018, .

2019 ***Decay of finite-length qubits on arbitrary spacetime trajectories***, *Asad Hussain & Hamza Ahmed*, ArXiv:1811.09432.

Open Source Contributions & Packages

Contributions
- `Distributions.jl`: Contributed folded versions of univariate distributions.
- `ringdown`: Increased accuracy of model approximant by $100\times$, and improved waveform handling

Packages Created
- `ringdb`: Utility package that creates a local HDF5 database for GW data
- `TruncatedGaussianMixtures.jl`: Implementation of the Expectation-Maximization algorithm for a mixture model with truncated gaussians
- `OperatorPerturbations.jl`: Symbolic system in Julia to solve double expansions of differential operators
- `typora2tex`: CLI to convert markdown files into latex documents

Skills

Relevant Courses: Quantitative Finance *(Ito Calculus, Options pricing)*, Numerical Analysis *(C++, Finite Element Methods)*, Tools & Techniques in Computational Science *(Bash, C++)*, Applied Stochastic Processes, Classical Mechanics, Statistical Mechanics, Electromagnetism, String Theory, Probability, General Relativity.

Programming Languages & Tools: Julia, Python, Mathematica, C++, Bash, MATLAB, SQL, Javascript, HTML & JQuery, Git, SLURM, AWS (EC2, Kibana, Dataloader, Lambda), Azure

Certifications: Microsoft Azure Certified Data Engineer (DP-203)