

# Michael Medford, Ph.D

I am an astrophysicist that loves building massive data processing pipelines that solve intractable problems. I have applied these skills to a diverse set of challenges ranging from scaling R&D products on cloud infrastructure to constructing calibration pipelines for the world's largest telescopes.

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**Skills** Python, Go, C, Git, SQL, Ruby on Rails, Docker, Kubernetes, MPI, OpenMP, cProfile, Cloud Computing, Statistics, Data Visualization, Agile Project Management, Continuous Integration & Delivery, Technical Writing

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**Work Experience** **Interim System Architect, Staff Software Engineer**  
Aumni, a JPMorgan Chase Company · July 2023 - Present

- Redesigned our backend architecture with management, product and engineering to enable flow in stream-aligned teams
- Developed a migration plan to maintain 100% uptime while refactoring our Ruby on Rails monolith into a set of independent services within the JPMorgan ecosystem
- Constructed contract testing framework to ensure independent deployability in collaboration with our Testing Enablement Team

## **Senior Software Engineer**

Aumni, a JPMorgan Chase Company · November 2022 - June 2023

- Designed, documented and deployed to production an independent microservice for indexing millions of documents into OpenSearch in only 6 weeks
- Invented an SQL unit test framework supported by a file parsing library on top of our core business logic
- Overhauled the infrastructure and tooling for developer data synchronization to reduce sync time from 15 minutes to 20 seconds

## **Technical Lead of Planet Fusion Monitoring Pod**

Planet Labs · March 2022 - October 2022

- Architected 10x increase in our daily processing to 595 TB while cutting per unit costs 80% in four months
- 98% reduction in database query latency & CPU utilization via SQL schema & query optimization
- Cut GCS & AWS data delivery processing overhead by 30x using batched GCP pubsub messages
- Moved team into a bi-weekly sprint structure with ticket triage, sprint retrospectives and sprint planning

## **Geospatial Software Engineer**

Planet Labs · June 2021 - October 2022

- Implemented automated data backups & disaster recovery via terraform to comply with ISO certification
- Set up on-call notifications by integrating Sentry, PagerDuty and Slack into our Python & Go stack
- Created a comprehensive cost estimate method to measure profit margin goals for our product teams
- Coordinated several refactors across our Compute, Pipeline and Infrastructure teams to facilitate growth

## **Part-time Geospatial Software Engineer**

Planet Labs · November 2020 - May 2021

- Enabled end-to-end development by connecting our React front-end, Go orchestrator & Python scripts
- Conducted our largest scale test to date, giving the green light to onboard new customer contracts
- Transitioned change detection algorithm to parallelized cloud context for a 100x speedup in E2E runtime

Research Experience	<b>A New Method for Detecting Solar System Objects on High Performance Computers</b>	
	Lawrence Berkeley National Laboratory · January 2016 - September 2019	w/ Dr. Peter Nugent
	<ul style="list-style-type: none"> <li>• Invented planet detection pipeline that searched 100+TB of images using 20,000+ lines of Python and C</li> <li>• Implemented real-time neural network scoring of planet candidates in Dockerized Python Flask apps</li> <li>• Engineered HPC scheduler to execute 1,000+ compute processes via many-to-many SQL databases</li> <li>• Measured accuracy and completeness by applying statistical methods to artificially injected signals</li> </ul>	
	<b>Detecting Black Holes in the Milky Way using Simulations and Observational Analysis</b> University of California: Berkeley · August 2018 - June 2020 <span style="float: right;">w/ Prof. Jessica Lu</span>	
	<ul style="list-style-type: none"> <li>• Predicted event rates for hypothetical telescope surveys by executing galaxy simulations</li> <li>• Designed OOP solution to include new astrophysical phenomenon in Bayesian model fitting process</li> <li>• Reduced pipeline execution time by 50% through memory profiling and IO optimization</li> </ul>	
	<b>Parallelized Executable for Removing Noise from Telescope Images</b> Lawrence Berkeley National Laboratory · September 2019 - June 2020 <span style="float: right;">w/ Dr. Peter Nugent</span>	
	<ul style="list-style-type: none"> <li>• Constructed physical models of atmospheric fringes in optical images with principle component analysis</li> <li>• Built parallelized feature identification and extraction tool currently running on 50,000+ images per night</li> <li>• Released code as an open source Python package: <i>fringe</i> <a href="#">fringe Documentation</a></li> </ul>	
Education	<b>PhD, Astrophysics</b> , University of California: Berkeley <span style="float: right;">May 2021</span> Advisors: Jessica Lu and Peter Nugent Thesis: <i>Discovery of Rare Signals in Large Scale Time Domain Surveys: Dark Planets and Black Holes</i>	
	<b>MA, Astrophysics</b> , University of California: Berkeley <span style="float: right;">GPA: 3.79 / 4.00   2017</span>	
	<b>BS, Physics and Astronomy</b> , Northwestern University <span style="float: right;">GPA: 3.75 / 4.00   2011</span> Weinberg College of Arts and Sciences Advisor: Dr. Michael Smutko, Collaborator: Dr. Vicky Kalogera	
	<b>BS, Theatre</b> , Northwestern University <span style="float: right;">2011</span> School of Communication	
Public Software Packages	<b>PopSyCLE</b> (2020) <span style="float: right;"><a href="#">PopSyCLE Documentation</a></span> Population Synthesis for Compact-object Lensing Events	
	<ul style="list-style-type: none"> <li>• Developed pipeline infrastructure to execute code in high performance supercomputing environments</li> <li>• Reconfigured data format schema to extendible compound HDF5 to enabling additional image filters</li> <li>• Introduced code reviews and unit tests to collaboration workflow among five person team</li> </ul>	
	<b>zort</b> (2019) <span style="float: right;"><a href="#">zort Documentation</a></span> ZTF (Zwicky Transient Facility) Object Reader Tool <span style="float: right;">Sole Author</span>	
	<ul style="list-style-type: none"> <li>• Executed spatial cross-matching and filtering for time-domain measurements of billions of objects</li> <li>• Official data reader for ZTF telescope Public Data Releases, representing 11+ international institutions</li> </ul>	
Awards	<b>UC-National Lab In-Resident Graduate Fellowship</b> The Regents of the University of California <span style="float: right;">04/2019 - 03/2021</span>	
	<ul style="list-style-type: none"> <li>• Awarded \$130,000 to discover isolated black holes at the Lawrence Livermore National Laboratory</li> </ul>	
Interests	Astrophotography, Racquetball, Chess, Theatre, Financial Coaching	