Ziyang Wang

CONTACT INFORMATION

Ziyang Wang
Ph.D. Candidate
Department of Electrical and Computer Engineering
Rice University, Houston, TX 77005, USA
Email: Ziyang.Wang@rice.edu **Website:** https://tigerwang3133.github.io/
Phone: +1-814-880-5837 **LinkedIn:** https://linkedin.com/in/ziyang-wang-rice

EDUCATION

Rice University, TX, USA
Ph.D., Electrical and Computer Engineering *8/2020 – Expected 5/2026*
Advisor: **Prof. Shengxi Huang**
M.S., Electrical and Computer Engineering *5/2023*
GPA: 4.00/4.00

The Pennsylvania State University, PA, USA
B.S., Computer Science, **B.S.**, Mathematics *8/2016 – 5/2020*
Graduated as Schreyer Honors Scholar with dual Magna Cum Laude Honors
GPA: 3.96/4.00, Dean's List: 6/6

RESEARCH INTERESTS

Artificial intelligence, Machine learning, Biomolecule and disease sensing, Materials characterization and design, Hyperspectral imaging

HONORS AND AWARDS

Travel Award, Rice Synthetic Biology Institute (RSBI) *2024*
Best Abstract Award, United States and Canadian Academy of Pathology (USCAP) *2024*
Phase One Winner, Nittany AI Challenge *2022*
Winner, Asian Future Innovation Challenge Seattle *2022*
Best Poster Award, IndustryXchange *2021*
Schreyer Honors Scholar, Penn State *2020*
Magna Cum Laude, College of Engineering, Penn State *2020*
Magna Cum Laude, Eberly College of Science, Penn State *2020*
Dean's List, Penn State *2016 – 2020*
Second Prize, FIRST Tech Challenge, China *2015*

RESEARCH EXPERIENCE

ScopeLab, Rice University *8/2020 – Present*
Research Assistant Houston, TX

- Pioneered an **interpretable machine learning (ML) biosensing** platform integrating Raman spectroscopy and 2D materials, enabling **rapid screening of Alzheimer's disease (AD) biomarkers**.
  - Developed interpretable ML algorithms, improving AD diagnosis accuracy from 77% to 98% with graphene enhancement; identified 3 novel biomarkers.

- Designed a specialized ML algorithm (PSE-LR) for spectral interpretation, achieving a benchmark F1-score of 0.95 with superior interpretability over conventional models.
- Integrated Raman hyperspectral imaging with ML, enabling label-free mapping of AD biomarkers across brain regions, advancing biomarker detection and distribution analysis.
- Published two first-author papers in *ACS Nano*; received industryXchange 2021 Best Poster Award and RSBI 2024 Award; one manuscript under review at *Light: Science & Applications*.

- Developed the **first-of-its-kind deep learning models** to extract optical properties using standard optical microscopes, enabling **in-operando characterization of functional and evolving materials**.
  - Created a benchmark dataset of 2.2 million material stacks via DFT simulations; designed convolutional, recurrent, and transformer neural networks, achieving state-of-the-art PCC of 0.99.
  - Published one first-author paper in *2D Materials*; presented at SCI Summer 2023, APS March 2023, MRS Fall 2022, APS March 2022; one manuscript in preparation.
- Designed **convolutional and transformer networks** for **respiratory virus strain identification** and biomolecule recognition, enabling portable virus detection devices.
  - Achieved 95% accuracy in virus strain identification using a convolutional neural network and developed a spectral transformer to classify 32 avian coronavirus strains.
  - Published in *PNAS* and *ISBI*, establishing foundation for advanced portable virus detection systems.
- Applied the **Raman-ML platform** for **early pancreatic cancer diagnosis**; utilized **unsupervised ML** to reveal **cellular heterogeneity** and support targeted treatment strategies.
  - Designed supervised ML models, achieving 95% accuracy in early cancer stages diagnosis; developed unsupervised ML to identify 3 cancer variations.
  - Received USCAP 2024 Best Abstract Award; one manuscript in preparation; collaborating for clinical validation.

PEER-REVIEWED PUBLICATIONS

Google Scholar Profile: https://scholar.google.com/citations?user=HrtXQdoAAAAJ

- **Z. Wang**, J. Ranasinghe, W. Wu, D. Chan, A. Gomm, R. Tanzi, C. Zhang, N. Zhang, G. Allen, S. Huang, "Machine Learning Interpretation of Optical Spectroscopy Using Peak-Sensitive Logistic Regression," *ACS Nano*, 19(16), 15457-15473 (2025). [News] [Interview]
- **Z. Wang**, J. Ye, K. Zhang, L. Ding, T. Granzier-Nakajima, J. Ranasinghe, Y. Xue, S. Sharma, I. Biase, M. Terrones, S. H. Choi, C. Ran, R. Tanzi, S. X Huang, C. Zhang, S. Huang, "Rapid Biomarker Screening of Alzheimer's Disease by Interpretable Machine Learning and Graphene-Assisted Raman Spectroscopy," *ACS Nano*, 16(4), 6426-6436 (2022). [News]
- **Z. Wang**, Y. C. Lin, K. Zhang, W. Wu, S. Huang, "Measuring Complex Refractive Index Through Deep-Learning-Enabled Optical Reflectometry," *2D Materials*, 10(2), 025025 (2023).
- A. Jain, A. Bhasin, **Z. Wang**, R. Gieseking, J. Robinson, S. Huang, "Effect of Molecular Configuration in 2D Materials Enhanced Raman Spectroscopy," *Carbon*, 120576, (2025).
- K. Zhang, **Z. Wang**, H. Liu, N. Perea-López, J. Ranasinghe, G. Bepete, A. M. Minns, R. M. Rossi, S. E. Lindner, X. Huang, M. Terrones, S. Huang, "Understanding the Excitation Wavelength Dependence and Thermal Stability of the SARS-CoV-2 Receptor-Binding Domain Using Surface-Enhanced Raman Scattering and Machine Learning," *ACS Photonics*, 9(9), 2963-2972 (2022).
- J. Ye, Y.-T. Yeh, Y. Xue, **Z. Wang**, N. Zhang, H. Liu, K. Zhang, R. Ricker, Z. Yu, A. Roder, N. P. Lopez, L. Organtini, W. Greene, S. Hafenstein, H. Lu, E. Ghedin, M. Terrones, S. Huang, S. X. Huang,

"Accurate Virus Identification with Interpretable Raman Signatures by Machine Learning," *Proceedings of the National Academy of Sciences (PNAS)*, 119(23), e2118836119 (2022). [News]

- J. Ranasinghe, **Z. Wang**, S. Huang, "Unveiling Brain Disorders Using Liquid Biopsy and Raman Spectroscopy," *Nanoscale* 16(25), 11879-11913 (2024). [News]
- J. Ranasinghe, **Z. Wang**, S. Huang, "Raman Spectroscopy on Brain Disorders: Transition from Fundamental Research to Clinical Applications," *Biosensors*, 13(1), 27 (2022).
- J. Ranasinghe, A. Jain, W. Wu, K. Zhang, **Z. Wang**, S. Huang, "Engineered 2D Materials for Optical Bioimaging and Path Toward Therapy and Tissue Engineering," *Journal of Materials Research*, 37(10), 1689-1713 (2022).

MANUSCRIPTS IN PROCESS

- **Z. Wang**, J. Ranasinghe, D. Chan, A. Gomm, R. Tanzi, C. Zhang, S. Huang, "High Resolution Molecular Atlas of Alzheimer's Brain via Machine Learning-Enhanced Hyperspectral Raman Imaging," *Light: Science & Applications*, Under Review.
- W. Wu, **Z. Wang**, X. Li, Y. Han, J. Kono, S. Huang, "Manufacturing Chip-Scale 2D Monolayer Single Crystals Through Wafer-Bonder-Assisted Transfer," *Nano Letters*, Under Review.
- J. Ranasinghe, S. Sanders, **Z. Wang**, W. Wu, E. Dimitrov, M. Terrones, A. Alabastri, S. Huang, "Noise Management of Surface-Enhanced Raman Spectroscopy Using Two-Dimensional Materials," *Carbon*, Under Review.
- **Z. Wang**, X. Wang, W. Wu, Y. C. Lin, S. Huang, "In-operando Optical Characterization of Evolving 2D Materials Using Recurrent Neural Network," In Preparation.
- J. Ranasinghe, **Z. Wang**, T. Liang, S. Huang, H. Wang, "Mapping Tumor Heterogeneity and Metabolomics of Pancreatic Ductal Adenocarcinoma Using Raman Hyperspectral Imaging with Machine Learning Interpretation," In Preparation.

BOOK CHAPTERS

- K. Zhang, A. Jain, W. Wu, J. Ranasinghe, **Z. Wang**, S. Huang, "Optical Properties and Emerging Phenomena of Two-Dimensional Materials," *Novel Optical Materials* (2023).

CONFERENCE PAPERS

- P. Jin, Y.-T. Yeh, J. Ye, **Z. Wang**, Y. Xue, N. Zhang, S. Huang, E. Ghedin, H. Lu, A. Schmitt, S. X. Huang, M. Terrones, "Strain-Level Identification and Analysis of Avian Coronavirus Using Raman Spectroscopy and Interpretable Machine Learning," *IEEE 20th International Symposium on Biomedical Imaging (ISBI)*, pp. 1-5 (2023).

CONFERENCE PRESENTATIONS

- MRS Fall Meeting 2024, "Machine Learning Interpretation of Optical Spectroscopy Using Peak-Sensitive Logistic Regression," Boston, MA, Dec. 2024.
- MRS Fall Meeting 2024, "2D Material Facilitated Surface-Enhanced Raman Spectroscopy of SARS-CoV-2 Receptor-Binding Domain," Boston, MA, Dec. 2024.
- MRS Fall Meeting 2024, "Designer 2D Materials and Machine-Learning Assisted Characterization," Boston, MA, Dec. 2024.

- Rice Synthetic Biology Institute (RSBI) Retreat, "High-Multiplexity Biosensing: Pancreatic Cancer Cell Heterogeneity Discovery," Galveston, TX, Oct. 2024.
- United States and Canadian Academy of Pathology (USCAP) 113th Annual Meeting 2024, "Mapping Tumor Heterogeneity and Metabolomics of Pancreatic Ductal Adenocarcinoma Using Raman Hyperspectral Imaging with Machine Learning Interpretation," Boston, MA, Mar. 2024.
- SCI Summer 2023 Research Colloquium, "Measuring Complex Refractive Index Through Deep-Learning-Enabled Optical Reflectometry," Houston, TX, Aug. 2023.
- APS March Meeting 2023, "EllipsoNet: Deep-Learning-Enabled Optical Ellipsometry for Complex Thin Films," Las Vegas, NV, Mar. 2023.
- MRS Fall Meeting 2022, "EllipsoNet: Deep-Learning-Enabled Optical Ellipsometry for Complex Thin Films," Boston, MA, Dec. 2022.
- APS March Meeting 2022, "Deep-Learning-Enabled Optical Ellipsometry for Complex Thin Films and 2D Materials," Online, Mar. 2022

TEACHING AND MENTORING

Mentor, Summer Undergraduate Researcher *2025*
Guided project on microplastic detection in mouse brain using ML-enhanced spectroscopy.

Mentor, Summer Undergraduate Researcher *2025*
Led development of a multimodal LLM-based lab agent for 2D material detection.

Mentor, Undergraduate Researcher *2025*
Directed application of supervised ML for segmentation of brain Raman atlas.

Mentor, Undergraduate Researcher 2024
Supervised implementation of CNN for high-accuracy virus classification from Raman spectra.

Mentor, Visiting Exchange Undergraduate *2024*
Implemented Vision Transformer (ViT) model for optical material characterization.

Mentor, Graduate Student *2022*
Designed and implemented automated ETL pipeline for data extraction and web crawling.

Mentor, Summer Undergraduate Researcher *2021*
Supervised development of spectral preprocessing pipeline; mentee later admitted to Ph.D. program at University of Delaware.

Mentor, Undergraduate Student *2020*
Co-authored publication in *ACS Nano*, 16(4), 6426-6436 (2022).

Mentor, Undergraduate Student *2020*
Advised undergraduate thesis titled "Machine Learning Classification for Raman Spectra."

Teaching Assistant, Introduction to the Theory of Computation *2019*
Graded exams and held office hours for student support and problem-solving.

Lecturer, UPVC, Penn State *2018*
Delivered lectures on product management and marketing strategy fundamentals.

SERVICES AND LEADERSHIP

Peer Reviewer, *Computers in Biology and Medicine* *2025*

Peer Reviewer, *ACS Sensors* *2025*

Peer Reviewer, *Journal of Physics: Condensed Matter* *2024*

Volunteer Mentor, USTC Visiting Program, Rice University *2024*

Volunteer Mentor, ECE Mentorship Program, Rice University *2024*
Poster Judge, SCI Summer 2023 Research Colloquium, Rice University *2023*
Graduate Student Leader, Nittany AI Challenge, Penn State *2022*
Chief Technology Officer, iDeal Technology (Startup), Pennsylvania *2020*
Student Lecturer, United Product Vision Club, Penn State *2018*
Volunteer Lecturer, Dabie Mountains Region, Anhui, China *2016*

GRANTS AND FUNDING

Assisted in writing "Multimodel AI Framework for Biomarker Discovery of Pancreatic Cancer." *2024*
Awarded $25,000 by the Ken Kennedy Institute Fund
Assisted in writing "Staging and Understanding Pancreatic Cancer Using Deep-Learning Assisted *2024*
Raman Spectroscopy." Submitted to the Provost's TMC Collaborator Fund
Assisted in writing "AI-Enabled High-Throughput In-Operando Optical Spectro-Microscopy for *2024*
Emerging Neuromorphic and Quantum Materials Characterization." Submitted to the National Science Foundation

WORKING EXPERIENCE

iDeal Technology, LLC (Startup) *3/2020 – 8/2020*
Chief Technology Officer & Co-founder State College, PA

- **Co-founded and launched a mobile app** on major app stores, achieving **15,000+ downloads** and **500+ DAU**, simplifying housing rentals and peer-to-peer trading for university students.
  - Led a development team of 4 to develop the app with Vue, SQL, PHP, and AWS; managed an R&D team of 3 to integrate a recommendation system with NLP, boosting ASD by 17.6%.
  - Attained $5 million GMV, winning the 2022 Asian Future Innovation Challenge.

DataCVG *5/2019 – 7/2019*
Data Analyst, Intern Shanghai, China

- Developed an **automated Python web crawler** to **extract 80K+ records** from **5000+ listed companies**, enhancing stockholder decision-making efficiency.
  - Extracted and parsed unstructured financial reports using Selenium, BeautifulSoup, Pandas, and NumPy; applied NLP tools to analyze report content; visualized insights using Power BI.

ATOZ Information Technology *5/2017 – 7/2017*
Software Engineer, Intern Shanghai, China

- Built **AI-powered inspection services** for factory maintenance and created **AR demos** for Microsoft HoloLens, showcasing industrial AI solutions to stockholders.
  - Calibrated spatial localization algorithms; established a visual inspection images database; trained a convolutional neural network using Microsoft CNTK for industrial defect recognition.

SKILLS

Programming Languages: Python, MATLAB, R, SQL, Vue, HTML, CSS, JavaScript, Java, C, PHP

Libraries: PyTorch, Scikit-learn, NumPy, Pandas, Selenium, BeautifulSoup, Flask, Django

Tools & Software: Jupyter, VS Code, Microsoft Office (PowerPoint, Word, Excel), Power BI, LaTeX, CompleteEase, WiRE, COMSOL, Blender, Shapr3D, AWS, CNTK, Docker, Git, Linux