ASHWIN KUMAR KARNAD

ashwin-kumar.karnad@mpsd.mpg.de *ashwinkumar.k.rao@gmail.com* ORCIDiD
Webpage: ashwinschronicles.github.io *Github: iamashwin99* Linkedin

Publications

• Senapati, T., **Karnad, A.K**. & Senapati, K. Phase biasing of a Josephson junction using Rashba–Edelstein effect. **Nature Communications** 14, 7415 (2023)

Relevant Work Experience

2022-23 *Research Software Engineer*, MPI FOR THE STRUCTURE AND DYNAMICS OF MATTER, Hamburg. Worked on **Computational Scientific support**, massively parallel **HPC codes** and **HPC infrastructure** maintenance (hardware and software), contributed to the **development of python packages** like: Postopus - POSTprocessing of OctoPUS simulations; mpsd-software-manager. Supported scientists in creating open-source, reproducible scientific software workflows.

Education

2022 BITS - PILANI UNIVERSITY, INDIA
*Int. **MSc. Physics** and **B.E Electronics and Instrumentation** (Dual Major) CGPA - 7.71 / 10.0*

2017 VVS GJ PU COLLEGE, MYSORE - CLASS 12^{th}
KSEB Board. Marks : Physics - 100%, Chemistry - 96 %, Mathematics 99%

2015 DEMONSTRATION SCHOOL - CLASS 10^{th}
CBSE Board. 9.8/10 CGPA

All India Rank in competitive examinations: TOEFL (score) 106/120, NGPE- Top 30, KVPY-55, UGC -CSIR NET 67

Interests

• **Experimental and computational condensed matter physics (magnetism and superconductivity**).

• Instrument design, Electrical drive system, Interfacing sensors with microcontrollers, Power management.

• Solving real-world problems using Distributed Ledger Technology and **Neuromorphic Computing**.

Honors and Awards

2023 2nd place, Kühne+Nagel and Google hackathon: Created AutoQuote, an AI service that automatically replies to customer email with a price quote for shipment requests.

2023 2nd place, ADLIFE hackathon: Created an LLM based solution to classify statements in a medical guidelines into diagnostic, therapeutic, warning remarks.

2023 1st place, Rad-Daten-Hackathon: worked on comfybikes.de an app to suggest optimal saddle height for your bike using image detection.

2022 1st place, COMPAR EU hackathon: Created an AI-based solution for a data platform which helps patients manage their serious chronic illness.

2019 National top 30 in NGPE-19 exam (Graduate physics exam with 11372 candidates).

2019 3^{rd}place in Open CBR Hackathon *organised by University of Leeds*.

2018 Awarded Kishore Vaigyanik Protsahan Yojana (KVPY) 2017 **Fellowship by *Govt. of India***.

2018 Offered Innovation in Science Pursuit for Inspired Research (**INSPIRE**) 2017 **Scholarship** by *Govt. of India*.

2016 Awarded ISCA Travel award by *Infosys Foundation*.

2014-16 Participated in 103^{rd} Indian Science Congress held at Mysore, India (2016); IRIS science fair organised by *Intel* at Delhi, India (2016); Rashtriya Kishore Vaigyanik Sammelan of 102^{nd} Indian Science Congress held at Mumbai, India (2015); 41^{st} Jawaharlal Nehru National Science Exhibition at Chandigarh (2014) (Presenting the project stated as "A Novel Stove Stand").

Projects and Experiences

Past Projects

• **Studying the effect of high spin orbit coupling material in Josephson Junctions**, at *Superconductivity lab, NISER, Bhubaneswar, India.*

• ***Design of a cryogenic probe for transport measurements at Superconductivity lab**, NISER, Bhubaneswar, India.*

• Design and Simulation of Battery Management System Algorithms for Electric Vehicle Applications. *Kaynes Technology India Pvt Limited, Mysore, India*.

• Simulation of IR seeker missiles and its counter measure in *Defence Avionics Research Establishment - DRDO, Bangalore, India*.

• GrayBlock Power: Decentralized financing of energy projects via smart contracts written on public blockchains. (Worrked as software developer and project coordinator)

• Team Imitato: Designing an exosuit to control a humanoid that can be beneficial in reaching in-accessible and non-human conditions. (Worked as Electronics, Communication and Haptics Control head)

• A Novel Stove Stand: Designed and built a contraption to harness electricity (about 20W) from the otherwise wasted heat energy produced while burning LPG gas for cooking. It also reduced the cooking time.

• Pressure sensitive mat: A mat that can sense touch, enabling the determination of different poses such as Running, Jumping, one leg hop etc.. (Worked in electronics and algorithm design).

• Past electronics team member of **Hyperloop India** and **Project Kratos**.

For more completed projects visit my web page, ashwinschronicles.github.io

Ongoing Projects

• **comfybikes.de:** A simple and smart app that helps you find the optimal saddle height for your bike using image detection techniques.

• **Mechanistic interpretability of Neural networks**: reverse-engineering neural networks from the learned weights down to human-interpretable algorithm.

Relevant Coursework

PHYSICS : • Quantum Mechanics I&II • **Non-Linear Dynamics** • **Solid State Physics** •**Atomic and molecular Physics** • Nuclear and Particle Physics • **Quantum Information and Computing** • Quantum Information Theory • Electromagnetic theory I&II • Classical Mechanics • Statistical Mechanics

ELECTRONICS : •**Analog and Digital VLSI design** • Microelectronics • Microprocessors and interfacing • Digital circuits • Electric Machines • Signals and Systems • Control Systems • Digital Image Processing • Modern Control Systems • **Transducers and measurement techniques** • **Electronics instruments & instrumentation technology** • Object Oriented Programming

Skills

Computational: • **Python** (pytest, numpy, pandas, xarray, scipy, plotting libraries) • Shell (bash, zsh, nu) • Git • **LabVIEW** • LTspice • Docker • LaTeX • 3D CAD modeling (Onshape, Fusion 360) • PCB Design (Eagle CAD) • **Matlab** • JavaScript • C++ • Illustrations (Inkscape, Blender)

Instrumentation: • Photolithography • DC Magnetron sputtering • Physical Property Measurement System (**DCR** and VSM) • **SEM, FIB and GIS**

List of Referees

1. PROF. KARTIKESWAR SENAPATI *(Master's Thesis supervisor)*
   Associate Professor
   School of Physical Sciences
   National Institute of Science Education and Research,
   Bhubaneswar – 752050, Odisha, India.
   Email: kartik@niser.ac.in

2. PROF. HANS FANGOHR *(Current Supervisor)*
   Head - SSU Computational Science
   Max Planck Institute for Structure and Dynamics of Matter
   Luruper Chaussee 149
   22761 Hamburg, Germany
   Email: hans.fangohr@mpsd.mpg.de

3. DR. DHAVALA SURI *(Research Mentor)*
   Assistant Professor
   Centre for Nano Science and Engineering (CeNSE),
   Indian Institute of Science,
   Bangalore, Karnataka, India.
   Email: dsuri@iisc.ac.in