Siddharth Maddali, Ph.D
Computational scientist/engineer

🌍 Fremont, CA

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in siddharthmaddali

💼 Experience

■ **Liminal Insights, Inc.**	**Emeryville, CA, USA**
– **Senior Applied Physics/ML Scientist**	Feb 2025 – present

- – Enhancing the sensitivity capabilities of Liminal's EchoStat© ultrasound inspection platform.
- – Addressing customer-specific ultrasound inspection needs with signal processing and ML.

– **Applied Physics/Machine Learning Consultant**	Nov 2024 – present

- – Developing ultrasound characterization techniques for structural defects in lithium batteries.
- – Building physics-inspired ML models for deployment on ultrasound-based inspection equipment.

■ **Independent**	**Fremont, CA, USA**
– **Scientific Consultant**	Feb 2024 – Nov 2024

- – Provided technical consulting for investors in emerging semiconductor technologies.
- – Built an AI-powered tool for automated land area survey trained on drone-based multi-spectral images.

■ **KLA Corporation (KLA-Tencor)**	**Milpitas, CA, USA**
– **Research Scientist**	Nov 2022 – Jan 2024

- – Developed methods for sensitivity enhancement in semiconductor wafer inspection processes.

■ **Argonne National Laboratory**	**Chicago, IL, USA**
– **Staff Scientist**	Oct 2019 – Sep 2022

1. Led the computational development and worked on the **first demonstration** of the X-ray MR-BCDI imaging technique.
2. Led the design of future imaging experiments at DoE facilities with physics-based signal processing techniques.
3. Built software libraries for 3D X-ray image reconstruction: `Phaser`, `mrbcdi`.
4. Raised $900k seed funding for computational R&D and novel microscopy infrastructure.
5. Proposed, executed novel proofs of concept in materials research (US, France).
6. Published work in high-impact scientific journals, mentored junior researchers, organized/chaired international workshops.

– **Postdoctoral researcher**	Jan 2017 – Sep 2019

1. **First demonstration** of multi-scale, high-energy coherent diffraction imaging (HEDM) of 3D materials.

■ **National Energy Technology Laboratory**	**Pittsburgh, PA, USA**
– **Postdoctoral Researcher**: ORISE Fellow	May 2016 – Nov 2016

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

■ **Carnegie Mellon University**	**Pittsburgh, PA, USA**
– **Graduate teaching/research assistant**	Aug 2009 – Feb 2016

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

📚 Education

🎓 **Ph.D**, & **M.S.**, Physics (Dissertation area: materials science)	**Pittsburgh, PA, USA**
— *Carnegie Mellon University*	Aug 2009 – Feb 2016
🎓 **M.Sc**, Physics	**Chennai, TN, India**
— *Indian Institute of Technology Madras (IIT-M)*	Aug 2007 – May 2009
🎓 **B.Sc**, Physics, mathematics, electronics	**Bengaluru, KA, India**
— *Bangalore University*	June 2004 – May 2007

🥷 Technical skills

- **Science & Engg.**: Geometric + Fourier optics, ultrasound/acoustic methods, microscopy, image formation (Hopkins, Abbe), diffraction gratings, X-ray science, condensed matter + materials physics, electromagnetics, mechanics, statistical physics, semiconductors, experimental design, quantum sciences
- **Math/computation**: Linear algebra, reconstruction, optimization, signal processing, control theory, inverse problems, simulations, statistics, probability, FDTD (meep), RCWA, computational geometry, differential equations
- **Software**: Python scientific stack (numpy, scipy, matplotlib, scikit-learn, pandas + more), Matlab, Linux, git, bash, LaTeX, HPC + parallel computing (MPI), GPU development, PyTorch, Tensorflow, C++, Docker, Qiskit
- **AI/ML**: LLMs, retrieval augmented generation (RAG), data science, applied statistics, machine learning, deep learning for computer vision, CNNs, NeRF, structure for motion

🏆 Awards & Grants

1. ANL LDRD Research grant: *Coherence-enhanced dark-field X-ray microscopy* (Role: PI; $930,000).
2. ANL LDRD Research grant: *detecting critical microstructural processes with AI* (Role: PI; $100,000).
3. ANL LDRD Research grant: *COHED: Coherence for high-energy diffraction* (Role: postdoc)
4. Oak Ridge Institute for Science & Education (ORISE) post-doctoral fellowship (2016).
5. Indian Institute of Technology Madras Academic Merit Scholarship (2007 – 2009).
6. IIT Joint Admission to M.Sc (IIT-JAM) All-india rank 5 (out of $\simeq$ 4000) (2007).
7. Bangalore University undergraduate rank 5 (2007).

👥 Professional Activities & Outreach (link to full CV)

- **Editorship**: *Crystals* special issue: Synchrotron Studies of Materials
- **Select invited talks**: The Minerals, Metals, Materials Society (TMS), Advanced Photon Source.
- **Society membership**: American Physical Society, Materials Research Society, TMS.
- **Select peer review**: US Department of Energy, American Physical Society, Optica.
- **Select workshop organization**: Advanced Photon Source User Meetings.

📜 Select publications (link to full CV)

1. **Maddali, S.**, Frazer, T.D., Delegan, N. *et al*, *Concurrent multi-peak Bragg coherent x-ray diffraction imaging of 3D nanocrystal lattice displacement via global optimization*, **Nature Partner Journals (npj) Computational Materials** 9, 77 (2023).
2. Wilkin, M., **Maddali, S.**, Hruszkewycz, S., Pateras, A., Sandberg, R., Harder, R., Cha, W., Suter, R., & Rollett, A. *Experimental demonstration of coupled multi-peak Bragg coherent diffraction imaging with genetic algorithms*, **Phys. Rev. B**, 103, 214103. (2021).
3. **Maddali, S.**, Allain, M., Cha, W., Harder, R., Park, J.S., Kenesei, P., Almer, J., Nashed, Y., & Hruszkewycz, S., *Phase retrieval for Bragg coherent diffraction imaging at high x-ray energies*, **Phys. Rev. A**, 99, 053838 (2019).
4. **Maddali, S.**, Park, J.S., Sharma, H., Shastri, S., Kenesei, P., Almer, J., Harder, R., Highland, M., Nashed, Y., & Hruszkewycz, S., *High-Energy Coherent X-Ray Diffraction Microscopy of Polycrystal Grains: Steps Toward a Multiscale Approach*, **Phys. Rev. Appl.**, 14, 024085 (2020).
5. Kandel, S., **Maddali, S.**, Allain, M., Hruszkewycz, S. O., Jacobsen, C., & Nashed, Y. S. G., *Using automatic differentiation as a general framework for ptychographic reconstruction*, **Opt. Express**, 27(13):18653–18672 (2019).

💬 Languages

English (fluent), Hindi (fluent), Tamil (intermediate), Telugu (intermediate), Marathi (intermediate), Kannada (intermediate), French (beginner)