Kalina Polet Slavkova, PhD

Postdoctoral Research Scientist
Columbia University Irving Medical Center
622 West 168th Street, New York, NY 10032
kslav@sas.upenn.edu
https://www.kalinaslavkova.com

EDUCATION

The University of Texas at Austin, Austin, TX, USA   **Aug 2022**
PhD in Physics
Thesis: *Towards advances in data acquisition and analysis for quantitative multi-contrast magnetic resonance imaging.*

University of Pennsylvania, Philadelphia, PA, USA   **May 2017**
BA in Physics (with Honors) and Biology
Honors Thesis: *Local Statistics of Natural Images Inform Visual Segmentation and Gist Perception with Foreseeable Applications in Scene and Art Characterization.*

RESEARCH EXPERIENCE

Postdoctoral Research Scientist, Department of Radiology   **Jan 2024 - Pres**
Columbia University Irving Medical Center, New York, NY, USA
- <u>Advisor</u>: Despina Kontos
- <u>Projects</u>: Applied Bayesian optimization tools for hyperparameter tuning of neural style transfer algorithm for medical images.

Postdoctoral Researcher, Department of Radiology   **Sept 2022 - Dec 2023**
University of Pennsylvania, Philadelphia, PA, USA
- <u>Advisors</u>: Despina Kontos, Angela DeMichele
- <u>Projects</u>: Built and tested a U-Net deep learning architecture for style transfer between breast medical images of different contrasts using PyTorch and PyTorch lightning. Computed hand-crafted radiomic features from breast medical images based on intensity values, histogram binning, and texture. Applied logistic regression on feature space to model clinical outcome. Bias-field corrected, resampled, and resized medical images for processing using OpenCV, Simple ITK, and in-house software.
- <u>Mentoring</u>: Guided summer undergraduate intern on segmenting medical image and extracting radiomic features, Worked with first-year PhD student and first year Masters student on medical image segmentation

Graduate Reserach Assistant, Department of Physics   **Aug 2018 - 2022**
The University of Texas at Austin, Austin, TX, USA
- <u>Advisors</u>: Thomas Yankeelov, Jonathan Tamir
- <u>Projects</u>: Implemented a generative model with PyTorch to achieve scan-specific image reconstruction and T1-mapping of brain MRIs from accelerated k-space. Applied noise pre-whitening to raw brain MRI k-space data and computed sensitivity maps using Python-based software. Applied k-means clustering to preclinical brain tumor MRI data to identify physiological regions and built an ODE model to model the change in size of the identified regions with and without treatment.
- <u>Mentoring</u>: Supervised undergraduate student on perfusion modelling of longitudinal breast MRI data

Graduate Research Assistant, Department of Physics   **Aug 2017 - 2018**
The University of Texas at Austin, Austin, TX, USA
- <u>Advisor</u>: Ila Fiete

- Projects: Investigated successor representation from reinforcement learning as an application in theoretical neuroscience. Modelled grid and border cell interactions in the mouse brain (MATLAB).

Undergraduate Research Intern, T-6 Division   **May - Aug 2017**
Los Alamos National Laboratory, Los Alamos, NM, USA
- Advisors: William Hlavacek, Marian Angel
- Projects: Modelled the recruitment of signaling proteins to the insulin-like growth factor 1 receptor (BioNetGen), Developed a preliminary Boolean network model for cellular autophagy, Curated a database of proteins involved in cellular autophagy.

Research Assistant, Department of Physics   **Feb 2016 - May 2017**
University of Pennsylvania, Philadelphia, PA, USA
- Advisors: Vijay Balasubramanian, Ann Hermundstad
- Projects: Characterized properties of natural images by computing higher order texture-based statistical features (MATLAB), Performed linear discriminant analysis to categorize images (MATLAB). Senior honors thesis on this work.

Undergraduate Research Intern, T-6 Division   **May - Aug 2016**
Los Alamos National Laboratory, Los Alamos, NM, USA
- Advisors: William Hlavacek, Ruy Ribeiro
- Projects: Contributed to a rule-based model for autophagy (ML-Rules and BioNetGen), Developed a heuristic model of influenza A effects on cellular autophagy (MATLAB), Presented oral tutorial on Data2Dynamics data analysis package at the 10th annual q-Bio Summer School.

Research Intern, European Molecular Biology Laboratory   **May - July 2015**
GIANT Research Campus, Grenoble, France
- Advisor: Matthew Bowler
- Project: Purified the CD domain of the MAP kinase p38α, Performed crystallography experiments to probe the structure of the CD domain of p38α.

Research Assistant, Perelman School of Medicine   **April 2014 - Jan 2015**
University of Pennsylvania, Philadelphia, PA, USA
- Advisors: Jianxin You, Sabrina Tsang
- Responsibilities: Transformed bacteria and induced expression of encoded protein, Purified small T protein from Human Polyomavirus 7 and from Merkel Cell Polyomavirus, Managed lab records and generally assisted lab members.

TEACHING EXPERIENCE

Mentor, Directed Reading Program, Dep. of Physics   **Jan 2020 - August 2021**
The University of Texas at Austin, Austin, TX, USA
- Mentees: Dhruva Karkada (Physics), Jacob Way (Mathematics)
- Duties: Advised students on selected projects in the fields of theoretical neuroscience and machine learning, Prepared students for final presentations.

Teaching Assistant, Department of Physics   **Aug 2017 - May 2018**
The University of Texas at Austin, Austin, TX, USA
- Courses: Introductory Mechanics for Engineers, Modern Physics
- Professors: Ernst-Ludwig Florin, Austin Gleeson

Physics Tutor, Department of Physics   **Feb 2016 - April 2017**
University of Pennsylvania, Philadelphia, PA, USA

Learning Assistant, Department of Physics   **Aug - Dec 2015**
University of Pennsylvania, Philadelphia, PA, USA

- Course: Introductory mechanics for premedical students
- Professor: Alison Sweeney

PUBLICATIONS   **Slavkova KP**, Patel S, Cacini Z, Kazerouni AS, Gardner A, Yankeelov TE, Hormuth II, DA. Mathematical modelling of the dynamics of image-informed tumor habitats in a murine model of glioma. *Scientific Reports.* 2023;13:2916. https://doi.org/10.1038/s41598-023-30010-6

Slavkova KP, DiCarlo JC, Wadhwa V, Wu C, Virostko J, Kumar S, Yankeelov TE, Tamir JI. An untrained deep learning method for reconstructing dynamic magnetic resonance images from accelerated model-based data. *Magnetic Resonance in Medicine.* 2023;89(4):1617-1633. http://doi.org/10.1002/mrm.29547

Wu C, Lorenzo G, Lima EABF, Hormuth II DA, **Slavkova KP**, DiCarlo JC, Virostko J, Phillips CM, Patt D, Chung C, Yankeelov TE. Integrating mechanism-based modeling with biomedical imaging to build practical digital twins for clinical oncology. *Biophysics Reviews.* 2022;3:021304. https://doi.org/10.1063/5.0086789

DiCarlo JC, Jarrett AM, Kazerouni AS, Virostko J, Sorace A, **Slavkova KP**, Woodard S, Avery S, Patt D, Goodgame B, Yankeelov TE. Analysis of simplicial complexes to determine when to sample for quantitative DCE-MRI of the breast. *Magnetic Resonance in Medicine.* 2022;89(3):1134-1150. https://doi.org/10.1002/mrm.29511

Virostko J, Sorace AG, **Slavkova KP**, Kazerouni AS, Jarrett AM, DiCarlo JC, Woodard S, Avery S, Goodgame B, Patt D, Yankeelov TE. Quantitative Multiparametric MRI Predicts Response to Neoadjuvant Therapy in the Community Setting. *Breast Cancer Research.* 2021;23(1). https://doi.org/10.1186/s13058-021-01489-6

Slavkova KP, DiCarlo JC, Kazerouni AS, Virostko J, Sorace AG, Patt D, Goodgame B, Yankeelov TE. Characterizing errors in pharmacokinetic parameters from analyzing quantitative abbreviated DCE-MRI data in breast cancer. *Tomography.* 2021;7(3):253-267. https://doi.org/10.3390/tomography7030023

Erickson KE, Rukhlenko OS, Shahinuzzaman M, **Slavkova KP**, Lin YT, Suderman R, et al. Modeling cell line-specific recruitment of signaling proteins to the insulin-like growth factor 1 receptor. *PLoS Comput Biol.* 2019;15(1):e1006706. https://doi.org/10.1371/journal.pcbi.1006706

INVITED TALKS   Untrained Learning for Image Acquisition and Reconstruction. **32nd Annual Meeting of the International Society for Magnetic Resonance in Medicine**. Toronto, CA. June 3, 2023.

Toward advances in data acquisition and analysis for quantitative MRI. **Quantitative Intelligent Medical Imaging Research Group, Boston Children's Hospital/Harvard Medical School**. Virtual. June 8, 2022.

Toward advances in data acquisition and analysis for quantitative MRI. **Department of Radiology, University of Pennsylvania**. Virtual. June 1, 2022.

Toward advances in data acquisition and analysis for quantitative MRI. **Biomedical Imaging and Research Institute, Cedars-Sinai Medical Center**. Los Angeles, CA, USA. May 25, 2022.

Performing quantitative DCE-MRI for abbreviated breast MRI. **Department of Radiology, Stanford University**. Virtual. October 12, 2020.

Investigating the feasibility of performing quantitative DCE-MRI in an abbreviated breast examination. **Department of Radiology, The University of Chicago**. Chicago, IL, USA. June 19, 2019.

CONFERENCE TALKS

Slavkova KP, Cohen EA, Chitalia R, Thakran S, Mankowski WC, Nguyen A, Horng H, et al. Combining radiomic features with background parenchymal enhancement from DCE-MRI data for predicting treat- ment response in breast cancer. Power Pitch Presentation. **32nd Annual Meeting of the International Society for Magnetic Resonance in Medicine**. Toronto, Ontario, Canada. June 2023.

Slavkova KP, DiCarlo JC, Wadhwa V, Yankeelov TE, Tamir JI. Implementing the ConvDecoder architecture with physics-based regularization to reconstruct under-sampled dynamic MRI data. **National Cancer Institute CSBC/PS-ON/BD-STEP Junior Investigator Meeting**. Virtual. August 30, 2021.

Slavkova KP. Designing novel anti-inflammatory drugs by targeting the CD domain of MAP kinase p38α. **APS Conference for Undergraduate Women in Physics**. Wesleyan University, Middletown, CT, USA. January 15, 2016.

CONFERENCE POSTERS

Slavkova KP, Cohen EA, Chitalia R, Thakran S, Mankowski WC, Nguyen A, Horng H, McDonald ES, Feldman M, DeMichele A, Kontos D. Combining radiomic features with background parenchymal enhancement from DCE-MRI data for predicting treatment response in breast cancer **32nd Annual Meeting of the International Society for Magnetic Resonance in Medicine**. Toronto, Ontario, Canada. June 2023.

Slavkova KP, Kumar S, Wadhwa V, Wu C, Virostko J, Tamir JI. Investigating the feasibility of unrolled methods for scan-specific, physics-informed reconstruction of multi-contrast MRI acquisitions **ISMRM Workshop on Data Sampling and Image Reconstruction**. Sedona, AZ, USA. January 2023.

Slavkova KP, DiCarlo JC, Wadhwa V, Yankeelov TE, Tamir JI. An untrained deep learning method with model-based regularization for reconstructing dynamic MR images from retrospectively accelerated data. **31st Annual Meeting of the International Society for Magnetic Resonance in Medicine**. London, UK. May 2022.

DiCarlo JC, Jarrett AM, Kazerouni AS, Virostko J, Sorace AG, **Slavkova KP**, Patt D, Goodgame B, Avery S, Yankeelov TE. Three timepoint pharmacokinetic modeling to incorporate within standard of care MRI breast exams. **San Antonio Breast Cancer Symposium**. San Antonio, TX, USA. December 2021.

Virostko J, Sorace AG, **Slavkova KP**, Kazerouni AS, Jarrett AM, DiCarlo JC, Woodard S, Avery S, Goodgame B, Patt D, Yankeelov TE. Quantitative Multiparametric MRI Predicts Response to Neoadjuvant Therapy in the Community Setting. **San Antonio Breast Cancer Symposium**. San Antonio, TX, USA. December 2021.

Slavkova KP, DiCarlo JC, Wadhwa V, Ma J, Rauch GM, Zhou Z, Yankeelov TE, Tamir JI. Implementing ConvDecoder with physics-based regularization to reconstruct under-sampled variable-flip angle MRI data of the breast. **29th Annual Meeting of the International Society for Magnetic Resonance in Medicine**.

Virtual. May 2021.

Slavkova KP, DiCarlo JC, Syed AK, Wu C, Virostko J, Sorace AG, Yankeelov TE. Characterizing errors in perfusion model parameters derived from retrospectively abbreviated quantitative DCE-MRI data **San Antonio Breast Cancer Symposium**.San Antonio, TX, USA. December 2020.

Slavkova KP, DiCarlo JC, Van Veen DM, Syed AK, Jalal A, Virostko J, Sorace AG, Dimakis AG, Yankeelov TE. Implementing compressed sensing with deep image prior to reconstruct undersampled dynamic contrast-enhanced MRI data of the breast. **28th Annual Meeting of the International Society for Magnetic Resonance in Medicine**. Virtual. April 2020.

Slavkova KP, DiCarlo JC, Syed AK, Wu C, Virostko J, Sorace AG, Yankeelov TE. Investigating the feasibility of performing quantitative DCE-MRI in an abbreviated breast examination. **San Antonio Breast Cancer Symposium**.San Antonio, TX, USA. December 2019.

Slavkova KP, DiCarlo JC, Syed AK, Virostko J, Sorace AG, Yankeelov TE. Investigating the feasibility of performing quantitative DCE-MRI in an abbreviated breast examination. **27th Annual Meeting of the International Society for Magnetic Resonance in Medicine**. Montreal, Quebec, CA. May 2019.

AWARDS AND HONORS		
Educational Stipend		**Annually, 2019-2022**
International Society for Magnetic Resonance in Medicine, Annual Meetings		
Podium Presentation Award		**Aug 2021**
NCI Junior Investigator Meeting, Virtual, USA		
Honorable Mention		**April 2019**
NSF Graduate Research Fellowship Program, USA		
Dean's List		**Aug 2016 - May 2017**
University of Pennsylvania; Philadelphia, PA, USA		
Certificate for Outstanding Oral Presentation		**Jan 2016**
Conf. for Undergrad. Women in Physics; Middletown, CT, USA		
Competent Communicator Certificate		**Nov 2012**
Toastmasters International; DeLand, FL, USA		

COMMUNITY INVOLVEMENT		
Peer Reviewer, Various journals		**Jan 2022 - Present**
Scientific Reports, *Breast Cancer Research*, *MDPI* , and others		
Co-Chair, Fundraising, Penn Postdoctoral Association		**Jan 2023 - Dec 2024**
University of Pennsylvania, Philadelphia, PA, USA		
Organizer, Directed Reading Program in Physics		**Jan 2020 - May 2022**
The University of Texas at Austin, Austin, TX, USA		
Co-president, Women in Physics at UT Austin		**Aug 2017 - Oct 2020**
The University of Texas at Austin, Austin, TX, USA		
Presenter, Physics Circus		**Aug 2018 - Nov 2019**
The University of Texas at Austin, Austin, TX, USA		
Founder & **Co-president**, Women in Physics		**Jan 2015 - April 2017**
University of Pennsylvania, Philadelphia, PA, USA		
Founder & **Co-president**, Society of Physics Students		**March 2015 - 2017**
University of Pennsylvania, Philadelphia, PA, USA		