April Sagan, Ph.D.

Summary

I am a postdoctoral researcher at the University of Pittsburgh Department of Biomedical Informatics and UPMC Hillman Cancer Center working with Dr. Hatice Osmanbeyoglu. Drawing upon my background as an applied mathematician, I use computational, statistical, and machine learning techniques to model gene regulatory networks using multi-omics data.

Education

PhD in Mathematics **May 2021**
Rensselaer Polytechnic Institute
Dissertation: "Nonconvex Regularizers for Sparse Optimization and Rank Minimization"
Advisor: John E. Mitchell

MS in Applied Mathematics **2019**
Rensselaer Polytechnic Institute

BS in Applied Mathematics **2016**
Rochester Institute of Technology

Academic Employment

Postdoctoral Fellow, August 2021-present
University of Pittsburgh, Department of Biomedical Informatics

Graduate Research Assistant, *January 2018- August 2020*
Rensselaer Polytechnic Institute, School of Mathematical Sciences – Troy, NY

Graduate Teaching Assistant, *August 2016 - May 2017, August 2020-May 2021*
Rensselaer Polytechnic Institute, School of Mathematical Sciences – Troy, NY

Teaching

June 28th, 2022	**Guest Lecture,** Introduction to Machine Learning, University of Pittsburgh Hillman Academy
Spring 2021	**Teaching Assistant,** Numerical Computing, RPI Department of Mathematical Sciences
Fall 2020	**Teaching Assistant,** Probability Theory and Applications, RPI Department of Mathematical Sciences
Fall 2019	**Teaching Assistant,** Calculus 1, RPI Department of Mathematical Sciences
Spring 2017, Summer 2017, Fall 2017	**Teaching Assistant,** Differential Equations, RPI Department of Mathematical Sciences
Fall 2016	**Teaching Assistant,** Multivariate Calculus, RPI Department of Mathematical Sciences
Spring 2016	**Teaching Assistant,** Discrete Mathematics and Introduction to Proofs, RIT School of Mathematical Sciences
Fall 2013	**Learning Assistant,** University Physics II, RIT School of Physics and Astronomy

Leadership and Service

March 2022	Judge, Pittsburgh Regional Science and Engineering Fair
Fall 2020	Judge, SIMIODE Challenge Using Differential Equations Modeling
2019-2020	Graduate Representative, RPI Department of Mathematical Sciences
2016-2017	Webmaster, RPI Society for Industrial and Applied Mathematicians Student Chapter

Journal Reviewer	Cell Reports Methods, Applied Mathematical Modelling, IEEE Transactions on Smart Grid, IEEE Letters on Control Systems
Conference Reviewer	ISMB 2022

Awards and Honors

2021	Joaquin B. Diaz Prize *at RPI for "showing curiosity in new questions, an inquiring mind, a love to understand things, and the patience for systematic inquiry"*
2019	Finalist, MOPTA-AIMMS Optimization Modeling Competition, 2019
2014	Top 500 on the Putnam Competition, 2014
2015	Honorable Mention, RIT Applied Math Competition, 2015

Travel Grants

2022	ISMB Travel Fellowship
2020	SIAM Gene Golub Summer School (Canceled due to COVID)
2019	NSF AMPS PI Workshop
2018	NSF AMPS PI Workshop

Affiliations

- International Society for Computational Biology (ISCB)
- Society for Industrial and Applied Mathematicians (SIAM)

Open Source Projects

- SpaLoR: A python library for sparse and low rank methods in machine learning and data science www.spalor.org
- ECHO: An R Package for Finding Rhythms Using Extended Circadian Harmonic Oscillators https://cran.r-project.org/web/packages/echo.find/

Technical Skills

- Programming Languages: R, Python, Matlab, AMPL, Java, C#
- Hardware: Raspberry Pi, Arduino, 3D Printing, confocal microscopy

Publications

Journal Articles

Low-Rank Factorization for Rank Minimization with Nonconvex Regularizers
April Sagan and John E Mitchell, *Computational Optimization and Applications* (2021)

Two Relaxation Methods for Rank Minimization Problems
April Sagan, Xin Shen, and John E. Mitchell. *Journal of Optimization Theory and Applications* (2020)

ECHO: an Application for Detection and Analysis of Oscillators Identifies Metabolic Regulation on Genome-Wide Circadian Output
Hannah De Los Santos, Emily J Collins, Catherine Mann, **April Sagan**, Meaghan Jankowski, Kristin Bennett, and Jennifer Hurley. *Bioinformatics* (2020)

Decentralized Low-Rank State Estimation for Power Distribution Systems
April Sagan, Yajing Lui, and Andrey Bernstein. *IEEE Transactions on Smart Grid (2021)*

Conference Proceedings

Matrix Completion Using Alternating Minimization for Distribution System State Estimation
Yajing Liu , **April Sagan**, Andrey Bernstein, Rui Yang, Xinyang Zhou, and Yingchen Zhang. *IEEE International Conference on Communications, Control, and Computing Technologies for Smart Grids (2020)*

Book Chapters

Linking expression of cell-surface receptors with transcription factors by computational analysis of paired single-cell proteomes and transcriptomes
April Sagan, Xiaojun Ma, Koushul Ramjattun, Hatice Ulku Osmanbeyoglu, in *Cancer Systems and Integrative Biology* (forthcoming)

In Review

Isolated BAP1 loss in malignant pleural mesothelioma predicts distinct immunogenicity with implications for immunotherapeutic response
Hatice Ulku Osmanbeyoglu; Drake Palmer; **April Sagan**; Eleonora Sementino; Joseph R Testa, bioRxiv 2022.05.06.490947

Immune landscape in estrogen receptor positive breast cancer identifies a differential role for macrophages
Sayali Onkar, Jian Cui, Carly Cardello, Anthony R Cillo, Mostofa Rafid Uddin, **April Sagan**, Marion Joy, Hatice U Osmanbeyoglu, Katherine Pogue-Geile, Priscilla F. McAuliffe, Peter C. Lucas, Adrian V Lee, Tullia C Bruno, Steffi Oesterreich, Dario A.A.Vignali, *Nature Cancer (revised and resubmitted)*

Provable Low-Rank Plus Sparse Matrix Recovery Via Nonconvex Regularizers
April Sagan and John E Mitchell, arXiv:2109.12713

Presentations

Conference presentations

April 2021 — East Coast Optimization Meeting (ECOM)
Provable Low-Rank Plus Sparse Matrix Recovery Via Nonconvex Regularizers

August 2019 — Modeling and Optimization: Theory and Applications (MOPTA)
Generalized Nonconvex Relaxations to Rank Minimization

August 2019 — Modeling and Optimization: Theory and Applications (MOPTA)
MOPTA-AIMMS Optimization Modeling Competition

March 2015 — American Physical Society March Meeting
1- and 2-Point Microrheology of Hyaluronic Acid

Seminars

January 2022 — University of Pittsburgh School of Medicine, Department of Biomedical Informatics
Utilizing spatial transcriptomics data to identify cell context-specific regulatory programs

December 2018 — Rensselaer Polytechnic Institute, Department of Mathematical Sciences Dynamical Systems Seminar
Nonconvex Relaxations for Rank Minimization as a Semidefinite Program with Complementarity Constraints

Posters

July 2022 — Intelligent systems for Molecular Biology (ISMB)
Using spatial transcriptomics data to identify cell context-specific regulatory programs

October 2021 — Hillman Cancer Center Scientific Retreat
Computational methods for delineating spatially informed cell context-specific regulatory programs

October 2019 — NSF Algorithms for Modern Power Systems (AMPS) Workshop
Nonconvex Approaches to Rank Minimization with Applications to PMU Data Recovery and Outlier Detection

October 201 — NSF Algorithms for Modern Power Systems (AMPS) Workshop
A Decentralized Matrix Completion Algorithm for State Estimation