

Ziyang Wang

CONTACT INFORMATION

Ziyang Wang

Ph.D. Candidate

Department of Electrical and Computer Engineering

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EDUCATION

Rice University, TX, USA

Ph.D., Electrical and Computer Engineering

8/2020 – Expected 8/2025

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

Graduate with Schreyer Honors Scholar, Magna Cum Laude Reward

GPA: 3.96/4.00, Dean's List: 6/6

RESEARCH INTERESTS

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

HONORS AND AWARDS

Rice Synthetic Biology Institute (RSBI) Travel Award	2024
Best Abstract Award, Pancreatobiliary Pathology Conference	2024
Nittany AI Challenge Phase One Winner	2022
Asian Future Innovation Challenge Seattle Winner	2022
Best Poster Award, IndustryXchange	2021
Schreyer Honors Scholar, Penn State	2020
Magna Cum Laude, Engineering College, Penn State	2020
Magna Cum Laude, Science College, Penn State	2020
Dean's List, Engineering College, Penn State	2016 – 2020
FIRST Tech Challenge, Second Prize, 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 biomarkers** of Alzheimer's disease (AD).
 - Developed interpretable ML algorithms (SVM, LR, XGBoost), elevating the AD diagnosis accuracy from 77% to 98% with graphene enhancement, identifying 3 critical AD biomarkers.

- Designed a specialized ML algorithm (PSE-LR) for spectral interpretation, achieving a benchmark F1-score of 0.95 with accurate interpretability, outperforming all the conventional ML algorithms.
- Applied Raman hyperspectral imaging with ML models, enabling label-free mapping of AD biomarkers across brain regions, advancing biomarker detection and distribution analysis.
- Published in *ACS Nano*; received industryXchange 2021 Best Poster Award and RSBI 2024 Award; one manuscript under review at *ACS Nano*, one manuscript under review at *Science Advances*.
- Developed the **first-of-its-kind deep learning models** to measure optical properties with 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 in *2D Materials*; presented at APS March 2023, SCI Summer 2023, and MRS Fall 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 with a CNN model and developed a spectral transformer for classification of 32 avian coronavirus strains.
 - Published in *PNAS* and *ISBI*, establishing foundation for advanced portable virus detection systems.
- Employed the **Raman-ML platform to diagnose early pancreatic cancer stages**; utilized **unsupervised ML** to reveal **cellular heterogeneity**, enhancing targeted pancreatic cancer treatment.
 - Designed supervised ML models and achieved 95% accuracy in early cancer stages diagnosis; developed unsupervised ML (kmeans, autoencoder) to identify 8 cancer variations.
 - Received 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*, Accepted (2025).
- **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. E. 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).
- **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).
- 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).

- J. Ranasinghe, **Z. Wang**, S. Huang, “Unveiling Brain Disorders Using Liquid Biopsy and Raman Spectroscopy,” *Nanoscale* 16(25), 11879-11913 (2024).
- 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, A. Gomm, R. Tanzi, C. Zhang, S. Huang, “High Resolution Molecular Atlas of Alzheimer’s Brain,” *Science Advances*, 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,” *ACS Photonics*, Under Review.
- A. Jain, A. Bhasin, **Z. Wang**, L. Jensen, R. Gieseck, J. Robinson, S. Huang, “Probing the Effect of Dye-2D Material Configuration on Their Surface-Enhanced Raman Spectra,” In Preparation.
- **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,” Cambridge, MA, Dec. 2024.
- MRS Fall Meeting 2024, “Structural Control and Design of 2D Layered Materials and Heterostructures Towards Novel Functionalities,” Cambridge, MA, Dec. 2024.
- Rice Synthetic Biology Institute (RSBI) Retreat, “High Multiplexity Biosensing: Pancreatic Cancer Cell Heterogeneity Discovery,” Galveston, TX, Oct. 2024.
- SCI Summer 2023 Research Colloquium, “Measuring Complex Refractive Index Through Deep-learning-enabled Optical Reflectometry,” Houston, TX, Aug. 2023.

- APS March Meeting 2023, “Deep-Learning-Enabled Optical Ellipsometry for Complex Thin Films and 2D Materials,” Las Vegas, NV, Mar. 2023.
- MRS Fall Meeting 2022, “EllipsoNet: Deep-Learning-Enabled Optical Ellipsometry for Complex Thin Films,” Cambridge, MA, Dec. 2022.

TEACHING AND MENTORING

Mentor for a first-year Ph.D. student	2024
Improved an unsupervised spectroscopy analysis approach.	
Mentor for an undergraduate student	2024
Developed a neural network for virus strain identification using Raman spectra.	
Mentor for a visiting undergraduate	2024
Implemented a Vision Transformer (ViT) for material characterization.	
Mentor for a graduate student	2022
Developed an automated data extract, transform, load (ETL) pipeline for web crawling.	
Mentor for a summer undergraduate researcher	2021
Implemented a spectral preprocessing pipeline.	
Mentor for an undergraduate student	2020
Co-authored publication, <i>ACS Nano</i> , 16(4), 6426-6436 (2022).	
Mentor for an undergraduate student	2020
Completed undergraduate thesis, “Machine learning classification for Raman Spectra”.	
Teaching Assistant for the course “Introduction to the Theory of Computation”	2019
Graded exams and held office hours for homework questions.	
Lecturer for UPVC	2018
Held lectures on product management principles and marketing strategies.	

SERVICES AND LEADERSHIP

Peer Reviewer, <i>Journal of Physics: Condensed Matter</i>	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, UPVC, 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”, awarded \$25,000 by the Ken Kennedy Institute Fund	2024
Assisted in writing “Staging and Understanding Pancreatic Cancer using Deep-Learning Assisted Raman Spectroscopy”, submitted to the Provost’s TMC Collaborator Fund	2024
Assisted in writing “AI-Enabled High-Throughput In-Operando Optical Spectro-Microscopy for Emerging Neuromorphic and Quantum Materials Characterization”, submitted to National Science Foundation	2024

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

- Designed and built an **automated web crawler** in Python and **extracted 80K+ records** from **5000+ listed companies**, enhancing stockholder decision-making efficiency.
 - Extracted and unstructured companies' reports with Python (Selenium, BeautifulSoup, Pandas, Numpy); applied NLP tools for analyzing financial reports; visualized insights in (Power BI).

ATOZ Information Technology

5/2017 – 7/2017

Software Engineer, Intern

Shanghai, China

- Developed **AI-powered inspection services** for factory maintenance; created **portable augmented reality demos** on Microsoft HoloLens, showcasing industrial AI applications to stockholders.
 - Calibrated spatial localization algorithms; established a visual inspection images database; trained a convolutional neural network using Microsoft CNTK image recognition services.

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, VScode, Microsoft Office (PowerPoint, Word, Excel), Power BI, LaTeX, CompleteEase, WiRE, COMSOL, Blender, AWS, CNTK, Docker, Git, Linux