

AMAN AGARWAL | RESUME

- **Status:** Pursuing Ph.D. in Physics
- **Institute:** [Perimeter Institute](#) and [University of Guelph](#)
- **Address:** 206, New Station Road, P.O. - Bhadrakali, P.S.-Uttarpara, Dist.- Hooghly, West Bengal
- **Date of Birth:** 20th October, 1996

➤➤➤ Areas of Interest

- Topics in astrophysics and astronomy like compact binary merger, multi-messenger astronomy, collapse of massive stars, accretion disks and nuclear astrophysics.
- Topics in general relativity including numerical relativity and gravitational waves, gravitational collapse and critical phenomena, compact objects and extensions to general relativity.
- Mathematical physics along with computational techniques and numerical methods used in different areas like n-body and numerical relativity simulations and statistical mechanics.
- Condensed Matter Theory, quantum many body problems, quantum information theory, open quantum systems, entanglement and application of Computer Science to it.

➤➤➤ Education

Current	Ph.D. Physics	Perimeter Institute
	➤ Pursuing first year of Ph.D. in Physics under the supervision of Dr. Daniel Siegel at Perimeter Institute(resident Ph.D.) and the University of Guelph	
August '20	M.Sc Physics and B.E. Computer Science	BITS Pilani University
	➤ Graduated from BITS Pilani K.K. Birla Goa Campus obtaining an M.Sc.(Hons.) in Physics and B.E.(Hons.) in Computer Science in August 2020 with DISTINCTION division and a CGPA of 9.03/10	
July '15	Higher Secondary	Hindmotor High School
	➤ Passed higher secondary (WBCHSE Board) from Hindmotor High School, near Kolkata in July 2015 with 89% and A+ grade.	

➤➤➤ Projects and Research Experience

Aug'20- Feb'21	Ph.D. project on collapsars	University of Guelph
	➤ I have completed a project on modelling fallback histories and ejecta composition of collapsars above the pair instability supernova mass gap under the supervision of Dr. Daniel Siegel. The results of our simulations have been forwarded to researchers at Columbia University, responsible for post processing the data. A paper outlining the results is also being drafted.	
May'19- Aug'20	MITACS(Canada) internship and Master's thesis project	McMaster University
	➤ I have worked on a project titled " Modelling dynamics of elongated Bose Einstein Condensates using Sine Gordon Hamiltonian " under the supervision of Dr. Duncan O'Dell in Canada under the prestigious MITACS program in the area of cold atomic gases. I continued the project as my Master's thesis under the supervision of Dr. Manas Kulkarni at ICTS, Bengaluru . The project focused on the mean field approach to elongated Bose-Einstein condensates using the Sine-Gordon Hamiltonian. The dynamics were numerically investigated for the presence of caustics using Truncated Wigner Approach. A paper is being drafted to publish the project findings.	

Aug'19- Dec'19	Thesis Project	IMSc, Chennai
	<p>► I worked for my first thesis project under Dr. C.M. Chandrashekar on open quantum systems and quantum computation at IMSc, Chennai. In the project we deployed a new discrete time quantum walk computational model, proposed by the research group at IMSc, for the first time, to implement Grover's search algorithm, quantum fourier transform and order finding algorithm. By comparing them with standard circuit algorithms, we established the efficiency of the proposed computational model. The results in the form of a paper has been submitted for publication.</p>	
Aug'18- May'19	Study Project	BITS Goa
	<p>► I have completed a study project titled "Numerical Approaches to Cosmological Singularities" under Dr. Kinjal Banerjee. After a literature review of numerical relativity, we implemented Mixmaster dynamics (approaching singularity) using a symplectic integration method given by Dr. Beverly Berger and collaborators, on MATLAB. Towards the end, we also focused on the previously controversial topic of the chaotic nature of the dynamics. The project report and details can be accessed here and here.</p>	
May-July'18	SPARK internship	IIT Roorkee
	<p>► I have worked on a project titled "Feature extraction and classification of storm image data" under the supervision of Dr. Mayank Goswami. The project focused around application of numerical analysis techniques for extracting relevant features from storm image data. The features extracted can be used for various purposes of classification and vortex recognition. In the later part of the project convolution neural networks(CNNs) were employed to classify tropical cyclone based on real time data. The project details can be found here and the results were published here in the IEEE journal.</p>	
May-July'17	Summer Research Internship	IGCAR, Kalpakkam
	<p>► I have worked on a project titled "Simulation of Plume gamma dose from normal atmospheric releases of Ar41 from Atomic Power Station" at Indira Gandhi Centre of Atomic Research (IGCAR), under Dr. C.V. Srinivas (Scientific Officer-G). In the project, I simulated the gamma dose received at the ground level from a Gaussian Plume model of radioactive cloud. The efficiency of various numerical models was deduced and the simulated data was then compared with a standard manual dose rate data and the best suitable model was ascertained. The project details can be found here</p>	
August'16- May'17	Study Project	BITS Goa
	<p>► I have worked on a Study-Oriented Projects titled "Estimate of Dark Matter in a Galaxy" under Dr. Tarun Kumar Jha. In the project the SPARC database of Galactic Rotational Curves was used to derive the amount of dark matter in a galaxy. The project reports can be found here</p>	

►►► Publications and Posters

- "Universal quantum computation using single qubit discrete-time quantum walk" 2020, [arXiv:2004.05956](#) [quant-ph].
- S. Shakya, S. Kumar and M. Goswami, "[Deep Learning Algorithm for Satellite Imaging Based Cyclone Detection](#)" in IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing, vol. 13, pp. 827-839, 2020. **[contributions accredited in acknowledgements]**
- Presented a poster on "**Illuminating the pair-instability supernova mass gap**" at Canadian Astronomical Society (CASCA) 2021 AGM and Canadian Student and Postdoc Conference on Gravity 2021 (CSPCG)
- Presented a poster on "**Image Interpolation and Processing**" at the SPARK poster presentation session, 2018.

Upcoming:

- A paper on '*Sine Gordon dynamics of elongated Bose-Einstein condensates*'. The paper is in review process before submission.
- A paper on '*Fallback histories of collapsars above the pair-instability supernova mass gap and kilonova signatures*'.

»»» Achievements and Awards

May' 21	Perimeter Ph.D. award	Perimeter Institute
	<p>» In summer 21, I had the honor of receiving a resident Ph.D. status at Perimeter Institute and a Ph.D. award of \$3000 per year</p>	
Feb' 21	Globalink Graduate Fellowship	MITACS, Canada
	<p>» In winter '21, I was graciously awarded a fellowship of the value \$ 15,000 by MITACS, Canada to assist me in my graduate studies in Canada.</p>	
Oct' 20	International Doctoral Tuition Scholarship	University of Guelph
	<p>» In fall '21, I was awarded a tuition scholarship by the University of Guelph of the value \$ 12,500 per year, awarded to incoming graduate students with excellent undergraduate performance.</p>	
May '19	Globalink Research Internship Award	MITACS, Canada
	<p>» In summer '19, I bagged the prestigious MITACS research internship position at McMaster University, Canada with an award amounting to \$ 7000</p>	
Jan'18	NGPE Topper	IAPT
	<p>» In winter '17, I attained the position of the National Topper (top 1% all India) from state of Goa in National Graduate Physics Examination held by the Indian Association of Physics Teachers.</p>	
May'17	Sub-Coordinator	SEDS Celestia
	<p>» In the year of 2017, to my great delight, I acted as a Sub-Coordinator of SEDS Celestia (The Astronomy and Astrophysics club of BITS Goa)</p>	
Aug'17-May'18	NGO publicity head	Nirmaan, BITS Goa
	<p>» I held the position of publicity head of Nirmaan (Student run NGO of BITS Goa) and implemented plans to increase public relations via social media interactions. The philanthropic works were regularly published on various social media accounts, local newspapers and blogs.</p>	
Oct'13	Award	
	<p>» I was awarded as the "Best Graduating Student of the Year" in 2013 in secondary school</p>	

»»» Teaching Endeavours

Jan'21-April' 21	Computational Methods in Material Science	University of Guelph
	<p>» I have worked as a Teaching Assistant under the supervision of Dr. Alexandros Gezerlis for a course on computational physics</p>	
Aug'18-May'19	Astronomy and Astrophysics	BITS Goa
	<p>» I have worked as a Teaching Assistant for the course of Statistical Mechanics and Astronomy and Astrophysics at BITS Goa with a performance review of EXCELLENT.</p>	
Sep'20-Oct'20	Astronomy and Astrophysics	Naxxatra
	<p>» I delivered lectures on the topics of stellar evolution, gravitational lensing, gravitational waves and introduction to python and julia as a part of equinox program organised by Naxxatra. The recordings can be accessed here</p>	
Sep'20	Mini Astro Series Workshop	PAE,BOSEX and SW
	<p>» I delivered lectures on the topics of stellar evolution and introduction to python and julia as a part of the mini-astro workshop. The recordings can be accessed here</p>	

»» Technical Knowledge

- Good Knowledge of programming languages and mathematical tools like C, C++, Python, Java, MATLAB, Mathematica, Julia, Prolog, MySQL and Verilog.
- Good Knowledge of two most widely used operating systems (Windows and Linux).

»» Other Personal Details

- Languages Known- English, Hindi, Bengali.
- Hobbies – Reading fantasy novels, watching sitcoms and listening to music