CSTUP – Summer Research Fellowship Program (CSTUP - SRFP) : 2022-23

Council of Science & Technology, U.P. offers summer research fellowships for two months to meritorious students of M.Sc. 1st& 2nd year to work with renowned Professors/Scientists of premier institutes of India. Fellowship is awarded to the students who are studying Physical Sciences, Chemical Sciences, Life Sciences, Mathematical Sciences and Agriculture in Uttar Pradesh. Students are selected based on their merit in 10th, 12th& B.Sc. and fellowship of Rs.25000.00 p.m. (Total Rs. 50,000.00) is given to the selected students. This is a unique opportunity for Science students of Uttar Pradesh to visit and learn about cutting edge Research & Development in the field of Science& Technology.

Timeline for CSTUP – SRFP: 2022-23 was as follows: -

S. No.	**Activity**	**Date/Duration**
1.	Advertisement	13.04.2022
2.	Online Applications received	13.04.2022 to 03.05.2022
3.	Merit Announcement	13.05.2022
4.	Summer Research Training	May, 2022 to October, 2022

CSTUP - Summer Research Fellows 2022-23

S.No.	Candidate's Name	Father's Name	Parent Institute	Supervisor & Alloted Institute	Training Period
1	Abdul Hameed	Mr. Varis Ali	SVBPUAT, Meerut	Dr. Chandra Bhanu, ICAR-IIFSR, Meerut	01-08-2022 to 30-09-2022
2	Abhinav Sharma	Mr. Uday Raj Sharma	BHU, Varanasi	Dr. Anand Singh, Geophysics IIT-Bombay, Mumbai	15-06-2022 to 15-08-2022
3	Abhishek Maurya	Mr. Ramsajeevan Maurya	University of Lucknow, Lucknow	Dr. Ratan Kar BSIP-Lucknow	05-07-2022 to 15-09-2022
4	Aditya Yadav	Mr. Ranvijay	Ewing Christian College, Prayagraj	Dr. S. Talukder, Electrical Engg. & Computer Sci., IISER-Bhopal	01-06-2022 to 15-07-2022
5	Akanksha Pathak	Mr. Mahabir Prasad Pathak	Ewing Christian College, Prayagraj	Dr. D. Ghosh, Material Sci. & Engg., IIT-Delhi	25-05-2022 to 10-08-2022
6	Aman Shukla	Mr. Anil Shukla	PPNPG College, Kanpur	Dr. A. Sadhanala, CeNSE, IISc-Bangalore	21-06-2022 to 26-08-2022
7	Amisha Rastogi	Mr. Sanjay Rastogi	GLA University, Mathura	Dr. A.K. Trivedi, Cancer Biology, CSIR-CDRI	20-06-2022 to 19-08-2022
8	Amisha Singh	Dr. Vinay Kumar	CCS University, Meerut	Dr. C.K. Jaggi, University of Delhi	04-07-2022 to 17-09-2022
9	Anshuman Tripathi	Ashok Kumar Tripathi	BBAU, Lucknow	Dr. S.P. Singh, Mathematics & Statistics IIT Kanpur, Kanpur	30-06-2022 to 30-08-2022
10	Ayush Shukla	Mr. Anil Shukla	PPNPG College, Kanpur	Dr. S.N. Tripathi, Civil Engg. IIT Kanpur, Kanpur	20-06-2022 to 28-09-2022
11	Balram Chauhan	Mr. Omvir Singh	CCS University, Meerut	Dr. J.C. Bansal, South Asian University, New-Delhi	04-07-2022 to 17-09-2022
12	Deeksha Mishra	Mr. Shrikat Mishra	BHU, Varanasi	Dr. Anand Singh, Geophysics IIT-Bombay, Mumbai	15-06-2022 to 15-08-2022
13	Deeksha Rai	Mr. Praduman Rai	BHU, Varanasi	Dr. Durgesh Tripathi, IUCAA-Pune	30-06-2022 to 22-08-2022
14	Diksha Rai	Mr. Harinarayan Rai	MGKVP, Varanasi	Dr. Nirpeksh Kumar, Statistics BHU, Varanasi	22-06-2022 to 22-08-2022
15	Gargi Verma	Mr. Prem Chandra Verma	PPNPG College, Kanpur	Dr. Pankaj Jain, IIT Kanpur, Kanpur	24-06-2022 to 31-08-2022
16	Harsh Vardhan	Mr. H.N. Tiwari	University of Lucknow	Dr. A.K. Choubey, Applied Geophysics, IIT(ISM), Dhanbad	22-07-2022 to 21-10-2022
17	Khagendra Sharma	Mr. Sita Ram Sharma	Dayalbagh Educational Institute, Agra	Dr. P. Bandyopadhyay, IPR-Gandhinagar	19-07-2022 to 17-09-2022
18	Manukriti Chauhan	Mr. Chanchal Kumar Chauhan	BHU, Varanasi	Dr. Sanjay Kr. Dey, Structural Biology Dr. BRACBR, University of Delhi	15-06-2022 to 15-08-2022
19	Mayank Kumar	Ms. Rajesh Kumar	University of Allahabad, Prayagraj	Dr. Mousumi Das, IIA-Banglore	20-06-2022 to 19-08-2022
20	Mohd Shahbaz	Mr. Mohd. Shafi	Aligarh Muslim University, Aligarh	Dr. Ashok Gupta, IIT-BHU, Varanasi	18-07-2022 to 16-09-2022
21	Nitya Gupta	Mr. Atul Gupta	Dayalbagh Educational Institute, Agra	Dr. Nirat Ray, Mater. Sci. & Engg., IIT-Delhi	16-06-2022 to 16-08-2022
22	Priyanshi gupta	Mr. Mukesh Gupta	Dayalbagh Educational Institute, Agra	Dr. P. Bandyopadhyay IPR-Gandhinagar	18-07-2022 to 17-09-2022
23	Ram Pravesh Pandey	Mr. Banshidhar Pandey	CMP Degree College, Prayagraj	Dr. Nidhi Mishra, IIIT-Allahabad	16-06-2022 to 09-09-2022
24	Sachin Chauhan	Mr. Praveen Singh Chauhan	Sharda University, Greater Noida	Dr. K.K. Maurya, CSIR-NPL, New Delhi	28-07-2022 to 14-09-2022
25	Shivansh Tiwari	Mr. Prabhakar Tiwary	BHU, Varanasi	Dr. S. Dhakate, Advanced Carbon Product & Meterology, CSIR-NPL, New Delhi	20-06-2022 to 20-08-2022
26	Sohal Yadav	Mr. Moti Singh	Aligarh Muslim University, Aligarh	Dr. D.N. Pandey, IIT-Roorkee	09-07-2022 to 08-09-2022
27	Utkasrh Pratap Singh	Mr. Nagendra Pratap Singh	BHU, Varanasi	Dr. Anand Singh, Geophysics IIT-Bombay	15-06-2022 to 15-08-2022
28	Yeshika Tanwar	Mr. Naresh Kumar	Meerut College, Meerut	Dr. Sagar Sengupta, NII, New-Delhi	18-07-2022 to 26-09-2022

CSTUP-Summer Research Fellowship Programme 2022-23

Candidate's Name: Abdul Hameed

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Name of the Institute where candidate is pursuing M. Sc.: Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut 250110 (U.P)

Allotted Department and Institute for Summer Research Training; Divison of Organic Agriculture system (OAS) of ICAR- Indian Institute of Farming System Research, Modipuram, Meerut

Training Period: 01/08/2022 **to** 30/09/2022

Name of Supervisor/Guide: Dr. Chandra Bhanu, Principal Scientist

Title and conclusion of the work carried out:
Title – Natural Farming
Conclusion: The experience of studying, field observations during the period gives the following conclusion suggests that natural farming not only works from an agronomic point of view, but also brings a variety of social and economic benefits. It is considered as a cost- effective farming practice with scope for raising employment and rural development. Natural Farming offers a solution to various problems, such as food insecurity, farmers' distress, and health problems arising due to pesticide and fertilizer residue in food and water, global warming, climate change and natural calamities. It also has the potential to generate employment, thereby stemming the migration of rural youth. Natural Farming, as the name suggests, is the art, practice and, increasingly, the science of working with nature to achieve much more with less.
The objective of natural farming, said the government's 2021 Economic Survey, is elimination of chemical fertilizers and pesticides, the indiscriminate use of which pollutes the environment, and to promote "**good agronomic practices**", which means using science and technology to manage crops.

Student's remark on how this training will be useful in his/her studies and career:

I would like to thank the CST team wholeheartedly for giving me this kind of opportunity. I got a lot of help from all of you during my training program. For this I am grateful thanks to you sir.

I take this opportunity to express my depth of respect and heartful gratitude to my **supervisor Dr. Chandra Bhanu** sir for their constant inspiration, helpful discussions, co-operation and valuable guidance at each step during the training program.

I am extremely grateful to **Dr. K.G. Yadav** (**Advisor** Master program, **SVPUAT,** Meerut) for providing me the necessary facilities during my training program.

Being an as Agronomy student, we should have objective to produce the crop in a sustainable manner. Among different method of cultivation of crop, Natural Farming is one of them to produce the crop without deteriorate the quality of ecosystem. Sir I would like also told to you

our master thesis trial is also going on the topic of **"Effect of organic, inorganic and Biofertilizer on the performance of Basmati rice in western U.P."**

It contains **3 Treatment** of Natural farming, So I hope this training will also further help in our research and development activities in future.

Signature of the Candidate

CSTUP-Summer Research Fellowship Programme 2022-23

(Affix your recent colour photograph)

Candidate's Name: Abhinav Sharma

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Name of the Institute where candidate is pursuing M.Sc.: Banaras Hindu University

Allotted Department and Institute for Summer Research Training: Department of Earth Sciences, Indian Institute of Technology Bombay

Training Period: 15 June 2022 **to** 15 August 2022

Name of Supervisor/Guide: Dr. Anand Singh

Title and conclusion of the work carried out (Maximum 300 words):

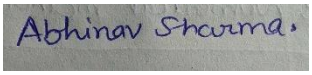
Project Title: "Synthetic seismogram generation through forward modelling and their analysis for various geological formations."

Forward modeling is the use of a model to simulate an outcome. Modeling of seismic data is a technique that creates synthetic seismic models from known geological information. This can be in 1D, 2D or 3D and is often created to simulate the result of a seismic survey and more specifically to estimate the expected seismic expression of a geological feature. Forward modelling is most frequently used to validate structural and stratigraphic interpretations. To confirm the initial interpretation, for instance, synthetic seismic sections obtained from forward modelling might be compared to stacked sections.

Prior to the gathering of field seismic data, the we can clarify the potential utility of the seismic technique using forward seismic modelling, which also makes it easier to interpret seismic data once it has been collected. Usually, seismic modelling is carried out both before and after seismic field data collection. In addition to helping with acquisition programme planning, it is crucial for interpretation since it enables correlation between the seen reflections and geology interfaces and confirms the seismic responses of inferred anomalies.

In this project I have developed some models and analyzed the output of that model. These outputs can be used to simulate the recorded seismogram from a seismic survey and to estimate the seismic expression of a geological feature.

Student's remark on how this training will be useful in his/her studies and career (Maximum 100 words): This internship gave me some hands-on experiences. I feel that through this internship I have developed some key skills that I can't get in a classroom. Skills such as MATLAB programming, research paper studying, learnt to deal with deadlines. This will be very useful in my job interview and other future references.



Signature of the Candidate:

CSTUP-Summer Research Fellowship Programme 2022-23

Candidate's Name: Abhishek Maurya

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Name of the Institute where candidate is pursuing M.Sc.: Department of Geology, University of Lucknow, Lucknow

Allotted Department and Institute for Summer Research Training: Birbal Sahni Institute of Palaeosciences (BSIP), Lucknow

Training Period: 05/07/2022 **to** 15/09/2022

Name of Supervisor/Guide: Dr. Ratan Kar

Title and conclusion of the work carried out:

USE OF STABLE ISOTOPE $\delta^{13}C$ FOR CLIMATIC INTERPRETATION OF CHOPTA-TUNGNATH, RUDRAPRAYAG DISTRICT, UTTARAKHAND

This internship focuses on the interpretation of vegetation and climatic changes in past with the help of preserved sediments of the area Chopta- Tungnath, Rudraprayag District, Uttarakhand with the use of Stable Isotope $\delta^{13}C$ as the region contain immense record of past climate and environment specially of Quaternary Period. Stable Isotope do not decay as they possess nuclear stability. As C^{13} is present in vegetation and different type of vegetation possess a fix range of $\delta\ ^{13}C$ value. During the training, sediments were collected from the study area and they were processed to remove inorganic particles from the samples by HCl treatment. Then samples were analyzed in Elemental Analyzer- Isotope Mass Ratio Spectrometer (EA-IRMS). The data obtained were analyzed and calculated. From this, the $\delta\ ^{13}C$ shows a range of (-26.0 ‰ to -28.4‰) which suggest C-3 type of vegetation of the area which includes shrubs and trees typical of cooler moist temperate type of climate.

Student's remark on how this training will be useful in his/her studies and career:

The training will be very much helpful for my future endeavors as it added my practical knowledge of paleoclimatic study and the use of isotopic studies, their relevance and applications in various aspects of geology and climatic studies and about the Quaternary climate. This will be very helpful for future research work in the field of geology as isotopic data is needed for various interpretation of various areas. Besides this, during the training I got a close observation, how research work is carried out in institutes and different other skills which will be helpful for carrying out professional work in future. Being a Masters student in Geology, it was a skill which will definitely help me in my future career.

Signature of the Candidate

CSTUP-Summer Research Fellowship Programme 2022-23

Candidate's Name: Aditya Yadav

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Name of the Institute where candidate is pursuing M.Sc.: Ewing Christian College,

University Of Allahabad, Prayagraj - 211003

Allotted Department and Institute for Summer: Electrical engineering and computer science, IISER Bhopal

Training Period: 01/06/2022 **to** 15/07/2022

Name of Supervisor/Guide: Dr. Santanu Talukder

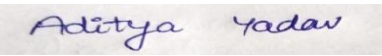
Title and conclusion of the work carried out (Maximum 300 words):

Title: Electrolithography

Conclusion: Electrolithography is a new lithography technique based on electro-migration driven material transport for drawing patterns at nanometer scales.

If Cr thin film is deposited on an insulating substrate, and high electric current is produced between probes situated sufficiently far away from each other and, in the presence of air, results in liquefaction of material below the cathode, the molten Cr compound flows radially outward from the cathode probe creating a ring shaped pattern around the static probe . If the probe is moved on a linear or curved path, while keeping the sample at electrical ground and the tip at a negative bias, the radial symmetry of the flow breaks and the liquid material flows away from the path on either side of the traversing probe creating a pattern along the way. In this way, desired pattern is obtained using electromigration.

Student's remark on how this training will be useful in his/her studies and career (Maximum 100 words): _ During summer research training I have gathered knowledge regarding electrical characterization techniques and tried to learn how we can draw patterns at nanometer or micrometer scales . Apart from that I have tried to learn how to take I-V characterization of given samples using SMU (source measure unit). The summer training helped me to gain some knowledge in the field of nanotechnology and fabrication.



Signature of the Candidate

CSTUP-Summer Research Fellowship Programme 2022-23

(Affix your recent color photograph)

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Name of the Institute where candidate is pursuing M.Sc.: Ewing Christian College, University Of Allahabad, Prayagraj - 211003

Allotted Department and Institute for Summer Research Training: Department Of Materials Science & Engineering, IIT Delhi - 110016

Training Period: 25-05-2022 **to** 10-08-2022

Name of Supervisor/Guide: Dr. Dibyajyoti Ghosh

Title and conclusion of the work carried out (Maximum 300 words):

Title: Layered (2D) Halide Perovskite (Materials for Next Generation Optoelectronics Devices) Band-gap engineering, impact of spacer cations on the exciton binding energy and modulation of quantum and dielectric confinement of layered halide perovskite

Conclusion:

The general crystal structure of 2D halide perovskite is $\mathbf{A'A_{n-1}B_nX_{3n+1}}$; where A' represents the bulky organic spacer cations (monovalent or divalent) forming a monolayer or a bilayer connecting to the inorganic 2D sheets whereas A represents small organic cations. B and X represents the metal ions and halide anions respectively. Here, n represents the thickness of the inorganic sheet that can be tuned.

1. For Ruddlesdon Popper phase layered perovskite, the optical bandgap decreases as the thickness of inorganic layer increases. The energy band gap for $PEA_2A_{1.5}Pb_{2.5}Br_{8.5}$ where PEA = Phenylethylamine, A = MA (methylammonium) perovskite decreases with increased layer thickness from 3.07 eV (n=1) to 2.48 eV (n=5).
2. The bulky organic spacer cations form the interlayer connecting inorganic sheets act as a high dielectric barrier determining electrostatic force for excitons. This huge dielectric contrast leads to high Exciton Binding Energy (E_b). Organic spacer of low dielectric constant should be preferred.

3. The Quantum confinement is reduced by increasing the inorganic layer's thickness (n). Reduced quantum confinement leads to systemic decrease of energy band gap of the layered halide perovskite and increases charge transport efficiency.
4. The strong dielectric contrast between the organic and inorganic layers reduces the material's efficiency. Utilizing an organic spacer with a high dielectric constant and low exciton binding energy, the dielectric confinement can be significantly reduced. Such low dielectric confined 2D perovskites show good carrier extraction efficiency and humid resistance in comparison to conventional 2D perovskite.

Student's remark on how this training will be useful in his/her studies and career (Maximum 100 words):

Materials having optoelectronics properties are in high demand especially as the renewable solar energy sources. Perovskite materials have shown tremendous potential in Photovoltaics, also known as the new rising stars in the Thin-Film Photovoltaics. This summer training on the analysis of 2D Perovskite materials helped me in understanding the optoelectronic properties required to prepare a stable and more efficient material. It increases my grasp in the field of Solar Photovoltaic, Quantum mechanics, Optoelectronics. This training provided me the knowledge of DFT technique which we use in Materials science for extracting different properties of materials.

Signature of the Candidate 

CSTUP-Summer Research Fellowship Programme 2022-23

Candidate's Name: Aman Shukla

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Name of the Institute where the candidate is pursuing M.Sc.: Pandit Prithi Nath College, Kanpur, affiliated to Chhatrapati Shahu Ji Maharaj University, Kanpur, Uttar Pradesh, India.

Allotted Department and Institute for Summer Research Training: Centre for Nano Science and Engineering (CeNSE), Indian Institute of Science, Bangalore, 560012, India.

Training Period: 21.06.2022 **to** 26.08.2022

Name of Supervisor/Guide: Prof. Aditya Sadhanala

Title and conclusion of the work carried out (Maximum 300 words):

Fabrication and Characterisation of Perovskite Solar Cells and Light Emitting Diodes

The next-generation perovskite materials are promising candidates for highly efficient optoelectronic applications owing to their superior optical properties, such as high absorption coefficient, long charge carrier lifetimes, high defect tolerance, etc., which originate from the characteristic chemical bonding nature, crystal structure, and electronic band structure of metal halide perovskites. Herein this project, perovskite solar cells, and LEDs are fabricated and characterized. Firstly, pinhole-free uniform surfaces of different layers of device architecture, i.e., a cathode layer, electron transporting layer, active layer, a hole transporting layer, and the anode layer, are achieved separately by optimizing spin coating parameters, annealing temperature, and timings. These layers are characterized by using X-ray diffraction, UV visible spectroscopy, Atomic Force Microscopy, and Field Emission Scanning Electron Microscopy. For solar cell devices, tin oxide (SnO_2) is used as the electron transporting material, which is deposited on the

ITO substrate using a spin coating technique at 3000 rpm for 60 seconds, followed by annealing at 150°C for 1 hour. Triple cation lead-based perovskite is deposited as an active layer onto the tin oxide layer, followed by a coating of Spiro-OMeTAD as hole transporting material. For LED fabrication, zinc oxide is used as ETL, and TFB is used as HTL. Different combinations of perovskite layers are tried to be coated for LEDs, out of these combinations, the FABr + PEABr+ $PbBr_2$ batch with air quenching and annealing shows better results. To serve the purpose of the anode, the gold coating is done by using the thermal evaporation technique. JV measurements of the fabricated devices are done by using the solar simulator and Keithley instruments. Out of the several batches, the maximum efficiency of 22% is achieved. To enhance the efficiencies furthermore, several novel fabricating strategies like defect passivation, double layer coating, etc. are required to be applied and analyzed. Conclusively, there is a wide scope of investigation in the field of "***Perovskite Optoelectronics***", which keeps on inspiring and dragging the interest of the scientific community worldwide.

Student's remark on how this training will be useful in his/her studies and career (Maximum 100 words):

As a graduate student of Chemistry with a specialization in material science, I am exposed to various theoretical concepts related to materials, but for complete understanding, practical experience is highly necessary. This training gifted me with rewarding hands-on expertise in various sophisticated techniques for fabricating and characterizing perovskite solar cells and LEDs. It provided me with refined insights into surface optimization and compatibility establishment in device architecture. Although it was a short-term training of two months, still it has given me such a wonderful opportunity to work at the prestigious Indian Institute of Science, which facilitated me to have a glimpse of active research. Overall, it has helped me in shaping my research interest toward perovskites. By virtue of the learnings gained there, I am confident and motivated enough to pursue research on perovskite optoelectronics and fuel the ultimate "Lab to Street" vision of the scientific community.

(AMAN SHUKLA)
Signature of the Candidate

CSTUP-Summer Research Fellowship Programme 2022-23

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Name of the Institute where candidate is pursuing M.Sc.: GLA University, Mathura, U.P

Allotted Department and Institute for Summer Research Training: CSIR- Central Drug Research Institute, Lucknow; Cancer Biology Department

Training Period: 20/06/2022 **to** 19/08/2022

Name of Supervisor/Guide: Dr. Arun Kumar Trivedi (Principal Scientist)

Title and conclusion of the work carried out (Maximum 300 words):

Title: Mammalian Cell Culture & Basic Laboratory Techniques

Conclusion: I have generally learnt how to handle or work with mammalian cell lines, such as HEK293 (Human Embryonic Kidney), and have dealt with cancer cell lines, such as MCF7, MDAMB231 etc. during my training. I have extracted DNA, RNA, and protein from different cells, and I have then processed them using the Bradford assay, western blotting, and SDS-PAGE analysis. To assess cell viability, proliferation, and cytotoxicity, carry out the MTT Assay as well. Using different cell lines, I also gained knowledge of transfection and electroporation procedures. Additionally, I've learned how to use a beta galactosidase/X-gal test to determine whether cancer cells are senescent or ageing. I have now mastered some fundamental IHC (Immunohistochemistry)

procedures, such as how to cut a tissue sample and process it in a wax block, followed by the preparation of a slide and study it under the microscope.

Student's remark on how this training will be useful in his/her studies and career (Maximum 100 words):

I want to thank you for providing me this great opportunity and overseeing my work as my training time has come to a close. I've learned a lot over this training session. I want to express my gratitude for providing me this chance. This brief training is really beneficial to me since it will advance my career in oncology and prepare me for my future studies. I value the guiding approach. I appreciate your help in making learning all of these new things so simple. I'm appreciative that my trainer is such a seasoned expert. Additionally, I want to continue working in the same line of work that this training really assisted me with.

Signature of the Candidate

CSTUP-Summer Research Fellowship Programme 2022-23

Candidate's Name: AMISHA SINGH

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Name of the Institute where candidate is pursuing M.Sc.: DEPARTMENT OF MATHEMATICS, CHAUDHARY CHARAN SINGH UNIVERSITY (CAMPUS), MEERUT

Allotted Department and Institute for Summer Research Training: DEPARTMENT OF OPERATION RESEARCH, UNIVERSITY OF DELHI, NEW DELHI

Training Period: 04/07/2022 **to** 17/09/2022

Name of Supervisor/Guide: Prof. CHANDRA K. JAGGI

Title and conclusion of the work carried out (Maximum 300 words):

Title: "SUPPLY CHAIN RESILIENCE"

During the duration of the fellowship, I studied and solved various research paper published in International Journals on my topic Supply Chain Resilience, I also presented two papers in front of research scholars and my supervisor, the title of the papers were 'Review of Quantitative Methods for Supply Chain Resilience Analysis' and 'Resilience of on-time delivery to capacity and material

shortages' respectively. I deeply studied the paper titled 'A digital supply chain twin for managing the disruption risks and Resilience in the era of industry 4.0' in this I got to know about predictive and reactive decisions to utilize the advantages of SC visualization and real time disruption data. I also did Systematic Literature Review (SLR) of 20 papers on the same topic. Overall in this fellowship I gained knowledge about Supply Chain Resilience and ways to develop models to reduce the disruption in Supply Chain and I am also writing a research paper of my own in this area.

Student's remark on how this training will be useful in his/her studies and career

(Maximum 100 words):

This training helped me a lot in many ways. I got to know the process of publishing your own research paper from scratch and how to develop your own theory after reading various papers already published and then to carry your own research on the topic. By presenting papers in front of supervisor I gained confidence and experience which will be helpful in future. I want to pursue PhD after my masters so this was an enriching experience for me.

Signature of the Candidate

CSTUP-Summer Research Fellowship Programme 2022-23

Candidate's Name: ANSHUMAN TRIPATHI

Father's Name: ASHOK KUMAR TRIPATHI

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(Affix your recent color photograph)

Residential Address:

VILLAGE GARHI KHAS POST SARAWAN DISTRICT RAEBARELI, UTTAR PRADESH

Name of the Institute where candidate is pursuing M.Sc.:

BABA SAHEB BHIMRAO AMBEDKAR UNIVERSITY, A CENTRAL UNIVERSITY, VIDYA VIHAR, LUCKNOW

Allotted Department and Institute for Summer Research Training:

DEPARTMENT OF MATHEMATICS AND STATISTICS, INDIAN INSTITUTE OF TECHNOLOGY, KANPUR

Training Period: 30/06/2022 to 30 AUGUST 2022

Name of Supervisor/Guide:

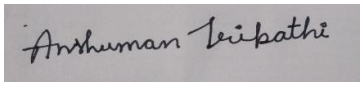
DR. SATYA PRAKASH SINGH, ASSISTANT PROFESSOR, DEPARTMENT OF MATHEMATICS AND STATISTICS, IIT KANPUR

Title and conclusion of the work carried out (Maximum 300 words): ___PROJECT TITLE:

DESIGN OF STEPPED WEDGE CLUSTER RANDOMIZED TRIALS AND ITS ANALYSIS

Stepped Wedge design is particular type of crossover randomized control trials (CRTs).A crossover designs are less commonly used in CRTs. A crossover CRT requires fewer clusters than a parallel but may take twice as long to complete (since each cluster receives both the treatment and control interventions). If the intervention requires lengthy follow up period, then this might make a crossover design impractical. In a standard crossover design the order of interventions is randomized for each cluster and a time period (called the ``washout'' period) is included between the two interventions so that the first intervention does not affect the second. Analysis of a standard crossover design focuses on within-cluster comparisons using a paired t-test. A Stepped wedge design is a type of crossover design in which different clusters cross over (switch treatments) at different time points. In this design, the clusters crossover in one direction only - usually, from control to intervention. Initially, none of the clusters receive the intervention of interest. At subsequent time points, clusters initiate the intervention of interest and response to the intervention is measured. More than one cluster may start the intervention at a time point, but the time at which a cluster begins the intervention is randomized.

Student's remark on how this training will be useful in his/her studies and career (Maximum 100 words): I am glad to inform that I was able to participate in this program. I learned a lot in the direction of how the researcher works carried out by at the top level and what impacts it make in our daily life. These things broaden my thinking capacity and it was not as easy for me without this program. I would like to thank the 'Council of science and technology, Government of Uttar Pradesh' for providing opportunities its students and researchers to move forward in this direction. I found this program very useful in studies and further in career.

Signature of the Candidate 

CSTUP-Summer Research Fellowship Programme 2022-23

Candidate's Name: Ayush Shukla

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Name of the Institute where candidate is pursuing M.Sc.: P.P.N. (PG) College, CSJM University, Kanpur.

Allotted Department and Institute for Summer Research Training: Department of Civil Engineering, Indian Institute of Technology (IIT), Kanpur.

Training Period: 20/June/2022 **to** 28/September/2022

Name of Supervisor/Guide: Prof. Sachchida Nand Tripathi

Title and conclusion of the work carried out (Maximum 300 words):

Comparative Evaluation of Low-Cost PM Sensors Deployed in Kanpur City

This study shows that there is a variation in PM2.5 concentration at different sites within the city that covers an area of approximately 403 km2 . The maximum inter-sensor distance is 11.9 km between Naubasta Chauraha and NSI, with mean PM2.5 value 32.49 and 37.07µg/m3 respectively. However, the minimum intersensor distance is 1.1 km between Nehru Nagar and Jareeb Chowki with mean PM2.5 values 36.16 and 41.67µg/m3 respectively. Among the sensors, Jareeb Chowki site has recorded the highest mean PM2.5 concentration (41.67 µg/m3) whereas the Kanpur Zoo site has measured the lowest mean PM2.5 concentration, (30.36 µg/m3) during the study period.

This study shows that these variations might be due to traffic movement, stack emission and site-specific activities. Thus, it is found that different sources at each site affect the PM2.5 concentration and in order to cover wide range of sources of entire city, dense network of low-cost sensors are needed to install in nearby distance. The accuracy of the data collected by low-cost sensors is validated by government fixed reference monitors. The correlation value for these collocated sites ranges from 0.51 to 0.61 and the data trend between low-cost sensors and CAAQMS monitors followed the same pattern with difference in measured PM2.5 concentration.

Student's remark on how this training will be useful in his/her studies and career (Maximum 100 words):

First of all, I would like to thank UP-CST authority for providing such a wonderful opportunity for us. I was familiar with air pollution measurement techniques earlier but working on that was a very difficult thing to do. With the help of this internship program, I got the chance to work with one of the renowned professor of this field. This internship helped me in getting an exposure of research labs. The experience and knowledge that I gained here will help me in my Ph.D. programme.

Ayush Shukla

Signature of the Candidate

CSTUP-Summer Research Fellowship Programme 2022-23

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Name of the Institute where candidate is pursuing M.Sc.: DEPARTMENT OF MATHEMATICS, CHAUDHARY CHARAN SINGH UNIVERSITY (CAMPUS) , MEERUT

Allotted Department and Institute for Summer Research Training: DEPARTMENT OF MATHEMATICS, SOUTH ASIAN UNIVERSITY, NEW DELHI

Training Period: 04/07/2022 **to** 17/09/2022

Name of Supervisor/Guide: Prof. JAGDISH CHANDRA BANSAL

Title and conclusion of the work carried out (Maximum 300 words):

Title: "SWARM INTELLIGENCE & 3D PATH PLANNING FOR UAV BY POPULATION BASED ALGORITHMS".

In last two months, I studied various papers which are published in International Journals related to this topic and learnt about the versatility of Swarm Intelligence in present time in various defense and civilian purposes and the importance of 3D Path planning, benefits of Population based algorithms with compare to Single solution based algorithms. I have studied about various Population based algorithms of which these are mainly

- Grey Wolf Optimization Algorithm
- Differential Evolution
- Sine Cosine Algorithm

- Particle Swarm Optimization

I also studied the importance and path planning of UAV's in military combats, traffic and weather monitoring, search and rescue operations and at the time of natural disasters that how effectively they work and I am also writing a chapter which tells us about population based algorithms and their advantages and limitations in comparative way.

Student's remark on how this training will be useful in his/her studies and career (Maximum 100 words):

This internship helped me in many ways, in these two months I learned how to actually do research in mathematics (specially in Swarm Intelligence). How can we develop the new approaches by reading already published research paper and taking idea from them. It gave me confidence and experience which will be beneficial for me in future during my P.hd after my masters so this fellowship was a prosperous experience for me.

Balram Chauhan

Signature of the Candidate

CSTUP-Summer Research Fellowship Programme 2022-23

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Name of the Institute where candidate is pursuing M.Sc.:—- Department Of Geophysics,Banaras Hindu University 221005

Allotted Department and Institute for Summer Research Training:—- Department of Earth Science, Indian Institute of Technology, Bombay

Training Period: — 15 Jun2022_to_15Aug2022

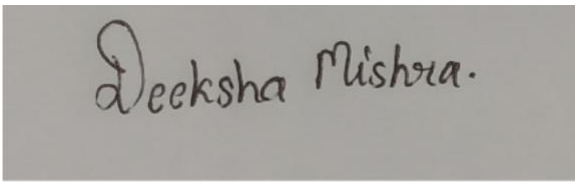
Name of Supervisor/Guide:— Dr Anand singh

Title and conclusion of the work carried out (Maximum 300 words):

My research topic is "Estimation of coda wave attenuation of Caribbean region". I have analyzed that the average Qc (coda wave attenuation) values of each zone against the matching frequency to examine the relationship between Qc and frequency. The attenuation of seismic waves is a reduction in amplitude or energy caused by scattering from heterogeneity or intrinsic absorption due to anelasticity or both. Despite the significant scatter, the computed Qc value increases with increasing frequncy for all four zones, showing a positive correlation with frequency.

Student's remark on how this training will be useful in his/her studies and career (Maximum 100 words): ——-

This training was very useful for my research work and an understanding about the seismological field. During the training period I met many professionals who did great work in seismology and by all my experience in this training program I can do further detailed analysis in other researches. This training program would be very helpful.



Signature of the Candidate

CSTUP-Summer Research Fellowship Programme 2022-23

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Name of the Institute where candidate is pursuing M.Sc.: Banaras Hindu University

Allotted Department and Institute for Summer Research Training: Inter-University Centre for Astronomy and Astrophysics, Pune

Training Period: 30-06-2022_to_22-08-2022

Name of Supervisor/Guide: Durgesh Tripathi

Title and conclusion of the work carried out (Maximum 300 words):

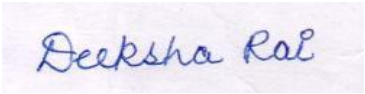
Title: To relate Extremely Ultra-Violet Intensity with photospheric magnetic field

In this project I tried to find a relationship between the Sun's EUV intensity and the photospheric magnetic field for six different EUV wavelengths. The EUV intensity of coronal loops depends upon the temperature and density which in turn depends upon the magnetic field. So, a well-defined relation between these two quantities can help us to understand the underlying mechanism of coronal heating. The data for the magnetic field and intensity has been obtained from NASA SDO AIA and HMI which is observing sun continuously since it's launch in year 2010. There are a lot of research going on to devise a theory to understand the mechanism of coronal heating. A relationship between intensity and magnetic field is found. The underlying parameters in the photospheric magnetic field and intensity relationship are found to be different for different wavelength. In order to get a more precise results more data sets needed to be analyzed. Coronal mass ejection is one of the major drivers of Space Weather which affects our satellites and hence communication system on earth. So, it is really important to understand the events happening at sun. These results can be helpful in understanding and giving constraints on coronal heating models.

Student's remark on how this training will be useful in his/her studies and career (Maximum 100 words):

The summer research fellowship program is one of the best opportunities that helped me to understand and learn a lot of things especially the methods and how the research is conducted. It helped me and motivated me to pursue research further. My guide helped me a lot to make me understand the very basics of research and make me learn a lot of new things. The topic I have chosen is related to solar physics and I am looking forward to continue this in my PhD. The exposure I have got through this program is really commendable as I got to learn about solar data analysis through IDL and SunPy programming languages. The experience I gained through this is going to help me and will serve me the best in my future researches. I am really grateful for getting selected under this wonderful program. Now I am looking forward for everything with a better sense of awareness. _____

Signature of the Candidate



CSTUP-Summer Research Fellowship Programme 2022-23

(Affix your recent colour photograph)

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Name of the Institute where candidate is pursuing M.Sc.: Mahatma Gandhi Kashi Vidyapith

Allotted Department and Institute for Summer Research Training: Department of statistic, Banaras Hindu University

Training Period: 22 June 2022 **to** 22 August 2022

Name of Supervisor/Guide: Dr. Nirpeksh Kumar

Title and conclusion of the work carried out (Maximum 300 words):

Project Title: -" Implementation of repetitive sampling in monitoring the process variability via control chart"

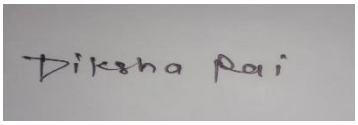
Control chart is useful in timely detecting the presence of assignable cause of variation and improving capability through the reduction of variability. It is mostly widely used SPC tool to detect the shift in the process. A typical control chart contains three lines: Central line (CL) represents the target or average value of the control chart corresponding to the in-control state of process. Two horizontal lines, namely upper control limit (UCL) and lower control limit (LCL), one on either side of the CL. Sample collected through simple random sampling are plotted on the control chart using a suitable parameter of our interest. If a charting statistic falls between UCL and LCL limits the process is declared as IC otherwise it will be OOC. To monitor the process variability here we consider the t_r-chart.

To assess the performance of the chart we have used the most prominent metric average run length (ARL) which is the expected number of run length until the first signal occur by the chart and average sample number (ASN) which is defined as the number of items we expect to sample.

In conclusion I got it that in order to enhance its ability to detect the changes in the process, the RS scheme has been used to the t_r-chart. The study shows that the t_4-chart with RS Outperforms the t_1-chart with RS in both improvement and deterioration cases. Based on the findings, we recommend the t_4-chart with RS over the standard exponential chart (t_1-chart) with RS because the former chart detects signal more quickly than the later.

Student's remark on how this training will be useful in his/her studies and career (Maximum 100 words):. I'm glad I was able to participate in this programme. I just need to say that I really enjoyed being in this program. This program was a good way for me to learning computing programming and analysis to some research paper and also how to write a paper with some points keep in mind such as correct spelling, punctuation and grammar etc. I learned more about myself. I got to meet wonderful people and I feel great because I have made a great impact in life. Keep these programs running for as long as possible because everyone needs to have this experience and share it with others.

Signature of the Candidate:



CSTUP-Summer Research Fellowship Programme 2022-23

Candidate's Name: Gargi Verma

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Name of the Institute where candidate is pursuing M.Sc.: Pandit Prithi Nath (P.G.) College, 96/12, Mahatma Gandhi Marg, Kanpur, 208001

Allotted Department and Institute for Summer Research Training: Department of Space Science, Indian Institute of Technology, Kanpur

Training Period: 24/06/2022 **to** 31/08/2022

Name of Supervisor/Guide: Prof. Pankaj Jain

Title and conclusion of the work carried out (Maximum 300 words):

Title: - Reconstruction of Extensive Air Shower

Conclusion: - In this project, a literature survey is carried out on the development of the extensive air shower in the atmosphere during the passage of primary cosmic rays and learned the shower arrival direction and parameters reconstruction procedures. The primary cosmic rays undergo a cascade of interactions during their passage through the atmosphere and produce a sizable air shower. We frequently use particle detectors on the ground to record the signal from the secondary particles. Reconstruction procedures are used to reconstruct shower direction and parameters. With the aid of in-depth simulations, we can estimate the characteristics of the primary cosmic rays from the shower parameters. The arrival direction is measured from the arrival time information from each detector, using the least-square minimization method. Shower features, such as shower size (N), shower age (s), and shower core (Xc, Yc), are reconstructed by fitting the observed particle density with the NKG lateral distribution function (LDF) using a log-likelihood method. A few direction reconstruction exercises for ideal and simple cases are done analytically. The reconstruction of shower direction and parameters for actual data involves optimizing the non-linear equation via detailed and suitable optimization algorithms, which is the motivation for future work.

Student's remark on how this training will be useful in his/her studies and career (Maximum 100 words): First of all, this is a once in a lifetime opportunity of me to understand something and work on it which is out of my regular university syllabus. This training and project helped me a lot in getting the inner and clearer picture of how the research work is done and how my topic of interest is a very useful for the betterment of science and future research works. While interacting with the guide, I really felt the need of more hard work, out of the box thinking and precise knowledge of the wider picture as well as the minute details. It helped me developing the basics of space science. The regular presentations and simulations helped me understanding the different aspects all at once and gave me confidence to speak in front of crowd.

Signature of the Candidate: -

CSTUP-Summer Research Fellowship Programme 2022-23

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Name of the Institute where candidate is pursuing M.Sc. - Institute of Hydrocarbon, Energy and Geo-Resources, ONGC Center for Advanced Studies, University of Lucknow.

Allotted Department and Institute for Summer Research Training: Department of Applied Geophysics, Indian Institute of Technology (Indian School of Mines), Dhanbad

Training Period: 22/07/2022 **to** 21/10/2022 (Including leave for final year examinations)

Name of Supervisor/Guide: Prof. Anil K. Chaubey

Title and conclusion of the work carried out:

SEISMIC ATTRIBUTES FOR IDENTIFICATION OF BOTTOM SIMULATING REFLECTOR AND GAS HYDRATES IN KRISHNA – GODAVARI BASIN.

The Internship focuses on the identification of Bottom Simulating Reflector (BSR) which is the most common and important attribute used for the identification of gas hydrates. The BSR is an indication of a physical boundary between the upper gas-hydrate bearing sediments and the lower non-bearing sediments. During the training different geophysical indicators for characterization of BSR were learnt, synthesis and processing of seismic data using SESISMIC UNIX as well as SEISEE was done, which all contributed for the characterization and interpretation of BSR in the Krishna – Godavari Basin. Gas hydrates are the potential energy resource for the future and their identification will enable to pave way for their exploration. The training concludes with the result that Krishna-Godavari basin has prominent BSR and Gas hydrates were also present in the Basin.

Student's remark on how this training will be useful in his/her studies and career:

The training will be very much helpful for my future endeavors as it will be adding to my practical knowledge of fuels and exploration. Being a masters in applied geology with specialization in petroleum geo-sciences, hands on with seismic data as well as seismic interpretation will enable me to have both geological as well as geophysical approach to the exploration and production of energy resources. Data handling is a must nowadays in oil and gas sector, and having prior knowledge will be beneficial .The training added to my skillset and also to my achievements as because of this training I got a chance to have real time data of KG basin and learnt how to process and make subsurface sections and also interpret them.

Signature of the Candidate

CSTUP-Summer Research Fellowship Programme 2022-23

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Name of the Institute where candidate is pursuing M.Sc.:

Dayalbagh Educational Institute, Dayalbagh, Agra

Allotted Department and Institute for Summer Research Training:

Dusty Plasma Section, Institute for Plasma Research, Gujarat

Training Period: 19/07/2022 **to** 17/09/2022

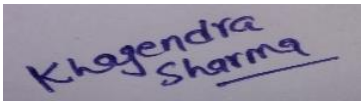
Name of Supervisor/Guide: Dr. Pintu Bandyopadhyay

Title and conclusion of the work carried out (Maximum 300 words): Characterization of Coulomb Crystals in Radio Frequency Discharges

Conclusion: We have verified Panchen's law of breakdown. We have successfully obtained the dusty plasma crystals in RF plasma discharge. These crystals can be sustained for many hours by maintaining the background plasma conditions. To confirm the crystalline structure of these crystals we determine their radial pair correlation function, bond order parameter, structural order parameter, Delaunay Triangulation and Voronoi diagrams of these crystals. We have also studied the variation of coulomb crystal parameters with change in pressure at different RF peak to peak voltage.

Student's remark on how this training will be useful in his/her studies and career (Maximum 100 words:

This project gave me wonderful chance of visiting a reputed institution, Institute for Plasma Research (IPR), Gujarat. In IPR, I explore myself in the field of Plasma and look how the giant plasma devices work. During this project, I learnt how to analyze data in python, how to use various electronic equipment, how research can be carried out in teams etc. These learnings will surely help me in the future.



Signature of the Candidate

CSTUP-Summer Research Fellowship Programme 2022-23

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Name of the Institute where candidate is pursuing M.Sc.: Banaras Hindu University

Allotted Department and Institute for Summer Research Training: Dr. B. R. Ambedkar Centre for Biomedical Research, University of Delhi

Training Period: 15/06/2022 **to** 15/08/2022

Name of Supervisor/Guide: Dr. Sanjay Kumar Dey

Title and conclusion of the work carried out (Maximum 300 words):

Title: Purification of SARS-CoV-2 ORF8

SARS-CoV-2 ORF8 is a rapidly evolving immune evasion protein. It is a 121-amino acid (aa) protein consisting of an N-terminal signal sequence followed by a predicted Ig-like fold. The crystal structure determined by X-ray crystallography reveals a ∼60-residue core with two dimerization interfaces unique to SARS-CoV-2 ORF8. The two interfaces are formed by covalent disulfide linkage through an N-terminal sequence and a separate noncovalent interface formed by another SARS-CoV-2−specific sequence, 73YIDI76. ORF8 protein of the SARS-CoV-2 downregulates MHC-1 evading immune system. If the ORF8 protein is targeted, The infection of SARS-CoV-2 can be controlled.

Due limitation of time period, I could only purify the protein. Further, the structural analysis of purified protein can be done using CD (Circular Dichroism) Spectroscopy, NMR, XRD, Cryo-EM, etc. The future perspective is to understand the rapid evolution of ORF8, its contributions to COVID-19 pathogenesis, and the potential for its neutralization by antibodies by structural analysis.

Student's remark on how this training will be useful in his/her studies and career (Maximum 100 words):

This training has been very helpful in shaping my career. As I aim to establish a successful lab in the future, it is very important to gain experience from various labs and expand my network of known individuals in a similar field. I gained hands-on experience in the purification of membrane protein and handling a cell culture laboratory. After performing them, I could relate to the techniques more efficiently and understand their working principle and uses. I used to attend lab meetings that taught me how to design projects and troubleshoot problems.

Signature of the Candidate

CSTUP-Summer Research Fellowship Programme 2022-23

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Name of the Institute where candidate is pursuing M.Sc.: University of Allahabad (Main Campus), Prayagraj

Allotted Department and Institute for Summer Research Training: Indian Institute of Astrophysics, Bangalore.

Training Period: 19 June 2022 to 29 August 2022

Name of Supervisor/Guide: Prof. Mousumi Das

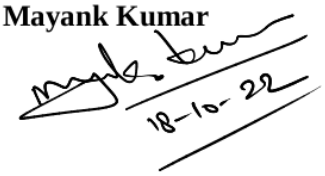
Title and conclusion of the work carried out (Maximum 300 words):

Galaxy mergers are one of the brightest sources of electromagnetic radiation in our universe. Most of the emission arises from the nuclear activity of the merging galaxies. As the galaxies merge their nuclei come closer together and if their supermassive black holes (SMBH) start accreting mass then they give out enormous amounts of energy. Such accreting SMBHs are called AGN. In galaxy mergers, in some rare cases both nuclei may host AGN, and such systems are called dual AGN. Dual AGN are known to emit large amounts of energy at X-ray wavelengths. In this project we examined the X-ray emission from a sample of dual AGN that have archival data. We used the data from the NASA Chandra telescope data archive. We downloaded the data, analyse using the CIAO software and obtain images of the X-ray emission around the dual AGN.

Student's remark on how this training will be useful in his/her studies and career (Maximum 100 words):

I always want to grasp the opportunities that can give me the exposure and hands on experience to work in the field of Astronomy. This summer internship is boon for me to accelerate my practices, knowledge, exposure and experiences which could take me the nearer to my dream of research in this field. With this SRFP I got chance to interact with various scientist and professors who guided me regarding research and development. Also I was able to learn various programming skills and research skills which will be very helpful for shaping my career in the field of research.

Mayank Kumar



Signature of the Candidate

CSTUP-Summer Research Fellowship Programme 2022-23

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Name of the institute where candidate is pursuing M.Sc.: Aligarh Muslim University (AMU), Aligarh, Uttar Pradesh

Allotted Department and Institute for Summer Research Training: Department of Mathematical Sciences, Indian Institute of Technology Banaras Hindu University (BHU), Varanasi

Training Period: 18 July 2022 to 18 September 2022

Name of Supervisor/Guide: Dr. Ashok Ji Gupta

Title and conclusion of the work carried out:

Project Title: - "Principal Component Analysis for Dimensionality Reduction"

I would like to discuss on how importance of Principal component Analysis (PCA) in machine learning algorithm. PCA is unsupervised machine learning algorithm. PCA is a multivariate approach to reduce the dimensionality (variable reduction) of data set consisting of a large number of interrelated variables, while retaining as much as possible of variation (retaining important information) present in the data set. This is achieved by transforming a new data set of variables, the Principal components, which are uncorrelated and which are ordered so that the first few retain most of the variation present in all of the original variable. Dimensionality reduction makes analysing data much easier and faster for machine learning algorithms without extraneous variables to process, making machine learning algorithms faster and simple in turn. Dimensionality reduction

is commonly used during the analysis of high dimensional data (e.g. multi pixel image of a face or texts from an article, astronomical catalogues etc.)

PCA Algorithms: - The PCA algorithms is based on some mathematical concepts such as

- Variance and Covariance
- Eigen values and Eigen vectors

Application of PCA

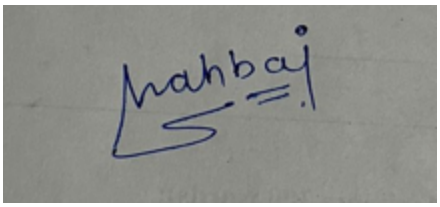
a) In a variety of Artificial Intelligence (AI) applications, including Computer vision, Image compression, face recognition etc.
b) In the Neuroscience, PCA is used to find identity of a neuron from the shape of its action potential.
c) Used in quantitative finance.

Student's remark on how this training will be useful in his studies and career:

I'm glad that I was able to be a part of this research programme. I got a lot of knowledge in the area of research during this programme. I used mathematics in machine learning in my project and I got a chance to do research on a very modern topic. I interacted with good professors as well as research scholars of my subject and I gained a lot of information in the area of research, writing papers and publications too.

This type of programme gives students an opportunity to learn and carry out the research work in the related subjects which is a great initiative for students. I really enjoyed this research programme and I want this scheme should further continue with more students.

Signature of the Candidate:



CSTUP-Summer Research Fellowship Programme 2022-23

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Name of the Institute where candidate is pursuing M.Sc.: Dayalbagh Educational Institute (Deemed University), Agra

Allotted Department and Institute for Summer Research Training: Department of Material Sciences and Engineering, IIT Delhi

Training Period:. 16/06/2022 to 16/08/2022

Name of Supervisor/Guide: Dr. Nirat Ray

Title and conclusion of the work carried out (Maximum 300 words):

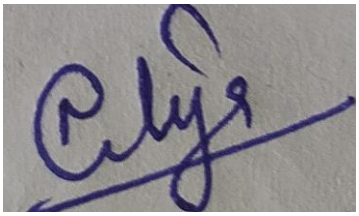
Title- Finding Various Material parameters using DFT Software Quantum Espresso

Conclusion-1) As the conclusion of the Research Work get to determine various material parameters like lattice parameter, Band structure, Density of states Bulk modulus, fermi energy etc of elements like Si, Al and Silver defossite AgAlO2 and also of Fe doped AgAlO2 and compare them with the theoritical lab data .

2)Get to learn simulations in the Italy based DFT Software'Quantum Espresso'. Which facilitates the commendable study of electronic structure and properties of materials.

Student's remark on how this training will be useful in his/her studies and career (Maximum 100 words):

This SRFP really motivated and gravitated me towards the Research Area. The endeavour proved out to be really encouraging and fruitful that I am determined to even continue my M.Sc Dissertation under the same supervisor with Topic "Phonon study in twisted Bilayer Graphene" which is area of immense interest currently that leverage the potential of Quantum Espresso for needful Research study.



Signature of the Candidate

CSTUP-Summer Research Fellowship Programme 2022-23

Candidate's Name: Priyanshi Gupta

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Residential Address:_55, Govind Puri Brij Vihar Phase 2 Kamla Nagar, Agra

Name of the Institute where candidate is pursuing M.Sc.:____ Dayalbagh Educational Institute

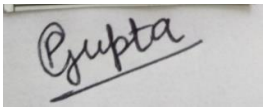
Allotted Department and Institute for Summer Research Training:__ Institute for Plasma Research Ahmedabad (Fundamental Plasma Experiment Division)

Training Period: _18\07\2022_to_17\09\2022

Name of Supervisor/Guide:_ Dr. Pintu Bandyopadhyay

Title and conclusion of the work carried out (Maximum 300 words): My title for the research project is 'Characterization of Coulomb Crystal in Radio Frequency Discharge'. To sum up, we have effectively shown the formation of dusty plasma crystals in an RF discharge plasma over a broad range of discharge parameters. These crystals have a long lifespan and can be sustained for hours under the condition of a background plasma. We have performed several diagnostic tests, such as determining the radial pair correlation function, coulomb coupling parameter, dust temperature, orientational bond ordering parameter, Delaunay triangulation, and Voronoi diagrams of the structures, to confirm the crystal nature of these structures. Also, we have studied the variation of interparticle distance with pressure, variation of coulomb coupling parameter with pressure, and variation of dust temperature with pressure.

Student's remark on how this training will be useful in his/her studies and career (Maximum 100 words): I enjoyed this training at Institute for Plasma Research, Ahmedabad, and gain valuable experience there in Plasma physics. This project is an asset for doing a Ph.D. or any other research work in the future. It will help me to take admission to any good college. There I closely understand how research work can be carried out. There I learned various programming languages which helps me to do analysis and will help me in the future. This training gives me hands-on experience with various instruments which is essential to develop skills.



Signature of the Candidate

CSTUP-Summer Research Fellowship Programme 2022-23

Candidate's Name: Ram Pravesh Pandey

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Name of the Institute where candidate is pursuing M.Sc.: C. M. P. Degree College, Allahabad University

Allotted Department and Institute for Summer Research Training: Department of Applied Sciences, IIIT ALLAHABAD

Training Period: 16/06/2022 to 09/09/2022

Name of Supervisor/Guide: Dr. Nidhi Mishra

Title and conclusion of the work carried out (Maximum 300 words): Title: Green Synthesis of Metallic Nanoparticles via Green Chemistry Approach and Investigation of their Antimicrobial Activity**,**

Conclusion: The present work focuses on the green synthesis of metallic nanoparticles using different plant extracts and aims to highlight their catalytic and antimicrobial activity. The present work also examines the different methodologies related to biogenic synthesis, which is usually simple, eco-friendly, and cost-effective. The NPs of Cu, Ag, and Ag2O were successfully synthesized using different plant extracts (Lemon,Beetroot,Peeli kaner, Neem) via a green chemistry approach. The synthesized samples, B, C, D, E, F, and G were characterized using XRD, FESEM, FTIR, and EDX. In XRD, the diffraction patterns revealed the signal phase highly crystalline MNPs were synthesized. The FESEM micrographs revealed the spherical shape for samples A, C, D, E, and F, capsule-like shape for sample B, and rod-like morphology for sample G. The large particle size for some metallic nanoparticles as calculated from FESEM micrographs is attributed to the agglomeration of the particles. The FTIR spectrum of synthesized samples

revealed the presence of functional groups -OH, -NH, -C-H, -N-O, -CN, -C=O, etc. The EDS spectra confirmed the formation of highly pure samples with negligible contamination. The biological assay was carried out against three bacterial strains, namely E. coli, Entrobacter, and Bacillus subtilis, to assess the bacterial inhibiting potential of the metallic nanoparticles. It can be concluded that the green chemistry approach can be effectively utilized for synthesizing metallic nanoparticles with enhanced antibacterial properties. Thus, the metallic nanoparticles can be employed for potential biomedical applications.

Student's remark on how this training will be useful in his/her studies and career (Maximum 100 words): The training helped to analyze and experience real-life experimental situations in the laboratory. I was able to carry out the wet lab as well as the antibacterial assay, which has opened the gateway for future research works on the topic of green chemistry. I also wish to pursue my research in the same field and aspire to publish good research articles in reputed journals. I also learned a lot about material characterization techniques and their applications in biomedical applications.

Signature of the Candidate 

CSTUP-Summer Research Fellowship Programme 2022-23

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UTTAR PRADESH 201102

Name of the Institute where candidate is pursuing M.Sc.: SHARDA UNIVERSITY GREATER NOIDA UTTAR PRADESH 201310

Allotted Department and Institute for Summer Research Training: CSIR-NATIONAL PHYSICAL LABORATORY NEW DELHI 110012

Training Period: 28/07/2022 to 14/09/2022

Name of Supervisor/Guide: Dr. K.K MAURYA

Title and conclusion of the work carried out:

<u>Salt doped polymer electrolyte films for electrochemical devices</u>

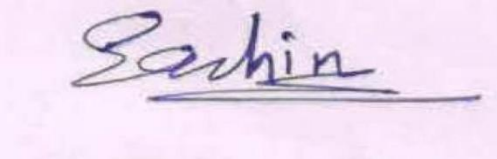
Energy storage is one of the key challenges we are facing in the modern day. The demand for energy is rapidly increases and will go higher in coming future. There is a need for more suitable energy storage device. . Not only for commercial but from day-to-day life, energy storage devices have completely surrounded us. From smallest devices like wristwatch to automobiles everything requires energy to operate functionally. For that we need derives which can store energy and can used for later, should be low in cost, highly efficient and most convenient like batteries, etc.

Most commonly devices for energy storage we used today are made up of organic liquid electrolytes which are very harmful, unsafe and flammable and have very limited ionic conductivity. Polymer electrolyte are the promising material for the modern-day technology electrochemical devices as they may be wearable, more secure, non-toxic and environment and may garage strength like liquid electrolyte however doesn't have drawback of that of liquid electrolyte The research and

development of polymer electrolytes have drawn great attention in the last three decades as they are applied in many electrochemical devices such as lithium batteries, nickel – metal hydride (Ni/MH) batteries, fuel cells/direct methanol fuel cells, super capacitors. Polymer electrolytes (PEs) are macromolecular systems capable of transporting charged species such as ions or protons. The main application of PEs is in energy conversion and storage devices such as batteries and fuel cells etc. Whereas polymer electrolyte is safer to syntheses and to use, are thermally and chemically stable and show much higher ionic conductivity. Polymer Electrolyte is both biodegradable and environment friendly which can replace liquid electrolyte. Polymer electrolyte shows a wider of properties like flexibility, mechanical and chemical stability, can be converted into thin films; act as a separator between the electrolyte and the electrodes which make them suitable for the electrochemical devices for energy storage. Polymer electrolyte can be classified into the bases of their natural occurrence i.e., natural or synthetic and based on the physical or chemical properties. To further improve the Performance of polymer, researchers have started processing doping and blending in polymer. Blending is a method in which a different polymer or suitable material added to polymer electrolyte which improves the characteristic of polymer like ionic conductivity at room temperature and also reduce the crystalline nature in polymer.

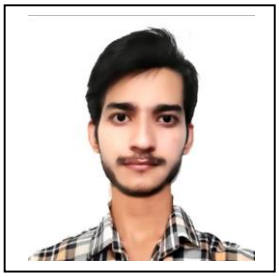
Student's remark on how this training will be useful in his/her studies and career:

This training program has given me the opportunity to work in a premier institute like NPL and has given me the chance to interact with some of the great professors**.** i could learn about new characterization techniques and how they are useful in the current scenario.
I could learn about new fields of research I the current scenario and my guide provided me the required support to carry out my work.



Signature of the Candidate

CSTUP-Summer Research Fellowship Programme 2022-23



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Name of the Institute where candidate is pursuing M.Sc.: Banaras Hindu University, Varanasi

Allotted Department and Institute for Summer Research Training: Advanced Carbon Products and Metrology, National Physical Laboratory, New Delhi

Training Period: 20/06/2022 to 20/08/2022

Name of Supervisor/Guide: Dr. Sanjay R. Dhakate

Title and conclusion of the work carried out (Maximum 300 words):

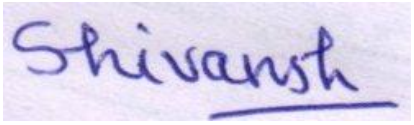
Title: - Synthesis of reduced graphene oxide using Petroleum coke and its applications in hydrogen production

In my internship, I was assigned to work on synthesizing reduced graphene oxide from waste Petroleum coke and utilising this rGO in water splitting as a substrate. Hydrogen energy is considered to be the fuel of the future because as there is continuous increase in world's population and shift in our life style, renewable and clean energy sources become important. Efficient production of hydrogen at large scale is a challenge for which water splitting electrolysis is a promising method. To increase the performance of water electrolysis, incorporation of substrate with catalyst is an important factor. Due to large surface area and high conductivity, reduced Graphene oxide (rGO) can be employed as a substrate in such reactions. A lot of work has been done to synthesize rGO from graphite but synthesis of rGO from Petroleum coke has not been explored much. This method not only can provide an alternative for production of rGO apart from graphite, but also it can help to solve the problem of waste management in oil refineries.

Conclusion- From XRD, Raman and FTIR analysis, it can be shown that Graphene oxide (GO) was successfully synthesized using Petroleum coke and further it was reduced to form rGO. If rGO is used as a substrate with catalyst in water splitting, due to its better conductivity and large surface area, we can expect enhanced activity and better efficiency of HER.

Student's remark on how this training will be useful in his/her studies and career (Maximum 100 words):

I would like to express my gratitude to R&D CST UP for providing me this opportunity to work with experienced scientists and PhD scholars and for giving me an exposure of the research field. My specialisation in M.Sc. is in Condensed Matter Physics and I had some basic knowledge of this field before. After this internship in National Physical Laboratory, my knowledge of the subject has increased and I have gained some experimental knowledge as well. Now, I am more confident about my future in research and my enthusiasm of choosing this field as my career has increased. I would also like to thank R&D CST UP for providing financial assistance of 50000/- which gave me support to live in New Delhi during this internship.



Signature of the Candidate

CSTUP-Summer Research Fellowship Programme 2022-23

(Affix your recent colour photograph)

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District –Etah, Uttar Pradesh

Name of the Institute where candidate is pursuing M.Sc.: Aligarh Muslim University Aligarh

Allotted Department and Institute for Summer Research Training: Department of Mathematics, Indian Institute of Technology Roorkee ROORKEE

Training Period: 09 July 2022 **to** 09 September 2022

Name of Supervisor/Guide: Dr. Dwijendra Narain Pandey

Title and conclusion of the work carried out (Maximum 300 words):

Project Title: -"Introduction to Sobolev Space"

As we have said, the importance of Sobolev spaces lies in the fact that they represent an ideal framework for seeking generalized solutions to boundary value problems. Fundamental are compact imbedding theorems of Sobolev spaces since they enable us to the compact operator's theory. Investigations in the idea of compact operators. (Linear and nonlinear) was to a great extent, stimulated by the need to study the solvability of partial differential equations.

Their importance comes from the weak solutions of some critical partial differential equations that exist in appropriate Sobolev spaces, even when there are no strong solutions in spaces of continuous functions with the derivatives understood in the classical sense.

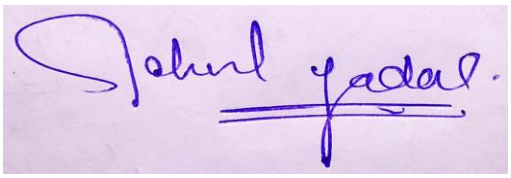
Let Ω be a smooth, bounded domain in R n and let f be a C ∞ function on Ω and u = 0 on the boundary of Ω. The reason of Sobolev space are effectively for PDE's is that Sobolev spaces are Banach spaces, and thus the powerful tools of functional analysis can be brought to bear. In particular, the existence of weak solution to many elliptical PDE follows directly from the Lax-Milgram theorem.

Student's remark on how this training will be useful in his/her studies and career (Maximum 100 words):

I'm glad I was able to participate in this program. I have few words to express the journey of two months that I enjoyed well this program. This Research Training was a good way for me to learn Mathematical Software and Analysis for some research papers and also how to write the paper with some points to keep in mind, such as correct spelling, punctuation, grammar, etc. I learned more about myself. Through this period, I also enjoyed the IITIAN life, and when I clear NET and GATE exams, I will continue my Ph.D. from the same institution. This program was a massive opportunity for me. Thanks for such a fantastic opportunity.

Finally, I want to say that keep this Summer Research Fellowship Program continuing and add one or two more months in this period (according to the budget) because two months is concise period to learn.

Signature of the Candidate:



CSTUP-Summer Research Fellowship Programme 2022-23

(Affix your recent colour photograph)

Reg. No: CSTSRF221393

Candidate's Name: **Candidate's Name:** Utkarsh Pratap Singh

Father's Name: Nagendra Pratap Singh

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Varanasi-221106

Name of the Institute where candidate is pursuing M.Sc.: Banaras Hindu University

Allotted Department and Institute for Summer Research Training: Department of Earth Sciences Indian Institute of Technology Bombay

Training Period: 15 June 2022 **to** 15 August 2022

Name of Supervisor/Guide: Dr. Anand Singh

Title and conclusion of the work carried out (Maximum 300 words):

Project Title: "Estimation of Earthquake Source Parameters of Caribbean Region "

Over the years there have been a various type of hazards that have emerged in different corners of the world that have caused devastating loss of life and property, but the most hazardous and unpredictable of all is an Earthquake. Thus study of any earthquake characteristics in a region has been important in understanding the tectonic nature of a region.

As a means of understanding the nature of earthquake source processes and as a guide for simulating significant ground motion for engineering reasons, the form of the seismic spectrum and how it scales with earthquake size have been topics of relevance. A data set of approximately 100 acceleration time histories recorded on sites have been used in this study. In order to estimate the spectral parameters, such as the corner frequency (fc) above which the spectrum decays, Kumar et al. (2012) employed the MATLAB programme EQK_SRC_PARA

In this project,I have analysed over 120 seismograms that were recorded at central frequencies of 1.5, 3, 0, 6, 0, 9, 12, 18, and 24.0 Hz in the Caribbean region. The matching bandwidth was set to 1-2 Hz and 16-32 Hz for the minimum and maximum centre frequencies, respectively. According to research, kappa value in 4 different parts of the Caribbean region was calculated .In the average value of kappa in zone A ranges from 0.0151 to 0.0432, which is comparable to zone D, where it

ranges from a minimum of 0.0163 to a maximum of 0.0458. While the kappa variation varies from 0.007 to 0.031 in zone B and from 0.008 to 0.035 in zone C, they are relatively comparable. The calculated kappa values accord well with the values that have been estimated by many academics throughout the world.

Student's remark on how this training will be useful in his/her studies and career (Maximum 100 words): This internship gave me some hands-on experiences. I feel that through this internship I have developed some key skills that I can't get in a classroom. Skills such as MATLAB programming, research paper studying, learnt to deal with deadlines. This will be very useful in my job interview and other future references.

Signature of the Candidate:

CSTUP-Summer Research Fellowship Programme 2022-23

Candidate's Name: **Yeshika Tanwar**
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Name of the Institute where candidate is pursuing M.Sc.: **Meerut College Meerut , Kutchery Road , Chadhary Charan Singh University - 250002**
Allotted Department and Institute for Summer Research Training**:_Department of Biotechnology STL2 lab , National Institute of Immunology, Aruna Asaf Ali Marg Jawaharlal Nehru University New Delhi - 110067**
Training Period: **18 July to 26 September**
Name of Supervisor/Guide: **Dr Sagar Sen Gupta Staff Scientist VII**

Title and conclusion of the work carried out (Maximum 300 words):

"Cloning of Top3A and RMI1 using GST pGEX4T1 and pcDNA3.1 zeocin (+) and Purification of His RNF8 protein"

Conclusion – Cloning of Top3A and RMI1 in pGEX 4T1 and pcDNA 3.1 (zeocin+) were successful and His RNF8 protein was successfully purified.

1-Cloning of Top3A and RMI1: Firstly plasmids pcDNA3.1 zeocin (+) N terminal SmBit and pGEX 4T1 were isolated by using QIAGEN miniprep kit and then run on 1% agarose gel. Three bands in the agarose gel indicate the successful isolation of pcDNA3.1 zeocin (+) N terminal SmBit and pGEX4T1. The concentration of vector was determined by using a spectrophotometer and found to be 514 ng/µl and 265 ng/µl respectively. After PCR amplification of RMI1 and Top3A with Phusion polymerase, the PCR product was run on 1% agarose gel and visible bands were obtained at 3Kbp for Top3A and 2Kbp for RMI1 (Figure 2). Standardization of PCR was done using different annealing temperatures (62°C to 70°C).The band was then gel purified and used for further cloning processes. Restriction digestion of pcDNA3.1 zeocin (+) N terminal SmBit, and inserts RMI1 and Top3A was done by using Kpn1-HF and Not1-HF restriction enzymes. Similarly pGEX 4T1, and inserts RMI1 and TOP3A were digested using Xho1 and Not1-HF. Digestion products were run on 1 % agarose gel. Suitable bands were gel purified and then used for ligation in ratio of 1:3 for vector and insert respectively. After transformation of ligation constructs into DH5α competent cells, screening was carried out either by boiling lysis and colony PCR (by Taq polymerase). Colony PCR was carried out using the bacterial colonies which have grown when the ligation mix has been transformed. PCR was performed by using same primers for TOP3A. 3 Kbp bands for colonies in 1% agarose gel indicate the positive clones for pcDNA3.1 Zeocin (+) N

terminal SmBit TOP3A. For boiling lysis colonies obtained after transformation of ligated product were inoculated in 3 ml LB media. Boiling lysis was done by harvesting the cultures and lysates were run on 1% agarose gel. Confirmation of Clones were done by restriction digestion for which plasmid was isolated using QIAGEN miniprep kit. Restriction digestion of recombinant plasmids was performed by using Kpn1-HF and Not1-HF restriction enzymes for pcDNA3.1 zeocin (+) N terminal SmBit TOP3A and RMI1 clones and with Xho1 and Not1-HF for pGEX4T1 TOP3A and RMI1 clones. Digested products were run on 1 % agarose gel. Suitable bands i.e., at 5.4 Kbp for pcDNA3.1 zeocin (+) N terminal SmBit , at 3 Kbp for Top3A and at 2 Kbp for RMI1 in gel indicate that cloning of pcDNA3.1 zeocin (+) N terminal SmBit and RMI1 or Top3A was successful . Similarly, digested bands at 4.9 Kbp, 3Kbp and 2Kbp for pGEX 4T1, Top3A and RMI1 respectively, indicate that cloning of TOP3A and RMI1 in pGEX4T1 were successful.

2- Purification of His RNF 8 protein: The His RNF8 proteins were eluted by using a gradient of imidazole prepared in his lysis buffer in two fractions of 50mM, 100mM and 200mM and one fractions of 300mM and 500mM. The pure proteins were obtained in all the gradients except 1st fraction of 50mM.

Student's remark on how this training will be useful in his/her studies and career: Firstly I would like to thank all the teachers who have given me this opportunity. This internship helped me to learn basic techniques like SDS PAGE, Western blotting and Agarose gel electrophoresis , processes of Gene Cloning and Protein Purification which are basics of any research work in life science and it has explored my career path in research field as I want to pursue PhD in the following year. I am happy after doing this internship and I want to pursue that again in next year.

Yeshika Tanwar

Signature of the Candidate**:**