

Lu Niu

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I am a fifth-year PhD student in Computer Science at the University of Notre Dame specializing in computer vision, machine learning, and signal processing. Experienced in building deep learning systems for large-scale video datasets, with applications in physiological sensing, biometric security, and AI-generated content. Skilled in end-to-end ML model development, signal/video processing, and algorithmic innovation. Passionate about applying research to real-world, large-scale video recommendation and content understanding systems.

EDUCATION

<i>Ph.D. in Computer Science and Engineering</i>	August 2021 - December 2026 (expected)
University of Notre Dame - Computer Vision Research Lab	Notre Dame, Indiana, USA
Advisor: Dr. Patrick Flynn	
<i>M.S. in Applied Data Science</i>	May 2021
University of Southern California (USC)	Los Angeles, California, USA
<i>M.S. in Industrial & Systems Engineering</i>	December 2016
University of Southern California (USC)	Los Angeles, California, USA
<i>B.S. in Engineering Management</i>	June 2014
Beijing University of Posts and Telecommunications (BUPT)	Beijing, China

TECHNICAL SKILLS

- Programming & ML: Python, PyTorch, TensorFlow, OpenCV, Pandas, Transformer, NumPy, Scipy, CNN, Time-Series Modeling, Recommendation Systems, LLM, Supervised & Unsupervised Learning
- Signal Processing & Health Sensing: rPPG Extraction, Bandpass Filtering, HRV Analysis, Multi-Sensor Fusion, Motion Artifact Removal
- Data & Infrastructure: Apache Spark, Hadoop, Docker, Git, Linux
- Workflow: Model deployment, data pipeline design, large-scale dataset curation

PROFESSIONAL EXPERIENCES

<i>PhD Research Intern</i>	May 2024 - August 2024
Dolby Laboratories	Sunnyvale, California, USA
• Fine-tuned Large Language Models (LLMs) and integrated multiple large language/vision models for Artificial Intelligence Generated Content (AIGC) research.	
• This work has led to a patent application currently under review, with a related publication in preparation.	
<i>Graduate Research Assistant</i>	August 2021 - Current
University of Notre Dame	Notre Dame, Indiana, USA
• Research in remote vitals estimation using deep learning and signal processing .	
• Collected a large-scale video dataset with simultaneous recordings of physiological signals.	
• Led ML research on large-scale video datasets for signal and pattern extraction; developed deep neural network pipelines to improve prediction accuracy and runtime efficiency for real-time biometric sensing.	
<i>Graduate Research Intern</i>	May 2020 - August 2021
Information Sciences Institute, USC	Remote (Marina del Rey, California, USA)
• Created Breast Cancer Clinical Trial Dataset by extracting data from published papers and clinicaltrials.gov, and developed a structured and quantitative approach for systematically comparing trials based on trial stages.	

- Built a **Knowledge Graph** based on the dataset, facilitating decision support for clinicians and implemented **SPARQL** queries on the Knowledge Graph using Apache Fuseki to enable advanced querying and analysis.

PATENT APPLICATIONS

- Jeremy Speth, Nathan Carpenter, Nathan Vance, **Lu Niu**, Siamul Khan, Adam Czajka, Patrick Flynn. “LIVENESS DETECTION”, United States Patent Application 20240334008
- Jeremy Speth, Patrick Flynn, Adam Czajka, Benjamin Sporrer, **Lu Niu**, Nathan Carpenter, Leandro Olie, “Trustworthy Anomaly-Aware Remote Pulse Estimation,” U.S. Patent Application No. 63/388,984, 2022.

PUBLICATIONS

1. **Lu Niu**, Jeremy Speth, Nathan Vance, Benjamin Sporrer, Adam Czajka, Patrick Flynn, “Full-Body Cardiovascular Sensing with Remote Photoplethysmography,” in *Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition Workshop (CVPRW) on Computer Vision for Physiological Monitoring (CVPM)*, 2023 (**Best Paper Award**)
2. Jeremy Speth, Nathan Vance, Benjamin Sporrer, **Lu Niu**, Patrick Flynn, Adam Czajka, “Hallucinated Heartbeats: Anomaly-Aware Remote Pulse Estimation,” *The 16th International Joint Conference on Biomedical Engineering Systems and Technologies: BIOSIGNALS*, ISBN 978-989-758-631-6, pp. 106-117, 2023 (**shortlisted for best student paper award**)
3. Jeremy Speth, Nathan Vance, **Lu Niu**, Benjamin Sporrer, Adam Czajka, Patrick Flynn, “Mspm: A multi-site physiological monitoring dataset for remote pulse, respiration, and blood pressure estimation” *IEEE Transactions on Instrumentation and Measurement*, 2024
4. **Lu Niu**, Benjamin Sporrer, Adam Czajka, Patrick Flynn, “Spoof detection Using Remote Photoplethysmography (rPPG) Signals”,(under preparation for Face Recognition 2nd round)
5. **Lu Niu**, Patrick Flynn, “Can the Ear Hear the Heart?: A Comparative Study of Ear vs Face rPPG Signals.”,(under preparation for CVPR)
6. **Lu Niu**, Patrick Flynn, “Twin rPPG: Hard-Impostor Representation Learning for Robust Physiological Biometrics”,(under preparation for ECCV)
7. **Lu Niu**, Patrick Flynn, “Trust Beyond the Face: Blockchain-Secured Twin-Resilient MFA”,(under preparation for IJCB)

RESEARCH PRESENTATIONS

- *Midwest Computer Vision Workshop* September 2024, Bloomington, Indiana
Presented current research on spoof detection through windshield using rPPG signals from polarimetric videos.
- *The Sixth International Workshop on Computer Vision for Physiological Measurement (CVPM) in junction of CVPR 2023* June 2023, Vancouver, Canada
Presented *Full-Body Cardiovascular Sensing with Remote Photoplethysmography (rPPG)* . Introduced newly collected large-scale dataset and baseline analysis using signal processing and deep learning methods to estimate pulse rate and pulse transit time from multiple body parts from video. (**best paper award**)

REVIEWS

- IEEE MultiMedia
- IEEE/CVF Winter Conference on Applications of Computer Vision (WACV)
- IEEE International Conference on Data Mining
- IEEE/CVF Conference on Computer Vision and Pattern Recognition