Arnold Kalmbach

Machine Learning Engineer

Building and shipping machine learning and computer-vision products from prototype to production.
Proven bridge between research, engineering, and product teams.

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Key Technical Expertise

Production ML Toolchain	PyTorch, transformers, ONNX, TensorRT, Triton, VLLM
AI Tools	OpenAI & Gemini APIs, vector databases, multimodal embedding models
Data Science	bigquery, pandas/polars, scientific python (numpy, scipy, scikit learn etc)

Professional Experience

Senior Data Scientist — Kinsol Research Inc. Jul 2022 - Present

- Team lead for multiple client projects – Managed day to day relationships with clients and led small teams of 1-3 junior data scientists and developers from Kinsol.
- Responsible prototyping, integration, and optimization of computer-vision, language, and signal processing models inside existing Saas products.

Key Projects:

- Built and shipped a real-time 'scale-visibility' detector for low-light stereo fish imagery: Used ViT embeddings + LLM-derived labels through a latent skill model. Compiled to a TensorRT model (<20 ms latency / inference), reducing poor quality fish detections by 60% and improving a downstream detector for small pests on the fish by +0.20 mAP.
- Designed and implemented brand-safety and alignment features based on creator social media histories (100s of videos and photo carousels per creator). Built a model to detect >1500 very fine-grained sensitive topics, with higher accuracy than GPT-4 on our test data. Delivered a pipeline to produce brand-safety reports at scale in minutes.
- Oversaw the data science plan and contributed to tools that build an inventory of all electrical substations in the USA. The tools use a combination of existing databases and a custom fine-tuned computer vision model applied to satellite data. Scaled the ML pipeline to perform inference on high-res satellite data from millions of candidate points, covering 100 metro areas in the USA.

Data Scientist — Kinsol Research Inc. May 2017 - Jul 2022

- Implemented machine learning, computer vision, and signal processing algorithms for a broad range of client projects.
- Provided value to clients by filling gaps from science to production; As scientist performing literature review and implementing rapid prototypes; As machine learning expert generalizing existing hand-tuned models based on data; As engineer optimizing and productionizing models too dense for engineering teams.
- Communicated with clients several times per week, delivering quantitative progress reports and coordinating development plans to meet business milestones.

Key Projects:

- Productionized an existing flood model, reducing runtime 2x from hydrologists' original version, facilitating scaling of the model from city to national level.
- Applied black-box optimization techniques to tune real-time vocal pitch detection algorithm parameters, leading to best-in-class pitch detection accuracy.
- Implemented specialized signal processing algorithms for motion tolerant heartbeat detection.

Automated Video Analysis Intern — Ocean Networks Canada — Jun - Nov 2015

- Implemented an algorithm to automatically produce sea-floor classification maps from dive-log videos (Kalmbach, WACV 2016 in Publications below).
- Implemented and deployed algorithms for automated quality control of live deep-sea video from a network of underwater observatories.

Test Technician & Autonomy Software Co-Op — Clearpath Robotics Inc. — Jan - May 2015 (Contract)

- Developed CI for robot autonomy behaviors such as localization, mapping, and path following using Gazebo (robot simulation environment).
- Deployed ROS tools for a robot with an integrated industrial arm, including arm control through the CAN protocol and integration with high level planning through MoveIt, MoveBase and Gazebo.

May - Aug 2014 (Co-Op)

Education

McGill University — MSc. Computer Science — Jan 2016 - Sep 2018

- Thesis - *Unsupervised Learning of Interpretable Models for Sparse, Smooth Data* (Sep. 2018). Contributed a variety of Bayesian non-parametric methods to learn temporally varying semantic maps.
- Significant work on machine learning, computer vision, and algorithmic robotics problems as well as robot deployments and field experiments.
- Coursework focus on the fundamentals of machine learning, computer vision, digital signal processing, and optimization.
- Supervisor Greg Dudek, Mobile Robotics Lab

McGill University — BSc. Comp. Sci. — Sep 2009 - May 2013

- Emphasis on mathematical foundations of Comp. Sci.
- Began involvement with robotics research, Mobile Robotics Lab (2012).

Honors and Awards

- 2nd place, Student Poster Competition, MTS Oceans 2017
- 2017 ICRA IEEE RAS Travel Grant Recipient
- Guest Student Appointment, Summer 2016, Woods Hole Oceanographic Institution
- 3rd place, McGill CS Undergraduate Research Symposium 2012

Selected Publications & Research Experience

Learning Seasonal Phytoplankton Communities with Topic Models. **MTS OCEANS 2017**
A Kalmbach, H M Sosik, G Dudek, and Y Girdhar

Phytoplankton Hotspot Prediction with an Unsupervised Spatial Community Model. **ICRA 2017**
A Kalmbach, Y Girdhar, H M Sosik and G Dudek.

Learning Deep-Sea Substrate Types with Visual Topic Models. **WACV 2016**
A Kalmbach, M Hoeberechts and A Branzan Albu

Unsupervised environment recognition and modeling using sound sensing. *A Kalmbach, Y Girdhar, and G Dudek* **ICRA 2013**