

JOSEPH JANIZEK

Website: jjanizek.github.io
(+1) 260 615-1886 ◊ jjanizek@uw.edu

EDUCATION

University of Washington *June 2016 - Present (Anticipated 2024)*
School of Medicine, Medical Scientist Training Program (MD)

University of Washington *March 2018 - 2022*
Paul G. Allen School of Computer Science & Engineering (PhD)

University of Chicago *October 2012 - June 2016*
Bachelor of Arts in Biological Sciences with General Honors

AWARDS AND HONORS

Poncin Scholarship *2022-2024*

ARCS Fellowship *2018-2021*

Madrona Prize (for research with greatest commercial potential) *2019*

Alexander Grinstein Endowed Fellowship *2016-2017*

Phi Beta Kappa *2016*

University of Chicago Dean's List *2012-2016*

National Merit Scholarship *2012-2016*

RESEARCH / WORK EXPERIENCE

Ph.D. Research Assistant at the University of Washington *2016 - 2022*
My thesis work in the lab of Prof. Su-In Lee was motivated by an interest in the application of deep learning techniques to medical diagnostic tasks and to drug development. In particular, I focused on the development of new explainable AI methods for interpreting and improving the behavior of neural networks and other complex machine learning models. For example, this included work using generative medical image models to reveal how radiographic classifiers relied on “shortcuts” rather than clinically meaningful signals when trained to diagnose COVID-19. This also included the development of novel training methods for deep neural networks to encourage the networks to ignore spurious confounders, thus allowing these models to transport across hospitals/datasets.

Prior to working with Prof. Lee, I also completed research rotations with William S. Noble (working on the development of machine learning methods for mass spec proteomics) and Jay Shendure and Lea Starita (working on the development of high-throughput genomic assays using CRISPR-Cas9 gene editing).

Teaching Assistant at the University of Washington *2021 - 2022*
Redesigned and restructured CSE 527 Computational Biology course with my research advisor to update the syllabus and connect classical results in bioinformatics and computational biology to the latest advances in machine learning for computational biology and medicine. Provided feedback and direction on class research projects, graded written material, and managed weekly office hours.

Research Assistant at University of Chicago *2012 - 2016*
Developed novel assays and therapeutics for the identification and treatment of hyperlipidemia.

Teaching Assistant at University of Chicago *2015 - 2016*
TA'd quantitative modeling in biology course designed for pre-med biology majors. Supervised weekly

programming labs. Provided feedback and guidance on how to write computer code to a group of primarily novice programmers. Graded coding assignments and mathematical problem sets.

PUBLICATIONS

(† equal contribution [co-first authorship, ordered alphabetically])

- Uncovering expression signatures of synergistic drug response using an ensemble of explainable AI models. 2023
Joseph D. Janizek, Ayse B. Dincer, Safiye Celik, Hugh Chen, William Chen, Kamila Naxerova, and Su-In Lee
Nature Biomedical Engineering
- Principled feature attribution for unsupervised gene expression analysis 2023
Joseph D. Janizek, Anna Spiro, Safiye Celik, Ben W Blue, Josh C Russell, Ting-I Lee, Matt Kaerberlin, Su-In Lee
Genome Biology
- A cost-aware framework for the development of AI models for healthcare applications. 2022
Gabriel Erion, **Joseph D. Janizek**, Carly Hudelson, Richard B. Utarnachitt, Andrew M. McCoy, Michael R. Sayre, Nathan J. White, and Su-In Lee.
Nature Biomedical Engineering, <https://doi.org/10.1038/s41551-022-00872-8>
- Course corrections for clinical AI. 2021
Alex DeGrave†, **Joseph D. Janizek**†, and Su-In Lee.
Kidney360
- AI for radiographic COVID-19 detection selects shortcuts over signal. 2021
Alex DeGrave†, **Joseph D. Janizek**†, and Su-In Lee.
Nature Machine Intelligence, <https://doi.org/10.1038/s42256-021-00338-7>
- Explaining Explanations: Axiomatic Feature Interactions for Deep Networks 2021
Joseph D. Janizek†, Pascal Sturmfels†, and Su-In Lee.
Journal of Machine Learning Research, Volume: 22, Issue: 104, Pages: 154
- Improving performance of deep learning models with axiomatic attribution priors and expected gradients. 2021
Gabriel Erion†, **Joseph D. Janizek**†, Pascal Sturmfels†, Scott Lundberg, and Su-In Lee.
Nature Machine Intelligence, <https://doi.org/10.1038/s42256-021-00343-w>
- Learning Deep Attribution Priors Based On Prior Knowledge. 2020
Ethan Weinberger, **Joseph D. Janizek**, and Su-In Lee.
Proceedings of Neural Information Processing Systems, NeurIPS, Volume: 33, Pgs: 14034-14045
- Adversarial Deconfounding Autoencoder for Learning Robust Gene Expression Embeddings. 2020
Ayse Dincer, **Joseph D. Janizek**, and Su-In Lee.
Bioinformatics (Selected for Spotlight talks at ECCB and ISMB 2020)
- An Adversarial Approach for the Robust Classification of Pneumonia from Chest Radiographs. 2020
Joseph D. Janizek, Gabriel Erion, Alex J. DeGrave, and Su-In Lee.
ACM Conference on Health, Inference, and Learning., <https://doi.org/10.1145/3368555.3384458>
- Explainable Prediction of Transcription Factor Binding based on Histone Modification Data 2019

William Chen, **Joseph D. Janizek**, and Su-In Lee.
Machine Learning in Computational Biology (Paper selected for Spotlight Talk)

Accurate classification of BRCA1 variants with saturation genome editing. 2018
Gregory M Findlay, Riza M Daza, Beth Martin, Melissa D Zhang, Anh P Leith, Molly Gasperini,
Joseph D Janizek, Xingfan Huang, Lea M Starita, Jay Shendure.
Nature

Explainable machine learning prediction of synergistic drug combinations 2018
for precision cancer medicine.
Joseph D. Janizek, Safiye Celik, Su-In Lee.
ICML & IJCAI Workshop on Computational Biology

Characterization of the Lipase Stimulating Domain for Apolipoprotein AV 2015
and the Development of a Therapeutic Peptide for the Treatment of Hypertriglyceridemia
Joseph D Janizek, Kim Munro, Michael H Davidson, John B Ancsin.
Arteriosclerosis, Thrombosis, and Vascular Biology, doi: 10.1161/atvb.35.suppl.1.537

A Novel Fluorescence-Based Assay is Used to Investigate the Triglyceride Hydrolytic 2014
Activity of Lipases and to Identify Synthetic Peptides With Strong Lipase-Stimulating Activities.
Joseph D Janizek, Kim Munro, Michael H Davidson, John B Ancsin.
Arteriosclerosis, Thrombosis, and Vascular Biology, doi: 10.1161/atvb.34.suppl.1.31

INVITED TALKS

NASA Ames Research Center, Open Science and Informatics Seminar Series, March 2022
Paul G. Allen School of Computer Science & Engineering Colloquium, October 2021
Future of Privacy Forum AI Working Group, October 2021
BigInsight (Norwegian AI Center), March 2021

REVIEWING

NeurIPS
BMC Bioinformatics
RECOMB
Neurocomputing (Elsevier)
Neural Networks (Elsevier)
CHI TRAIT: Workshop on Trust and Reliance in AI-Human Teams
ICML WCB

SKILLS

Biomedical Data Modalities: Medical images, ER Clinical Data, bulk and single-cell RNA-seq, small molecule screening libraries, cheminformatics datasets
Programming Languages: Python, R, Matlab, C, JavaScript
Deep Learning Frameworks: PyTorch, TensorFlow, JAX
Software: Git, Numpy, Jupyter, Pandas, Sklearn, Keras, D3.js, XGBoost