

# AIDAN SWOPE

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## RESEARCH

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### Representation Learning for Remote Sensing: An Unsupervised Sensor Fusion Approach

First-author paper on training neural networks unsupervised to understand many-sensor aerial imagery. Open-source TensorFlow 2 code available at [https://github.com/descarteslabs/contrastive\\_sensor\\_fusion](https://github.com/descarteslabs/contrastive_sensor_fusion).

## EDUCATION

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### California Institute of Technology (Caltech)

2016 – 2020

*B.S. in Computer Science. GPA: 3.8.*

*Pasadena, CA*

- **Selected Classes (Mathematics and Statistics):** Machine Learning (various classes; Python), Representation Learning (TensorFlow), Numerical & Applied Linear Algebra (MATLAB), Bayesian Statistics, Probability Models
- **Selected Classes (Computer Science):** GPU Programming (CUDA), Algorithms, Operating Systems (C), FPGA Programming (VHDL), Computer-Assisted Theorem Proving (Coq), Introduction to Quantum Computing

## EXPERIENCE

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### NVIDIA

February 2021 - Present

*Research Scientist – Applied Deep Learning*

*Remote*

- **RL Automated Theorem Proving:** Designing and building an automated theorem prover using model-based reinforcement learning and natural language processing.

### Caltech & NVIDIA

June 2020 - February 2021

*Machine Learning Research Intern – Generalization*

*Remote*

- **Generalization Research:** Investigated why Transformers sometimes generalize better than tree- and graph-structured neural networks despite broader inductive bias. Ran experiments and co-authored a paper.

### Descartes Labs

Summer 2019

*Machine Learning Research Intern – Unsupervised Learning*

*San Francisco, CA*

- **Unsupervised Sensor Fusion Research:** Developed a new algorithm for training convolutional neural networks unsupervised on many sensors at once. Paper described under “Research” above.
- **Transfer Learning Model:** Trained a large sensor-fusion model on 20 TB of data with TPUs. Transfer learning from this model is the basis for Descartes Labs’ current computer vision models, improving performance on multiple vision tasks.

### Caltech

Spring 2019 - Spring 2020

*Student Lecturer*

*Pasadena, CA*

- **Deep Learning Class:** Designed and led a class on deep learning with TensorFlow and Keras.

### Descartes Labs

Summer 2018

*Machine Learning Intern – Computer Vision*

*Santa Fe, NM*

- **Tree Segmentation Model:** Developed a convolutional neural network to segment trees in overhead imagery. Deployed this model across California and urban areas worldwide, creating 15 TB of product data.
- **Pointcloud Ingest Pipeline:** Developed and deployed a point cloud data pipeline to preprocess and ingest over 100 TB of LIDAR heightmap data. Data used as ground truth for training multiple models since.

## PERSONAL PROJECTS AND TECHNICAL SKILLS

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**Differentiable Fluid Simulator:** A GPU-accelerated fluid simulator supporting backpropagating through simulation.

**AlphaZero Othello Bot:** A strong game-playing bot trained with model-based reinforcement learning.

**Reinforcement Learning with Binary Neural Networks:** Applies gradient-free optimization to train binary neural networks with reinforcement learning. Implements fast binary neural networks with Cython on CPU and CUDA on GPU.

**Music Accompaniment VAE:** Adapts a variational autoencoder to add accompaniment to music.

**Selected Technologies:** TensorFlow (1 & 2), PyTorch, Jax, NumPy, Python, C, C++, Haskell, CUDA (basics), SQL (basics)