Daniel Ariad

Physics PhD · Scientific Polymath · Applied Scientist

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Summary

Applied scientist with a track record of developing original mathematical models and computational algorithms to solve complex scientific problems. My work spans space shockwaves, quantum materials, cancer detection, and reproductive medicine. Across these seemingly disparate fields, I challenge assumptions, uncover hidden patterns, and draw unexpected connections between disciplines. For example, I combined ideas from forensic genetics with mathematical concepts from quantum physics to recover information previously considered inaccessible from sparse and noisy genetic data. I thrive on problems that require integrating statistical inference, mechanistic modeling, machine learning, and domain-specific knowledge to produce reliable, actionable insights.

Professional Experience

Applied Scientist | **Evidium Inc,** San Francisco, CA, USA Feb 2026 – Jun 2026

- Developed rule-based and unsupervised clustering methods to extract and analyze oncology treatment patterns from large-scale healthcare RWD.
- Translated oncology clinical guidelines into machine-readable rules and billing-code mappings using an LLM-assisted agent coupled with validation tests to enforce logical consistency and code-system integrity while enabling scalable, reproducible feature generation from claims data.

Senior Data Scientist (Bioinformatics Data Scientist until Jul 2024) | **PrognomiQ Inc,** San Mateo, CA, USA Oct 2022 – Dec 2025

- Developed and validated machine-learning models using multi-omics data generated through mass spectrometry (proteomics, metabolomics, and lipidomics), Luminex, ELISA, and RNA-seq. Integrated clinical data to identify and mitigate technical biases, improving model accuracy and reproducibility. Identified biomarkers for early lung cancer detection, with findings informing diagnostic product development.
- Enhanced cancer diagnostic models by customizing scikit-learn frameworks, including recursive feature elimination methods that preserve core features and apply omics-specific feature elimination rates.
- Led an investigation into reproducibility issues in large-scale epigenomic data, tracing the root cause to insufficient sample volumes and incompatible CRO protocols. Quantified the impact and presented findings to leadership, driving a strategic decision to discontinue the experimental approach and redirect R&D resources.
- Developed computational methods to estimate tumor-derived cell-free DNA fractions using fragmentomics and methylation patterns, identify cancer-associated genetic variants through variant calling, and detect tumor-related peptides using a DBSCAN-inspired clustering algorithm for library-free data-independent acquisition proteomics.
- Automated model training, evaluation, and deployment workflows using the AWS SDK for Python (boto3), enabling execution at scale.

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

- Mapped mechanisms underlying chromosomal abnormalities in early embryonic development and translated these insights into a clinical diagnostic solution to identify cases often overlooked by conventional preimplantation genetic testing.
- Developed LD-PGTA, a machine-learning classifier designed to identify whole-genome ploidy variation, distinguish between meiotic and mitotic aneuploidies, and infer sex-specific recombination patterns.
- Formulated Bayesian classification models for extremely low-coverage whole-genome sequencing data, combining ideas from forensic genetics with the formalism of fermionic occupation states from quantum many-body physics. These models form the computational core of LD-PGTA.

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

- Developed a mechanistic classifier to identify phases of matter and phase transitions in disordered graphene using high-performance computing clusters. Also modeled flat-band formation in twisted bilayer graphene at low magnetic fields.

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

- 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.

Master's Researcher | **Ben-Gurion University of the Negev,** Beer-Sheva, Israel Oct 2009 – Jul 2012

- Developed mathematical models and numerical algorithms to analyze space plasma dynamics using Voyager II spacecraft observations, advancing the understanding of solar wind interactions with the interstellar medium.

Education

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

MSc in Physics (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

Core Expertise

Algorithmics
Bioinformatics
Cancer Research
Creativity and Innovation
Critical Thinking & Logic
Data Science
First-Principles Reasoning
Genomics
Machine Learning
Quantum Computation
Real-World Modeling
Reproductive Medicine
Scientific Programming
Statistical modeling
Technical Writing
Translational Science

Selected publications, Preprints and Patents

- **Daniel Ariad**, Manuel Viotti, Rajiv McCoy. "Methods for distinguishing aneuploidies in non-invasive prenatal testing". Patent Application number: US 19/135,464; Patent number: US 2026/0204352 A1; Publication date: July 16, 2026.
- **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 ± 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

Programming Languages	**Python, Julia**, Bash, C++, SQL, HTML, CSS, PHP and Assembler.
Python Packages	**pandas, numpy, scipy, scikit-learn, PyTorch**, matplotlib, pysam, cyvcf2 and gmpy2
Sequencing assays	**DNA-seq, RNA-seq, Epigenomics**, Microarrays, Single-cell RNA-seq and Mass Spec-Based Proteomics.
Bioinformatics tools	**BWA, Samtools, Cell Ranger, Nextflow**, Bedtools, GATK and Scanpy.
Genomic databases	**1000 Genomes Projects**, GTEx, TCGA and COSMIC.
Productivity	**LaTeX, Git**, Confluence, Slack, Zoom and JIRA.
Healthcare	**Real-world data (RWD), Electronic Health Record (EHR)**, ICD-10, CPT, HCPCS, NCCN and ESCP.

Service and Outreach

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