

# Daniel Ariad

Data Scientist · Physicist

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## Summary

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Accomplished Bioinformatics Data Scientist with a robust foundation in physics, specializing in the analysis of molecular entities in biological fluids for complex disease detection. Expert in integrating physics-based approaches with data science to tackle complex biological challenges, with a strong record of developing innovative diagnostic solutions for early cancer detection and reproductive medicine. Proficient in computer programming, scientific algorithm development, and machine learning model implementation. Dedicated to leveraging my interdisciplinary expertise to drive the advancement of diagnostic and therapeutic technologies.

## Professional Experience

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**Senior Data Scientist** | PrognomiQ Inc, San-Mateo, CA, USA Jul 2024 – Present

- Developed and validated machine learning models, including logistic regression, random forest, and XGBoost, using nested cross-validation on proteomics data acquired from mass spectrometry, Luminex, and ELISA. Identified key biomarkers for early lung cancer detection and provided data-driven recommendations to the R&D team for LDT product development.
- Integrated clinical data with proteomics measurements to identify potential sources of technical bias, leading to protocol improvements that enhanced the accuracy and reproducibility of machine learning classifiers.

**Bioinformatics Data Scientist** | PrognomiQ Inc, San-Mateo, CA, USA Oct 2022 – Jul 2024

- 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.
- 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.

**Postdoctoral Researcher** | Johns Hopkins University, Baltimore, MD, USA Mar 2020 – Oct 2022

- Specialized in developing diagnostic solutions for reproductive medicine. More specifically, I identified the basic mechanisms responsible for chromosomal abnormalities in early embryonic development 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.
- Formulated Bayesian statistical models for classification, tailored for extremely low-coverage whole-genome sequencing data from preimplantation genetic testing for aneuploidy.

**Postdoctoral Researcher** | Indiana University Bloomington, Bloomington, IN, USA Mar 2019 – Mar 2020

- Modeled the formation of flat bands in twisted bilayer graphene at low magnetic fields.
- Built a classifier to predict phases of matter and phase transitions in disordered Graphene, leveraging high performance clusters.

**Graduate Researcher** | Ben-Gurion University of the Negev, Beer-Sheva, Israel Oct 2013 – Nov 2018

- Engaged in cutting-edge research to address fundamental questions in quantum and many-body physics, demonstrating a capacity for innovative thinking and problem-solving.
- Formulated models to study phases of matter and the properties of quantum vortices in topological superconductors, using quantum field theory and tight-binding models with advanced gauge techniques.
- Demonstrated the ability to articulate complex scientific concepts through high-impact research publications and collaborative projects.

**Masters Graduate Researcher** | Ben-Gurion University of the Negev, Beer-Sheva, Israel Oct 2009 – Jul 2012

- 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

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**PhD in Theoretical Condensed Matter Physics** Oct 2013 – Nov 2018  
Ben-Gurion University of the Negev Beer-Sheva, Israel

**MSc in Astrophysics** Oct 2009 – Jul 2012  
Ben-Gurion University of the Negev Beer-Sheva, Israel

**BSc in Physics** Oct 2006 – Oct 2009  
Ben-Gurion University of the Negev Beer-Sheva, Israel

## Military Service

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**Electro-optic technician** | Sergeant First Class, Israel Defense Forces (IDF)

Jul 2003 – Jul 2006

- Tested, evaluated, and analyzed EO/IR devices. Performed test planning, day-to-day operation, data analysis, and the preparation of reports.
- Designed and implemented software to track the maintenance status of all EO/IR devices across all units associated with the optics armory.

## Selected publications, Preprints and Patents

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- **Daniel Ariad**, Manuel Viotti, Rajiv McCoy. “Methods for distinguishing aneuploidies in non-invasive prenatal testing”. Patent Application number: PCT/US2023/081262; Patent number: WO 2024/129354 A1; Publication date: June 20, 2024.
- **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**, Manuel Viotti, Rajiv McCoy. “Methods and related aspects for analyzing chromosome number status”. Patent Application number: US 18/035,811; Patent number: US 2023/0307130 A1; Publication date: September 28, 2023.
- **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  $p \pm ip$  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 Josephson 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

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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 and JIRA.

## Service and Outreach

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