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.

MichaelMedford@gmail.com · 973.600.0340 · www.MichaelMedford.com · github.com/MichaelMedford

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

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

A New Method for Detecting Solar System Objects on High Performance Computers
Lawrence Berkeley National Laboratory • January 2016 - September 2019 w/ Dr. Peter Nugent

- Invented planet detection pipeline that searched 100+TB of images using 20,000+ lines of Python and C
- Implemented real-time neural network scoring of planet candidates in Dockerized Python Flask apps
- Engineered HPC scheduler to execute 1,000+ compute processes via many-to-many SQL databases
- Measured accuracy and completeness by applying statistical methods to artificially injected signals

Detecting Black Holes in the Milky Way using Simulations and Observational Analysis
University of California: Berkeley • August 2018 - June 2020 w/ Prof. Jessica Lu

- Predicted event rates for hypothetical telescope surveys by executing galaxy simulations
- Designed OOP solution to include new astrophysical phenomenon in Bayesian model fitting process
- Reduced pipeline execution time by 50% through memory profiling and IO optimization

Parallelized Executable for Removing Noise from Telescope Images
Lawrence Berkeley National Laboratory • September 2019 - June 2020 w/ Dr. Peter Nugent

- Constructed physical models of atmospheric fringes in optical images with principle component analysis
- Built parallelized feature identification and extraction tool currently running on 50,000+ images per night
- Released code as an open source Python package: *fringez* fringez Documentation

Education

PhD, Astrophysics, University of California: Berkeley May 2021
Advisors: Jessica Lu and Peter Nugent
Thesis: *Discovery of Rare Signals in Large Scale Time Domain Surveys: Dark Planets and Black Holes*

MA, Astrophysics, University of California: Berkeley GPA: 3.79 / 4.00 | 2017

BS, Physics and Astronomy, Northwestern University GPA: 3.75 / 4.00 | 2011
Weinberg College of Arts and Sciences
Advisor: Dr. Michael Smutko, Collaborator: Dr. Vicky Kalogera

BS, Theatre, Northwestern University 2011
School of Communication

Public Software Packages

PopSyCLE (2020) PopSyCLE Documentation
Population Synthesis for Compact-object Lensing Events

- Developed pipeline infrastructure to execute code in high performance supercomputing environments
- Reconfigured data format schema to extendible compound HDF5 to enabling additional image filters
- Introduced code reviews and unit tests to collaboration workflow among five person team

zort (2019) zort Documentation
ZTF (Zwicky Transient Facility) Object Reader Tool Sole Author

- Executed spatial cross-matching and filtering for time-domain measurements of billions of objects
- Official data reader for ZTF telescope Public Data Releases, representing 11+ international institutions

Awards

UC-National Lab In-Resident Graduate Fellowship
The Regents of the University of California 04/2019 - 03/2021

- Awarded $130,000 to discover isolated black holes at the Lawrence Livermore National Laboratory

Interests

Astrophotography, Racquetball, Chess, Theatre, Financial Coaching