

Junlan Lu

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EDUCATION

- **Duke University, GPA 3.93** Durham, NC
Doctor of Philosophy in Medical Physics Aug. 2019 – May 2024
- **Cornell University, GPA: 3.86; Magna Cum Laude with honors** Ithaca, NY
Bachelor of Science in Engineering Physics Aug. 2016 – May 2019

INDUSTRY EXPERIENCE

- **Kitware - Computer Vision Team** Durham, NC
Computer Vision Intern May 2021 - Aug. 2021
 - **Super-resolution:** Used deep learning for developing a supervised cross-domain single-image super-resolution model of satellite images. Increased performance metrics of PSNR and SSIM significantly compared to current state-of-the-art methods

RESEARCH EXPERIENCE

- **Duke Driehuys Lab - Medical Imaging with Hyperpolarized ^{129}Xe MRI** Durham, NC
Graduate Researcher in Professor Bastiaan Driehuys's Group Aug 2019 - Present
 - **Deep learning for automated segmentation:** Implemented 3D U-NET to automatically segment thoracic cavity in ^{129}Xe MRI images
 - **Deep learning for image super resolution:** Implemented Single-image super-resolution deep learning models to enhance ^{129}Xe MRI image resolution
 - **RF Inhomogeneity Correction:** Investigated RF inhomogeneity correction technique using radial sampling acquisition techniques
- **Caltech Atwater Lab - 2D Materials and Optics** Pasadena, CA
Caltech SURF Fellow in Professor Harry Atwater's Group June 2018 - Aug. 2018
 - **Exfoliation and Identification of Monolayer Transition Metal Dichalcogenides(TMDC's):** Mechanically exfoliated different TMDC's from bulk crystal to form novel heterostructures. Optically characterized heterostructures with photoluminescence and Raman scattering measurements.
 - **Band Alignment Determination of TMDC Heterostructures:** Utilized Kelvin Probe Force Microscopy(KPFM) to determine band alignment and time-resolved photoluminescence to study carrier dynamics. Developed presentation skills and presented research in final summer symposium.
- **Princeton Lyon Lab - Experimental Quantum Computing** Princeton, NJ
MRSEC REU Student in Professor Stephen Lyon's Group June 2017 - Aug. 2017
 - **Sputtering NbSi:** Developed procedure for sputtering NbSi to thermalize electron motion in cryogenic temperatures for quantum computing systems.
 - **Determination of Electrical Properties of NbSi at Low Temperatures:** Characterized surface composition and roughness with atomic force microscopy (AFM), scanning electron microscopy (SEM), energy dispersive x-ray spectroscopy (EDX), and x-ray photoelectron spectroscopy (XPS). Developed analytical skills in MATLAB and presented results in final summer REU poster symposium.
- **Cornell Shvets Lab - Bioplasmonics** Ithaca, NY
Undergraduate Researcher in Professor Gennady Shvets's Group Aug. 2016 - May 2019
 - **Metasurface Fabrication:** Fabricated plasmon resonant metasurfaces with electron-beam lithography.
 - **Mouse Lung Tissue Biosensing:** Investigated spectroscopic features of cancerous and non-cancerous tissue with metasurface-enhanced IR spectroscopy.
 - **Microsphere Dielectrophoresis:** Created Python script to track fluorescent microsphere velocities under dielectrophoresis.
- **Princeton Puchalla Lab - Microfluidics** Princeton, NJ
Lab Learning Program Intern and Volunteer in Dr. Jason Puchalla's Group Jan. 2016; June 2015 - Sept. 2015

- **AC Electro-osmotic Flow Using Zeta Potential Modulation in Microchannels:** Fabricated experimental setup for driving microspheres using rectified AC electroosmotic flow in Polydimethylsiloxane (PDMS) microchannel.
- **Photo-active PDMS:** Investigated the viability of using photoactive PDMS as a substitute for conventional soft-lithography. Created procedure in exposing and developing the PDMS.

- **Princeton Plasma Physics Lab - Experimental Cosmology** Princeton, NJ
*Semester-long Intern with **Charlie Gentile*** *Sept. 2015 - May 2016*
 - **PTOLEMY (“Princeton Tritium Observatory for Light, Early Universe Massive Neutrino Yield”):** Assisted in manufacturing components and in measuring various experimental parameters for detecting Big Bang neutrinos.

JOURNAL PUBLICATIONS

- LJ Rankine, **J. Lu** , ..., and B. Driehuys. *Radiation-Induced Lung Injury Quantified by Hyperpolarized ^{129}Xe MRI: Dose-Dependence and Association with Changes in Global Lung Function*. International Journal of Radiation Oncology, 2022.
- **J. Lu** , ..., and B. Driehuys. *Bias Field Correcting Hyperpolarized ^{129}Xe Ventilation MRI Using Templates Derived by RF-Depolarization Mapping*. Magnetic Resonance in Medicine, 2022.
- A. Matheson, ..., **J. Lu** , ..., and B. Driehuys. *Hyperpolarized ^{129}Xe Pulmonary MRI and Asymptomatic Atrial Septal Defect*. Chest, 2022.
- E. Bier, ..., **J. Lu** , ..., and S. Rajagopal. *Noninvasive Diagnosis of Pulmonary Hypertension with Hyperpolarized ^{129}Xe Magnetic Resonance Imaging and Spectroscopy*. ERJ Open Research, 2022.
- P. Niedbalski , ..., **J. Lu** , ..., and B. Driehuys. *Utilizing Flip Angle/TR Equivalence to Reduce Breath hold Duration in Hyperpolarized ^{129}Xe 1-Point Dixon Gas Exchange Imaging*. Magnetic Resonance in Medicine, 2021.
- Z. Wang, ..., **J. Lu** , ..., and B. Driehuys. *Using hyperpolarized ^{129}Xe gas-exchange MRI to model the regional airspace, membrane, and capillary contributions to diffusing capacity*. Journal of Applied Physiology, 2021.
- D. Mummy, ..., **J. Lu** , ..., Y. Huang. *Regional Gas Exchange Measured by ^{129}Xe Magnetic Resonance Imaging Before and After Combination Bronchodilators Treatment in Chronic Obstructive Pulmonary Disease*. Journal of Magnetic Resonance Imaging. 2021.
- G. Kelp, J. Li, **J. Lu** , ... G. Shvets. (2020) *Infrared spectroscopy of live cells from a flowing solution using electrically-biased plasmonic metasurfaces*. Lab Chip. doi:10.1039/C9LC01054H

CONFERENCE PUBLICATIONS

- A. Matheson, ..., **J. Lu** , ..., and G. Parraga. *^{129}Xe Gas-Transfer MRI RBC-to-Barrier Ratio in Post-Acute COVID19 Syndrome: Clinically-relevant?*. ISMRM 2022.
- A. Bechtel, ..., **J. Lu** , ..., and B. Driehuys. *Establishing a hemoglobin correction for ^{129}Xe gas exchange MRI*. ISMRM 2022.
- **J. Lu** , ..., and B. Driehuys. *Evaluating physiological gradients after bias field correction of Hyperpolarized ^{129}Xe Gas Ventilation MRI*. ISMRM 2022.
- **J. Lu** , ..., and B. Driehuys. *A general framework of synthesizing ^{129}Xe MRI data for improved segmentation model training*. ISMRM 2022.
- **J. Lu** , ..., and B. Driehuys. *Practical RF-pulse shape designs to minimize off-resonance artifacts in dissolved-phase hyperpolarized ^{129}Xe MR*. ISMRM 2022.
- S. Leewiwatwong, **J. Lu** , ..., and B. Driehuys. *Ventilation Defect Synthesis in Hyperpolarized ^{129}Xe Ventilation MRI to Accelerate Training of Segmentation Models*. ISMRM 2022.
- D. Mummy, ..., **J. Lu** , ..., and B. Driehuys. *Hyperpolarized ^{129}Xe MRI and spectroscopy in healthy control subjects reveals age-related changes in measurements of pulmonary gas exchange*. ISMRM 2022.
- D. Mummy, A. Swaminathan, **J. Lu** , ..., and B. Driehuys. *Hyperpolarized ^{129}Xe MRI and spectroscopy of healthy subjects reveal age-related changes in gas exchange function*. International Workshop on Pulmonary Functional Imaging 2022.
- D. Mummy, **J. Lu** , ..., and R. Tighe. *Changes in hyperpolarized ^{129}Xe MRI metrics three months after initiation of therapy in patients with idiopathic pulmonary fibrosis (IPF)*. 21st International Colloquium on Lung and Airway Fibrosis (ICLAF).

- E. Bier, D. Mummy, **J. Lu**, ..., and B. Driehuys. *Within-session repeatability of pulmonary ^{129}Xe static and dynamic spectroscopy*. Presented at ISMRM, 2021.
- E. Bier, F. Alenezi, **J. Lu**, ..., and B. Driehuys. *Extension of a diagnostic model for pulmonary hypertension with hyperpolarized ^{129}Xe magnetic resonance imaging and spectroscopy*. Presented at ISMRM, 2021.
- S. Leewiwatwong, **J. Lu**, ..., and B. Driehuys. *Deep learning-based thoracic cavity segmentation for hyperpolarized ^{129}Xe MRI*. Presented at ISMRM, 2021.
- **J. Lu**, ..., and B. Driehuys. *Convolutional Neural Networks for Super-resolution of Hyperpolarized ^{129}Xe MR Images of the Lung*. Presented at ISMRM, 2021.
- **J. Lu**, ..., and B. Driehuys. *Template-based bias field correction of Hyperpolarized ^{129}Xe Gas Ventilation MRI*. Presented at ISMRM, 2021.
- **J. Lu**, ..., and B. Driehuys. *Bias Field Correction in Hyperpolarized ^{129}Xe Gas Ventilation MRI*. Presented at ISMRM, 2020.
- E. Bier,... **J. Lu** and B. Driehuys. (2020) *Noninvasive Diagnosis of Pulmonary Hypertension with Hyperpolarized ^{129}Xe Magnetic Resonance Imaging and Spectroscopy*. American Thoracic Society.

PRESENTATIONS

- G. Kelp, J. Li, **J. Lu**... G. Shvets. (2019) *Infrared spectroscopy of live cells from a flowing solution using electrically-biased plasmonic metasurfaces*. SPIE Photonics West 2019.
- **J. Lu**, A. Asfaw, and S. Lyon. *Electrical properties of NbSi thin films at cold temperatures*. Presented at the PCCM REU Summer Symposium, 2017.
- **J. Lu**, J. Li, and G. Shvets. *Biosensing with Plasmonic Metasurfaces*. Presented at the Cornell Undergraduate Research Board Fall Symposium, 2018.
- **J. Lu**, Z. A. Balushi, and H. A. Atwater. *Exploring band alignment in transition-metal dichalcogenide atomic layers*. Presented at the SURF Summer Symposium, 2018.

AWARDS AND HONORS

- **Peer Advisor Outstanding Service Award**, Cornell University (2019)
- **Best Poster Award: Applied Sciences**, Cornell Undergraduate Research Board Spring Symposium (2019)
- **NSF Graduate Research Fellowship**, (2019)
- **Frank and Rosa Rhodes Scholarship**, Cornell University (2018)
- **Best Poster Design Award**, Cornell Undergraduate Research Board Fall Symposium (2018)
- **Engineering Learning Initiatives (ELI) grant**, Cornell University (2018)
- **Tau Beta Pi**, Cornell University (2018)
- **RoboSub Competition 1st Place**, Cornell University (2017)
- **Dean's List**, Cornell University (2016, 2017, 2018)

CAMPUS AND COMMUNITY INVOLVEMENT

- **Duke University Graduate and Professional Student Council Member (FA 2020 - Present)**: Responsible for representing graduate program in determining funding for graduate school organizations
- **Duke University Hospital Patient Experience Volunteer (FA 2019 - Present)**: Responsible for providing support services to nursing unit staff to enhance patient care.
- **Food Bank of Central & Eastern North Carolina Volunteer (FA 2019 - Present)**: Assisted in replenishing stocks, implementing food hygiene standards, maintaining storage spaces clean and organized, and loading and unloading food items.
- **Cornell Engineering Peer Advisor (FA 2018)**: Planned and co-led weekly seminars for freshmen engineering students (class of 15+). Seminars centered around introducing freshmen to academic and social activities on campus.
- **Cornell Science Olympiad Invitational Volunteer (FA 2016 - Current)**: Event lead for events such as Game On, Wind Power, and Duct Tape Challenge. Assisted in the organization of Cornell Invitational (60+ schools in attendance) which is planning to host the national competition in 2019. Led the initiative in introducing fun events to the invitational.
- **Cornell Autonomous Underwater Vehicle Project Team Member (FA 2016)**: Created team's sponsorship packet with Adobe Indesign as part of the business subteam that generated over \$50K in sponsorship.

TEACHING EXPERIENCE

- **Head Graduate Teaching Assistant:** 1) Diagnostic Medical Imaging 2)Advanced Topics of Ionizing Based Imaging Modalities
- **Undergraduate Physics Teaching Assistant:** 1) Advanced waves, optics, and thermodynamics. 2)Waves and oscillations. 3) Introductory mechanics.
- **Private High School Physics Tutoring:** Hosted a private physics class of 10 high school students on Princeton University campus in partnership with the **Princeton Center for Complex Materials (PCCM) Education Outreach** team.

RELEVANT SKILLS

- **Programming/Software:** Adobe Suite • AutoCAD • C • C++• Computer Vision • Deep Learning • Final Cut Pro • Latex • MATLAB • Java • R & R Markdown • Python (includes numpy, scipy, pandas, tensorflow, keras, tkinter, pytorch packages) • ITK • ANTs • Siemens IDEA programming • Sublime text • Bash
- **Physics and Engineering:** Atomic Force Microscopy • Cryogenics • E-Beam Evaporation • E-Beam Lithography • Energy-dispersive X-ray spectroscopy • Fourier Transform Infrared Spectroscopy • Kelvin Probe Force Microscopy • Laser Cutting • Siemens MRI Magnetom scanner • Photolithography • (Time-Resolved) Photoluminescence Spectroscopy• Raman Spectroscopy • Scanning Electron Microscopy • Sputtering • X-ray Photoelectron Spectroscopy • 3D Printing