Giavanna Jadick

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Education

Ph.D. Medical Physics, University of Chicago | *Chicago, IL* 2021 – Aug. 2026
- Dissertation: "Spectral X-ray Imaging and Phase Retrieval"
- Advisor: Patrick La Rivière, Ph.D.
- Funding: NSF Graduate Research Fellowship Program, AAPM/RSNA Graduate Fellowship

B.S. Physics & B.A. Political Science, Duke University | *Durham, NC* 2016 – 2020
- Honors: Angier B. Duke Memorial Scholar, Cum Laude

Research Experience

Research Assistant (Postdoctoral Research) | *Dept. of Radiology, University of Chicago* Sep. 2026 – present
- Supervised by: Patrick La Rivière, Ph.D.
- Advancing and completing projects on spectral propagation-based (PB) X-ray phase-contrast imaging (XPCI), including material decomposition, phase retrieval, and system optimization
- Mentoring Ph.D. students on projects including ordered-subsets expectation maximization (OSEM) phase retrieval, multi-GPU-compatible iterative reconstruction, and cone-beam XPCI-CT simulation
- Leading development and maintenance of the open-source xpc-ct framework for XPCI-CT simulation and reconstruction in collaboration with junior researchers

Graduate Researcher | *Committee on Medical Physics, University of Chicago* 2021 – 2026
- Advised by: Patrick La Rivière, Ph.D.
- Developed model-based iterative reconstruction framework for spectral PB-XPCI for simultaneous phase retrieval and material decomposition
- Created GPU-accelerated, auto-differentiable CT simulation pipeline including polychromatic spectra, propagation-based phase contrast, multi-slice wave modulation, photon-counting and energy-integrating detector models, parallel-beam and fan-beam geometries, system spatial blur, and noise
- Derived and implemented Cramér–Rao lower bound (CRLB) models for PB-XPCI material decomposition to optimize spectral system design
- Applied CT simulation and estimation-theory pipelines to demonstrate the utility of dual-energy CT with megavoltage spectra for radiotherapy imaging
- Implemented multi-material decomposition strategies for dual-energy CT in cardiac imaging applications
- Collaborated on comparative evaluation of X-ray fluorescence emission tomography and micro-CT

Research Technician II | *Ravin Advanced Imaging Labs, Duke University* 2020 – 2021
- Advised by: Ehsan Samei, Ph.D. & Ehsan Abadi, Ph.D.
- Co-developed DukeSim CT simulation platform; implemented beam-hardening correction, tube current modulation, spherical detector geometry, and photon-counting detector noise model
- Created a Python wrapper to accelerate workflow of large-scale virtual imaging trials
- Designed and delivered multi-modal DukeSim training sessions for incoming lab members

"Saxophone Mouthpiece Design" Research Team | *Bass Connections, Duke University* 2019 – 2020
- Advised by: Joshua Socolar, Ph.D. & Matthew Busch
- Built digital archive of vintage saxophone mouthpieces using micro-CT scanning
- Extracted acoustic metrics from Fourier spectra of recordings with original and 3D-printed mouthpieces
- Linked micro-CT geometric measurements with acoustic properties through custom Python analysis
- Project featured in articles from Duke Today and 3dprint.com

Undergraduate Research Assistant | *Physics Department, Duke University* 2019 – 2020

- Advised by: Christoph Schmidt, Ph.D.
- Studied *E. coli* membrane response under osmotic stress using microscopy and image analysis
- Created Python scripts and simulations to quantify inner membrane elastic bending energy

Clinical Research Intern | *Digestive Health Institute, Florida Hospital Tampa* 2015 – 2016

- Advised by: Alexander Rosemurgy, M.D. & Sharona Ross, M.D.
- Performed chart review and statistical analyses of surgical outcomes in patients with esophageal disorders
- Contributed to studies assessing patient satisfaction and long-term outcomes in achalasia treatment
- Piloted investigation of the relationship between age, achalasia severity, and patient outcomes

Fellowships, Awards, & Honors

Fellowships & Scholarships

AAPM/RSNA Graduate Fellowship | *American Association of Physicists in Medicine (AAPM)* 2025 – 2026

NSF Graduate Research Fellowship | *National Science Foundation* 2023 – 2026

Lawrence H. Lanzl Medical Physics Graduate Fellowship | *UChicago* 2024

- Voted by faculty as best dissertation proposal presentation

Summer Research Fellowship | *Physics Department, Duke University* 2020

Angier B. Duke Memorial Scholarship | *Duke University* 2016 – 2020

- Duke's flagship full-ride merit scholarship awarded annually to ∼10 incoming undergraduates

Lord Rothermere Fellowship | *Oxford University* 2017

- Full funding for summer studying political philosophy at Oxford with Duke University cohort

Research & Presentation Awards

Runner-Up, Physics of Medical Imaging Student Paper Award | *SPIE Medical Imaging Conference* 2026

Finalist, Robert F. Wagner All-Conference Best Student Paper Award | *SPIE Medical Imaging Conference* 2026

Blue Ribbon Poster Award | *AAPM Annual Meeting* 2025

Second Place Oral Presentation | *Young Investigator Symposium, AAPM Midwest Chapter Meeting* 2025

Best Poster Award | *Trainee Associate Member Symposium, Cancer Center, UChicago* 2025

Carl J. Vyborny Award | *Committee on Medical Physics, UChicago* 2024

- Voted by students as best journal club talk

Second Place Oral Presentation | *Young Investigator Symposium, AAPM Midwest Chapter Meeting* 2023

Truth-Based CT Reconstruction Challenge, Top Five | *AAPM* 2022

- Ranked among most accurate reconstruction algorithms; invited to co-author challenge report

Runner-Up Poster | *Bass Connections Showcase, Duke University* 2020

Travel Grants & Professional Development

Travel Award | *Fully 3D Image Reconstruction Meeting* 2025

Dean's Council Travel Award | *Biological Sciences Division, UChicago* 2024

Professional Development Grant | *Cancer Center, UChicago* 2024

Students & Trainees Partial Scholarship | *Virtual Imaging Trials in Medicine Conference* 2024

Student Travel Award | *SPIE Medical Imaging Conference* 2024

Small Grant ($2,000) | *Office of Diversity & Inclusion, Biological Sciences Division, UChicago* 2023

In review/preparation

1. **G. Jadick** and P. La Rivière. "Full spectral material decomposition and phase retrieval for polychromatic X-ray imaging with a photon-counting detector."
2. **G. Jadick**, A. Ferretti, C. Riggs, P. La Rivière. "Phase retrieval for dual-energy micro-CT: a multi-slice approach."

Dissertation

1. **G. Jadick**. *Spectral X-ray Imaging and Phase Retrieval*. PhD thesis, The University of Chicago, Aug. 2026. doi:10.6082/dppas-zfp10

Peer-reviewed articles

1. **G. Jadick** and P. La Rivière. Cramér–Rao lower bound for spectral propagation-based x-ray phase-contrast imaging. *Physics in Medicine & Biology*, 71(21):215026, 2026. doi:10.1088/1361-6560/aebd38
2. E. Abadi, W. P. Segars, N. Felice, S. Sotoudeh-Paima, E. A. Hoffman, X. Wang, W. Wang, D. Clark, S. Ye, **G. Jadick**, M. Fryling, D. P. Frush, and E. Samei. AAPM Truth-Based CT (TrueCT) reconstruction grand challenge. *Medical Physics*, pages 1–13, 2025. doi:10.1002/mp.17619
3. **G. Jadick**, M. Ventura, and P. La Rivière. Utility of photon-counting detectors for MV-kV dual-energy computed tomography imaging. *Journal of Medical Imaging*, 11(S1):S12811–S12811, 2024. doi:10.1117/1.JMI.11.S1.S12811
4. H. DeBrosse, **G. Jadick**, L. J. Meng, and P. La Rivière. Contrast-to-noise ratio comparison between x-ray fluorescence emission tomography and computed tomography. *Journal of Medical Imaging*, 11(S1):S12808–S12808, 2024. doi:10.1117/1.JMI.11.S1.S12808
5. **G. Jadick**, G. Schlafly, and P. La Rivière. Dual-energy computed tomography imaging with megavoltage and kilovoltage x-ray spectra. *Journal of Medical Imaging*, 11(2):023501–023501, 2024. ***Featured on journal cover**. doi:10.1117/1.JMI.11.2.023501
6. E. Abadi, **G. Jadick**, D. A. Lynch, W. P. Segars, and E. Samei. Emphysema quantifications with CT scan: Assessing the effects of acquisition protocols and imaging parameters using virtual imaging trials. *Chest*, 163(5):1084–1100, 2023. doi:10.1016/j.chest.2022.11.033
7. **G. Jadick**, E. Abadi, B. Harrawood, S. Sharma, W. P. Segars, and E. Samei. A scanner-specific framework for simulating CT images with tube current modulation. *Physics in Medicine & Biology*, 66(18):185010, 2021. doi:10.1088/1361-6560/ac2269
8. D. J. Downs, **G. Jadick**, F. Swaid, S. B. Ross, and A. S. Rosemurgy. Age and achalasia: how does age affect patient presentation, hospital course, and surgical outcomes? *The American Surgeon*, 83(9):952–961, 2017. doi:10.1177/000313481708300931
9. A. Rosemurgy, D. Downs, **G. Jadick**, F. Swaid, K. Luberice, C. Ryan, and S. Ross. Dissatisfaction after laparoscopic Heller myotomy: The truth is easy to swallow. *The American Journal of Surgery*, 2017. doi:10.1016/j.amjsurg.2017.03.043

Conference proceedings

1. **G. Jadick** and P. La Rivière. Spectral x-ray phase-contrast imaging of microcalcifications via automatic-differentiation material decomposition. In *Medical Imaging 2026: Physics of Medical Imaging*, volume 13924, pages 135–140. SPIE, 2026. ***Finalist, All-Conference Best Student Paper Award; Runner-Up, Physics of Medical Imaging Student Paper Award**. doi:10.1117/12.3088061
2. **G. Jadick** and P. La Rivière. Basis material Cramér–Rao lower bound: the theoretical utility of propagation-based phase contrast. In *Medical Imaging 2026: Physics of Medical Imaging*, volume 13924, pages 114–119. SPIE, 2026. doi:10.1117/12.3087671
3. E. M. Galeotafiore, **G. Jadick**, and P. La Rivière. Breast density quantification with dual-energy x-ray phase-contrast imaging. In *Medical Imaging 2026: Physics of Medical Imaging*, volume 13924, pages 778–782. SPIE, 2026. doi:10.1117/12.3087953

4. **G. Jadick** and P. La Rivière. Material decomposition of weakly absorptive structures with spectral x-ray phase-contrast CT. In *IEEE Nuclear Science Symposium (NSS), Medical Imaging Conference (MIC) and Room Temperature Semiconductor Detector Conference (RTSD)*, November 2025. doi:10.1109/NSS/MIC/RTSD57106.2025.11287842
5. **G. Jadick** and P. La Rivière. Optimization-based phase retrieval for material decomposition with multi-energy computed tomography. In *18th International Meeting on Fully 3D Image Reconstruction in Radiology and Nuclear Medicine*, May 2025. doi:10.48550/arXiv.2508.12509
6. **G. Jadick** and P. La Rivière. Accuracy of propagation-based phase-contrast CT under the projection approximation. In *8th International Conference on Image Formation in X-Ray Computed Tomography*, 2024. doi:10.48550/arXiv.2508.12505
7. **G. Jadick** and P. La Rivière. Modeling propagation-based x-ray phase-contrast imaging: validity of the projection approximation. In *Proc. Virtual Imaging Trials in Medicine*, pages 68–72, 2024. doi:10.48550/arXiv.2405.05359
8. **G. Jadick** and P. La Rivière. Cramér–Rao lower bound in the context of spectral x-ray imaging with propagation-based phase contrast. In *Medical Imaging 2024: Physics of Medical Imaging*, volume 12925. SPIE, 2024. doi:10.1117/12.3006282
9. **G. Jadick**, I. Reiser, and P. La Rivière. Sensitivity analysis of dual-energy computed tomography multi-triplet material decomposition. In *Medical Imaging 2024: Physics of Medical Imaging*, volume 12925. SPIE, 2024. doi:10.1117/12.3006548
10. H. DeBrosse, **G. Jadick**, L. Meng, and P. La Rivière. Comparing x-ray fluorescence emission tomography and computed tomography: contrast-to-noise ratios in a numerical mouse phantom. In *Medical Imaging 2024: Clinical and Biomedical Imaging*, volume 12930. SPIE, 2024. doi:10.1117/12.3006795
11. M. Ventura, **G. Jadick**, and P. La Rivière. Comparison of energy-integrating detectors and photon-counting detectors for MV-kV dual-energy imaging on a tomographic therapy system. In *Medical Imaging 2024: Physics of Medical Imaging*, volume 12925. SPIE, 2024. doi:10.1117/12.3006854
12. **G. Jadick** and P. La Rivière. Optimization of MV-kV dual-energy CT imaging for tomographic therapy. In *Medical Imaging 2023: Physics of Medical Imaging*, volume 12463, pages 557–566. SPIE, 2023. doi:10.1117/12.2653674
13. S. S. Shankar, **G. Jadick**, E. A. Hoffman, J. Atha, J. C. Sieren, E. Samei, and E. Abadi. Scanner-specific validation of a CT simulator using a COPD-emulated anthropomorphic phantom. In *Medical Imaging 2022: Physics of Medical Imaging*, volume 12031, pages 953–960. SPIE, 2022. doi:10.1117/12.2613212
14. F. Ria, **G. Jadick**, E. Abadi, J. B. Solomon, and E. Samei. Comparing two different noise magnitude estimation methods in CT using virtual imaging trials. In *Medical Imaging 2022: Physics of Medical Imaging*, volume 12031, pages 729–734. SPIE, 2022. doi:10.1117/12.2612219
15. E. Abadi, **G Jadick**, C. McCabe, S. Sotoudeh, M. Fryling, B. Harrawood, E. Samei, S. Havadej, M. Sedlmair, J. Ramirez, and K. Stierstorfer. Development and application of a virtual imaging trial platform to evaluate and optimize state-of-the-art photon-counting CT. In *Radiological Society of North America Annual Meeting*, 2021
16. **G. Jadick**, E. Abadi, B. Harrawood, S. Sharma, W. P. Segars, and E. Samei. A framework to simulate CT images with tube current modulation. In *Medical Imaging 2021: Physics of Medical Imaging*, volume 11595, pages 22–30. SPIE, 2021. doi:10.1117/12.2580983
17. E. Abadi, **G. Jadick**, E. A. Hoffman, D. Lynch, W. P. Segars, and E. Samei. COPD quantifications via CT imaging: ascertaining the effects of acquisition protocol using virtual imaging trial. In *Medical Imaging 2021: Physics of Medical Imaging*, volume 11595, pages 160–166. SPIE, 2021. doi:10.1117/12.2581965

Oral presentations

1. **G. Jadick** and P. La Rivière. Spectral x-ray phase-contrast imaging of microcalcifications via automatic-differentiation material decomposition. In *Medical Imaging 2026: Physics of Medical Imaging*, volume 13924, pages 135–140. SPIE, 2026. ***Finalist, All-Conference Best Student Paper Award; Runner-Up, Physics of Medical Imaging Student Paper Award**. doi:10.1117/12.3088061
2. **G. Jadick** and P. La Rivière. Basis material Cramér–Rao lower bound: the theoretical utility of propagation-based phase contrast. In *Medical Imaging 2026: Physics of Medical Imaging*, volume 13924, pages 114–119. SPIE, 2026. doi:10.1117/12.3087671

3. **G. Jadick** and P. La Rivière. Material decomposition of weakly absorptive structures with spectral x-ray phase-contrast CT. In *IEEE Nuclear Science Symposium (NSS), Medical Imaging Conference (MIC) and Room Temperature Semiconductor Detector Conference (RTSD)*, November 2025. doi:10.1109/NSS/MIC/RTSD57106.2025.11287842
4. **G. Jadick** and P. La Rivière. A tale of two techniques: multi-energy versus multi-distance material decomposition with x-ray phase-contrast imaging. American Association of Physicists in Medicine, Midwest Chapter Meeting, April 2025. ***Second Place, Young Investigator Symposium**
5. **G. Jadick** and P. La Rivière. Modeling propagation-based x-ray phase-contrast imaging: validity of the projection approximation. In *Proc. Virtual Imaging Trials in Medicine*, pages 68–72, 2024. doi:10.48550/arXiv.2405.05359
6. **G. Jadick** and P. La Rivière. Cramér–Rao lower bound in the context of spectral x-ray imaging with propagation-based phase contrast. In *Medical Imaging 2024: Physics of Medical Imaging*, volume 12925. SPIE, 2024. doi:10.1117/12.3006282
7. **G. Jadick** and P. La Rivière. Dual energy CT imaging with a megavoltage spectrum. American Association of Physicists in Medicine, Midwest Chapter Meeting, April 2023. ***Second Place, Young Investigator Symposium**
8. **G. Jadick**, E. Abadi, B. Harrawood, S. Sharma, W. P. Segars, and E. Samei. A framework to simulate CT images with tube current modulation. In *Medical Imaging 2021: Physics of Medical Imaging*, volume 11595, pages 22–30. SPIE, 2021. doi:10.1117/12.2580983

Posters

1. E. M. Galeotafiore, **G. Jadick**, and P. La Rivière. Breast density quantification with dual-energy x-ray phase-contrast imaging. In *Medical Imaging 2026: Physics of Medical Imaging*, volume 13924, pages 778–782. SPIE, 2026. doi:10.1117/12.3087953
2. **G. Jadick**, C. Riggs, and P. La Rivière. Quantitative forward modeling of propagation-based x-ray phase-contrast imaging at clinical scale. In *American Association of Physicists in Medicine, Annual Meeting*, July 2025. ***Blue Ribbon Poster**
3. **G. Jadick** and P. La Rivière. Material decomposition with propagation-based x-ray phase contrast: a comparison of multi-energy and multi-distance imaging. In *American Association of Physicists in Medicine, Annual Meeting*, July 2025
4. **G. Jadick** and P. La Rivière. Optimization-based phase retrieval for material decomposition with multi-energy computed tomography. In *18th International Meeting on Fully 3D Image Reconstruction in Radiology and Nuclear Medicine*, May 2025. doi:10.48550/arXiv.2508.12509
5. **G. Jadick** and P. La Rivière. Accuracy of propagation-based phase-contrast CT under the projection approximation. In *8th International Conference on Image Formation in X-Ray Computed Tomography*, 2024. doi:10.48550/arXiv.2508.12505
6. **G. Jadick** and P. La Rivière. An estimation theory approach to assessing spectral x-ray phase-contrast imaging. In *Gordon Research Conference on Image Science*, June 2024
7. **G. Jadick**, I. Reiser, and P. La Rivière. Sensitivity analysis of dual-energy computed tomography multi-triplet material decomposition. In *Medical Imaging 2024: Physics of Medical Imaging*, volume 12925. SPIE, 2024. doi:10.1117/12.3006548
8. **G. Jadick** and P. La Rivière. Optimization of MV-kV dual-energy CT imaging for tomographic therapy. In *Medical Imaging 2023: Physics of Medical Imaging*, volume 12463, pages 557–566. SPIE, 2023. doi:10.1117/12.2653674
9. **G. Jadick**, M. Bartlett, M. Busch, and J. Socolar. The art and craft of saxophone mouthpiece design. Fortin Foundation Bass Connections Virtual Showcase, May 2020. ***Runner-Up Poster Award**
10. **G. Jadick**, R. Garces, and C. Schmidt. Physiology of *E. coli* bacteria in high external osmotic pressure. Conference for undergraduate women in physics at the University of Maryland, January 2020

Leadership & Service

Peer Reviewer | *Medical Physics; Journal of Medical Imaging; Optica* 2023 – present

Dean's Council Representative | *Biological Sciences Division (BSD), University of Chicago* 2025 – 2026
- Represent Medical Physics in monthly BSD meetings and convey program needs to administration
- Advocate for funding, resources, and community-building events to support graduate students

President | *SPIE, UChicago Student Chapter* 2024 – 2025
- Secured maximum annual funding from SPIE national to support student chapter activities
- Organized undergraduate outreach events and community optics demonstrations
- Coordinated tours of local lens manufacturer and Adler Planetarium for chapter members

Director of Outreach | *Medical Physics Diversity & Outreach Committee, UChicago* 2022 – 2025
- Led medical physics outreach demonstrations at science fairs, schools, and community events
- Secured grant funding to design and build original CT, MRI, and radiation therapy demos
- Worked with UChicago Cancer Center to host professional learning days for public school science teachers and to purchase portable ultrasound unit
- Wrote an invited AAPM newsletter article highlighting UChicago's outstanding outreach program

President | *Graduate Program in Medical Physics, University of Chicago* 2022 – 2023
- Elected to serve as primary student/faculty liaison and to lead student initiatives
- Joined faculty meetings and organized journal club, peer-mentor program, and quarterly socials
- Led planning and coordination of the annual student/faculty retreat after a three-year hiatus

President | *Society of Physics Students, Duke University Chapter* 2018 – 2020
- Reestablished chapter, authored constitution and by-laws, secured funding, and designed website
- Launched coding crash courses, career advising sessions, and community outreach programs
- Won national SPS awards: 2019 Distinguished Chapter, 2020 Outstanding Chapter

Physics Community Outreach Volunteer | *Physics Department, Duke University* 2017 – 2020
- Performed physics demonstrations for grade-school students at science fairs and field trips

Teaching

Graduate Teaching Assistant | *Medical Physics, UChicago* 2022 – 2025
- Led weekly 1-hour discussion sessions (∼5 students) with original lectures and group problem sets, which continue to be used by current course TAs
- Created interactive Jupyter notebooks demonstrating abstract physics/math concepts
- Graded and provided detailed feedback on homework, labs, and final exams
- Courses: MPHY 388 "Physics of Medical Imaging III" (Summer 2025), MPHY 386 "Physics of Medical Imaging I" (Winter 2023), MPHY 349 "Mathematics for Medical Physics" (Fall 2022)

Quantitative Biology "qBio" Bootcamp TA | *Biological Sciences Division, UChicago* 2023
- Taught intensive one-week coding/data analysis course for ∼100 incoming biology Ph.D. students
- Served as head TA for image analysis workshop on cell tracking: co-developed workshop material, delivered part of the lecture, and guided students through debugging

Coding in Science (Invited Lecturer) | *Cancer Center, UChicago Medicine* 2023
- Led two 3-hour lessons on coding for ∼40 high school and undergraduate summer research students
- Introduced coding fundamentals and scientific applications with original Jupyter notebook lessons

House Course: Exploring Physics in Cinema (Instructor) | *Duke University* 2020
- Designed and taught an interdisciplinary course introducing physics concepts through film analysis

House Course: Physics for Everyone (Instructor) | *Duke University* 2019
- Designed and taught a seminar on equity in STEM and best practices for learning physics

Undergraduate Teaching Assistant | *Duke University* 2017 – 2020
- PHY 141/142/151/152: Led weekly labs (∼30 students) on introductory mechanics and E&M, staffed help room and office hours, and graded exams and lab reports
- PHY 151/152: Selected by instructor and dean to lead weekly remedial sessions for at-risk students; independently developed lectures and tailored problem sets, resulting in all ∼10 participants passing
- CS 101: Co-led weekly introductory computer science labs (∼30 students) and graded final exams
- MATH 105/106/111/112: Ran help room for introductory calculus

Professional Affiliations

American Association of Physicists in Medicine | *Student Member*	2021 – present
IEEE, Institute of Electrical and Electronics Engineers | *Student Member*	2025 – present
SPIE, International Society for Optics and Photonics | *Student Member*	2021 – present
UChicago Medicine Comprehensive Cancer Center | *Trainee Associate Member*	2024 – 2026

Skills

Computational: Bash, C/C++, CUDA, ImageJ, Git, LaTeX, Linux/Unix, Python, MATLAB, Mathematica, R
Libraries: Chromatix, CuPy, JAX, Pandas, NumPy, Matplotlib, Optax, PyCUDA, SciPy
Experimental: CT, micro-CT, microscopy (DIC, confocal, AFM), electronics, clinical medical imaging
Personal interests: 3D printing, Brazilian jiu-jitsu, language learning, philosophy

[CV compiled on November 15, 2026]