Siddharth Maddali, Ph.D

Computational Scientist

NOTE: Icons are clickable links.

Summary

Computational scientist with **7+ years' professional research experience** in optical and X-ray microscopy, optics, imaging algorithms and systems, signal processing, high-performance computing, scientific software development and materials physics. **1+ years** experience in high-resolution measurement/detection methods in the semiconductor industry. Previous stints at top US national laboratories. Professional with a Ph.D in physics and strong fundamentals in mathematics and computation. Passionate about computational, experimental and AI innovation in any field, particularly the physical sciences.

Citizenship: India
Sponsorship required: No

Education

🎓 **Ph.D**, Applied physics — *Carnegie Mellon University* — **Pittsburgh, PA, USA**, 2010 — 2016

🎓 **MS**, Physics — *Carnegie Mellon University* — **Pittsburgh, PA, USA**, 2009 — 2010

🎓 **M.Sc**, Physics — *Indian Institute of Technology - Madras* — **Chennai, India**, 2007 — 2009

🎓 **B.Sc**, Physics, mathematics, electronics — *Bangalore University* — **Bengaluru, India**, 2004 — 2007

Skills

Proficiency	Physics	Computation	Programming
👍 **Research**	Fourier/physical/wave optics, microscopy, X-ray diffraction, condensed matter/materials physics	Linear algebra, imaging, reconstruction, signal processing, inverse problems, simulations	Python (numpy, scipy, pandas, matplotlib, scikit-learn), MATLAB, Linux, Bash, LaTeX
👌 **Expert**	Computational electromagnetics, quantum & statistical physics, mechanics	Statistics, probability, FDTD, visualization, high-dimensional geometry, complex analysis	HPC/parallel computing (mpich GPU development (PyTorch, Tensorflow)
Functional	Semiconductors, Experimental design	Differential equations, machine learning, deep learning	C/C++
Miscellaneous	Quantum information	Bayesian inference, uncertainty quantification, quantum computing	HTML, Javascript, CSS, Qiskit, cuQuantum

Experience

Independent
Scientific Consultant
Fremont, CA, USA
Jan 2024 —present

KLA Corp. (KLA-Tencor) Milpitas, CA, USA
Research Scientist: Broadband Plasma (BBP) Division Nov 2022 —Jan 2024

Accomplishments:
— Developed methods for sensitivity enhancement in semiconductor wafer inspection with broadband optical illumination.

Argonne National Laboratory Chicago, IL, USA
Staff Scientist (≅ Assistant Professor): Materials Science Division Oct 2019 — Oct 2022

Accomplishments:
— Led the computational development and **first experimental demonstration** of multi-reflection Bragg coherent diffraction imaging (MR-BCDI).
— Pioneered design of futuristic experiments at Department of Energy facilities with physics-based signal processing techniques.
— Spearheaded the multi-scale X-ray diffraction imaging approach to characterizing materials in difficult-to-access environments (APS, ESRF).
— Commandeered research grants (ANL LDRD) for early-stage exploratory X-ray microscopy and experimental automation at synchrotron facilities.
— Proposed and executed successful synchrotron experiments (US, France).
— Published in high-impact journals, mentored postdocs and students, organized/chaired international workshops.

Argonne National Laboratory Chicago, IL, USA
Post-doctoral researcher: Materials Science Division Jan 2017 — Sep 2019

Accomplishments: **First demonstration** of multi-scale, high-energy coherent diffraction imaging (HEDM) of 3D material microstructure.

National Energy Technology Laboratory Pittsburgh, PA, USA
Post-doctoral researcher: ORISE Fellow May 2016 — Nov 2016

— Developed guidelines for machine learning-driven materials discovery of novel, function-optimized steel alloys.

Carnegie Mellon University Pittsburgh, PA, USA
Graduate student: Physics Department Aug 2009 — Feb 2016

— Dissertation on mining meso-scale materials physics from high-energy synchrotron data.
— Created HierarchicalSmooth: mesh smoothing for physical interface networks.
— Taught mechanics & electromagnetism to undergraduate science majors.

🏆 Awards & Grants

— ANL LDRD: *Coherence-enhanced dark-field X-ray microscopy* (Role: PI; $930,000).
— ANL LDRD: *Detecting critical micro-structural processes with AI* (Role: PI; $100,000).
— Oak Ridge Institute for Science and Education (ORISE) post-doctoral fellowship (2016).
— Indian Institute of Technology Madras Merit Scholarship (2007 — 2009).
— IIT Joint Admission to M.Sc (IIT-JAM): All-India rank 5 out of ≃ 4000 (2007).
— Bangalore University overall undergraduate rank 5 (2007).

Hobbies & Activities

Swimming, hiking, biking, table tennis (ping-pong), squash.