Jie Wang

Ph.D. Graduand

University of Virginia Charlottesville, VA 22903

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With enthusiasm and experience in image analysis from theory (mathematical modeling) to practice (bioinformatics analysis, machine learning, computer vision).

RESEARCH INTEREST

Multi-dimensional image processing, biological and biomedical images analysis, object detection, bioinformatics, active surface models, graph analysis, shape analysis, and machine learning.

EDUCATION

Ph.D.	University of Virginia	Aug 2017 - Dec 2021
	in Electrical Engineering (image processing)	Charlottesville, USA
	Advisor: Dr. Scott T. Acton	
	Dissertation: Segmentation and Machine Learning for the Analysis of	
	Bacterial Biofilm Images (Defended on July 28th, 2021)	
	Funding resources:	
	Presidential Fellowship in Data Science, Research Assistantship (NIH R	.01)
M.S.	University of Virginia	Aug 2015 - May 2017
	in Electrical Engineering	Charlottesville, USA
	Thesis: 3D segmentation and analysis on bacteria biofilms	
B.S.	Nanjing University of Posts and Telecommunications	Aug 2015 - May 2017
	in Electrical and Computer Engineering	Nanjing, China
	Awards and Honors:	
	Excellent Graduate; Dean's list;	
	National First Prize Scholarship (top 1%);	
	School First Prize Scholarship (top 2%);	
	Outstanding Student and Outstanding Student Leader in Jiangsu Provin	ce;
	National-funded research in Telecommunications.	

RESEARCH EXPERIENCE

Presidential Fellow in Data Science

University of Virginia

Investigate the growth dynamic of 4D bacterial biofilms

- Developed graph-based toolkit for bacterial cell segmentation and extended to incorporating with deep neural networks;
- Analyzed bio-informatics of bacterial biofilms.

Research Assistant

May 2016-Aug 2021

University of Virginia

Developed algorithms to solve real-world problems for collaborators in medical, biological, and chemical departments.

Select projects:

Segmentation and Machine Learning for the Analysis of Bacterial Biofilm Images *May.2016-Aug.2021*

- Implemented software for graph-based 3D single-cell segmentation, GAN-based biofilm image synthesis and evaluation, and shape-based biofilm reconstruction and analysis.
- Developed algorithms: Bact-3D, LCuts, Shapefilter, m-LCuts, 3D Cyclic GAN, SSQA.

Cell analysis: calcium imaging of neuron, FLIM imaging of cancer cells

Dec 2017 - May 2019

Resolved difficulty in extracting single cell bioinformatics by statistical shape analysis and morphological processing.

Adversarial machine learning

Jan 2018 - May 2018

Exploited L2-attack to generate adversarial examples and trained two neural networks with/without R-CDT.

Undergraduate Research Team Leader

May 2013-May 2015

Nanjing University of Posts and Telecommunications

B.S. project: Functional cane for the blind

Sep 2014-May 2015

Designed and participated in implementing a 3D-printed product for assisting the blind walk individually (detect the obstacles on the way) and remotely inform the guardian.

Jun 2019-May 2020

National funded undergraduate project

May 2013-Oct 2014

Designed and participated in developing an intelligent cooperative communication software based on the open platform of China Telecom's collaborative communication.

TEACHING EXPERIENCE

Course Instructor

University of Virginia

Fully in charge of ECE 4750/ 6750 Digital Signal Processing course during Fall 2021 semester. The course is a combined section of undergraduate student and graduate students.

Graduate Teaching Assistant

Jan 2018-May 2019

Aug 2021-Dec 2021

University of Virginia

Spring 2018: ECE 3750 Fundamentals of ECE III (Topic: Engineering Signals and Systems, Microelectronic Circuit Design);

Fall 2018: ECE 3103 Solid States Devices (Topic: Transistors, Semiconductor Devices); Spring 2019: ECE 3430 Embedded Computing Systems (Topics: hardware and software organization, power management, digital and analog I/O devices).

Guest Lecturer/Speaker

University of Virginia

Fall 2019: Guest lecturer for digital image processing class with the section regarding image deconvolution and denoising; Spring 2019: Guest speaker for microscopy class on "Cell Analysis via Morphological Image

Processing Techniques".

PUBLICATIONS

Journal:

J1. M. Zhang[†], J. Zhang[†], Y. Wang[†], **J. Wang**, A. Achimovich, S. T. Acton, and Andreas Gahlmann, "Non-Invasive Single-Cell Morphometry and Tracking in Living Bacterial Biofilms." *Nature Communications*, 11(1), pp.1-13. (2020)

†: Equal contribution

J2. N. Tabassum, J. Wang, M. Ferguson, J. Herz, M.I Dong, A. Louveau, J. Kipnis, and S. T. Acton. "Image Segmentation for Neuroscience: Lymphatics." *Journal of Physics: Photonics*, 3(3). (2021) J3. J. Wang, M. Zhang, J. Zhang, Y. Wang, Andreas Gahlmann, and S. T. Acton, "Graph-theoretic Post-processing of Segmentation with Application to Dense Biofilms." *IEEE Transaction on Image Processing*. (2021)

J4. T. T. Ly, **J. Wang**, K. Bisht, U. Eyo, and S. T. Acton. "C3VFC: A Method for Tracing and Quantification of Microglia in 3D Temporal Images." *Applied Sciences*, 11(13), 6078. (2021)

J5. J. Wang, N. Tabassum, T. T. Toma, Y. Wang, A. Gahlmann, and S. T. Acton. "3D GAN Image Synthesis and Dataset Quality Assessment for Bacterial Biofilm". In *Submission*. (2021)

Conference:

C1. J. Wang, R. Sarkar, A. Aziz, A. Vaccari, A. Gahlmann, and S. T. Acton. "Bact-3D: A level set segmentation approach for dense multi-layered 3D bacterial biofilms." In 2017 IEEE International Conference on Image Processing (ICIP), pp. 330-334. (2017) Presentation.

C2. J. Wang, Z. Fu, N. Sadeghzadehyazdi, J. Kipnis, and S. T. Acton. "Nonlinear shape regression for filtering segmentation results from calcium imaging." In 2018 25th IEEE International Conference on Image Processing (ICIP), pp. 738-742. (2018) Presentation.

C3. J. Wang, T. Batabyal, M. Zhang, J. Zhang, A. Aziz, A. Gahlmann, and S.T. Acton. "LCuts: Linear Clustering of Bacteria Using Recursive Graph Cuts." In *2019 IEEE International Conference on Image Processing (ICIP)*, pp. 1575-1579. (2019) Poster. Listed in the Top 10% of papers in ICIP 2019

C4. T. T. Toma, Y. Wu, J. Wang, A. Srivastava, A. Gahlmann, and S. T. Acton. "Realistic-shape Bacterial Biofilm simulator for Deep Learning-based 3D Single-Cell Segmentation" *submitted to ISBI* 2022. (2022)

Abstract:

A1. M. Zhang, J. Zhang, J. Wang, A. M. Achimovich, A.A. Aziz, J. Corbitt, S. T. Acton and A. Gahlmann. "3D Imaging of Single Cells in Bacterial Biofilms using Lattice Light-sheet Microscopy." *Biophysical Journal*, 116(3), p.25a. (2019)

A2. J. Zhang, M. Zhang, Y. Wang, J. Wang, S. T. Acton, and Andreas Gahlmann, "Non-Invasive Single-Cell Morphometry and Tracking in Living Bacterial Biofilms." *Biophysical Journal*, 120 (3), 358a. (2020)

A3. J. Zhang, Y. Wang, M. Zhang, A. Achimovich, **J. Wang**, S. Acton, and A. Gahlmann. "High-Resolution Imaging of Single-Cell Behaviors in 3D Bacterial Biofilms using Lattice-Light Sheet Microscopy and Deep Learning-Based Image Processing." *Microscopy and Microanalysis* 27, no. S1, 3038-3040. (2021) A4. J. Wang, A. Gahlmann, and S. Acton. "Graph-theoretic processing and statistical shape analysis of bacterial biofilms." Bioimage Informatics 2021. **Oral presentation**.

LEADERSHIP / TEAMWORK EXPERIENCE

2019-2021, Chair of IEEE Signal Processing Society Student Chapter at UVA;
2018-2019, Co-Chair of IEEE Signal Processing Society Student Chapter at UVA for communications;
2015, volunteer at elderly house;
2013-2014, President of NUPT Department Student Council;
2013, VIP-Protocol Assistant of 2nd Asian Youth Games, etc.

SKILLS

Language Chinese (Native), English (Fluent)

Programming skills Matlab (Advanced); Python (Intermediate); Java (Novice)

Soft skills

Team spirit in cooperation; Creativity in research; Proven leadership.

Other skills

Photoshop, Illustrator, Microsoft Office, Latex, CAD, Website Design, microprocessors, SQL.