Aaditya Lalitbhai Kachhadiya

Curriculum Vitae
(Updated October 15, 2026)

Contact Information

Aaditya L. Kachhadiya
Independent Researcher
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Research in Scientific Machine Learning

- Physics-Informed Machine Learning
- Nonlinear Inverse Problems
- Numerical Optimization
- Scientific Computing and Learned methods

Research Experience

October 2026–Present **Brown University**
Division of Applied Mathematics, CRUNCH Group
Student Researcher | Remote

Conducting research with Brown University's CRUNCH Group under the mentorship of Prof. George Em Karniadakis and Ruthwik Chivukula. Investigating SciML approaches to semiconductor heat transport.

March 2026–Present **Sardar Vallabhbhai National Institute of Technology**
Department of Artificial Intelligence
Research Collaborator | On-site and Remote

Collaborated with Prof. Anupam Shukla & Dr. Tanmoy Hazra (mentor), along with fellow researchers, on optimization methods for physics-informed and heterogeneous scalarized learning. First and corresponding author of manuscript [3].

2024–Present **Independent Research**
Scientific Machine Learning and Nonlinear Inverse Problems
Independent Researcher

Research on learned local inverse geometry, nonlinear physics inversion, optimization, and reliability diagnostics for learned solvers. Solo Author of [1] and [2]

Education

2026–March 2027 **Shardayatan School**
Gujarat Secondary and Higher Secondary Education Board
Senior Secondary, Class XII, ongoing

2024–2025 **Shardayatan School**
Gujarat Secondary and Higher Secondary Education Board
Secondary, Class X, 89.33%, Top 4.66% state-wide in Gujarat

Publications and Preprints

[3] **Aaditya L. Kachhadiya**, Meet Dabgar, Tanmoy Hazra, and Anupam Shukla, "Component-Access Subspace Optimization for Heterogeneous Scalarized Learning," *manuscript under review at IEEE Transactions on Neural Networks and Learning Systems*, 2026.

[2] **Aaditya L. Kachhadiya**, "Local Inverse Geometry Can Be Amortized," *arXiv:2605.13068 [cs.LG]*, 2026. arXiv. Code.

[1] **Aaditya L. Kachhadiya**, "Deceptron: Learned Local Inverses for Fast and Stable Physics Inversion," *Machine Learning and the Physical Sciences Workshop (ML4PS), NeurIPS 2025*, San Diego, California, 2025.

Invited Talks and Presentations

- **CRUNCH Group Weekly Seminar Spotlight**, Division of Applied Mathematics, Brown University, September 25, 2026.
  Invited Speaker. Presented "Component-Access Subspace Optimization for Heterogeneous Scalarized Learning."

- **NeurIPS 2025, ML4PS Workshop**, San Diego Convention Center, California, December 6, 2025.
  Poster presentation: "Deceptron: Learned Local Inverses for Fast and Stable Physics Inversion."

- **Shardayatan School**, Surat, June 15, 2025.
  Invited Lecture on "Introduction to Machine Learning for Higher Secondary School Students."

Academic Service

- **Invited Peer Reviewer**, 9th Annual Workshop on Machine Learning and the Physical Sciences (ML4PS 2026), hosted by the AI4Science Center, Georgia Institute of Technology, 2026.

Academic Recognition

- **Appreciation from the Vice Chancellor of VNSGU Surat, 2025**, Invited and commended by the Vice Chancellor of VNSGU, Dr. Kishorsinh N. Chavda, for exceptional academic contribution and regional impact.

Research Software

- **Deceptron / D-IPG** — open-source PyTorch research implementation for learned local-inverse optimization in nonlinear inverse problems. Includes forward–reverse models, D-IPG inference, Jacobian-composition training, runtime diagnostics, PDE benchmarks, and reproducibility scripts.
  github.com/AadityaKachhadiya/deceptron

Selected Research Contributions

- **Deceptron / D-IPG.** Developed a learned local-inverse solver for nonlinear physics inversion, with Jacobian-composition regularization and runtime inverse-consistency diagnostics. Achieved comparable or better recovery quality at up to 77× lower inference-time solve cost than evaluated baselines on the main PDE benchmarks.
- **Component-Access Subspace Optimization (CASO).** Research on optimization methods for heterogeneous scalarized learning objectives, with applications to physics-informed scientific learning. First and corresponding author; manuscript under review at *IEEE TNNLS*.

Technical Skills & Research Methods

- **Programming:** Python; PyTorch, NumPy, pandas, Matplotlib; LaTeX
- **Scientific Machine Learning:** nonlinear inverse problems, physics-informed machine learning, differentiable modeling, learned solvers, and surrogate modeling
- **Numerical Optimization:** nonlinear least squares, Gauss–Newton and Levenberg–Marquardt methods, BFGS/L-BFGS, line-search and trust-region methods, and reduced-subspace optimization