

Saurabh

Curriculum Vitae

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↗ <https://Relativist1.github.io>

Objective

To create interest among the youngsters in the field of Science, especially in the field of Physics and Astronomy and to develop creative and enquiring learning mind committed to lifelong learning and get acquainted with the fun along learning.

Education

- 2017–2020 **B.Sc Honours (Physics)**,
Department of Physics, Dyal Singh College, University of Delhi, India.
- 2017 **Higher Secondary Education**,
Manav Rachna International School,Charmwood Village, Faridabad, India (82%).
- 2015 **Matriculation Examination**,
Manav Rachna International School, Charmwood Village, Faridabad, India (CGPA 8.4).

Scholastic and Curricular Achievements

- 2017-present Member of the College Physics Society - Cosmos
- 2017 Founded **Stellar Universe** - A student organisation for every astronomy and physics enthusiast to work and learn collectively while providing a platform to grow in the field by doing activities such as research/learning projects, seminars, webinars, lectures , interactive sessions, etc. and organising interactive sessions every weekend.
- 2015-2017 Member of the Student council as Vice-House Captain (2015-16) and House-Captain (2016-17))
- 2015 AIR - 100 in National Astronomy Olympiad organised by Orange Organisation
- 2014-2017 Won several awards and top positions while representing the school in inter(intra)-school competitions (Dance Drama (1st), Mono-acting(3rd), Debate, Volleyball, Basketball,Cricket etc.)

Awards

- 1 1st Prize for Online Paper Presentation, 2020 by Motilal Nehru College, University of Delhi, Topic: Shadows cast by compact and ultracompact objects
- 2 1st Prize for Presentation/Seminar Presentation, 2020 at Dyal Singh College, University of Delhi, Topic: Shadows cast by compact and ultracompact objects
- 3 1st Prize, Astronomy Quiz during SKA-Outreach at Vigyan Samagam, New Delhi.

Technical Skills

Programming	PYTHON, C++, SCILAB, FORTRAN, BASH
Software	MATHEMATICA, CASA (COMMON ASTRONOMY SOFTWARE APPLICATION), LATEX

Publications

- (1) Sourabh Nampalliwar, **Saurabh K.**, Kimet Jusufi, Qiang Wu, Mubasher Jamil, Paolo Salucci , 'Modelling the Sgr A* Black Hole Immersed in a Dark Matter Spike', 2021 [arXiv:2103.12439]
- (2) Kimet Jusufi & **Saurabh**, 'Black Hole Shadows in Verlinde's Emergent Gravity', *MNRAS*, 2021, d10.1093/mnras/stab476
- (3) **Saurabh** & Kimet Jusufi, 'Imprints of Dark Matter on Black Hole Shadows using Spherical Accretions', 2020 [arXiv:2009.10599]
- (4) **Saurabh** & Himanshu Kumar, 'The ageing problem of twins in Reissner–Nordström spacetime', *Mod. Phy. Lett. A*, 2019, 10.1142/S021773232050008X
- (5) Shubham Kala, **Saurabh**, Hemwati Nandan,'Deflection of light and Shadow cast by a Dual Charged Stringy Black Hole', *Int. Jour. of Mod. Phy. A*, 2020, 10.1142/S0217751X20501778 [arXiv:2010.03615]
- (6) Shreyas Bapat, (34 authors), **Saurabh**, (15 authors), 'EinsteinPy: A Community Python Package for General Relativity', 2020 [arXiv:2005.11288]

Codes

- (1) **Gallifray**: Geometric Modelling and Parameter Estimation Framework for Black hole images obtained from VLBI using Bayesian Techniques. (Python) [Developer]

Link <https://github.com/Relativist1/Gallifray>

- (2) **EinsteinPY**: Python package dedicated to problems arising in General Relativity and gravitational physics (Python) [Contributor]

Link <https://einsteinpy.org>

- (3) **ShadowPY** : Shadow of General Static and Spherically Symmetric Spacetime using Raytracing algorithm (Python) [Developer]

Link <https://github.com/Relativist1/Shadowpy>

Research Interests

General Relativity, General Relativistic Ray-Tracing and Radiative Transfer, Black hole Imaging, Radio Interferometry and Synthesis Imaging

Responsibilities

- (1) Stellar Universe - Student's organisation for astronomy and astrophysics enthusiasts.
Position Founder
- (2) BOSE-X - Bose.X is an independent multidisciplinary research organization
Position Associate Mentor & Project Lead

Work Experience

- (1) Indian School of Robotics (ISRRBOTICS): Paid part-time work
Position Technical Educator
Teaching Massive Online Open Course (MOOC) Astronomy and Machine learning to Kids.

Mentoring Experience

- (1) Mentor-Mentee Program, 2020 organised by SciRox, Guru Nanak Dev University, Amritsar, India [Project Mentor]

Research Internships

- (1) Summer Research Internship Program - 2019
Mentor Prof. Pankaj Joshi
Topic Shadows of Black Holes and Naked Singularities
Institution International Centre for Cosmology (ICC), CHARUSAT University, Gujarat
- (2) Summer Internship - 2019
Mentor Dr. Himanshu Kumar
Topic Twin Paradox Studies and Simulations in General Relativity
Institution Dyal Singh College, University of Delhi

Projects Undertaken

Completed

- (1) Twin Paradox around Black Hole (Resinner-Nordstrom Spacetime)
(2) Timelike and Null Geodesics in spherically symmetric static and stationary Spacetimes. [Reading Project].
(3) Data Analysis (Timing) of VELA PULSAR (data taken from Ooty Radio Telescope.)
(4) Measuring angular diameter of the sun using hand-made Solar Projector.

Ongoing

- (1) Programming Beamformer system on *Raspberry Pi* for the SWAN system.
(2) Making a Horn antenna for radio astronomical observations.
(3) **GALLIFRAY**: Geometric Modelling and Model Comparison Framework for Black hole images obtained from VLBI using Bayesian Techniques.
(4) Imaging and Simulations of Shadows cast by Compact objects such Black Holes.
(a) **Theory-Independent tests of General Relativity by analysing Black hole images**
(b) **Modelling and Observing Sgr A* surrounded with Dark Matter with the Event Horizon Telescope**
(c) **Testing Naked Singularity at the Galactic Center with the observations of Event Horizon Telescope.**
Supervisor : Prof. Pankaj Joshi (ICC and Charusat University)
(5) Radio Interferometry and Synthesis Imaging with SWAN

Talks and Poster presentation

- (1) Talk - '*GALLIFRAY-A Geometric Modelling and Parameter Estimation Framework for Black hole images using Bayesian Techniques*', during ngEHT (next-generation Event Horizon Telescope) Science Meeting, 2021.
- (2) Talk - '*Theory-Independent test of General Relativity by analysing Black hole images using VLBI*', during VLBI Splinter session of SKA Science Conference, 2021.
- (3) Oral Poster - '*GALLIFRAY-A Geometric Modelling and Parameter Estimation Framework for Black hole images using Bayesian Technique*', RATOP (Relativistic Astrophysics, Theory and Observational Perspectives) Scientific Symposium, 2021.
- (4) Oral Poster - '*GALLIFRAY-A Geometric Modelling and Parameter Estimation Framework for Black hole images using Bayesian Technique*', HamSCI Workshop, 2021.
- (5) Talk - '*Theory-Independent tests of General Relativity by analysing Black hole images*' during Undergrad Symposium, Precision'20, Presidency College, Bangalore, India.
- (6) Lightning Talk - '*Theory-Independent tests of General Relativity by analysing Black hole images*' during Sixth Southern Regional Meeting, Research in Astronomy: Opportunities and Challenges, Sponsored by IUCAA
- (7) Poster Presentation - '*The ageing problem of twins in Reissner–Nordström spacetime*' during International Workshop on Astrophysics and Cosmology, ICC, Gujarat, India
- (8) Talk - '*Shadows cast by compact and ultracompact objects*' during Presentation/Seminar Presentation, Dyal Singh College, University of Delhi
- (9) Talk - '*Timing of Vela Pulsar using Python (Data taken from Ooty Radio Telescope)*' as Student-Coordinator during SKA-Outreach Week, Vigyan Samagam, New Delhi

Conferences & Workshops

- (1) ngEHT (next-generation Event Horizon Telescope) Science Meeting, 2021.
- (2) SKA Science Conference - A precursor view of the SKA sky, 2021.
- (3) Relativistic Astrophysics, Theory and Observational Perspectives (RATOP) Scientific Symposium, 2021.
- (4) HamSCI Workshop, 2021.
- (5) 31st meeting of the Indian Association for General Relativity and Gravitation (IAGRG) organised by IIT Gandhinagar, India.
- (6) Sixth Southern Regional Meeting, Research in Astronomy: Opportunities and Challenges, Sponsored by IUCAA, 2020
- (7) 23rd Capra Meeting on Radiation Reaction in General Relativity, University of Texas at Austin
- (8) Black Hole Perturbation Toolkit (BHPToolkit) Spring 2020 Workshop
- (9) Cosmology Summer School 2020 (University of Michigan)
- (10) International Workshop on Astrophysics and Cosmology organised by International Centre for Cosmology (ICC), Charusat University, Gujarat, India
- (11) 30th Indian Association for General Relativity and Gravitation Meet (IAGRG) at BITS Pilani Hyderabad Campus.

- (12) Co-hosted and Participated in Astronomy Boot Camp organised by Nehru Planetarium (2019)
- (13) Astronomy Code Camp organised by Nehru Planetarium (2018)
- (14) Research Assistant at One-Day RAD Workshop (ODRAW) at St. Stephens College, Delhi University organised by RAD@HOME
- (15) RAD@HOME Discovery Camp (2018)

Participations

- (1) Organised Astro Retreat 2020, an online/virtual meet for talks and poster presentations in collaboration with SciRox (Science Club, Guru Nanak Dev University, Amritsar).
- (2) Organising a free certificate course on 'Special and General Theory of Relativity' in Collaboration with Scienteen Edt. Pvt. Ltd., Ramanujan Research Institute and Nehru Planetarium.
- (3) Volunteer at LIGO-India booth (One week) at Vigyan Samagam, Delhi
- (4) SWAN Imaging Challenge (Creating a 100 Sq.degree Image of any part of sky with observations from SWAN).
- (5) Attended lecture by Prof. Kip Thorne at ICTS, Bangalore
- (6) Co-organised and attended Lecture by Dr. Bharat Ratra at Nehru Planetarium, New Delhi.
- (7) Regular participation in lectures organised in the Colleges and Universities.