

# Rushil Anirudh

## Resumé

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### Education

- March 2016 **PhD**, *Arizona State University*, Tempe, *GPA 3.95/4.00*.  
Advisor: Dr. Pavan Turaga  
Thesis: Statistical and Dynamical Modeling of Riemannian Trajectories with Application to Human Movement Analysis [[Thesis Online](#)]
- June 2012 **MS**, *Arizona State University*, Tempe.
- April 2010 **B.Tech**, *National Institute of Technology Karnatka (NITK)*, Surathkal, India.

### Experience

- 10/19 - Now **Director**, *Open Data Initiative*, [[webpage](#)].  
Leading the effort to curate and organize LLNL's rich data ecosystem towards the goal of open sourcing science datasets to drive scientific machine learning. **Recognized by AI.gov under strategic pillars for AI R&D** [[link](#)] and National Security Commission on Artificial Intelligence (NSCAI) as a "pathfinder mission" [[page 448](#)]
- 7/18 - Now **Computer Scientist**, *Machine Intelligence Group @ LLNL*.  
Current Projects: (1) Generalization and robustness of ML models; (2) ML for high repetition lasers; (3) Rep learning for knowledge graphs; (4) computational imaging for 4D X-ray CT. ML consultant on several other efforts. [[Group webpage](#)]
- 10/16 - 7/18 **Postdoctoral Researcher**, *Lawrence Livermore National Laboratory*.  
Contributed to various research efforts in machine learning, deep learning, computer vision, and high dimensional data analysis.
- 4/16 - 10/16 **Postdoctoral Researcher**, *IBM Research - Almaden*, San Jose, CA.  
Contributed to the image analytics/de-identification for PHI datasets for the medical sieve grand challenge. [[Group web-page](#)]
- Summer 2015 **Research Scholar**, *Lawrence Livermore National Laboratory*, Livermore, CA.  
Efficient lung nodule detection and segmentation from CT scans using 3D CNNs.  
Mentors: Dr. Peer-Timo Bremer and Dr. Jayaram J. Thiagarajan.
- Summer 2014 **Intern**, *Dropcam Inc. (now part of Nest Labs/Google)*, San Francisco, CA.  
Explored methods to estimate accuracy of human detectors with minimal supervision.  
Mentor: Dr. Jason Laska.
- Summer 2013 **Research Intern**, *Intuitive Surgical Inc.*, Sunnyvale, CA.  
Worked on developing, and testing new sensor processing and fusion algorithms for robust real-time surgical robotic navigation.  
Mentor: Dr. Vincent Duindam.
- Summer 2009 **Undergraduate Intern**, *Institut polytechnique de Grenoble (INPG)*, France.  
Developed an interface to study the spatio-temporal model of the retina and understand how patients with macular degeneration performed image categorization.

## Grant Awards

- PI on LDRD (DOE) grant to characterize extrapolation in DNNs: \$1.725M (10/21 - 9/24)
- PI on ISCP (institutional) grant to curate LLNL's Data Ecosystem: \$240K (10/19 - 09/22)
- Co-PI on LDRD grant next gen. ML (promoted to PI for FY21): \$1.5M (10/18 - 09/21)
- Co-PI on LDRD grant on exploring rep. learning for ECG data: \$560K (10/17 - 09/19)

## Selected Publications

(H-index: 15, Citations: 920+, as of July 2022)

Some recent papers are listed, broadly grouped by topic; see my [Google Scholar](#) profile for an exhaustive list

### ML application areas: healthcare, sciences, imaging

1. **R. Anirudh** et al., *Accurate Calibration of Agent-based Epidemiological Models with Neural Network Surrogates* in AI4COVID ICML Workshop [\[paper\]](#) (2022).
2. A. W. Reed, H. Kim, **R. Anirudh**, K. A. Mohan, K. Champley, J. Kang, S. Jayasuriya, *Dynamic CT Reconstruction from Limited Views with Implicit Neural Representations and Parametric Motion Fields* in ICCV. [\[paper\]](#), (2021).
3. **R. Anirudh**, H. Kim, J.J. Thiagarajan, K.A. Mohan, K. Champley, T. Bremer, *Lose The Views: Limited Angle CT Reconstruction via Implicit Sinogram Completion. (Spotlight: ~10% acceptance rate)* in CVPR [\[paper\]](#), (2018).
4. **R. Anirudh**, J.J. Thiagarajan, P.T. Bremer, B. K. Spears, *Improved Surrogates in Inertial Confinement Fusion with Manifold and Cycle Consistencies* in PNAS [\[paper\]](#), (2020).
5. J. J. Thiagarajan, B. Venkatesh, **R. Anirudh**, P.T. Bremer, J. Gaffney, G. Anderson, B.K. Spears, *Designing Accurate Emulators for Scientific Processes using Calibration-Driven Deep Models* in Nature Communications ([Editor's picks](#)) [\[paper\]](#) (2020).
6. S. Liu, **R. Anirudh**, J.J. Thiagarajan, P.T. Bremer, *Uncovering Interpretable Relationships in High-Dimensional Scientific Data Through Function Preserving Projections* in Machine Learning: Science and Technology (MLST) [\[paper\]](#), (2020).
7. B. Kustowski, J. A. Gaffney, B. K. Spears, G. J. Anderson, **R. Anirudh**, P.T. Bremer, J. J. Thiagarajan, M. K. Kruse and R. C. Nora, *Suppressing simulation bias in multi-modal data using transfer learning.* Machine Learning: Science and Technology (MLST) [\[paper\]](#) (2022).
8. S. Liu, **R. Anirudh**, J. J. Thiagarajan, and P.T. Bremer, *Uncovering interpretable relationships in high-dimensional scientific data through function preserving projections.* in Machine Learning: Science and Technology (MLST) [\[paper\]](#), (2020).
9. **R. Anirudh** and J. J. Thiagarajan, *Bootstrapping graph convolutional neural networks for autism spectrum disorder classification*, In ICASSP [\[paper\]](#) (2019).
10. A. Marathe, **R. Anirudh**, N. Jain, A. Bhatele, J. J. Thiagarajan, B. Kailkhura, J. S. Yeom, B. Rountree and T. Gamblin, *Performance modeling under resource constraints using deep transfer learning*, In Supercomputing (SC) [\[paper\]](#) (2017).
11. **R. Anirudh**, J. J. Thiagarajan, P.T. Bremer, and H. Kim, *Lung nodule detection using 3D convolutional neural networks trained on weakly labeled data*, In SPIE Medical Imaging [\[paper\]](#) (2016).
12. **R. Anirudh** and P. Turaga, *Interactively Test Driving an Object Detector: Estimating Performance on Unlabeled Data*, IEEE WACV, [\[paper\]](#) (2014).

## Robustness, Uncertainty Quant., and Interpretability

13. J. J. Thiagarajan, **R. Anirudh** et al., *Data-Efficient Scientific Design Optimization with Neural Network Surrogates* in ReALML ICML Workshop (2022).
14. V. Narayanaswamy, Y. Mubarka, **R. Anirudh** et al., *Improved Medical Out-of-Distribution Detectors For Modality and Semantic Shifts* in Principles of Distribution Shift (PODS) ICML Workshops (2022).
15. **R. Anirudh**, J. J. Thiagarajan, *Out of Distribution Detection using Neural Network Anchoring*, Under review [[paper](#)] (2022).
16. J. J. Thiagarajan\*, **R. Anirudh**\*, V. Narayanaswamy, PT. Bremer, *Single Model Uncertainty Estimation via Stochastic Data Centering* Under review (2022).
17. V. Narayanaswamy, Y. Mubarka, **R. Anirudh**, D. Rajan, A. Spanias, J. J. Thiagarajan, *Revisiting Inlier and Outlier Specification for Improved Out-of-Distribution Detection* Under review (2022).
18. T. Gokhale, **R. Anirudh** et al. *Improving Diversity with Adversarially Learned Transformations for Domain Generalization* Under Review [[paper](#)] (2022).
19. V. Narayanaswamy, **R. Anirudh**, I. Kim, Y. Mubarka, A. Spanias, J. J. Thiagarajan, *Predicting the Generalization Gap in Deep Models using Anchoring*, in ICASSP [[paper](#)] (2022).
20. T. Gokhale, **R. Anirudh** et al. *Attribute-guided Adversarial Training for Robustness to Natural Perturbations* in AAAI [[paper](#)], (2021).
21. J. J. Thiagarajan, V. Narayanaswamy, **R. Anirudh**, PT. Bremer, A. Spanias, *Accurate and Robust Feature Importance Estimation under Distribution Shifts*, AAAI [[paper](#)] (2021).
22. **R. Anirudh**\*, J. J. Thiagarajan\*, R. Sridhar, and P. T. Bremer, *MARGIN: Uncovering Deep Neural Networks Using Graph Signal Analysis* in Frontiers in Big Data, [[paper](#)] (2021).
23. J. J. Thiagarajan, I. Kim, **R. Anirudh**, and P. T. Bremer, *Understanding deep neural networks through input uncertainties* In ICASSP [[paper](#)] (2019).
24. K. Thopalli, **R. Anirudh**, J. J. Thiagarajan, P. Turaga, *Multiple subspace alignment improves domain adaptation*, in ICASSP [[paper](#)], (2019).

## Generative Modeling and its applications

25. M. Olson, S. Liu, **R. Anirudh**, J. J. Thiagarajan, PT. Bremer, WK. Wong, *Cross-Model Attribute Discovery for Independently Trained StyleGANs*, Under Review (2022).
26. S. Liu, **R. Anirudh**, J. J. Thiagarajan, P. T., Bremer, *Sparsity Improves Unsupervised Attribute Discovery in StyleGAN*, in ICASSP [[paper](#)] (2022).
27. M. Olson, S. Liu, **R. Anirudh** et al., *Unsupervised Attribute Alignment for Characterizing Distribution Shift* in DistShift NeurIPS Workshop, [[paper](#)] (2021).
28. **R. Anirudh**, S. Lohit, P. Turaga, *Generative Patch Priors for Practical Compressive Image Recovery* in WACV (**Best Paper Honorable Mention**) [[paper](#)], (2021).
29. S. Lohit, **R. Anirudh**, P. Turaga, *Recovering Trajectories of Unmarked Joints in 3D Human Actions Using Latent Space Optimization* in WACV [[paper](#)] (2021).
30. Q. Li, B. Kailkhura, **R. Anirudh** et al. *MR-GAN: Manifold Regularized Generative Adversarial Networks for Scientific Data* in SIAM Journal on Mathematics of Data Science [[paper](#)], (2021).
31. **R. Anirudh**, J.J. Thiagarajan, B. Kailkhura, P.T. Bremer, *MimicGAN: Robust Projection onto Image Manifolds with Corruption Mimicking* in IJCV [[paper](#)], (2020).

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\* = equal contribution

32. V. Narayanaswamy, J. J. Thiagarajan, **R. Anirudh**, A. Spanias, *Unsupervised audio source separation using generative priors*, in INTERSPEECH [paper] (2020).
33. **R. Anirudh** et al. *Improving Limited Angle CT Reconstruction with a Robust GAN Prior*, in Deep Inverse Workshop at NeurIPS (2019).
34. **R. Anirudh** et al. *Exploring Generative Physics Models with Scientific Priors in Inertial Confinement Fusion*, in Machine Learning for Physical Sciences Workshop at NeurIPS [paper] (2019).

## Activity Recognition & Riemannian Geometry

35. E. Jeon, S. Lohit, **R. Anirudh**, P. Turaga, *Robust Time Series Recovery and Classification Using Test-Time Noise Simulator Networks*, Under review (2022).
36. K. Koneripalli, S. Lohit, **R. Anirudh**, and P. Turaga, *Rate-invariant autoencoding of time-series*. In ICASSP [paper] (2020).
37. **R. Anirudh**, J. Su, A. Srivastava and P. Turaga, *Elastic Functional Coding of Riemannian Trajectories*, in IEEE PAMI [paper] (2017).
38. **R. Anirudh** and P. Turaga, *Geometry-based Adaptive Symbolic Approximation for Fast Sequence Matching on Manifolds.*, IJCV [paper] (2016).
39. **R. Anirudh**, V. Venkataraman, K. N. Ramamurthy, and P. Turaga, *A Riemannian framework for statistical analysis of topological persistence diagrams*, In CVPR Workshops [paper] (2016).
40. **R. Anirudh**, J. Su, A. Srivastava and P. Turaga, *Elastic Functional Coding of Human Actions: From Vector-Fields to Latent Variables*, in CVPR, [paper] (2015).
41. **R. Anirudh**, V. Venkataraman, and P. Turaga, *A generalized Lyapunov feature for dynamical systems on Riemannian manifolds* In BMVC Workshops [paper] (2015).
42. A. Sivakumar, **R. Anirudh**, P. Turaga, *Geometric Compression of Orientation Signals for Fast Gesture Analysis*, in Data Compression Conference [paper], (2015).

## Skills

Programming Python (most frequent), C++ and Java (less frequent) Matlab (used in grad school)  
 Packages Deep learning (Pytorch, Tensorflow), OpenCV (computer vision), basic OpenGL, data analysis packages in Python (scikit learn, pandas)

## Honors & Awards

- ICLR 2022 Highlighted Reviewer [Link] (Apr 2022)
- ICLR 2021 Outstanding Reviewer (May 2021)
- WACV 2021 Best Paper Honorable Mention Award for Generative Patch Priors (Jan 2021)
- Recognized as a top reviewer for ICML 2020. (Sept 2020)
- Part of GOLD award winning team at LLNL for our COVID-19 modeling efforts. (Aug 2020)
- Invited to participate in the Dagstuhl seminar on Interpretability in ML [Link] (Nov 2019)
- Placed 2/50 in LLNL's Annual Research Slam Competition with a prize of \$3000. (Oct 2018)
- Awarded Outstanding Reviewer for Journal Computer Methods in Bio-medicine. (Aug 2018)
- My work was profiled by LLNL [Link] (Aug 2018)
- Featured on LLNL's Data Science Institute Spotlight [Link] (July 2018)
- NVIDIA's AI blog featured our paper on GANs for Inverse Problems [Link to Article] (June 2018)
- Invited to perform Academic Program Review at Arizona State University. (Apr 2018)
- Awarded Outstanding Reviewer for Journal Pattern Recognition. (Oct 2017)
- Travel grant of \$350 to attend DCC 2015. (Apr 2015)
- Co-Chair of the annual tech symposium with a budget of \$50K. (Oct 2009)

- Head of IEEE chapter with a 300+ strong student body. (July 2009 - April 2010)
- Gold medal for being among the top 0.1% in India in Chemistry by CBSE (June 2006)

## Service

- Area Chair for WACV 2022.
- Co-Organizer of DiffCVML Workshop at CVPR 2021. [[workshop webpage](#)]
- Session Chair at Asilomar 2020
- Program Committee: ICLR, NeurIPS, CVPR, ICCV, AAAI, ICML, ECCV, WACV, FG, ICVGIP
- Journal Reviewer: IEEE Transactions on Medical Imaging, ACM-Computing Surveys, Pattern Recognition Letters, Pattern Recognition, Computer Vision and Image Understanding, IEEE Trans. Image Processing.

## Immigration

Legal Permanent Resident of the United States (Green Card)  
Citizen of India