Abhisek Saha

CONTACT INFORMATION

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CURRENT POSITION

(2017 - Current) Senior Research Fellow (INSPIRE Fellow) - Department of Physics, University of Hyderabad, Prof.C.R.Rao Road, Hyderabad, India 500046

RESEARCH INTEREST

I am interested in working on topics related to heavy-ion collision, Quark-Gluon plasma, QCD phase transition, and early universe cosmology. My recent work is on power spectrum analysis of anisotropic flow and temperature fluctuations. I have also worked on Machine Learning models to predict various initial state geometry parameters of heavy-ion collision. I use simulation models, e.g., AMPT, VISHNew, and UrQMD to generate the collision dynamics. I am also interested in data analysis.

EDUCATION

University of Hyderabad, Hyderabad, India 2015-2017
M.Sc. in Physics (CGPA:8.07)
(Thesis name: Geodesic Motion in the Space-Time of a Cosmic String)

Maulana Azad College, University of Calcutta, Kolkata, India 2012-2015
B.Sc(Hons.) in Physics (Percentage Marks: 63.13)

West Bengal Council of Higher Secondary Education,
West Bengal, India 2012
12^{th}grade (Percentage Marks: 87.6)

West Bengal Board of Secondary Education,
West Bengal, India 2010
10^{th}grade (Percentage Marks: 81.625)

RESEARCH PAPER PUBLISHED IN REFEREED JOURNAL

In reverse chronological order

1. *Machine Learning model driven prediction of the initial geometry in Heavy-Ion Collision experiments*
   Abhisek Saha, Debasis Dan, Soma Sanyal
   PHYSICAL REVIEW C 00, 004900 (2022)
   arXiv:2203.15433 [hep-ph]

2. *Temperature fluctuations, turbulence and Tsallis statistics in Relativistic Heavy Ion collisions*
Abhisek Saha, Soma Sanyal
Mod. Phys. Lett. A Vol. 36, No. 22, 2150152 (2021)
arXiv:2004.03118 [nucl-th]

3. *Decay of baryon inhomogeneities in an expanding universe.*
Pratik K. Das, Sovan Sau, Abhisek Saha, Soma Sanyal
Eur. Phys. J. C 81, 816 (2021)
arXiv:2101.01980 [hep-ph]

4. *Flow and vorticity with varying chemical potential in relativistic heavy ion collisions.*
Abhisek Saha and Soma Sanyal
Int. J. Mod. Phys. E Vol. 29, No. 01, 2050001 (2020)
arXiv:1902.08368 [hep-ph]

5. *Diffusion of massive particles around an Abelian-Higgs string.*
Abhisek Saha, Soma Sanyal
JCAP03(2018)022
arXiv:1710.05556 [hep-ph]

PAPER ON ARXIV

1. *Anisotropic turbulence in relativistic plasmas.*
Abhisek Saha and Soma Sanyal
arXiv:2108.01847 [nucl-th]

CONFERENCE PROCEEDINGS

1. *Temperature fluctuations and Tsallis statistics in Relativistic Heavy-Ion collisions*
Abhisek Saha, Soma Sanyal
(Submitted for proceedings in DAE 2020)

2. *Vorticity with varying collision energy in relativistic heavy ion collisions.*
Abhisek Saha, Soma Sanyal
Proceedings of DAE Nuclear Physics 2019, Year 2019, Pages 728 .

3. *Shear viscosity and vorticity patterns in relativistic heavy ion collisions.*
Abhisek Saha, Soma Sanyal
Springer Proceedings in Physics Volume 248, Chapter 48. (FHEP 2019)
`https://doi.org/10.1007/978-981-15-6292-1_48`

SEMINAR TALKS

- Presented a talk on "Machine Learning model driven prediction of the initial geometry in Heavy-Ion Collision experiments" at Students Colloquium organized by School pf Physics, University of Hyderabad, India on 18th May 2022.

CONFERENCE TALKS

1. Presented a talk on "Temperature Fluctuations and Tsallis Statistics in Relativistic Heavy Ion Collisions" at **DAE-BRNS HIGH ENERGY PHYSICS SYMPOSIUM 2020** organized by National Institute of Science Education and Research (NISER), Odisha, India on 16th December 2020.

2. Given a talk on "Shear viscosity and vorticity patterns in relativistic heavy ion collisions" at **International Workshop on Frontiers in high energy**

physics (FHEP 2019) organized by IIT Hyderabad and University of Hyderabad on 14 -17 October 2019, Hyderabad (Submitted for proceedings).

POSTER PRESENTED

1. Presented a poster at **Boson Physics Fest 2020** (6-7 March) organised by School of Physics, University of Hyderabad.

2. Presented a poster entitled "Vorticity with varying collision energy in relativistic heavy ion collision" at **64th DAE-BRNS Symposium on Nuclear Physics(22-27 Dec, 2019)** at Lucknow University (Submitted for proceedings).

3. Presented a poster "Flow and vorticity in heavy ion collision with varying to collision energy" in **Pressing for Progress 2019**, An **IPA** national conference towards gender equity in physics (19-21 Sep 2019) at University of Hyderabad, Hyderabad.

4. Presented a poster entitled "Study of Vorticity in Heavy Ion Collisions using AMPT model" at **Frontiers in Physics and Cosmology conference(FIPPC-January, 2019)** at University of Hyderabad.

5. Presented a poster in **XXIII DAE-BRNS high energy Physics symposium** held at IIT Madras, India(December 2018).

6. Presented poster entitled "Clustering of massive particles around Abelian Higgs String" at National Conference on **Physics at Small Scales and Advanced Materials**, 8-9th Sept 2017, University of Hyderabad.

ACADEMIC ACHIEVEMENTS

- Fellowship : **DST-INSPIRE** Fellowship as Senior Research Fellow (**SRF**).
- Scholarship : Innovation in Science Pursuit for Inspired Research **(INSPIRE)** by Department of Science and Technology (DST).
- Awarded Central Sector Scheme of Scholarships for college and University Students in 2012.

TEACHING ASSISTANT

1. Advanced Computation Techniques in Physics using python (M.Sc. Course). (2022)

2. Mathematical Methods (M.Sc. course)(2018).

3. **Advance Computational course** using **Fortran** language (2020) M.Sc. and PhD course .

WORKSHOPS AND CONFERENCES ATTENDED

1. Participated **DAE-BRNS HIGH ENERGY PHYSICS SYMPOSIUM 2020** (14-18 December 2020) organized by National Institute of Science Education and Research (NISER), Odisha, India on 16th December 2020.

2. Attended **EXTREME NONEQUILIBRIUM QCD (ONLINE)** conference (5-9 Oct 2020) held at ICTS, Bangalore, India.

3. Attended **SPIN AND HYDRODYNAMICS IN RELATIVISTIC NUCLEAR COLLISIONS** ECT* Online Event(5-16 Oct 2020).

4. Participated in **64th DAE-BRNS Symposium on Nuclear Physics** (22-27 Dec, 2019) and also attended the pre symposium Orientation programme on 22nd December 2019 at Lucknow University, India.

5. Participated in **International Workshop on frontiers in high energy physics (FHEP)** at University of Hyderabad, 14 -17 October 2019, Hyderabad, India.

6. Volunteered in **Pressing for Progress 2019**, An IPA national conference towards gender equity in physics at University of Hyderabad, Hyderabad.

7. Participated in the school **"The Myriad Colorful Ways of Understanding Extreme QCD Matter"** held at ICTS Bangalore, India.

8. Participated in **Frontiers in Physics and Cosmology**(FIPPC- January, 2019) at University of Hyderabad.

9. Participated in **XXIII DAE-BRNS high energy Physics symposium** held at IIT Madras, India(December 2018).

10. Attended **"SERB Preparatory School on Theoretical High Energy Physics"** at University of Hyderabad, Hyderabad (Aug-Sep 2018).

11. Participated in the **"CNT Workshop on Effective Field Theory of Hadrons : Vacuum to Medium"** organized at VECC, kolkata by the Centre for Nuclear Theory (CNT)(March 2018).

12. Participated in the **National Conference on Physics at Small Scales and Advanced Material 2017**, organized by University of Hyderabad.

13. Workshop on Astroproject in the NSSC 2016, held at IIT Kharagpur.

14. **Frontiers in Physics (FIP-2016)** organized by School of Physics, University of Hyderabad.

15. I have attended the **National Student Space Challenge-2016** (NSSC), Organised by IIT Kharagpur and ISRO, India.

16. I have participated in the National day celebration 2014 in Variable Energy Cyclotron Centre (VECC), Kolkata. And also got a chance to visit the laboratories in VECC.

RESEARCH EXPERIENCE

- Currently I am doing Ph.D. at University of Hyderabad under the supervision of Dr. Soma Sanyal, working on **Heavy Ion Collision Physics** and anomalous transport effects in **quark-gluon plasma**.
- I did a project on ***'Geodesic Motion in the Space-Time of a Cosmic String'*** (M.Sc. Thesis work). Mentor: Dr. Soma Sanyal, University of Hyderabad, Hyderabad, India.

COMPUTATION SKILLS

Courses taken:

- **Python for DATA ANALYSIS** (An NPTEL course, passed as a topper).
- **Computational Physics** using **FORTRAN** (An NPTEL course, Successfully passed with certificate).
- **Programming, Data Structures And Algorithms Using Python** (An NPTEL course).
- **Introduction to Quantum Computing: Quantum Algorithms and Qiskit** (An NPTEL course, passed with an Elite batch).
- **Database Management System(DBMS)** (An NPTEL course, passed with an Elite+Silver batch).
- **Programming in Java** (An NPTEL course , passed with an Elite+Silver batch).
- Introduction to **Machine Learning**- A certified online course authorized by **Duke University** and offered through Coursera.
- Complete Responsive **Web Development**: 4 Courses in 1(**HTML, CSS, Bootstrap, jQuery**)

Programming Languages:
Python, Java, FORTRAN (77,90,95), SQL, C++, HTML, CSS, Bootstrap

Technical Interests:
I have experience in Machine Learning using Python. I have also experience in data-analysis, data-processing, data-cleaning, data-visualization and data-scrapping.

Please visit my git-hub account(`https://github.com/SahaAbhisek`), where I upload projects that I have done on a usual basis. I have done several projects on machine learning where I have done a detailed analysis of several real-life datasets and used ML models to predict the unknown features(e.g., **Classification, regression, clustering, etc.**). I have collected several datasets from Kaggle and scrapped a few using Python. I have worked on projects on image data analysis, natural language processing, time series predictions, etc., using deep learning models. I have made websites using HTML, CSS, and Bootstrap. I have also made several games using the pygame module.

Software packages used:

- **Mathematical Packages:** Mathematica, Matlab.
- **Graph Plotting:** GNU Plot, XMGrace, Matplotlib, Seaborn.

Programming software/IDE used:
Visual Studio Code, Spyder, Jupyter, Octave, MySQL.

Documentation Languages:
Latex.

Operating System used:
Windows, Linux(Ubuntu, Redhat).

LANGUAGE SKILLS English, Hindi, Bengali, German(Basic).