Isaac Corley, Ph.D.

| 🌐 isaacc.dev | </> github/isaaccorley | 🔖 Google Scholar |

RESEARCH SUMMARY

Machine learning scientist/engineer specializing in the entire lifecycle of data acquisition, distributed training, and deploying computer vision and vision-language models (VLM), and large-language models (LLM) at scale in the cloud or on embedded devices. Published 10+ conference and workshop papers in top-tier venues (WACV, IROS, CVPR, NeurIPS, ICLR, ECCV). Leading contributor to open-source geospatial ML frameworks like TorchGeo.

EXPERIENCE

Zeitview   **Nov. 2021 – Present**
Senior Machine Learning Scientist
- Technical lead for AI/ML team, driving innovation in renewable energy inspection using computer vision
- Researched, fine-tuned, and deployed deep learning, computer vision, image matching, depth estimation, vision-language models (VLM), point cloud segmentation & object detection, and 3D photogrammetry & reconstruction methods for enhancing renewable energy inspections and analytics, including solar farms, wind turbines, commercial & residential rooftops, power transmission & distribution stations, and telecom towers.
- Developed novel inspection VLM (InspectLM) for visually analyzing a variety of renewable energy assets for defects using analyst documentation via Chain-of-Thought (CoT) and providing maintenance/repair recommendations. Fine-tuned LLaVA v1.6, InternVL, PaliGemma, and LLaMa 3.2B. Deployed at scale in AWS using vLLM.
- Developed novel method for extraction of rooftop and performing link prediction with a graph neural networks (GNN) for measuring the surface area of commercial buildings.
- Led research projects through the entire life-cycle of establishing requirements with stakeholders, collecting data, managing and quality-check of data annotation, selecting and training models, deployment to serverless or batch processing cloud services, and model logging and monitoring.
- Patented and published novel research to conferences. Led research collaborations with NREL and UTSA SAIL Labs.

Microsoft Research   **Apr. 2024 – Jun. 2024**
PhD Research Intern (AI for Good Lab)
- Researched Large-Scale Multimodal Pretraining of Foundation Models for Remote Sensing.
- Developed a multimodal visual-grounded dataset of 5M satellite images with GPT-V captions and SAM masks.
- Pretrained a geospatial-aware FLAVA architecture on a cluster of 8xA100s and benchmarked on 13 downstream tasks.

SLB (formerly Schlumberger)   **Oct. 2022 – Oct. 2023**
PhD Research Intern
- Researched using deep learning for estimation of global xCO2 emissions using ODIAC fossil fuel emissions, OCO-2, and GOSAT-2 satellite datasets for climate analysis

BlackSky   **Jan. 2021 – Mar. 2022**
Senior Machine Learning Engineer
- Developed and deployed computer vision models to drive the Spectra AI platform's satellite image analytics
- PI of the IARPA SMART program for global monitoring and characterization of large-scale construction sites
- Trained video object tracking models for detecting and segmenting construction activity in Sentinel-2, Landsat 7/8, and Maxar Worldview 2/3 satellite time-series imagery.

Spruce   **Oct. 2021 – June. 2022**
Senior Machine Learning Engineer (Contract)
- Deployed OCR methods (PaddlePaddle & Tesseract) for extracting content from a corpus of financial real-estate documents variations in format, and LLMs (BERT & XLNet) for summarizing and parsing desired fields.

HouseCanary   **Dec. 2019 – Dec. 2020**
Senior Machine Learning Engineer
- Trained and deployed classification, object detection, segmentation, depth estimation, and image retrieval models for extracting insights and features from real estate listing property images for improving HouseCanary's Automated Valuation Model (AVM) utilized by real estate investors.
- Pretrained image encoders with contrastive learning for property recommender system based on interior style & aesthetics.
- Trained segmentation and classification models on high-resolution satellite image crops of properties to estimate the area and confirm the existence of outdoor structures such as pools and sheds.
- Fine-tuned HorizonNet model for 3D room layout estimation from indoor panoramic images.
- Utilized image matching models to sort and group indoor images captured from the same rooms.

Booz Allen Hamilton   Aug. 2018 − Nov. 2019
Data Scientist (AI for Cybersecurity Team)
- Developed novel method for filtering image steganography content with GANs while minimizing image quality degradation
- Trained a text-generation GAN for producing malicious domains to fool Domain Generation Algorithm (DGA) classifiers

Southwest Research Institute (SwRI)   Jul. 2016 − Aug. 2018
Research Engineer (Defense & Intelligence Solutions Division)
- PI and lead developer of USAF projects
- Detecting near engine stalls onboard the A-10 Warthog using gaussian mixture models implemented in C and Ada
- MIL-STD-1553 comms exploitation and jamming algorithm deployed on a microcontroller via Cython – Evaluated on live A-10 Warthog & Apache helicopter

Oak Ridge National Laboratory (ORNL)   Jun. 2015 − Aug. 2015
Research Intern (Intelligent Systems Group)
- Recorded and annotated a dataset of seismic signals of human and vehicle activity and trained machine learning algorithms to detect this activity on features extracted using signal processing methods such as FFT. Tested on a NVIDIA Jetson TX2.

EDUCATION

Ph.D. Electrical Engineering   University of Texas at San Antonio
Dissertation: Multimodal Learning for Mapping in Remote Sensing   2024
M.Sc. Electrical Engineering   University of Texas at San Antonio
Thesis: EEG Spatial Super-Resolution with Generative Adversarial Networks   2019
B.Sc. Electrical Engineering   Texas A&M University-Kingsville
Minors: Mathematics, Security Systems Engineering   2016

SOFTWARE

Languages: python, c/c++, r, go, typescript

Libraries: torch, jax, flax, torchvision, timm, hf transformers, lightning, opencv, mmdetection, mmrotate, mmseg, mmpose, kornia, tensorrt, triton, gdal, rasterio, shapely, pystac, geopandas, faiss, sklearn, skimage, streamlit, gradio, openai, pytorch-geometric, networkx, langchain, autogen, vllm, fastapi, flask, tensorflow<2.0.0

Databases: postgresql, athena, spark, dask, mongodb, elasticsearch

Cloud: aws & azure: ec2, s3, batch, rds, ecs, ecr, lambda, sagemaker, step-functions; earth engine, stac; azure ml studio, blob, tensordock, runpod

Misc: git, github, gitlab, docker, kubernetes, kubeflow, airflow, metaflow, jira, confluence, trello, jira, teams, slack, scrum, okr, wandb, mlflow

SELECTED PUBLICATIONS

ZRG: A High Resolution 3D Residential Rooftop Geometry Dataset for Machine Learning   **WACV 2024**
I. Corley, J. Lwowski, P. Najafirad

Seeing the Roads Through the Trees: A Benchmark for Modeling Spatial Dependencies   **IGARSS 2024**
C. Robinson, I. Corley, A. Ortiz, R. Dodhia, J. Lavista Ferres, P. Najafirad

Revisiting pre-trained remote sensing model benchmarks   **CVPR 2024 PBVS**
I. Corley, C. Robinson, R. Dodhia, J. Lavista Ferres, P Najafirad

Supervising Remote Sensing Change Detection Models with 3D Surface Semantics   **ICIP 2022**
I. Corley and P. Najafirad

A Change Detection Reality Check   **ICLR 2024 ML4RS**
I. Corley, C. Robinson, A. Ortiz

Barely-Visible Surface Crack Detection for Wind Turbine Sustainability   **IROS 2024**
S. Agrawal, I. Corley, C. Wallace, C. Vaughn, J. Lwowski

Estimating Earthquake Magnitude in Sentinel-1 Imagery via Ranking   **ECML-PKDD 2024 MACLEAN**
D. Cambrin, I. Corley, P. Garza, P. Najafirad

Depth Any Canopy: Depth Foundation Models for Canopy Height Estimation   **ECCV 2024 CV4E**
D. Cambrin, I. Corley, P. Garza

SSL4EO-L: Datasets and Foundation Models for Landsat Imagery   **NeurIPS 2023 D&B**
A. Stewart, N. Lehmann, I. Corley, Y. Wang, Y. Chang, N. Ali Braham, et al.

TorchGeo: Deep Learning with Geospatial Data   **SIGSPATIAL 2022**
A. Stewart, C. Robinson, I. Corley, A. Ortiz, J. Lavista Ferres, A. Banerjee

Solar Panel Mapping via Oriented Object Detection   **ICLR 2023 TCCML**
C. Wallace, I. Corley, J. Lwowski

Deep EEG Super-Resolution: Upsampling EEG Spatial Resolution with GANs   **IEEE BHI 2018**
I. Corley and Y. Huang

Open-Source

I am a passionate open-source developer and regularly active on github, creating issues and reviewing and contributing PRs to libraries like flax, kornia, and torchmetrics. I primarily develop in Python, PyTorch, and/or Jax. Below are a select few of the libraries that I maintain.

torchgeo: Core Maintainer (3k stars) PyTorch datasets, transforms, samplers, and pre-trained models for processing geospatial data

torchseg: Fork of segmentation-models-pytorch (smp). PyTorch implementations of Modern Semantic Segmentation methods with SOTA pretrained backbones

torchrs: PyTorch implementations of Remote Sensing models and datasets (merged into Microsoft TorchGeo)

jax-enhance: Jax model implementations and training code for image super-resolution

faissknn: GPU-accelerated FAISS implementations of multiclass and multilabel KNN classifiers with an sklearn compatible API

Academic Service

Reviewer: NeurIPS (2024), ECCV CV4E Workshop (2024), SciPy (2024), NeurIPS HADR Workshop (2021)

Organizer: ECML-PKDD 2024 SMAC Discovery Challenge