Eric Cotner, PhD

Full-stack data scientist

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Location: San Diego, CA

Data scientist with experience in machine learning, statistics, optimization, data exploration, analysis, visualization, and end-to-end product development. Have worked on optimization of supply chain processes, vehicle routing, and time series forecasting within the automotive industry, and real-time recommendation and optimization systems within the grocery delivery business. Background in theoretical physics, lending to strong conceptual/logical/mathematical aptitude. Plenty of experience communicating analytical results to various non-technical audiences at all levels.

Technical skills/tools

- Languages: Python, C/C++, JavaScript/TypeScript, bash/sh, Java
- Data analysis/manipulation/visualization: pandas, numpy, scipy, jupyter, matplotlib/seaborn, plotly, folium/leaflet
- Statistics and machine learning: statsmodels, scikit-learn, (num)pyro, pytorch, TensorFlow/Keras, mxnet/gluonTS, JAX, XGBoost, LightGBM
- Databases: BigQuery, Oracle, SQL Server, MySQL, PostgreSQL, SQLite, DuckDB, Snowflake
- Cloud computing: AWS EC2/EBS, S3, ECS, Google Cloud services like Compute Engine, Cloud SQL, BigQuery, GCS, Cloud Run, Container Registry, Data Studio
- Web dev: Flask, FastAPI/pydantic, bottle, WebAssembly/emscripten, WebGL, jQuery, HTML/CSS/JS/TypeScript
- HPC: GPGPU, CUDA, numba, GPU.js, Cython
- Operations research: OR-Tools, OSRM, Valhalla, MILP (COIN-OR, MIPCL, cvxpy), MDP's, dynamic programming
- Other: Docker, Kubernetes, Kafka, Redis, Terraform, MLFlow/comet.ml, git/GitHub, airflow, Drone

Experience

Principal Data Scientist, Shipt (subsidiary of Target), 2022-Present
Senior Data Scientist, Shipt (subsidiary of Target), 2021-2022

- Marketplace offering: creating algorithms to match shoppers/driver with orders in ways that are equitable, enjoyable for drivers, and result in more successful deliveries. Maintain several kubernetes-managed microservices that pair delivery drivers with orders by using LightGBM to predict probability of success, then maximize expected profit using OR-Tools to solve an ILP.

Lead Data Scientist, Toraqata Data and Analytics (subsidiary of ATD), 2020-2021
Data Scientist, American Tire Distributors, 2019-2020

- Route optimization: Created algorithm to optimize flexible order delivery by using a Markov decision process and Monte Carlo simulation of probabilistic route forecast to calculate the expected risk of delaying the decision to deliver, in the context of uncertain future orders. Constructed production system to pull live order data from Oracle database, generate delivery recommendations, and serve to route planners in the warehouse. Currently operating at 130 warehouses on an hourly basis and has been shown to save roughly $0.50/order in transportation/labor costs.
- Dynamic routing: Led an initiative to research the application of dynamic routing optimization to our daily delivery routes using constraint satisfaction programming (OR-Tools). Ran simulations on historical data to demonstrate proof-of-concept, considerable potential savings (roughly 15% of variable costs) and effects of establishing concrete delivery service levels, leading to adoption of the idea by leadership. Implementation is currently underway.
- Forecasting: constructed multiple time-series forecasting pipelines to predict product flow in/out of warehouses (to anticipate labor requirements). Reduced forecasting error (uMAPE) by over 50% in some cases relative to pre-existing models. Automated forecast flows into data lake every week and performance is monitored with MLFlow. Also built a predictive scenario tool for demand planning team to forecast purchase orders (to share with our manufacturing partners in the hopes that increased visibility will lead to increased fill rates and decreased lead times). Turned the tool into an interactive web application, saving their analysts dozens of hours a month, and allowing them to service themselves and adjust model inputs.
- Mentorship: Mentored a data science intern, guiding her through a project to try and improve our route forecasting capabilities by improving our customer ordering forecast from a simple MAP model to an ML-based one using XGBoost. She was able to get a job at Oracle with the experience she gained with us. Also mentored an associate in our Baltimore warehouse as part of our "Data Science Accelerator" program, which seeks to improve ATD's non-data-oriented employees' data fluency, who was working on a project to identify sales prospects using data from Google Places.

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Academic background

PhD, MSc, Theoretical Physics, UCLA, 2013-2018

Graduate student researcher, UCLA, 2014-2018

- Studied exotic dark matter candidates, black holes, cosmology, and particle physics
- Performed numerical simulations of boson star collisions
- Modeled statistical fluctuations of Q-ball density, leading to formation of primordial black holes
- Publications in multiple top physics journals, and invited speaker to multiple conferences

Teaching Fellow, UCLA 2013-2018

- Led undergraduate discussion/lecture/laboratory sections for a large variety of subjects (quantum, electromagnetism, mechanics, thermodynamics, nuclear/particle, cosmology, etc.)

BSc, Physics, UCSD, 2009-2013

- Majored in physics with a minor in mathematics

Volunteer/hobby

- Route optimization: built a web application to optimize delivery routes with an interactive map using OR-Tools, Valhalla, and GCP.
- Open-source: contributor to several scientific python packages such as pyro, matplotlib, and pytorch.
- Meet-ups/hackathons: gave presentation on Markov decision processes to Charlotte PyData chapter; mentor/judge for HackNC annual hackathon.
- CoderDojo: Taught elementary/middle school children computer science concepts using Scratch. Recipient of *Volunteer of the Month award*, February 2020.
- Science communication: graduate student coordinator at *Exploring Your Universe* expo at UCLA for 4 years.
- Eviction aid: worked with lawyers at Legal Aid Chicago and urban development researchers at UC Berkeley to analyze evictions in Cook County using historical eviction data from the Sheriff's office combined with ACS data from the US Census Bureau to create maps highlighting racial segregation and unfairness in the eviction process.
- Video games: maintain a Valheim server for playing games with friends. Server is hosted on GCP and has a front end web app for managing server state, including integration with Steam and auto-shutdown to save costs.