Ali Mousavi, Ph.D.

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Work experience (visit my profile website)

Technical Lead consultant, UH Manoa & HWMO partnership (Hawaii wildefire management organization) | July. 2024

- Owned roadmap and architecture decisions across engineering and domain science stakeholders, translating research into an operational ConvLSTM wildfire forecasting system for Hawaii incident-response planning.
- Established evaluation governance for 1–3 day Oahu/Maui forecasts, reaching R^2 **0.963** and AUC **0.871**.
- Mentored junior engineers and shaped integration strategy with National Weather Service Honolulu Red Flag workflows.
- Led agentic AI prototyping and roadmap for autonomous monitoring and LLM-assisted incident-response decision support.

Tools: PyTorch/TensorFlow | geospatial (rasterio) | metaheuristics (Firefly) | GPU training | agentic AI (MCP)

Senior Machine Learning Engineer, Enovation Analytics (Startup) | Aug. 2022 – Oct. 2025

- Defined and rolled out a scalable **MLOps** foundation, **CI/CD**, retraining automation, and model observability.
- Developed AI forecasting models for electric market (ERCOT ISO) across long-term price and short-term price, load, wind, and solar, aligning delivery with high-stakes stakeholder timelines, including **BlackRock** programs.
- Owned ERCOT forecasting delivery across long-term price and short-term load, wind, and solar models, aligning execution to high-stakes stakeholder timelines, including **BlackRock** corporate programs.
- Built ETL and systematic parametric experimentation for real-time price forecasting (feature engineering and tuning), driving **13% KPI improvement** and **35% profit increase** over the prior baseline.
- Pioneered the company's first **evaluation and back-testing** pipelines, optimizing asset trading strategies.
- Scaled **forecasting** from **1 to 27+ pipelines** in under three quarters (first in company).
- Held production ownership over **8 ML models** across pipelines, expanding portfolio scope by **6**×.
- Built a foundation of **10+ auto-update data pipelines** (ingestion, cleaning, QC, storage), unlocking **3**× data velocity.
- Deployed **interactive dashboards & webapps** for non-technical stakeholders; adopted by management and end users.
- Shipped reusable **python modular packages and APIs** that standardized workflows and accelerated delivery.
- Established **cloud** orchestration and cost governance for the ML platform, reducing spend and operational overhead.

Tools: Linux | Python | PyTorch | React/Dash WebApps | SQL | Pandas | Docker | Git | bash | GCP/AWS | Airflow

Data Scientist, Center for Tire Intelligence, Intelligent Fiber Optic Systems (IFOS) | Aug. 2020 – Aug. 2022

- Delivered real-time **anomaly detection** for an ultrasonic metal 3D printer, enabling in-process fault response.
- Designed time/time-frequency feature pipelines on high-rate (1.3 MHz) accelerometer, enabling robust signal classification.
- Artichected a wavelet + **CNN classifier** that outperformed Numenta and KNN-CAD baselines on production signals.
- **Physics-informed models** + ML; reduced fabrication and maintenance costs up to **42%**.

Tools: Python | MATLAB | CNN | Clustering | Regression | statsmodel | Spark | Git | Scipy | TenssorFlow | TensorBoard

Software Engineer, Energy & Sazeh Co. | Jan. 2011 – Jan. 2013

- Designed C-based control software for molding machines, supporting stable production-line operation.
- Debugged and maintained large legacy codebases (200K LOC).

Research Assistant, Virginia Tech | Aug. 2016–Aug. 2020
Institute for Critical Technology and Applied Sciences (ICTAS)

- Engineered advanced surface design, build, and test processes; led **techno-economic** analysis of flow battery systems.
- Delivered >200 pages of quarterly professional report to the **Department of Energy (DOE)** on critical-energy research.
- Reduced condenser levelized cost by a **factor of 2.5** in a 550 MW coal-fired power plant study.
- As lab manager, owned SOPs, team coordination, safety audits, and managed advance equipment procurement.

Mentor, Mechanical Engineering Senior Design, Virginia Tech | Sep. 2017 – Dec. 2017

- Mentored teams on Virginia Tech recreational electric vehicle design. Led HV battery testing, and cooling protocol.

Graduate Research fellow, Hawaii Natural Energy Institute (HNEI) | Jan. 2013 – Dec. 2015

- Owned full-cycle **design of experiments (DOE)** for two projects; 2^k factorial designs, Central Composite Design (CCD), and **Response Surface Analysis (RSA)**; t-tests and ANOVA.
- Led **parametric studies** across the operating envelope to stress-test sensitivity & bound feasible **optimization** regimes.

Selected projects

Walmart Sales Forecasting (Kaggle M5 competition)

- **Ranked in top 1% globally**. Real-world Walmart sales data. Ensemble of LightGBM & FBProphet after evaluating ARIMA, XGBoost, LSTM, and TCN. Adapted Hyndman reconciliation for coherent forecasts across five years of data.

Generative AI chatbot

- Shipped a Telegram LLM-RAG chatbot (persona + prompt engineering) with a retrieval layer for grounded answers.

AgenticAI / Secure MCP

- Designed a secure FastMCP HTTP server with tool/resource APIs, client-side permissioning, audit logging and LLM.

Large-scale data & Spark

- Built a Spark ML pipeline on >100 GB of Q&A platform XML, achieving ∼91% accuracy with Word2Vec and downstream classifiers (RDD + DataFrame APIs).

Geospatial data wrangling

- Scraped public data; ETL via GeoPandas and built an interactive map with Folium and for California vehicle emissions.

NLP & pattern recognition

- Built SVM, RF, and GBDT models with tokenization, TF–IDF/n-grams, and vectorization for NLP classification.

Advanced SQL analytics (NYC restaurant inspections database)

- Wrote advanced SQL (CTEs, window functions, multi-table joins) to categorize frequent health violations.

Technical skills

Languages & scripting
Python | SQL | Bash | R | C++ | web apps (Dash/React, HTML/CSS)

Machine learning
Time-series forecasting (hierarchical/grouped, price) | deep learning (Transformers, LSTM/CNN) | anomaly detection (autoencoders) | NLP (embeddings, Transformers, classification) | signal/image processing (CNNs, wavelets) | advanced visualization | frameworks: PyTorch, TensorFlow, scikit-learn, Spark ML.

Agentic AI
Agents (LangChain, LangGraph; tool use & function calling) | RAG | vector DBs (ChromaDB) | MCP | FastAPI | prompt engineering (Zero/Few-shot, Chain-of-Thought, self-consistency)

MLOps & platform
Pipelines (Airflow, ETL/feature) | deployment (Docker, CI/CD, FastAPI) | cloud (AWS, GCP) | experiment tracking (MLflow) | model observability (drift/performance)

Statistics & experimentation
DOE (factorial, CCD, RSA) | hypothesis testing (ANOVA, t-tests) | backtesting & ablation studies | statsmodels

Education and Qualification

Ph.D., Mechanical Engineering — Virginia Tech; GPA 3.90/4.0 — Oct. 2021
Data Science Fellowship — The Data Incubator (admitted within top 2% of applicants) — Spring 2020
M.S., Mechanical Engineering — University of Hawaii at Mānoa; GPA 3.96/4.0 — Dec. 2015
B.S., Mechanical Engineering — Sharif University of Technology; GPA 3.56/4.0 — May 2011
Summer School Excellence — Chiemsee, Germany; CEA (France) / TUM (Germany) — Summer 2016
"On the future of common European energy strategy"
* Excellent verbal and communication skills; author of several scientific articles: Google Scholar.