

ANIKET PANT

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Professional Summary

I enjoy using machine learning to solve interdisciplinary problems. I use machine learning to solve challenges integral to national security. I develop AI/ML solutions to enable the nuclear deterrent and other areas of national security.

Education

University of Illinois Urbana-Champaign – Champaign, IL Expected graduation Dec 2025
Candidate for Master of Science in Materials Science and Engineering
Critical Skills Recruiting recipient @ Sandia National Labs

Georgia Institute of Technology – Atlanta, GA May 2024
Bachelor of Science in Materials Science and Engineering (GPA: 3.22)
Minor in Physics

Jefferson County International Baccalaureate (JCIB) – Birmingham, AL May 2020
High School Diploma, Summa Cum Laude

Experience

2022 - Present Year-Round Intern – R&D S&E, Sandia National Laboratories

- Develop deep learning-based anomaly detection methods for improving the productivity of critical additive manufacturing pipelines. Work published as SAND report.
- Employ deep learning techniques for high-fidelity materials surrogate modeling and failure prediction. Work was featured in 2023 Sandia-wide HPC Annual Report.
- Support multiple capabilities (including topic modeling, document querying, knowledge retrieval and transfer) for various mission partners.
- Developer in tri-labs (SNL, LLNL, LANL) GenAI collaboration: enabler for RAG efforts in IRIS initiative (PI: Christopher Garasi); developing “Virtual SME” tools for ND detonators and fuzing community (ASC).
- Lead developer of ATLAS, an internal AI software package for offline, secure networks of high importance to Sandia National Labs.
- Presented to and connected with numerous partners at NNSA, NRC, NASA, ORNL, and SNL, leading to numerous ongoing and prospective funding sources. Presented ML/DL products to international mission partners.
- Delivered ND Tech Talk on NLP/LLMs for nuclear deterrence to NNSA+DOE leadership. Contents were presented to an audience of ~1400 attendees.
- Submitted original research proposal for late start LDRD. Proposal was funded for 6-figure amount.
- Served as organizer for ML/DL conference, an annual DOE-wide conference for ML/DL practitioners. Facilitated sessions with external collaborators from numerous DOE labs and universities.

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- Selected for Sandia Critical Skills Recruiting (CSR) program to fund graduate studies in Materials Science and Engineering.
- Awarded Sandia Certificate of Excellence Award (1x), Sandia managerial spot award (2x), and Thunderbird Kudos (5x) awards.
- Internal coursework in Nuclear Deterrence and Policy, Lifecycle Management, Basic Nuclear Weapons Physics and Design, and Nuclear Weapons Surety.

2021 - 2023 Biological Systems, Computer Vision – Girish Melkani, Dept. of Pathology, University of Alabama at Birmingham

- Developed semantic segmentation techniques for Drosophila fly cardiac recordings. Led expansive study on use of deep learning for automated analysis of high-speed, high-resolution optical cardiac videography.
- Responsible for lab-wide software infrastructure. Led procurement and actively manage laboratory compute resources. Manage 50TB of shared space.
- Collaborate closely with graduate students for developing novel assays and custom code for data analysis. Responsible for analysis of sleep, circadian, and lipid aggregation data.
- Created and maintain lab website and online presence. Serve as web master.

2017 – Present Nanophotonics, Ultrafast Spectroscopy – Kannatassen Appavoo, Laboratory for Nanoscale and Quantum Photonics, Dept. of Physics, University of Alabama at Birmingham

- Develop machine learning models for characterization and analysis of nanostructures for optoelectronic applications. Study dimensionality reduction techniques for unsupervised modeling.
- Used deep learning techniques for expediting processing and acquisition of time-resolved ultrafast spectroscopy.

Summer 2019 Nanochemistry – Anthony Dylla, College of Natural Science, University of Texas at Austin

- Synthesized and characterized properties of nanoparticles synthesized via the dendrimer-encapsulated nanoparticle (DEN) technique.
- Performed trials for the degradation of 4-Nitrophenol, a common pollutant found in wastewater.

Summer 2017 Genetics – Sonia Fargue, Dept. of Urology, University of Alabama at Birmingham

- Studied metabolic pathways related to Primary Hyperoxaluria in a urology, wet lab environment.
- Gained molecular biology, analytical chemistry, cell culture and mass spectrometry experience.

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Skills

- Programming: Python, MATLAB, Java, JavaScript (React)
- Machine Learning (ML/DL): Keras/TensorFlow, Scikit Learn, PyTorch, Wandb
- Data Visualization: Matplotlib, Seaborn, Plotly/Dash, MATLAB, Deck.gl, Streamlit
- Big Data: PostgreSQL, TimeseriesDB, Dask, Datashader, S3
- Computer Vision: OpenCV, PIL, TorchVision, CVAT, ImageJ/FIJI
- Electrodynamics Simulations: Lumerical FDTD, MEEP, Mie Scattering codes (PyMieScatt/MiePython)
- Quantum optics: Ultrafast spectroscopy, photoemission spectroscopy, angle-resolved cathodoluminescence microscopy
- High Performance Computing: SLURM, Docker, Singularity, Ray, Dask
- Large Language Models: HuggingFace/Accelerate, Ray, LangChain, VectorDB (ChromaDB)
- Operating Systems: Windows, Linux (Ubuntu/Debian, RHEL)
- Version Control: GitHub, GitLab, Git CLI
- Digital Media: Microsoft PowerPoint, Microsoft Word, Adobe Illustrator, Adobe After Effects

Manuscripts

- 2024** **A. Pant[†]**, Y. Melkani[†], G. C. Melkani, “*Machine Learning of Contractile Dynamics of Drosophila Hearts*”, published in *Nature: Communications Biology*, doi: 10.1038/s42003-025-06371-7.
- A. Pant** and K. Appavoo, “*Machine Learning of Photonic Nanostructures in their Environment*” in preparation.
- 2023** K. L. Johnson, P. J. Noell, H. Lim, R. B. Macedo, D. Maestas, A. T. Polonsky, J. M. Emery, M. W. Vaughan, C. Martinez, K. Potter, **A. Pant**, “*Exploring plasticity and damage through high-fidelity modeling and novel X-ray techniques*” published in *2023 Sandia Annual HPC Report* (<https://www.sandia.gov/news/publications/hpc-annual-reports/>).
- C. Arnold[†], J. Collingwood[†], M. Rathbun, **A. Pant**, P. Dangle, “*Symptomatic Pediatric Stone Disease at the Emergency Department – A Review of PHIS National Database*” in review at *Journal of Urology*.
- C. Arnold[†], J. Collingwood[†], **A. Pant**, M. A. Rathbun, P. Dangle, “*Future projections of symptomatic pediatric nephrolithiasis in the United States - a time series analysis*”, American Urological Association meeting (Late Breaking Abstract), doi: 10.1097/JU.0000000000003360.13.
- 2022** B. Dhami[†], V. Iyer[†], **A. Pant[†]**, R. Tripathi, E. J. Taylor, B. Lawrie, K. Appavoo, “*Angle-Resolved Cathodoluminescence Polarimetry of Hybrid Perovskites*”, published in *Nanoscale*, doi: 10.1039/D2NR03261A.
- K. M. Potter, S. Famili, A. P. Garland, J. E. Jones, **A. Pant**, “*Automatic Detection of Defects in High-Reliability Components*”, published by US-DOE NNSA (SAND Report), doi: 10.2172/1890067.
- 2021** **A. Pant** and K. Appavoo, “*Plasmonic and Dielectric Nanostructures: Distinguishing Size, Material, and Dielectric Environment via Machine Learning*”, published in *CLEO (conference publication)*, doi: 10.1364/CLEO_SI.2021.SM1Q.6.

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Posters and Talks

- 2024**
- T. Ganter, **A. Pant**, “*Natural Language Processing and Large Language Models for Nuclear Deterrence*”, Virtual (D6K Innovation Club), February 2024, Albuquerque, NM.
- A. Hooker, B. Kessel, **A. Pant**, “*Natural Language Processing and Large Language Models for Nuclear Deterrence*”, Virtual (ND Tech Talk), January 2024, Albuquerque, NM.
- T. Ganter, **A. Pant**, “*Natural Language Processing and Large Language Models for Nuclear Deterrence*”, Virtual (ND Tech Talk), January 2024, Albuquerque, NM (delivered to NNSA/DOE, SNL AI Board, and SNL Internal).
- 2023**
- A. Pant**, J. Leonard, A. Garland, A. MacFarland, M. Fuller, “*NOMAD/Bounty Hunter: Generative AI for Synthetic Data Pipelines*”, Virtual (Online Talk), October 2023, Albuquerque, NM (SNL Internal).
- A. Pant**, “*LLMs at Sandia: CUI Capabilities on the SRN*”, Staff Briefing (Oral), July 2023, Albuquerque, NM (SNL Internal).
- A. Pant**, A. MacFarland, D. Gomez, “*Integrating LLMs with Virtual Reality*”, 7th Annual Sandia XR Conference (Hands-on Demo), July 2023, Albuquerque, NM.
- K. L. Johnson**, R. B. Macedo, P. Noell, A. Polonsky, D. Maestas, H. Lim, J. Emery, C. Martinez, A. Pant, K. Potter, “*Predicting Microstructure-Aware Mechanical Reliability using Deep Learning*”, Non-Conference Presentation (Poster), July 2023, Albuquerque, NM.
- C. Arnold[†], **J. Collingwood[†]**, M. A. Rathbun, A. Pant, “*Assessing Basic Laparoscopic Skill Development in Medical Students: A Simulation Study*”, ACOM Spring Conference (Poster), April 2023, Dothan, AL.
- C. Arnold[†]**, J. Collingwood[†], A. Pant, M. A. Rathbun, P. Dangle, “*Future projections of symptomatic pediatric nephrolithiasis in the United States - a time series analysis*”, American Urological Association meeting (Late Breaking Abstract), April 2023, Chicago, IL. doi: 10.1097/JU.0000000000003360.13. [Podium]
- C. Arnold[†]**, J. Collingwood[†], A. Pant, M. A. Rathbun, P. Dangle, “*Future projections of symptomatic pediatric nephrolithiasis in the United States - a time series analysis*”, American Urological Association meeting (Late Breaking Abstract), April 2023, Chicago, IL. doi: 10.1097/JU.0000000000003360.13. [Poster]
- A. Pant** and K. Appavoo, “*Machine learning for disentangling ultrafast fast dynamics in high-performance electronics*”, Georgia Tech MRS Expo (Poster), March 2023, Atlanta, GA.
- K. L. Johnson**, J. Emery, H. Lim, R. D. Macedo, D. Maestas, C. Martinez, A. Pant, S. Kramer, P. Noell, A. Polonsky, “*Predicting the Mechanical Response of Microstructurally Complex Materials using Machine Learning*”, Conference Presentation (Oral), March 2023, Online.
- 2022**
- B. Dhami**, V. Iyer, A. Pant, R. Tripathi, E. Taylor, B. Lawrie, K. Appavoo, “*Angle-resolved cathodoluminescence polarimetry of hybrid organic-inorganic lead halide perovskites*”, APS Fall Meeting, November 2022, Oxford, MS.
- D. Hoxie**, A. Pant, P. Bangalore, K. Appavoo, “*Unsupervised learning of nanophotonic optical responses via embedded spectra in t-distribution stochastic neighbor embedding methods*”, APS Fall Meeting, November 2022, Oxford, MS.

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- E. Taylor**, B. Dhami, A. Pant, K. Appavoo, “*Probing exciton dynamics in hybrid perovskites via femtosecond interferometric techniques*,” APS Fall Meeting, November 2022, Oxford, MS.
- A. Pant**, Y. Melkani, and G.C. Melkani, “*Machine learning for contractile dynamics in Drosophila hearts*,” UAB Pathology Research Retreat (Poster), September 2022, Birmingham, AL. [Exemplar Staff Scientist Award]
- A. Pant** and K. Appavoo, “*Machine learning for disentangling ultrafast fast dynamics in high-performance electronics*,” UAB Undergraduate Expo (Poster), July 2022, Birmingham, AL. [1st Prize]
- A. Pant, **Y. Melkani**, G.C. Melkani, “*Machine learning of contractile dynamics of Drosophila hearts*,” UAB Undergraduate Expo (Oral), July 2022, Birmingham, AL.
- 2021** **A. Pant** and K. Appavoo, “*Distinguishing the optical properties of plasmonic and dielectric nanostructures via machine learning*,” CLEO Meeting, May 2021, Online.
- A. Pant** and K. Appavoo, “*Distinguishing the optical properties of plasmonic and dielectric nanostructures via machine learning*,” APS March Meeting, March 2021, Online.
- 2020** **A. Pant** and K. Appavoo, “*Novel Applications of Machine Learning for Nanoscale Biosensing*,” Junior Sciences and Humanities Symposium, May 2020, Online. [Int. Finalist]
- A. Pant** and K. Appavoo, “*Novel Applications of Machine Learning for Nanoscale Biosensing*,” Alabama Junior Academy of Science, Mar 2020, Online. [1st Prize]
- 2019** **A. Pant** and K. Appavoo, “*Novel Applications of Machine Learning in Ultrafast Optics*,” Alabama Regional Science and Engineering Fair, April 2019, Huntsville, AL. [1st Prize]
- A. Pant** and K. Appavoo, “*Novel Applications of Machine Learning in Ultrafast Optics*,” Central Alabama Regional Science and Engineering Fair, Mar 2019, Birmingham, AL. [2nd Prize]
- A. Pant** and K. Appavoo, “*Novel Applications of Machine Learning in Ultrafast Optics*,” Alabama Junior Academy of Science, Mar 2019, Tuskegee, AL. [3rd Prize]
- 2018** **A. Pant** and K. Appavoo, “*Optical Studies of Nanostructures for Biosensing Studies*,” Intel International Science and Engineering Fair, May 2018, Pittsburgh, PA. [Int. Finalist]
- A. Pant** and K. Appavoo, “*Optical Studies of Nanostructures for Biosensing Studies*,” Junior Sciences and Humanities Symposium, May 2018, Hunt Valley, MD. [Int. Finalist]
- A. Pant** and K. Appavoo, “*Optical Studies of Nanostructures for Biosensing Studies*,” Alabama Junior Academy of Science, Mar 2018, Birmingham, AL. [2nd Prize; Selected for the Junior Sciences and Humanities Symposium]
- A. Pant** and K. Appavoo, “*Optical Studies of Nanostructures for Biosensing Studies*,” Alabama Regional Science and Engineering Fair, April 2018, Birmingham, AL. [3rd Prize]
- A. Pant** and K. Appavoo, “*Optical Studies of Nanostructures for Biosensing Studies*,” Central Alabama Regional Science and Engineering Fair, Mar 2018, Birmingham, AL. [1st Prize; Selected for Intel International Fair]

Honors and Awards

Sciences:

- 2024** **Critical Skills Recruiting – May 2024**
 Selected for Critical Skills Recruiting program. Supported by Sandia funding (approx. value: \$500K) to pursue graduate studies.
- Managerial Spot Award – February 2024**
 Awarded managerial Spot Award (\$450) for 2024 ND Tech Talk.
- Thunderbird Kudos – February 2024**
 Awarded Thunderbird Kudos for 2024 6300 Innovation Series Presentation.
- 2023** **Thunderbird Kudos – August 2023**
 Awarded Thunderbird Kudos for 2023 MLDL Workshop Planning Committee.
- Thunderbird Kudos – August 2023**
 Awarded Thunderbird Kudos for MLDL Moderation Hero.
- Thunderbird Kudos – May 2023**
 Awarded Thunderbird Kudos for 5570 Kid's Day Team.
- Certificate of Excellence Award – May 2023**
 Awarded by 5575 manager (Charles Snider) for Kid's Day event.
- 2022** **UAB Pathology Department Retreat – September 2022**
 Awarded (1 of 1) Staff Scientist monetary award for exemplar contribution in Dept. of Pathology.
- UAB Undergraduate Expo – July 2022**
 1st Place Physical Sciences poster.
- 2020** **John Hunter, Jr. MSE (dept.) Scholarship – August 2020**
 Awarded USD 3K/semester scholarship for pursuing MSE studies at Georgia Tech.
- Georgia Tech Birmingham Alumni Scholarship – July 2020**
 Awarded (1 of 1) \$16K scholarship from Birmingham Alumni association.
- Junior Sciences and Humanities Symposium (JSHS) – May 2020**
 Represented Alabama at JSHS (1 of 5). Materials Science competitor.
- Alabama Junior Academy of Science (AJAS) – March 2020**
 1st Place Physics Oral Presenter. \$1000 award.
- 2019** **US Presidential Scholar Nomination and Semi-Finalist – October 2019**
 JSHS US Presidential Scholar nomination for the state of Alabama (1 of 2 students).
- Alabama Science and Engineering Fair (ASEF) – April 2019**
 1st Place Materials Science Poster. Awarded IEEE - Huntsville Section: Senior Best of Show (\$100) and Society of Photo-Optical Instrumentation Engineers (SPIE): 1st Place (\$250) Award.
- Alabama Junior Academy of Science (AJAS) – March 2019**
 3rd Place Engineering/Mathematics Oral Presenter. Voted Special Assistant to the Director.
- Central Alabama Regional Science and Engineering Fair (CARSEF) – March 2019**
 2nd Place Engineering Poster.

- 2018** **Intel International Science and Engineering Fair (Intel ISEF) – May 2018**
 Represented Alabama at Intel ISEF (1 of 20). Material Science competitor.
- Junior Sciences and Humanities Symposium (JSHS) – May 2018**
 Represented Alabama at JSHS (1 of 5). Chemistry/nanomaterials competitor.
- Alabama Science and Engineering Fair (ASEF) – April 2018**
 3rd Place Chemistry Poster. Awarded Directed Energy Professional Society Award (Outstanding Senior Project), Society of Photo-Optical Instrumental Engineers (SPIE) (3rd Place Senior), U.S. Army Science and Engineering Award: Senior Honorable Mention.
- Alabama Junior Academy of Science (AJAS) – March 2018**
 2nd Place Physical Sciences Oral Presenter, Elected Treasurer. Invited to JSHS.
- Central Alabama Regional Science and Engineering Fair (CARSEF) – March 2018**
 1st Place Chemistry Poster. Competition Top Honor, recipient of Intel ISEF award and scholarship.
- Science Olympiad – March 2018**
 Regional Competition: 2nd Place Astronomy, 2nd Place Material Science, 3rd Place Anatomy and Physiology; State Competition: 3rd Place Material Science
- Computer Science:**
- 2023** **DS@GT Hacklytics – February 2023**
 Team Award: ~\$300. Most Creative Hack.
- 2022** **HackGT 9 – October 2022**
 Team Award: \$200. 2nd Place, BlackRock Challenge.
- 2020** **NASA Space Apps – October 2020**
 Team Award: \$1000. 1st Place Professional Team.
- HudsonAlpha Tech Challenge – March 2020**
 Team Award: \$1000. 1st Place High School.
- 2019** **NASA Space Apps – October 2019**
 Team Award: \$3000, 1st Place High School.
- University of Alabama Capture the Flag – April 2019**
 Team Award: \$400, 2nd Place High School.
- HudsonAlpha Tech Challenge – February 2019**
 Team Award: \$1000 Prize, 1st Place High School.
- 2018** **Congressional App Challenge – November 2018/May 2019/November 2019**
 Led team of four to be named Congressional District 6 winner and national finalists. Selected to present designed app at U.S. Capitol, Washington, D.C.