DR. SRASHTI GOYAL

@ srashti.goyal@icts.res.in +49 15231693993 Berlin, Germany

Data Scientist with **5+ YoE** in machine learning, big data analysis, and statistical modeling. Proven ability to build **scalable data-driven solutions** and **end-to-end deployment ML models** in production. **Physics PhD** with a strong foundation in **inter-disciplinary research, deep learning, Bayesian inference, and large-scale distributed computing.**

srashtig | srashti.goyal/projects | 0000-0002-4225-010X

SKILLS

Programming: Python, C, MATLAB, Bash, SQL.

Packages: Pandas, Scikit-learn, TensorFlow, Keras, Emcee/Nestle, seaborn, scipy, matplotlib, opencv.

Data Science & ML: EDA, PCA, Bayesian Inference, Regression, NNs, CNNs, XGBoost, RDBMS, Transfer Learning, Clustering, word2vec, Normalizing Flows, CVAEs.

Software Development & Version Control: Git, Configparser, Setuptools, Conda.

Theory: Probability & Statistics, Neural Networks, Optimisation, Numerical Analysis, Mathematical modelling, Graphs, Game Theory, Physics.

Communication : Oral Presentations, Poster, Technical Writing, LaTeX, Grant Writing, Active Listening.

Languages: English (C2), Hindi (C2), German (A1)

EXPERIENCES

Astrophysics Research Scientist

Max Planck Institute for Gravitational Physics

October 2023 – Ongoing Potsdam, Germany

- Develop **numerical analysis tools** to model the diffraction effects in gravitational waves, increasing detection capabilities by at least 2x and contributing to the open-source package GLoW. [git, paper]
- **Forecast detection prospects of diffraction effects** for upcoming space-based gravitational wave detector (LISA) using **distributed computing** for many sources. 2+ papers published.

Data Analyst Volunteer

TANIT New Earth Solutions

June 2024 - ongoing Berlin, Germany

- Data gathering and **scientific advice through literature review**. Calculated CO_2 sequestration for regenerative agriculture.

Gravitational Waves Data Scientist

LIGO Scientific Collaboration (LSC) of 1000+ Scientists worldwide

October 2020 – Ongoing Remote - part time

- Pioneered an **ML algorithm** using CNNs, achieving 1000x faster compared to Bayesian methods for identification of strong lensing candidates from LIGO data. [git][paper]
- Built **end-to-end automated software** (LensID) that pulls LIGO's time-series data, deploys ML model and passes results. 3+ papers published.
- **Found 'most promising' lensing candidate** out of 5000 event-pairs observed by LIGO during 2019-2020 despite 20 other scientists. [git,paper]

Senior Research Fellow (Physics PhD)

International Center for Theoretical Sciences, Tata Institute of Fundamental Research (ICTS-TIFR)

August 2019 - September 2023 Bengaluru, India

- Performed **hypothesis testing with Bayesian inference** to rule out alternative gravity theories against Einstein's theory of relativity using the observed time series data in LIGO-Virgo detectors. 3+ papers published. [git, paper]

- **Statistically analysed the data and proposed a phenomenological model of COVID-19** disease spread and various intervention strategies for different countries, voluntarily. Co-authored a paper that software industry experts highly appreciated. [git, paper]

EDUCATION

BS-MS Dual Degree in Physics

Indian Institute of Science Education & Research, Kolkata (IISER-K)

August 2013 – June 2018 | Kolkata, India

- Master's Thesis: Dynamical analysis and **mathematical modelling** of wave-like patterns from a biological experiment as non-linear PDEs using **C & OPENMP**.

ACHIEVEMENTS

- 12+ Publications: 0000-0002-4225-010X
- 2+ open-source codes in LIGO Gitlab: srashti.goyal/projects
- 15+ International Conferences & Workshops, 6+ Invited talks, 4+ Poster presentations, 5+ Mentees, 4+ Outreach events, and 3+ Courses tutored.
- 99.5 percentile score in IIT-JEE 2013 and JEST 2018 competitive exams.
- DST-Inspire Fellowship Recipient 2013-2018.

PERSONAL INTERESTS

Hobbies: Yoga, Dancing, Swimming, Trekking, Playing instruments, Learning new things and Travelling.

Philosophy: I am enthusiastic about new challenges in life and curious about various things like sustainability, climate change, the economy, forests, human behaviour, AI and physics. I aim to work towards a positive (and possibly high) impact on society and the natural environment.

RELEVANT PUBLICATIONS

1. **Rapid Identification of Strongly Lensed Gravitational Wave Events with Machine Learning**, S Goyal, S J Kapadia, P Ajith, 2021. *Physical Review D.* [ArXiv]
2. **Covid-19: Analysis of a Modified SEIR Model, a Comparison of Different Intervention Strategies and Projections for India**, A Das, A Dhar, S Goyal, A Kundu, S Pandey. 2021. *Chaos.*, [ArXiv]
3. **GLoW: novel methods for wave-optics phenomena in gravitational lensing** , H Villarrubia-Rojo, S Savastano, M Zumalacárregui, L Choi, S Goyal, 2024. *Submitted.* [ArXiv]
4. **Search for Gravitational Wave Lensing Signatures in LIGO/Virgo the Full O3 Data**, LVK Collaboration, 2023. The Astrophysical Journal. [ArXiv]
5. **Probing Lens-induced Gravitational Wave Birefringence as a Test of General Relativity**, S Goyal, A Vijaykumar, J M Ezquiaga, M Zumalacarregi, A K Mehta, 2023. *Physical Review D.*[ArXiv]