Sajid Ali

PhD Candidate
Applied Physics
Northwestern University

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Overview

Objective — To continually enhance my expertise in computational science so as to accelerate development of reusable scientific software and maintain software infrastructure for high performance computing.

Summary — Extensive experience in computational physics across various domains including modeling, simulations and inverse problems. Skilled in scientific software engineering, parallel programming and management of software stacks on clusters.

Education

2016–Present — **Northwestern University**, *Evanston, IL*,
Ph.D., Applied Physics,
Computational x-ray optics, Technique development for X-ray Microscopy.

2011–2016 — **IIT Madras**, *Chennai, India*,
Masters of Tech. in Microelectronics and VLSI Design Electrical Engg.,
Master's Thesis : Impurity induced magnetism in Graphene.

2011–2016 — **IIT Madras**, *Chennai, India*,
Bachelors of Technology, Electrical Engg.,
Minor: Physics.

Professional Experience

Summer 2020 — **WJ Cody Associate**,
Mathematics and Computer Science Division, Argonne National Laboratory, PI: Dr Wendy Di.
- Improving the performance and scalability of a tomography reconstruction code written in C++/PETSc.
- Added exception handling, tests and continuous integration.

Research Experience

2018–Present — **X-Ray Wave Propagation**,
X-Ray Microscopy Group, Northwestern University, PI: Prof Chris Jacobsen.
- Developed parallelized computer codes for large scale wave propagation.
- Implemented finite difference based wave propagation in PETSc.

2016–2019 — **Zone Plate Testing**,
X-Ray Microscopy Group, Northwestern University, PI: Prof Chris Jacobsen.
- Tested high aspect ratio zone plates for efficiency and tilt tolerance at APS and NSLS.
- Developed code to simluate the effect of tilt misalignment.

2015–2016 — **Magnetism in Graphene**,
Computaional Condensed Matter Group, IIT Madras, PI: Prof Ranjit Nanda.
- Investigated the magnetic properties of ntercalated bilayer graphene using DFT.
- Performed stability analysis for those which exhibited a non-trivial magnetic moment.

Teaching Experience

2018 **Dept. of Physics & Astron., Northwestern University**, *Evanston, IL*, Teaching Assistant.
- Undergraduate Lab methods course for calculus based EM
- Led laboratory sections to demonstrate and facilitate experiments.
- Held discussion hours to facilitate learning by one-on-one discussion of homework problems.

2015 **Dept. of Electrical Engg., IIT Madras**, *Chennai, India*, Teaching Assistant.
- Introduction to the basics of scientific computing using C and Python.
- Facilitated lab sessions, held office hours and graded assignments.

Publications

2020 Comparison of distributed memory algorithms for X-ray wave propagation in inhomogeneous media **Sajid Ali**, Ming Du, Mark F. Adams, Barry Smith, and Chris Jacobsen *Optics Express Vol. 28, Issue 20, pp. 29590-29618* **Editor's pick**

2020 Benchmark informed software upgrades on Quest, Northwestern's HPC cluster **Sajid Ali**, Alper Kinaci, and Alexander John Mamach *In Practice and Experience in Advanced Research Computing (PEARC '20), Association for Computing Machinery (526–529)*

2020 Tunable hard x-ray nanofocusing with Fresnel zone plates fabricated using deep etching Kenan Li, **Sajid Ali**, Michael Wojcik, Vincent De Andrade, Xiaojing Huang, Hanfei Yan, Yong S. Chu, Evgeny Nazaretski, Ajith Pattammattel, and Chris Jacobsen *Optica Vol. 7, Issue 5, pp. 410-416*

2020 Effect of tilt on circular zone plate performance **Sajid Ali** and Chris Jacobsen *Journal of the Optical Society of America A Vol. 37, Issue 3, pp. 374-383*

2018 Zone Plate Performance as a Function of Tilt Analyzed via Multislice Simulations **Sajid Ali**, Kenan Li, Michael Wojcik and Chris Jacobsen *Vol 24, Suppl. S2 (Proc. of the 14th Intl. Conf. on X-ray Microsc. 2018) pp. 298-299*

2016 Magnetism in intercalated graphene **Sajid Ali**, BRK Nanda *AIP Conference Proceedings 1731, 130040*

Conference & Workshops

2020 **PEARC20**, *Virtual*,
Poster: Benchmark informed software upgrades on Quest, Northwestern's HPC cluster.

2019 **PEARC19**, *Chicago, USA*,
Award : Most Outstanding Student Modeling Challenge Presentation.

2019 **PETSc User Meeting**, *Atlanta, USA*,
Talk: X-Ray Wave Propagation in PETSc,
Panel: Simulation Beyond PDEs (Can PETSc do more?).

2018 **X-Ray Microscopy**, *Saskatoon, Canada*,
Poster: Zone Plate Performance as a Function of Tilt Analyzed via Multislice Simulations.

Professional Activities

Organizing	Member, Student Program Committee, PEARC20
Volunteering	Student Volunteer PEARC19, Literature Review at NumFOCUS DISC, XSEDE Student Champion
Membership	US-Research Software Engineering Association

Parallel & Scientific Computing Skills

Languages	(Proficient) C, Python, (Novice) C++, Bash, Matlab
Parallel Prog.	PETSc, MPI
Platforms	ALCF-Theta, ANL-LCRC
Workflows	Balsam, Maestrowf
Perf. Eng.	Intel VTune, Intel APS, Caliper
Sys. Admin.	Spack, Environment Modules, yum/dnf, apt
Soft. Eng.	Git , GitLab CI, Travis CI, Codecov, GNU Debugger