Department of Mathematics
Union College, Schenectady, NY
☎ *(518) 338 - 6498*
✉ *wangj@union.edu*
www.math.union.edu/∼wangj
Union College profile link

Jue Wang

"Teaching is more than imparting knowledge, it is inspiring change.
Learning is more than absorbing facts, it is acquiring understanding."
– William Arthur Ward

Research Interests

∗ Image analysis and processing ∗ Mathematical modeling ∗ Inverse problems
∗ Medical imaging ∗ Cancer/disease detection and classification ∗ Medical data analysis
∗ Artificial intelligence ∗ Machine learning ∗ Deep learning
∗ Fluid dynamics and turbulence

Employment

2023–present **Professor**, Union College.
2017–2023 **Associate Professor**, Union College.
2011–2017 **Assistant Professor**, Union College.
2007–2011 **Visiting Assistant Professor**, Union College.

Education

2007 **Ph.D. in Mathematics**, University of Wisconsin – Madison.
Dissertation: On Lower Branch Exact Coherent Structures in Turbulent Shear Flows

2001 **B.S. in Mathematics**, Peking University, Beijing, China.

Grants

2020–2022 **New York Six Academic Collaboration Grant**, *PI*.
Collaborative Partnership to Foster Liberal Arts Education and Research in Applied Mathematics

2020–2021 **Union College IEF Teaching with Technology Grant**.
Designing Effective, Engaging, Enjoyable E-learning

2019–2022 **NSF – MRI (NSF 1919570) $384,725**, *Co-PI*.
Acquisition of a High-speed Volumetric Particle Image Velocimetry System for Fluid Mechanics Research and Research Training in Science, Mathematics, and Engineering

2018–2019 **Union College Faculty Research Grant**.
Enabling Real-Time Volumetric 3D Ultrasound Imaging at Low Cost

2018–2019 **Union College MOSH Maker Co-Curricular Activity Grant**.
Bringing Mathematics to Life with 3D Making

2018–2019 **Albany Medical Center (in-kind)**, *Co-Investigator*.
Application of Enclosure Transform Interest Point Detectors and Deep Convolutional Neural Networks in Determining Malignant vs Benign Masses on Breast Imaging

2017–2018 **Union College Faculty Research Grant**.
Cancer Classification via Convolutional Neural Networks

2015–2016 **Union College Internal Education Foundation Grant $10,095**, *Co-Investigator*.
Acquisition of a Laser Cutter to Enhance MakerWeb Curricular Activities

2011–2016 **NIH – NIBIB (NIH 1R15EB012299–01A1) $250,000**, *PI*.
Artifact-Free Reconstruction of Medical Imaging Information

2010–2011 **Union College Faculty Research Grant**.
Attenuation Compensation in Ultrasound Imaging

Honors and Awards

2023–2026 **NSF Framing Mathematics as a Foundation for Ethical STEM**.

2023–2024 **Faculty Interest Groups for Student Success (FIGs^2)**, *Union College, Howard Hughes Medical Institute (HHMI) Grant Inclusive Excellence Initiative*.

2021 **Invited Speaker**, *Data Science for Social and Environmental Justice Writing and Research Development Group, Jackson State University*.
Expanding the Network of STEM Scholars through the Advance Women of Color Summer Writing Retreat

2020 **Faculty Development Institute Incubator**, *Make Next Year Special, Union College*.

2019 **Invited Speaker**, *Leaps of Faith: 8 Stories about Cultivating Complex Thinkers, Union College*.

2018 **Invited Leader**, *Women in Engineering (WIE) Networking, IEEE LSC*.

2018 **NSF SIMIODE Curriculum Development in STEM Effort**.

2016 **Presidential Project for Global Learning**, *Andrew W. Mellon Foundation Presidential Leadership Grant*.
Faculty Study Tour in China: to see first-hand the effects of rapid industrialization and economic growth, and to develop new interdisciplinary courses

2015 **Faculty Development Institute for Teaching with Technology**, *Union College*.

2011 **NSF Travel Award**, *Casablanca International Workshop on Mathematical Biology*.

2010 **NSF Travel Award**, *The Workshops on Inverse Problems and Applications, MSRI*.

2009 **NSF Travel Award**, *The Workshop on Mathematical Problems in Industry*.

2007 **First Place Poster Prize**, *SIAM Conference on Applications of Dynamical Systems*.

2007 **AWM Travel Award**, *SIAM Conference on Applications of Dynamical Systems*.

2006 **Excellence in Teaching Award**, *University of Wisconsin-Madison*.

2004 **Letters and Sciences Teaching Fellow**, *University of Wisconsin-Madison*.

2003 **Elizabeth Hirschfelder Fund Scholarship**, *University of Wisconsin-Madison*.

2001–2005 **Superior Teaching Assistant**, *University of Wisconsin-Madison*.

1999 **2nd Place Award**, *The Mathematical Contest in Modeling (MCM), China*.

1998 **Jiuzhang Mathematical Scholarship Award**, *Peking University, China*.

Peer-Reviewed Publications

29. **Fluorescence image visualization using multi-channel minimax optimization (MCMO)**, *with Y. Yu*, Proc. IEEE CBMS (Computer-Based Medical Systems), 137–142, 2023.
28. **Convexified coupled active contour segmentation of clues cells for assessing bacterial vaginosis with immunofluorescence microscopy**, *with Y. Yu*, Proc. Asilomar Conference on Signals, Systems, and Computers, 307–311, 2023.
27. **Dual resolution detection and identification of circulating cancer cells from immunofluorescence microscopy**, *with Y. Yu*, Proc. Asilomar Conference on Signals, Systems, and Computers, 312–316, 2023.
26. **Mathematics for Sustainable Humanity – Population, Climate, Energy, Economy, Policy, and Social Justice**, book chapter in the Foundations for Undergraduate Research in Mathematics (FURM), Mathematics Research for the Beginning Student, Volume 1, Springer, 2022.
25. **Automatic detection and identification of trichomonas vaginalis from fluorescence microscopy images**, *with Y. Yu*, Proc. BIOSTEC Volume 2: Bioimaging, 190–197, 2022.

24. **Categorization of circulating tumor cells from lung cancer with compact deep learning**, *with Y. Yu*, Proc. SPIE Medical Imaging: Computer-Aided Diagnosis, 1203310, 2022.
23. **A novel grid regression demodulation method for radiographic grid artifact correction**, *with Y. Yu*, Medical Physics, vol. 48, no. 7, 3790–3803, 2021.
22. **Coupled active contours for clue cell segmentation from fluorescence microscopy images**, *with Y. Yu*, Proc. BIOSTEC Volume 2: Bioimaging, 144–151, 2021.
21. **Detection of filamentous microorganisms in fluorescence microscopy images**, *with Y. Yu*, Proc. IEEE Eng. Med. Biol. Soc., 1895–1898, 2020.
20. **Pandemic modeling – Ebola, COVID-19, and many more**, SIMIODE, 7518, 2020.
19. **Morphological rank-space segmentation of clumped filaments in fluorescence microscopy images**, *with Y. Yu*, Proc. ICCM (International Conference on Computational Methods), 777–786, 2019.
18. **Automated enumeration and classification of bacteria in fluorescent microscopy imagery**, *with Y. Yu*, Proc. IEEE LSC (Life Sciences Conference), 57–60, 2018.
17. **The next time you play HvZ, think about differential equations**, SIMIODE, 5214, 2018.
16. **Inner ear drug delivery for treating hearing loss**, SIMIODE, 5069, 2018.
15. **Differential equations and resonance – can a human singing voice shatter a wine glass?**, SIMIODE, 5051, 2018.
14. **Modeling cancer growth with differential equations**, SIMIODE: Systemic Initiative for Modeling Investigations and Opportunities with Differential Equations, 4845, 2018.
13. **Variational principle for ultracoustic artifact correction and signal segmentation**, *with Y. Yu*, Proc. Asilomar Conference on Signals, Systems, and Computers, 1486–1490, 2017.
12. **Enclosure transform for interest point detection from speckle imagery**, *with Y. Yu*, IEEE Transactions on Medical Imaging, vol. 36, no. 3, 769–780, 2017.
11. **Automatic detection of direct radiation for digital fluoroscopy optimization**, *with Y. Yu and S.T. Acton*, Proc. IEEE ICIP, 3379–3383, 2016.
10. **X-ray collimator shutter detection by active-rods**, *with Y. Yu and S.T. Acton*, Proc. IEEE ICIP, 2350–2354, 2016.
9. **Automatic contrast enhancement by variational minimax optimization**, *with Y. Yu*, Proc. IEEE ICIP, 173–177, 2015.
8. **The asymptotic eigenvalues of first-order spectral differentiation matrices**, *with F. Waleffe*, Journal of Applied Mathematics and Physics, vol. 2, no. 5, 176–188, 2014.
7. **Heel effect adaptive flat field correction of digital x-ray detectors**, *with Y. Yu*, Medical Physics, vol. 40, no. 8, 081913, 2013.
6. **Beam hardening-respecting flat field correction of digital x-ray detectors**, *with Y. Yu*, Proc. IEEE ICIP (International Conference on Image Processing), 2085–2088, 2012.
5. **Despeckling trilateral filter**, *with Y. Yu and G. Dong*, Proc. IEEE IVMSP (Image, Video, and Multidimensional Signal Processing), 42–47, 2011.
4. **Backscatter-contour-attenuation joint estimation model for attenuation compensation in ultrasound imagery**, *with Y. Yu*, IEEE Transactions on Image Processing, vol. 19, no. 10, 2725–2736, 2010.
3. **Homogenization of the equations governing the flow between a slider and a rough spinning disk**, *with D. Cargill et al.*, MPI Workshop Report, MIIS Eprints Archive, 2009.
2. **Lower branch coherent states in shear flows: transition and control**, *with J. Gibson and F. Waleffe*, Physical Review Letters, 98:204501, 2007.
1. **Transition threshold and the self-sustaining process**, *with F. Waleffe*, IUTAM Symposium on Laminar-Turbulent Transition and Finite Amplitude Solutions, Springer, 85–106, 2005.

Research Conference Presentations

2023 **10th International Congress on Industrial and Applied Mathematics (ICIAM)**, *Tokyo, Japan*, Coupled Active Contour Segmentation of Clue Cells from Immunofluorescence Microscopy.

2023 **IEEE 36th International Symposium on Computer-Based Medical Systems**, *L'Aquila, Italy*, Fluorescence Image Visualization using Multi-Channel Minimax Optimization (MCMO).

2022 **Asilomar Conference on Signals, Systems, and Computers**, *Pacific Grove, CA*, Convexified Coupled Active Contour Segmentation of Clues Cells for Assessing Vacterial Vaginosis with Immunofluorescence Microscopy.

2022 **MAA Seaway Meeting**, *Loudonville, NY*, Quaternions – Navigating in Space and inside the Human Body.

2022 **International Conference on Bioimaging**, Automatic Detection and Identification of Trichomonas Vaginalis from Fluorescence Microscopy Images.

2021 **International Conference on Bioimaging**, Coupled Active Contours for Clue Cell Segmentation from Fluorescence Microscopy Images.

2020 **International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)**, Detection of Filamentous Microorganisms in Fluorescence Microscopy Images.

2019 **Northeast Society for Developmental Biology Meeting**, *Woods Hole, MA*, Computational Analysis of the Spiral Intestine in Leucoraja Erinacea, poster.

2019 **AMS Special Session on Statistical, Variational, and Learning Techniques in Image Analysis and their Applications to Biomedical, Hyperspectral and Other Imaging, AMS-MAA Joint Mathematics Meetings**, *Baltimore, MD*, Automatic Detection of Breast Masses and Location of the Prostate.

2018 **IEEE Life Sciences Conference**, *Montréal, Canada*, Automatic Detection of Direct Radiation for Digital Fluoroscopy Optimization, poster.

2017 **Asilomar Conference on Signals, Systems, and Computers**, *Pacific Grove, CA*, Variational Principle for Ultracoustic Artifact Correction and Signal Segmentation.

2017 **SIAM Annual Meeting**, *Pittsburgh, PA*, Detecting Breast Masses and the Location of the Prostate.

2016 **IEEE International Conference on Image Processing (ICIP)**, *Phoenix, AZ*, Automatic Detection of Direct Radiation for Digital Fluoroscopy Optimization, poster.

2016 **IEEE International Conference on Image Processing (ICIP)**, *Phoenix, AZ*, X-ray Collimator Shutter Detection by Active-Rods, poster.

2016 **SIAM Conference on Imaging Science**, *Albuquerque, NM*, A Weak Form Attenuation Compensation Model for Ultrasonic Imagery.

2015 **GE Global Research Center**, *Niskayuna, NY*, Artifact Correction in Ultrasound Images with Application in Prostate Cancer Treatment.

2015 **IEEE International Conference on Image Processing (ICIP)**, *Québec City, Canada*, Automatic Contrast Enhancement by Variational Minimax Optimization, poster.

2014 **International Conference on Applied and Engineering Mathematics**, *Shanghai, China*, The Asymptotic Eigenvalues of First-Order Spectral Differentiation Matrices.

2013 **SIAM Conference on Computational Science & Engineering**, *Boston, MA*, Heel Effect Adaptive Flat Field Correction of Digital X-ray Detectors.

2012 **IEEE International Conference on Image Processing (ICIP)**, *Orlando, FL*, Beam Hardening-respecting Flat Field Correction of Digital X-ray Detectors, poster.

2012 **SIAM Conference on Imaging Science**, *Philadelphia, PA*, Attenuation Compensation in Ultrasound Imaging.

2011 **Casablanca International Workshop on Mathematical Biology**, *Casablanca, Morocco*, 3D Vascular Segmentation Using A Sequential Monte Carlo Approach.

2011 **IEEE Image, Video, and Multidimensional Signal Processing Workshop (IVMSP)**, *Ithaca, NY*, Despeckling Trilateral Filter.

2011 **Joint Mathematics Meetings**, *New Orleans, LA*, Blood Vessel Segmentation in Volumetric Ultrasound.

2010 **SIAM Annual Meeting**, *Pittsburgh, PA*, Ultrasound Image Segmentation and Attenuation Estimation.

2009 **SIAM Conference on Mathematics for Industry: Challenges and Frontiers**, *San Francisco, CA*, BCA Joint Estimation Method for Attenuation Compensation in Ultrasound Images.

2009 **Project NExT Young Mathematicians' Network Poster Session at the Joint Mathematics Meetings**, *Washington D.C.*, Lower Branch Exact Coherent Structures in Turbulent Shear Flows.

2008 **Union College**, The Minimization Problem in Image Restoration.

2007 **AWM Workshop in conjunction with the SIAM Conference on Applications of Dynamical Systems**, *Snowbird, Utah*, Lower Branch Exact Coherent Structures – Backbone of The Separatrix, poster.

2007 **SIAM Conference on Applications of Dynamical Systems**, *Snowbird, Utah*, R^{-1} Scaling of Lower Branch Coherent States in Plane Couette Flow.

2004 **APS Division of Fluid Dynamics 57th Annual Meeting**, *Seattle, WA*, R^{-1} Scaling of The Lower Branch Exact Coherent Structures.

Teaching Presentations

2022 **Panel Discussion for New Faculty: Teaching and Pedagogy**.

2021 **President's Council Meeting**, Minervas Large-Scale Societal and Environmental Challenges Course Presentation.

2020 **Silver Linings: Stories of Innovation at Union College**.

2019 **8x8 Leaps of Faith: 8 Stories about Cultivating Complex Thinkers for a Messy World**, Engaging Students to Connect Mathematical Concepts: See-Touch-Do-Connect-Apply Math.

2019 **Panel Discussion for New Faculty: Teaching and Pedagogy**.

2018 **Panel Discussion for New Faculty: Teaching and Pedagogy**.

2016 **Faculty Development and Learning Presentation**, Big Ideas, Experiences and Takeaways.

2016 **Faculty Development and Learning Presentation**, Read it, Calculate it, Build it: Student Learning in the 3rd Dimension.

2012 **Committee on Teaching Panel: Adjusting to Union**.

2008 **Thurston House Seminar Talk and Discussion**, Abacus: History and Use.

Student Mentorship

- **Mentoring undergraduate summer research**.
  - 22 students (166 student weeks), Summers 2011, 12, 13, 17, 18, 20, 21, 22
    Funding sources:
    - Union College Summer Research Fellowship
    - National Institutes of Health (NIH)
    - Kelsey Hastings Golitz Memorial Fund for Cancer Research
    - Sciortino Cancer Research Fund
    - Davenport Research Fellowship
    - NASA New York Space Grants
- **Mentoring senior theses, scholars projects, independent studies, and other research projects**.
  - 60 students (72 academic terms)
- **Mentoring students presenting at national conferences**.
  - 2 at the National Conference on Undergraduate Research (NCUR), 2012, 2021
  - 4 at the IEEE MIT Undergraduate Research Technology Conference, 2017, 2020, 2022

- **Mentoring students presenting at regional conferences**.
  - NY6 Upstate Undergraduate Research Conference
  - Hudson River Undergraduate Mathematics Conference
  - Northeast Society for Developmental Biology Meeting
- **Mentoring students presenting at local meetings**.
  - Annual Steinmetz Symposium
  - Summer Research Poster Sessions
  - Homecoming Poster Sessions
  - Math Department Student Seminars
- **Co-mentoring 1 undergraduate peer-reviewed journal publication**, 2019.
- **Mentoring student teams participating in the MCM/ICM**.
  MCM: Mathematical Contest in Modeling. ICM: Interdisciplinary Contest in Modeling
  - Meritorious Winner (top 10%): 2008, 2009, 2010, 2014, 2015
  - Honorable Mention (top 40%): 2011, 2013
  - Successful Participant: 2012, 2016–18, 2020
- **Mentoring students participating in the 7th Annual WiDS Datathon Challenges: Equity in Healthcare**, 2023–24.
  WiDS: Women in Data Science Worldwide. This challenge involves a machine learning task to predict time to cancer treatment based on patients' characteristics through analyzing a rich, real-world oncology dataset.

Professional Service

- **Reviewer**.
  - IEEE Transactions on Medical Imaging (impact factor: 11.037)
  - IEEE Access (impact factor: 3.9)
  - IEEE ICIP (acceptance rate: 40-45%)
  - MICCAI: Medical Image Computing and Computer Assisted Intervention (acceptance rate: 30%)
  - BMC Medical Research Methodology (impact factor: 4.614)
  - Cluster Computing, Springer Nature (impact factor: 4.4)
  - Journal of Medical and Biological Engineering (impact factor: 2.0)
  - Asian Journal of Mathematics and Computer Research
- **Conference Session Chair**.
  - 10th International Congress on Industrial and Applied Mathematics (ICIAM), 2023
  - SIAM Annual Meeting, 2017
  - SIAM Conference on Imaging Science, 2012 & 2016
  - Upstate New York Undergraduate Research Conference, 2012
- **Program Committee / Reviewer / Session Chair**.
  - The 16th Australasian Data Mining Conference, 2018
  - Hudson River Undergraduate Mathematics Conference XVI 2009 & XXII 2015
  - Union College Mathematics Conference, 2011
- **Biography Writer and Data Collector**, The Association for Women in Mathematics (AWM) "EvenQuads": Notable Women in Mathematics Playing Cards Project, 2022.
- **Contest Judge**, SIMIODE Challenge Using Differential Equations Modeling (SCUDEM), 2020.
- **Co-Organizer**, The Skidmore-Union Network (SUN) Lecture, 2012.

College Service

- **College Committee**.
  - Committee on Teaching and Advising (COTA), 2021–present
  - Writing Board, 2021–present
  - Faculty Appeals Committee (FAC), 2022 SP–present
  - Search Committee for the Director of Templeton Institute and Associate Dean for Engineering and Computer Science, 2022 FA–2023 WI
  - Committee for Idol Relocation and Communications, 2022 SU–present
  - New Gen Ed "Complex Questions: Global Challenges & Social Justice" Implementation Committee, 2021–2022
  - Interview Committee for Class Dean Search, 2022 FA
  - Ad Hoc Tenure Committee, 2018–2019, 2023–2024
  - Co-Chair, The President's Commission on the Status of Women, 2013–2015
- **Pedagogical Partner**, Mentorship Program for New Faculty, 2018–19, 2019–20, 2022–23.
- **Planner**, Minerva Central's "All Around U" Event, a celebration of cultural diversity, differences, and inclusion, 2021.
- **Faculty Marshal**, Commencement, June 2022.
- **Faculty Representative**, Admissions Open House.

Departmental Service

- **Mentor / Advisor**.
  - Mathematical/Interdisciplinary Contest in Modeling (MCM/ICM) Advisor, 2008–present
  - Actuarial Advisor, 2011–2013
  - Graduate School Advisor, 2007–2009
- **Organizer / Coordinator**.
  - Transfer Coordinator, 2021–present
  - Research Seminar Organizer/co-organizer, 2009–10, 2014–15, 2023–24
  - Student Seminar Organizer/co-organizer, 2008–09, 2019–20
- **Departmental Committee**.
  - Global Challenge for Calculus Task Force, 2022–2023
  - Committee for Establishing Financial and Actuarial Mathematics Minor, 2021–2022
  - Departmental Mentor Group, 2018–2022
  - Math Curriculum Steering Committee, 2020–2021
  - MTH 130 Curriculum Redesign Task Force, 2019–2021
- **Departmental Representative**.
  - Mathematical Association of America (MAA) Seaway Representative, 2015–present
  - Career Center Representative, 2017–present
  - Admissions Liaison, 2017–2020

Service to the Broader Community

- Presenting exhibitions at the Electric City Mini Maker Faire, showcasing 3D printing and visualization in mathematics, 2019 & 2022
- Volunteering in the Octopus's Garden, a student-run garden for local sustainable initiatives
- Trained Resident Care Volunteer at the Joan Nicole Prince Home providing bedside care and emotional support to the terminally ill at the end of life since June 2022

Teaching Experience (Union College)

IMP 111: Integrated Mathematics and Physics (team-taught)

IMP 121: Integrated Mathematics and Physics 2 (team-taught)

MIN 203: Climate Change: Knowledge Empowers Action (team-taught)*

MTH 063: Mathematics of Sustainability*

MTH 110: Differential Calculus
MTH 113: AP Calculus
MTH 115: Differential Vector Calculus and Matrix Theory
MTH 115H: Enriched Differential Vector Calculus and Matrix Theory
MTH 117: Integral Vector Calculus
MTH 130: Ordinary Differential Equations
MTH 138: Methods of Applied Mathematics 1
MTH 197: Discrete Mathematics
MTH 234: Differential Equations
MTH 238: Methods of Applied Mathematics
MTH 295H/296H: Mathematics Honors Independent Project
MTH 334: Partial Differential Equations*
MTH 340: Linear Algebra
MTH 490: Independent Study
MTH 497/498/499: Mathematics Senior Thesis
IDM 487/488/489: Interdepartmental Senior Thesis (team-taught)
* new courses I developed/co-developed