Daniel Ariad

Bioinformatics Data Scientist · Physicist

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Summary

Experienced Bioinformatics Data Scientist with a strong background in physics, specializing in the analysis of molecular entities in biological fluids. Skilled in applying physics-based methodologies to complex biological problems, with a proven track record in early embryonic development, condensed matter physics, and astrophysics research. Proficient in computer programing and experienced in developing scientific algorithms and machine learning models. Aiming to leverage my interdisciplinary background to advance the development of genetic tests for early disease detection. Holding a Ph.D. from Ben-Gurion University of the Negev, complemented by postdoctoral research at Indiana University Bloomington and Johns Hopkins University.

Professional Experience

10/2022 - Present **Bioinformatics Data Scientist**, PrognomiQ Inc, CA, USA

- Formulated a methodology based on fragmentomics and methylation patterns to estimate the proportion of cell-free tumor DNA in liquid biopsies, enhancing early cancer detection capabilities.
- Spearheaded a comprehensive analysis of the company's genomics dataset, assessing the reproducibility of measurements and the detection boundaries of tumor signals through the implementation of diverse features and techniques.
- Developed an approach to identify tumor related peptides from a library-free data-independent acquisition of proteomics.
- Enhanced predictive models for diagnosing cancer by customizing machine learning algorithms within the scikit-learn framework. The identified cancer biomarkers guide the development of our diagnostic products.

03/2020 - 10/2022 **Postdoctoral Researcher**, Johns Hopkins University, MD, USA

- Uncovered basic mechanisms responsible for chromosomal abnormalities and conceived diagnostic tests to detect them.
- Developed machine learning classifiers to distinguish between meiotic and mitotic aneuploidies and to infer sex-specific landscapes of recombination. The classification is accomplished through Bayesian statistical models that I crafted, tailored for extremely low-coverage whole-genome sequencing data from preimplantation genetic testing for aneuploidy.

03/2019 - 03/2020 **Postdoctoral Researcher**, Indiana University Bloomington, IN, USA

- Classified phases of matter and phase transitions in disordered Graphene, using high performance clusters.

10/2013 - 11/2018 **Graduate Researcher**, Ben-Gurion University of the Negev, Beer-Sheva, Israel

- Engaged in cutting-edge research to address fundamental questions in quantum physics, showcasing a capacity for innovative thinking and problem-solving.
- Formulated sophisticated models to study the properties of quantum vortices in topological superconductors, employing path-integral methods and tight-binding models for quantum simulations.
- Demonstrated the ability to articulate complex scientific concepts through high-impact research publications and collaborative projects.

10/2009 - 07/2013 **Masters Graduate Researcher**, Ben-Gurion University of the Negev, Beer-Sheva, Israel

- Conceived numerical methods for studying space plasma dynamics in space, integrating theoretical physics with practical computational applications.
- Built mathematical models and developed algorithms to interpret space observation data from the spacecraft Voyager II, contributing to the understanding of solar wind interactions with the interstellar medium.

Education

PhD in Theoretical Condensed Matter Physics 10/2013 - 11/2018
Ben-Gurion University of the Negev Beer-Sheva, Israel

MSc in Astrophysics 10/2009 - 07/2013
Ben-Gurion University of the Negev Beer-Sheva, Israel

BSc in Physics 10/2006 - 10/2009
Ben-Gurion University of the Negev Beer-Sheva, Israel

Military Service

07/2003 - 07/2006 **Sergeant First Class**, Combat Corps, IDF, Israel
Electro-optic technician. Tested, evaluated, and analyzed EO/IR devices. Performed test planning, day-to-day operation, data analysis, and the preparation of reports.

Selected publications, Preprints and Patents

Daniel Ariad, Svetlana Madjunkova, Mitko Madjunkov, Siwei Chen, Rina Abramov, Clifford Librach, Rajiv C. McCoy. "Aberrant landscapes of maternal meiotic crossovers contribute to aneuploidies in human embryos" Genome Research. 2024 Jan 1;34(1):70-84, bioRxiv:10.1101/2023.06.07.543910

Daniel Ariad, Rajiv Mccoy, and Manuel Viotti. Patent: "Methods for distinguishing aneuploidies in non-invasive prenatal testing." Provisional application was filed in the U.S Patent and Trademark Office on 16 December 2022 by Johns Hopkins University.

Daniel Ariad, Rajiv C. McCoy, Manuel Viotti. Patent: "Methods and related aspects for analyzing chromosome number status". U.S. Patent Application 18/035,811, May 12, 2022

Daniel Ariad, Stephanie M. Yan, Andrea R. Victor, Frank L. Barnes, Christo G. Zouves, Manuel Viotti, Rajiv C. McCoy. "Haplotype-aware inference of human chromosome abnormalities". PNAS November 16, 2021 118 (46), bioRxiv:10.1101/2021.05.18.444721; Appeared on the PNAS cover

Daniel Ariad, Yshai Avishai and Eytan Grosfeld. "How vortex bound states affect the Hall conductivity of a chiral p ± ip superconductor". Phys. Rev. B 98, 104511 (2018), arXiv:1603.00840; Appeared on PRB Kaleidoscope

Daniel Ariad, and Eytan Grosfeld. "Signatures of the topological spin of Josesphson vortices in topological superconductors". Phys. Rev. B 95, 161401(R) (2017), arXiv:1301.0538

Daniel Ariad, Eytan Grosfeld, and Babak Seradjeh. "On the effective theory of vortices in two-dimensional spinless chiral p-wave superfluid". Phys. Rev. B 92, 035136 (2015), arXiv:1407.2553

Daniel Ariad, and Michael Gedalin. "The role pickup ions play in the termination shock". Journal of Geophysical Research: Space Physics 118.6 (2013): 2854-2862

Technical Skills

Languages **Python, Julia**, Bash, C++, SQL, HTML, CSS, PHP and Assembler.
Bioinformatics **cfDNA sequencing, Methylation Sequencing**, RNAseq, WGS, WGBS, Single-Cell (10x) and Microarrays.
Productivity **Latex, Git**, Confluence, Slack, Zoom ,JIRA

Service and Outreach

2020 - 2024 **Reviewer of manuscripts for Nature Portfolio Journals**, Nature, Nature Communication
2015 - 2018 **Journal Referee for the American Physical Society**, Physical Review Letters, Physical Review B