

Youlin Liu

📍 Purdue University, West Lafayette, IN 📞 765-409-6703 ✉ yliu0593@gmail.com 🌐 Website

Overview

- Research experience in spectroscopic image analysis, chemometrics, physics modeling with relevant statistical methods
- Interdisciplinary problem solving driven combining broad chemistry knowledge and coding skills
- Documentation system management with scripting languages on an aesthetics level
- Comfortable communicating complex data to lay and technical audiences in written, verbal, and visual formats

Education

Purdue University

PhD in Chemistry (expected Aug. 2021)

West Lafayette, Indiana

2016–present

University of Science and Technology of China (USTC)

Bachelor of Science, Chemistry

Hefei, China

2012–2016

Projects

Simpson Lab of Nonlinear Optics

Graduate Researcher

Purdue University

11/2016–present

Generative Adversarial Linear Discriminant Analysis

- Designed the structure of the main algorithm
- Optimized coding efficiency by substituting a genetic algorithm with an analytical model
- Evaluated the GALDA model with PCA, PLS-DA, PCA-LDA and Regularized LDA with rigorous cross-validation
- Published a public git repository for the GALDA model

Hyperspectral infrared imaging microscope design and digital image analysis

- Aligned optical components for a microscope to achieve co-propagation of a visible beam with an IR beam
- Managed and trouble-shoot electronics for synchronized digitization across signal acquisition
- Tested various image segmentation methods for various samples (chemical and tissue)
- Used ML packages from Matlab and scikit for classification tasks

High-throughput fluorescence recovery after photobleaching diffusion analysis of protein/excipient interactions

- Modeled an untraditional artificial neural network as a regression model with complex layer design for incorporated physics level parameters with experimental measurables
- Tested and validated DLVO model with simulated FRAP (Fluorescence recovery after photobleaching) data
- Assessed model accuracy with multivariate analysis and error propagation

Synchrotron X-ray damage analysis with non-negative matrix factorization

- Performed X-ray diffraction experiments at Argonne National Laboratory
- Converted Synchrotron raw data to Matlab accessible images for in-house analysis
- Indexed peaks with XDS, HKL2000

DNA-Enabled-Nano-Group, USTC

Undergraduate Researcher

Hefei, China

05/2015–06/2016

SERS (Surface-enhanced Raman spectroscopy) with gold nanoparticles

- Optimized inorganic synthesis via reaction control
- Characterized gold dimers for plasmonic properties

Mesoscale Chemical Systems, University of Twente

Research Intern

Enschede, The Netherlands

06/2015–08/2015

Sonochemical effects analysis with microfluidic sonochemical reactor

- Designed and conducted experiments to analyze sonochemical effects with chemiluminescence
- Analyzed large amount of data for statistical significance
- Validated a microfluidic sonochemical reactor's capability for producing localized radicals

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Environmental Engineering Laboratory, USTC

Undergraduate Researcher

SeCd Quantum dots detoxification analysis in C. elegans

- Toxicity analysis with SeCd forming to quantum dots within C. elegans
- Characterization methods: HPLC, fluorescence microscopy

Hefei, China

01/2014–04/2015

Skills & Interests

Laboratorial: Standard inorganic&organic synthesis, optics alignment, X-ray diffraction operation

Proficient coding languages: Matlab, python

Typesetting and documentation management: L^AT_EX, Markdown, html, pandoc, git, bash

Other standalone suites: LabView, XDS, HKL2000, CCP4, Vina, ImageJ

Outreach & Teaching

Teaching Assistant: General chemistry teaching assistant, Purdue University 2017-2018

Course Coordinator: General chemistry II course coordinator for interactive teaching 2018

Graduate TA Mentor: Guidance and feedback to new graduate teaching assistants 2018-2019

Conferences

SciX Generative Adversarial Linear Discriminant Analysis (virtual) 2020

ACS Generative Adversarial Linear Discriminant Analysis San Diego, CA (virtual) 2020

Pittcon Conference Hyperspectral image classification Chicago, IL 2020

Turkey Run Analytical Chemistry Conference Adversarial Spectroscopy Marshall, IN 2019

Pittcon Conference Hyperspectral IR imaging Philadelphia, PA 2019

Publications

Li, M., Razumtcev, A., Yang, C.; Liu, Y., Rong, J., Razumtcev & Simpson, G. J. "Fluorescence-Detected Mid-Infrared Photothermal Microscopy" (submitted)

Liu, Y., Smith, C., Cao, Z.; Sherman, A., & Simpson, G. J. "Generative Adversarial Linear Discriminant Analysis" (in revision)

"High-throughput fluorescence recovery after photobleaching diffusion analysis of protein/excipient interactions" (manuscript in preparation)

Sarkar, S, Florian, H., Liu, Y., Geiger, A. & Simpson, G. J. "Non-negative Matrix Factorization for Isolating Damage-Free Reflections in Macromolecular Synchrotron Data Collection" (manuscript in preparation)

Smith, C., Liu, Y., & Simpson, G. J. "Defense against adversarial spectroscopic attacks" (Conference Presentation). In Big Data: Learning, Analytics, and Applications (Vol. 10989, p. 109890F). International Society for Optics and Photonics.

Geiger, A. C., Ulcickas, J. R., Liu, Y., Witinski, M. F., Blanchard, R., & Simpson, G. J. "Sparse-sampling methods for hyperspectral infrared microscopy". In Image Sensing Technologies: Materials, Devices, Systems, and Applications VI (Vol. 10980, p. 1098016). International Society for Optics and Photonics.

Bram, V., Liu, Y., Pérez, A., Castro-Hernandez, E., & Rivas, D. F. "Scaled-up sonochemical microreactor with increased efficiency and reproducibility." ChemistrySelect 1, no. 2 (2016): 136-139.