

Siddharth Maddali, Ph.D

Computational scientist/engineer

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 siddharthmaddali



Experience

■ Liminal Insights, Inc. (startup)	Emeryville, CA, USA
– Senior Applied Physics/ML Scientist	Feb 2025 – present
– Building deployable ultrasound defect models and inverse solvers for EV battery stacks from fundamental theory.	
– Leading computational R&D efforts in various emerging spaces pertaining to lithium battery inspection.	
– 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 – Jan 2025
– 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/acoustics, microscopy, image formation (Hopkins, Abbe), diffraction/scattering, 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)

References

Name	Relation	Organization	E-mail	Phone
Shaurjo Biswas, Ph.D	Manager, CEO	Liminal Insights, Inc.	shaurjo@liminalinsights.com	+1 (734) 757-0131
Jonny Hofmeister	Colleague	Liminal Insights, Inc.	jonny.hofmeister@gmail.com	+1 (503) 616-1016
Dr. Stephan Hruszkewycz	Supervisor	Argonne National Laboratory	shrus@anl.gov	+1 (630) 252-3214
Dr. Robert M. Suter	Ph.D advisor	Carnegie Mellon University	suter@cmu.edu	-
Dr. Anthony D. Rollett	Collaborator	Carnegie Mellon University	rollett@cmu.edu	+1 (412) 268-3177
Dr. Marc Allain	Collaborator	Aix-Marseille Univ/Inst. Fresnel	marc.allain@fresnel.fr	-