Kalina Polet Slavkova

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RESEARCH INTERESTS

Quantitative magnetic resonance imaging in cancer. Development of mathematical models of phenomena in cancer biology. Deep learning for magnetic resonance imaging.

EDUCATION

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**
Bachelor of Arts in Physics (with Honors) and Biology
Minor in Mathematics
Honors Thesis: *Local Statistics of Natural Images Inform Visual Segmentation and Gist Perception with Foreseeable Applications in Scene Analysis and Art Characterization.*

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. 2022. *Under review: Scientific Reports.* https://doi.org/10.21203/rs.3.rs-2058436/v1

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. 2022. *Under review: Magnetic Resonance in Medicine.* arXiv:2205.01604

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. 2022. *Accepted: Magnetic Resonance in Medicine.*

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

RESEARCH EXPERIENCE

Graduate Reserach Assistant, Cntr. for Comp. Oncology **Aug 2018 - Present**
University of Texas at Austin, Austin, TX, USA

- Advisors: Thomas Yankeelov (PhD advisor), Jonathan Tamir (informal advisor)
- Projects: Untrained deep learning for accelerated MRI; quantitative DCE-MRI in an abbreviated breast examination; modelling tumor habitats in a murine model of glioma.

Rotation Student, Neuroscience Department **Jan - Aug 2018**
University of Texas at Austin, Austin, TX, USA

- Collaborators: Ila Fiete, Tzuhsuan Ma
- Projects: Investigating grid cell model with boundary conditions imposed by border cells; understanding the successor representation from reinforcement learning as an application in neuroscience.

Research Intern, T-6: Theoretical Biology & CNLS **May - Aug 2017**
Los Alamos National Laboratory, Los Alamos, NM, USA

- Collaborators: William Hlavacek, Marian Angel
- Projects: Formulating a predictive model of recruitment of signaling proteins to the insulin-like growth factor 1 receptor; developing of a preliminary Boolean network model for cellular autophagy; curating database of proteins involved in cellular autophagy.

Undergraduate Researcher, Physics Department **Feb 2016 - May 2017**
University of Pennsylvania, Philadelphia, PA, USA

- Collaborators: Vijay Balasubramanian, Ann Hermundstad
- Projects: Investigating linear discriminant analysis for categorizing natural images based on local statistics. Senior honors thesis based on research conducted.

Research Intern, T-6: Theoretical Biology & CNLS **May - August 2016**
Los Alamos National Laboratory, Los Alamos, NM, USA

- Collaborators: William Hlavacek, Ruy Ribeiro, Ryan Suderman
- Activities: Developing a rule-based model for autophagy using the ML-Rules and BioNetGen language. Developing a heuristic model of influenza A effects on cellular autophagy. 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

- Collaborators: Matthew Bowler
- Project: Designing novel anti-inflammatory drugs by targeting the CD domain of the MAP kinase p38α.

Research Assistant, Perelman School of Medicine **April 2014 - Jan 2015**
University of Pennsylvania, Philadelphia, PA, USA

- Collaborators: Jianxin You, Sabrina Tsang
- Activities: Transformed bacteria and induced expression of encoded protein. Purified small T protein from Human Polyomavirus 7 and from Merkel Cell Polyomavirus. Managed lab records, made common reagents, and assisted lab members.

TEACHING EXPERIENCE

Mentor, Directed Reading Program, Physics Department **Jan 2020 - Present**
University of Texas at Austin, Austin, TX, USA

- Mentees: Dhruva Karkada (Physics), Jacob Way (Mathematics)
- Duties: Advise students on selected projects in the fields of theoretical neuroscience and machine learning.

Teaching Assistant, Physics Department **Aug 2017 - May 2018**
University of Texas at Austin, Austin, TX, USA

- Course: Introductory mechanics for engineers
- Professor: Ernst-Ludwig Florin
- Duties: Hosted weekly office hours and discussion sections to address students' questions and provide guided group problems. Graded homework assignments and exams. Attended weekly meetings with fellow teaching assistants and professor.

Teaching Assistant, Physics Department **Aug 2017 - May 2018**
University of Texas at Austin, Austin, TX, USA

- Course: Modern physics for Plan II
- Professor: Austin Gleeson
- Duties: Hosted weekly office hours and problem solving sessions. Graded homework assignments and exams. Attended weekly meetings with fellow teaching assistants and professor.

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

- Tutored introductory physics for premedical students in PHYS101 and PHYS102.
- Tutored introductory calculus-based PHYS150 and PHYS151.

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

- Course: Introductory mechanics for premedical students
- Professor: Alison Sweeney
- Duties: Assisted graduate teaching assistant in leading weekly active learning recitations. Hosted weekly office hours to address students' questions. Graded exams.

AWARDS AND HONORS

Educational Stipend **2022, 2021, 2020, 2019**
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

SKILLS

Programming Languages: MATLAB, Python
Computing: Machine learning, high-performance computing
Experiment: familiarity with basic wet lab skills in cell work
Languages: English (native proficiency), Bulgarian (native proficiency), Spanish (advanced proficiency), Urdu (elementary proficiency)

INVITED TALKS

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, DiCarlo JC, Wadhwa V, Yankeelov TE, Tamir JI. Implementing the ConvDecoder architecture with physics-based regularization to reconstruct undersampled 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, 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

LOCAL TALKS

Slavkova, KP. Modeling tumor composition in a murine model of glioma. **The Center for Nonlinear Dynamics Seminar Series**, The University of Texas at Austin. Austin, TX, USA. April 6, 2022.

Slavkova, KP. Advances in data acquisition and analysis for quantitative dynamic contrast-enhanced MRI of the breast. **Center for Computational Oncology Spring Seminar Series**, The University of Texas at Austin. Austin, TX, USA. March 3, 2021.

Slavkova, KP. Characterizing errors in perfusion model parameters from analyzing retrospectively abbreviated quantitative DCE-MRI data . **The Center for Nonlinear Dynamics Seminar Series**, The University of Texas at Austin. Austin, TX, USA. September 30, 2020.

Slavkova, KP. Rapid Fire Presentation. **2nd Annual Translational Imaging Conference: AI and Machine Learning in Imaging, Gulf Coast Consortia**. Virtual. November 8, 2020.

LOCAL POSTERS

Slavkova KP, DiCarlo JC, Van Veen D, Dimakis AG, Yankeelov TE. Proof-of-concept Pipeline for Implementing Compressive Sensing with Deep Image Prior to Improve the Spatio-temporal Resolution of Dynamic Contrast-enhanced MRI Data of the Breast. **1st Annual Translational Imaging Conference, Gulf Coast Consortia**. Houston, TX, USA. October 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. **Livestrong Cancer Institute Basic/Translational Research Retreat**. Austin, TX, USA. November 2018

PROFESSIONAL ACTIVITIES

Attendee, ISMRM Data Sampling/Image Recon Workshop **Jan 2020**

Sedona, AZ, USA

Presenter, ISMRM Annual Meeting 2019 **May 2019**
Montreal, Quebec, CA

Attendee, ISMRM Machine Learning Workshop II **Oct 2018**
Washington D.C., USA

Attendee, APS Conf. for Undergrad Women in Physics **Jan 2017**
Princeton University, Princeton, NJ, USA

Presenter, APS Conf. for Undergrad Women in Physics **Jan 2016**
Wesleyan University, Middletown, CT, USA

Attendee, 10th Annual q-Bio Conference **July 2016**
Vanderbilt University, Nashville, TN, USA

Certificate for Completion, 10th Annual q-Bio Summer School **July 2016**
University of New Mexico, Albuquerque, NM, USA

Attendee, APS Conf. for Undergrad Women in Physics **Jan 2015**
Rutgers University, New Brunswick, NJ, USA

COMMUNITY INVOLVEMENT

Organizer, Directed Reading Program in Physics **Jan 2020 - Present**
University of Texas at Austin, Austin, TX, USA

Co-president, Women in Physics at UT Austin **Aug 2017 - Oct 2020**
University of Texas at Austin, Austin, TX, USA

Presenter, Physics Circus **Aug 2018 - Nov 2019**
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

Events Manager, Kings Court English College House **Feb 2014 - April 2015**
University of Pennsylvania, Philadelphia, PA, USA

Interrelations Officer, Women in Computer Science **Oct 2013 - Jan 2014**
Kings Court English College House, Philadelphia, PA, USA

ACADEMIC MEMBERSHIPS

International Society for Magnetic Resonance in Medicine
American Physical Society