ABHINAV M

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RESEARCH INTERESTS

Computational Physics · Computational Material science · Data Analysis and Machine Learning

EDUCATION

Central University of Punjab – Bathinda, Punjab, IN — ***2021 –Present***
MSc. in Physics
Department of Physics

University of Kerala – Trivandrum, Kerala, IN — ***2018 —2021***
B.Sc. in Physics, Computer Applications
Government College Kariavattom
CGPA : 7.63/10

Central Board of Secondary Education – Delhi, IN — ***2016 —2018***
Class 12 Senior Secondary Certificate Exam in
Physics, Chemistry, Math, Computer Science, English
City Central School, Kollam, Kerala, IN
Result : 94.4%

Central Board of Secondary Education – Delhi, IN — ***2015 —2016***
Class 10 Secondary School Examination
City Central School, Kollam, Kerala, IN
CGPA : 9.6/10

OTHER QUALIFICATIONS

GATE (PH) 2021 QUALIFIED
Score : 402
Validity : Mar 2024

TOEFL Score : 106 (IELTS Band 7.5+)
Validity : Oct 2024

ONGOING PROJECTS

Data-driven optimization of basin hopping algorithm for Zn-O-H clusters
Guide: Dr. Krishnakanta Mondal, Central University of Punjab (Completion: 2023)

Analyzing data, finding correlations and developing ML enhanced DFT based algorithms for faster and more efficient calculations. Modified basin hopping global optimization algorithm for improved performance by analyzing data from Zn-O-OH clusters. Developed GPAW PARSE software utility. *(Available on GitHub)*

Acoustic Metamaterials
Guide: Dr. Prashant Alegaonkar, Central University of Punjab (Completion: 2023)
Dr. Himanshu Baksey, Scientist F, DMSRDE, DRDO, Kanpur

Studying noise suppression techniques by modeling and simulation of Acoustic meta-materials. Designed and developed rectangular Helmholtz oscillator based sonic crystals for noise suppression in the frequency range of 1-3Khz. Designed, developed and filed patent for a novel geometry of sonic crystal that selectively amplifies frequencies and applied it in the context of detection of enemy drones using their sound signature. Constructed said sonic crystals using 3D printing.

PROJECT EXPERIENCE

Connected component analysis on C-AFM images 2019 - 2021
Guide: Dr. D Sajeev, University of Kerala (Completion : 09-2022) *TVPM, Kerala, IN*

Analyzing C-AFM images of Indium Sulphide thin films to study their conductivity and mechanism of conductivity using connected component analysis and percolation theory.
(Available on GitHub)

Computer model to simulate and study Percolation 2019 - 2021
Department of Physics, Govt. College Kariavattom *TVPM, Kerala, IN*

Created a computer model to simulate percolation phenomenon on Fortran95. Estimated percolation threshold for a square lattice. Performed preliminary studies by varying different parameters and observing how it affected key metrics such as percolation threshold. Developed algorithm to count number of percolating paths in the system.

Developed another project as a tangent to this that focused on *Image analysis using percolation theory*.
The algorithms for this were written in MATLAB. It focused on studying the changes in a system by using cluster analysis on the images of a system before and after a change has taken place. By using cluster analysis, hidden correlations between variables in the system could be studied by using image data. Both projects were carried out under the supervision of Asst. Prof. Dr. D. Sajeev. of the Department of Physics at Govt. College Kariavattom, Thiruvananthapuram, Affiliated with the University of Kerala.
(Available on GitHub)

Tracking Quantum Phase Transitions in atomic nuclei Feb 2022 -May 2022
Guide: Dr. A.M Vinodkumar, University of Calicut (Completion: 05-2022) *TVPM, Kerala, IN*

Studying the change in ratios of atomic energy levels (2+/4+ 4+/6+ etc.) with increase in neutron number for different nuclei as a simple method to detect a QPT.

2D layer structure materials, TMDCs, water splitting, Transition metal intercalated graphene Feb 2022 - Apr 2022
Guide: Dr. Srimanta Phakira, MEMS, IIT Indore *TVPM, Kerala, IN*

Studying the effects of transition metal intercalation in bilayer and bulk graphene, applications of TMDCs in water splitting and other properties of the materials such as density of states, Dirac cone characteristics, band structure etc. using DFT/DFT-D and other computational methods.

Client-Server based Facial Recognition System (CSFRS) Oct 2018 - May 2021
Department of Computer Science, Govt. College Kariavattom *TVPM, Kerala, IN*

Developed a simple Client-Server based cross-platform facial recognition system open-cv python backend and PHP based frontend. The Client side has capabilities to upload reference images of the face to be recognized. The images would automatically get passed to the server, where facial recognition would run on different IP-video streams connected to it. When a matching face was detected by the server, a screenshot and camera location data was returned back to the client side through Imgur API.
(Available on GitHub)

Random-walk simulation applied to Nuclear Reactor Shielding Problem Nov 2020 - Mar 2021
Government College Kariavattom, University of Kerala *TVPM, Kerala, IN*

Implemented a random-walk model for Neutrons escaping a nuclear reactor core on MATLAB. Studied various statistics by varying parameters such as Kinetic energy of neutrons, size of shielding, intensity of radiation etc.
(Available on GitHub)

Distributed Real-time Air Quality Indexing System Apr 2019

Keysight Innovation Challenge 2019 *Kollam , Kerala, IN*

Developed a distributed real-time data gathering sensor network for local Air Quality Indexing.
Each unit comprised of a Raspberry Pi Zero microcontroller connected to a webserver, solar power and robust design language were used to suit the all-weather operation and virtually zero maintenance the project demanded. Was selected as a top 100 entry into the Keysight Innovation Challenge 2019. *(Available on GitHub)*

IoT relay based on ESP8266 Feb 2019

Hobby Project *Kollam , Kerala, IN*

Constructed an IoT relay with ESP8266 based NodeMCUv3 microcontroller as a proof-of-concept smart home implementation. The relay was made accessible via the internet using port-forwarding.
(Available on GitHub)

INTERNSHIPS AND WORK EXPERIENCE

INTERNSHIPS

1. **Young Innovators Program (YIP), Kerala Development and Innovation Strategic Council (KDISC)**
   Oct 2020 – May 2021 . 8 mos.
   Thiruvananthapuram, Kerala
   Position : Mentee
   Developed a general-purpose client-server-based computer vision system for *Star Challenge 2020*. Attended the Design Thinking and Pitch Deck Preparation training program.
   Participated in Second level evaluation and was awarded a certificate.

2. **Walk With Scholar (WWS), University of Kerala**
   Nov 2018 – Jan 2020 . 1 yr. 3 mos.
   Thiruvananthapuram, Kerala
   Position : Mentee
   Interacted with many eminent personalities and attended weekend workshops.
   Attended field visit to CUSAT and KUFOS to understand the basics of doing scientific research at the postgraduate level.

3. **Infinite Tutelage Pvt.Ltd., Bangalore, IN**
   Jul 2021 – Aug 2021 . 2 mos.
   Position : Junior Academic Content Writer (on Payroll)
   I was involved in writing high quality, researched articles and chapters on cryptocurrencies, trading strategies and other topics related to the Crypto world.

4. **IIT Kharagpur, Kharagpur, IN**
   Jun 2021 . 2d.
   Position : Participant, Online workshop on simulation methods in scientific computing.
   Attended a 2-day workshop organized by IIT Kharagpur and National Supercomputing Mission.

5. **IIT Indore, Indore, IN**
   Feb 2021 – Mar 2021 . 1mo.
   Position : Research Intern, Metallurgy Engineering and Materials Science (MEMS, IITI).
   Involved in computational material science projects.

6. **S.N. Bose National Centre for Basic Sciences, Kolkata, IN**
   May 2022 – August 2022 . 6mo.
   Position : Summer Research Intern, Department of CMP & MS, Quantum Materials Group Band Structure Calculations of Two Dimensional Square Lattice Using Tight Binding Approximation.

WORK EXPERIENCE

1. **Freelance Web Developer**
   Jun 2019 – present
   Developed numerous highly customized websites for businesses and other projects.
   Samples : ipmacademy.org, skaquaworld.in, dhanus.ml, csfrs.eu.org, abnv.ml, CUP 428 Lab website

2. **Ignite Edutech Pvt.Ltd., Madurai, IN**
   Jun 2021 – June 2021 . 1 mo.
   Position : Freelance Academic Content Writer
   My responsibilities included creating and proofreading academic content for various Ed-tech platforms.

ACTIVITIES AND SOCIETIES

2022 - Now Indian Physics Association, Student member (SM-2022-CHA-13732)

2021 - Now National Service Scheme (NSS), Central University of Punjab, *Volunteer*

2021 - Now International Association of Physics Students, *Member, India NC*
- *Volunteering in the Advocacy and Outreach group*
- *Website and IT working group, AIPS qualifiers, PLANCKS 2022*

2019 - 2021 Association of Physics, Govt. College Kariavattom, *Member*
- *Organized International webinar on Quantum Cryptography*

2018 - 2021 Science Club, Govt. College Kariavattom, *Member*

2020 - 2021 Young Innovators Program (YIP), KDISC, *Mentee*

2018 - 2020 Walk With Scholar (WWS), University of Kerala, *Mentee*

SOFT SKILLS

Languages **:** English *(Fluent)*, Hindi *(Fluent)*, Malayalam *(Fluent)*, French *(Basic working proficiency)*

Other skills **:** Good leadership qualities, experience in working in teams, critical thinking, near native proficiency in English – verbal and written, advanced coding skill.

TECHNICAL STRENGTHS

Programing Languages, Proficient	: Python, C, C++, MATLAB, JS, PHP, Fortran, HTML/CSS
Programing Languages, Basic	: Julia, React, OpenMPI
Databases	: MySQL
Tools	: LaTeX, Gaussian, VESTA, CRYSTAL17, COMSOL, ASE
Operating Systems	: Windows, Linux
Software	: MS Office, Photoshop

REFERENCES

Available on request.