

Professional Experience

7/2019 – **Senior Computer Vision Engineer, HOVER Inc.**

Present ○ **iOS Team Lead:**

- Lead developer for internal iOS SDK providing data acquisition, on-device processing, and user guidance to enable 3D reconstructions. Used within the iOS HOVER app on every capture. Written in Swift & C++.
- Team lead for HOVER iOS developer group. Grew iOS team from 2 to 8 people.
- Wrote iOS framework supporting all HOVER iOS mobile machine learning models (PyTorch mobile & CoreML). Used within the HOVER app for all on-device ML processing workflows. Written in Swift & C++.
- Prototype new AR-based capture modalities; coordinate user experimentation and work cross functionally on full path from prototype to production.
- Wrote iOS framework in Swift & C++ using CoreML models to give real-time user guidance on streaming video. Pilot analysis within HOVER app showed reduction in first-time user capture fail rates by 40%.
- Wrote and maintained internal iOS library CI/CD pipelines.

○ **Cloud Machine Learning:**

- Developed custom distributed ML model serving service, able to run locally and in k8s on GCP. Capable of serving models from arbitrary frameworks on CPU or GPU. Supported all HOVER production Computer Vision workflows for ~3 years.
- Wrote algorithm & implemented cloud endpoint for assessing image quality for 3D reconstruction purposes. Invoked on every user photo capture session within production HOVER Android & iOS apps.
- Won internal *HOVER Values* award for exceptional performance.

8/2018 – **Staff Software Engineer, Wise.io, from GE Digital.**

7/2019 ○ **Proprietary Machine Learning Toolkit:**

- Responsible for writing efficient data structures and frameworks in Python & C++ to support scalable and fault-tolerant data science pipelines. Used in production on large scale industrial AI applications within GE.
- Wrote tensor support, enabling arbitrary dimensional data storage and handling for industrial asset data, a key feature for streamlining deep learning capabilities.
- Designed and implemented memory-efficient, asynchronous tensor caching to support GIL-free lazy-loading of tensors in parallel.
- Wrote extensive tests and integrated with internal CI/CD pipelines.
- Received the highest possible performance-based annual bonus, indicating exemplary performance.

7/2012 – **Software Engineer, UtopiaCompression.**

9/2016 ○ **Real-time Maritime Anomaly Detection in an Embedded Environment:**

- Implemented, parallelized, and optimized C++ proprietary detection and tracking software system to run in real time on the Movidius Myriad2, a low-power embedded multiprocessor Vision Processing Unit.
- Wrote the software from project inception to production, conducted demos both in-lab and on-board a motorboat for stakeholders.
- Software released as 1st generation ClearCruise™ in FLIR M132 and M232 thermal cameras.

○ **Applied Computer Vision R&D Projects:**

- Implemented and optimized proprietary detection algorithm for panoramic infrared video data in C++. Optimized sections of the algorithm to run on the GPU using OpenCL.
- Implemented and optimized novel, high-performance perception-lossless compression algorithm in C++ for satellite imagery.
- Designed and implemented a multithreaded framework for concurrent video processing and fusion of multiple heterogeneous video sources.
- Implemented algorithm suite for performing X-ray CT reconstruction using C++ and MATLAB. Optimized components to run on the GPU with CUDA.

9/2009 – **Software Developer, UCSD Cortical Systems and Behavior Laboratory.**

- 7/2012 ○ Wrote core experiment software, integrating neural and behavioral experiments into a parallel, interactive unified system in C++ and MATLAB.
- Wrote GUI-based tools to acquire, denoise, recognize, and extract events in audio data to automate experiment post-processing and analysis.

Education

- 2016–2018 **Master of Science, Computer Science**, *Oregon State University*,
Minor: Risk and Uncertainty Quantification in Earth Systems.
Thesis: [Video Analysis: Techniques for Semi-Supervised Video Object Instance Segmentation and Tracking-by-Detection in the Wild](#).
- 2007–2011 **Bachelor of Science, Computer Science**, *University of California, San Diego*.

Publications and Patents

- [1] William Castillo, Brandon Scott, Alrik Firl, David Royston Cutts, Jonathan Mark Ignier, Dario Rethage, and Domenico Curro. Techniques for enhanced image capture using a computer-vision network, August 5 2021. US Patent App. 17/163,043.
- [2] Amirreza Shaban, Alrik Firl, Ahmad Humayun, Jialin Yuan, Xinyao Wang, Peng Lei, Nikhil Dhanda, Byron Boots, James M Rehg, and Fuxin Li. Multiple-instance video segmentation with sequence-specific object proposals. In *CVPR Workshops*, volume 14, 2017.
- [3] Sameer Sheorey, Alrik Firl, Hai Wei, and Jesse Mee. Adaptive prediction with switched models. In *Data Compression Conference (DCC)*, 2015.
- [4] Atulya Shree, Giridhar Murali, Jeffrey Sommers, Kerry Gould, William Castillo, Brandon Scott, Alrik Firl, David Royston Cutts, Jonathan Mark Ignier, Dario Rethage, and Domenico Curro. Systems and methods for image capture, August 4 2022. Patent App. PCT/US2022/014164.

Awards

- 2017-2018 **NSF Research Traineeship (NRT): Risk and Uncertainty Quantification in Marine Science**, NSF-funded transdisciplinary research project and training program, with focus on combining mathematics, statistics, and computer science with environmental and social sciences to improve study, protection, and management of ocean systems.
- Wrote dockerized open source video annotation toolset and data cleaning scripts. Software and documentation available at: <https://bitbucket.org/alrikai/fishlabeler>.
 - Implemented and trained a deep tracking-by-detection system for groundfish off the Oregon coast using generated beamtrawl dataset.
 - Received full tuition scholarship and stipend for 2017-2018 academic year.

Skills

- Languages** C++, Swift, Python, CUDA, OpenCL, Bash
- Libraries and Tools** ARKit, Tensorflow, PyTorch, CoreML, NumPy, OpenCV
- Areas of Expertise** Computer Vision, Deep Learning, Image Processing, Machine Learning, Parallelism and Concurrency, GPGPU, Algorithms, Data Structures, Software Architecture, iOS, Augmented Reality
- Github** <https://github.com/alrikai>