# Siddharth Maddali, Ph.D

## Computational Scientist

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NOTE: Icons are clickable links.

## Summary

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

**Citizenship**: India
**Sponsorship required**: No

## 🕮 Education

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|---|---|---|
| 🎓 **Ph.D**, Applied physics<br>— *Carnegie Mellon University* | | **Pittsburgh, PA, USA**<br>2010 — 2016 |
| 🎓 **MS**, Physics<br>— *Carnegie Mellon University* | | **Pittsburgh, PA, USA**<br>2009 — 2010 |
| 🎓 **M.Sc**, Physics<br>— *Indian Institute of Technology - Madras* | | **Chennai, India**<br>2007 — 2009 |
| 🎓 **B.Sc**, Physics, mathematics, electronics<br>— *Bangalore University* | | **Bengaluru, India**<br>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

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

*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.