Iris Seaman

Research Engineering | Applied Machine Learning & Production Systems

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Machine learning researcher and senior data scientist combining production Python engineering with research in graph learning, probabilistic modeling, and uncertainty-aware prediction. Experience spans customer-facing AI systems, computer vision, data pipelines, automated image registration, and rigorous model evaluation. Current doctoral work investigates predictive reliability through carefully controlled experiments and explicit validation boundaries.

PROFESSIONAL EXPERIENCE

Senior Data Scientist May 2023 to Sep 2026
Gray Falkon LLC | Remote

- Built the **Python backend for a customer-facing policy recommendation agent**, integrating live listing analysis, policy retrieval, tools, conversation state, APIs, and cloud deployment. Helped build deterministic, rubric-based, and production-monitoring evaluations.
- Took an **LLM-based product-classification workflow from prototype to production**, owning classification logic, Python implementation, database integration, and Airflow orchestration. Added retries, monitoring, and explicit handling of unsuccessful or inconclusive results.
- Built an **agentic image crawler** using Crawl4AI and source-specific connectors across brands, countries, and marketplaces. Added offline and online evaluations of extraction coverage, freshness, and failures.
- Built and maintained event-driven services for violation submission, status ingestion, and account-lifecycle workflows, coordinating Pub/Sub workers, browser automation, and PostgreSQL state tracking.
- Built and scaled image-infringement pipelines across **hundreds of thousands of e-commerce images**, using perceptual hashing, SIFT features, optical character recognition (OCR), and image-comparison metrics.
- Developed reusable OCR, authentication, email-processing, and account-management components with idempotent database updates, dashboards, and alerts for production automation.
- Designed LLM-powered messaging workflows for classification, translation, and response generation, incorporating conversation history and database-backed context.

Developer Mar 2022 to 2023
Gray Falkon LLC | Remote

- Built the initial image-infringement pipeline for Walmart and Amazon product imagery using perceptual hashing, SIFT features, and image-comparison methods.
- Developed foundational tooling for account provisioning, communications, browser-profile isolation, proxy workflows, CAPTCHA integrations, secure internal access, and real-time monitoring.

Associate Software Engineer 2014 to 2016
Imagine Learning | Provo, UT

- Implemented one of the company's early machine-learning models for evaluating free-response student text, helping establish machine learning as a product capability.
- Built and maintained REST APIs for educator-facing analytics and reporting.
- Developed interactive literacy games in Unity and prototyped educational tools with product and design partners.

ENGINEERING STACK

Python, SQL, FastAPI, Starlette, SQLAlchemy, PostgreSQL, asynchronous services, REST APIs, Google Cloud, Cloud Run, Pub/Sub, Airflow, Docker, Terraform, CI/CD, monitoring, and regression evaluation.

DOCTORAL RESEARCH

PhD Researcher, Machine Intelligence Lab

Aug 2024 to Present

The University of Texas Rio Grande Valley | Edinburg, TX

Research scope: retrospective medical-imaging studies and research prototypes. Ongoing work investigates uncertainty-aware prediction and careful evaluation. These projects do not represent clinical deployment.

Graph Forecasting with Calibrated Uncertainty

Published, *IEEE Access*, 2026

Investigated functional tumor volume (FTV) forecasting from serial dynamic contrast-enhanced magnetic resonance imaging (DCE-MRI).

- Built a scheduled-sampling message-passing forecaster over registration-consistent tumor supervoxel graphs, with residual Monte Carlo simulation and bucket-conditional conformal prediction intervals.
- Across five patient-held-out folds covering 758 I-SPY2/ACRIN-6698 patients, reduced deterministic baseline T0–T3 FTV mean absolute error from 12.88 to 4.63 mL and 90% interval width from 59.51 to 22.38 mL. Results are **internal cross-validation**, not independent external validation.

Tumor-Graph Deep Learning from Pretreatment DCE-MRI

Manuscript draft, 2026

Investigating spatial and scalar prediction from pretreatment imaging with graph representations and calibrated uncertainty.

- Combined frozen ResNet-18 node embeddings with crystal-shell edge-gated graph message passing to predict regional presurgery enhancement, scalar FTV, and pathologic complete response.
- Trained on 556 I-SPY2 patients and froze model and uncertainty choices before evaluating 202 nested ACRIN-6698 patients held out from training and calibration. Achieved 3.08 mL deterministic FTV error and 0.936 coverage for the selected 90% prediction interval within this evaluation.

Stochastic Digital Twin for Neoadjuvant Chemotherapy

Collaborative work in progress, 2026

Developing stochastic reaction-diffusion models with sequential Bayesian calibration and reduced-rank proliferation fields.

- Investigating parameter uncertainty, process variation, observation models, and identifiability through model-based experiments and posterior predictive evaluation.
- Treatment optimization and physical longitudinal spatial correspondence remain outside the validated scope. The current work is a research framework, not a clinically deployed treatment system.

INTERDISCIPLINARY & EARLIER RESEARCH

Automated Registration for Sequential Embryo Imaging

Published, *PLOS Genetics*, 2026

Developed and implemented an optimization-based 2D similarity-transform registration pipeline to align repeated fluorescence images of individual embryos across imaging rounds. Used DAPI-derived embryo masks to estimate translation, rotation, and scale corrections, then applied the same transform to corresponding gene-expression channels. Evaluated alignment through mask overlap and visual inspection, supporting sequential imaging of up to ten genes within individual embryos.

Probabilistic Reasoning About Autonomous Agents

Master's thesis and research, 2018

Studied nested reasoning about autonomous agents using probabilistic programs. Coauthored *Nested Reasoning About Autonomous Agents Using Probabilistic Programs*, presented as a spotlight at the ICML 2019 Workshop on Generative Modeling and Model-Based Reasoning for Robotics and AI.

PUBLICATIONS & THESIS

Endpoint-Calibrated Spatial Graph Rollouts for Functional Tumor Volume Forecasting With Conformal Uncertainty in Serial Breast DCE-MRI 2026
I. Seaman, T. Oraby, and M. Moqbel. *IEEE Access*, vol. 14, pp. 170746–170763. First author. doi:10.1109/ACCESS.2026.3749191.

High-multiplexity imaging reveals distinct modes of translating time into space during embryonic patterning 2026
J. Garcia-Guillen, M. Ahmadi, T. Frimpong, **I. Seaman**, et al. *PLOS Genetics*, 22(11):e1012390. Article. Registration code.

Nested Reasoning About Autonomous Agents Using Probabilistic Programs 2018
I. R. Seaman, J.-W. van de Meent, and D. Wingate. arXiv:1812.01569. Spotlight at the ICML 2019 Workshop on Generative Modeling and Model-Based Reasoning for Robotics and AI.

Probabilistic Programming for Theory of Mind for Autonomous Decision Making 2018
I. R. Seaman. Master's thesis, Brigham Young University. ScholarsArchive 6826.

Personalized Table-Top Game Recommendations 2017
Y.-K. Ng and **I. Seaman**. *IEEE ICTAI*, pp. 396–403. doi:10.1109/ICTAI.2017.00068.

Making Personalized Movie Recommendations for Children 2016
E. Tan, **I. Seaman**, H. Leung, and Y.-K. Ng. *18th International Conference on Information Integration and Web-Based Applications & Services*, pp. 96–105.

Prevalence and Attitudes about Illicit and Prescription Drugs on Twitter 2016
I. Seaman and C. G. Giraud-Carrier. *IEEE ICHI*, pp. 14–17. doi:10.1109/ICHI.2016.98.

EDUCATION

The University of Texas Rio Grande Valley Expected May 2027
PhD candidate, Computer Science with Interdisciplinary Applications. Dissertation-only.

Northeastern University Sep 2018 to 2020
Doctoral studies, Computer Science. Bayesian and Machine Learning Lab.

Brigham Young University Sep 2016 to Aug 2018
MS, Computer Science. Perception, Control, and Cognition Lab. Information Retrieval Lab.

Massachusetts Institute of Technology Jul 2017 to Aug 2017
Visiting Student, MIT Probabilistic Computing Project.

Brigham Young University Sep 2011 to Dec 2014
BS, Computer Science. Data Mining Lab.

RESEARCH METHODS & TOOLS

Methods: Graph neural networks, spatiotemporal forecasting, probabilistic modeling, conformal prediction, Monte Carlo simulation, Bayesian calibration, experimental design, patient-level holdouts, and reproducible evaluation.

Tools: PyTorch, PyTorch Geometric, scikit-learn, NumPy, SciPy, computer vision, image processing, 2D image registration, OCR, and Unity.