Porter Dosch

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Education

The University of Tennessee, Knoxville, Tickle College of Engineering — Knoxville, Tennessee
Bachelor of Science in Computer Science and Mathematics — Graduation: May 2027
Minor: Machine Learning • Cumulative GPA: 3.98/4.00 • Computer Science Honors

Preprints & Manuscripts

- **P. Dosch**, M. Tang, H. Qi (2026). Semantic Alignment of Flow-Matching Models for Remote Sensing. Manuscript in preparation.
- R. Elgedawy, J. Sadik, **P. Dosch**, S. Ruoti. (2026). *Crouching Code, Hidden Vulnerabilities: A Longitudinal Study of LLMs Functionality-Security Disconnect*. Current manuscript. Earlier preprint: arXiv:2402.00689.
- A. Cozma, H. Ijadunola, **P. Dosch**, C. Murphy, H. Qi. (2026). Architecture Follows Data: CNN Backbone Design for Tiny Object Detection. In revision.

Research Experience

Independent Research Project — Knoxville, Tennessee
Semantic Alignment of Flow-Matching Models for Remote Sensing — March 2026 – Present

- Adapted 12B-parameter FLUX.1-dev backbone using LoRA and label-free alignment with representations from a frozen DINOv3-Sat teacher, optimizing semantic and flow-matching objectives jointly on satellite imagery.
- Built a PyTorch feature extraction and evaluation pipeline across six GEO-Bench classification tasks, three segmentation tasks, and five label budgets; improved mean-over-budget So2Sat accuracy by **4.5** percentage points and BigEarthNet micro-F1 by **3.6** points over frozen FLUX.
- Evaluated flow-only, semantic-only, and joint adaptation, reducing held-out satellite-generation FID from **74.6 to 40.9** relative to flow-only training while preserving semantic-transfer gains.

Brown University, Visual Computing Group — Providence, Rhode Island
Leadership Alliance SR-EIP Intern — June 2026 – August 2026

- Adapted a streaming 3D transformer (StreamVGGT) to fuse sparse robot-sensor depth into dense, metric, temporally-consistent depth for real-time VR teleoperation of Boston Dynamics Spot robots.
- Fine-tuned the model with LoRA and a temporal-consistency objective to reduce frame-to-frame jitter in streaming depth reconstruction.
- Ran ablations isolating which design choices drive performance; continuing the work remotely toward a first-author publication.
- Presented at Leadership Alliance National Symposium (oral) and Brown Summer Undergraduate Research symposium (poster).

Advanced Imaging and Collaborative Information Processing Lab — Knoxville, Tennessee
Undergraduate Research Assistant — August 2024 – Present

Tiny Object Detection

- Developed deep-learning models for tiny defect detection in tire X-ray imagery, where small, elongated targets make downsampling and feature retention challenging.
- Ran controlled ablations of backbones, FPN designs, and training configurations, improving small-object AP by approximately **5 points** on synthetic imagery and **1.5 points** on real tire imagery.

Remote-Sensing Foundation Models

- Proposed and implemented a JEPA-based objective for remote-sensing representation learning, conducting initial evaluations on fMoW across RGB and Sentinel-2 imagery for integration into a broader multimodal fusion architecture.

Oak Ridge National Laboratory, Learning Systems Group — Oak Ridge, Tennessee
SULI Intern — May 2025 – August 2025

- Accelerated adversarial detector training from 0.17 → 6 it/sec (**35× speedup**) by modifying training pipeline to load pregenerated adversarial images instead of generating attacks on-the-fly.
- Benchmarked adversarial perturbation detectors on CelebA (202k images), finding ResNet-based detectors generalized better than ViTs across tested FGSM and PGD attack settings.
- Built PyTorch DataLoaders, FFT-based data augmentations, custom plotting code, and SLURM pipelines for large-scale evaluation on A100 clusters.

Usable Security Empirical Research Lab Knoxville, Tennessee
Undergraduate Research Assistant January 2024 – May 2025

- Co-authored arXiv preprint analyzing quality and security defects in code generated by 9 LLMs across 3 families.
- Collected and evaluated **400+ LLM code samples**, analyzing CWE patterns, model failures, and version drift across open and proprietary models.
- Trained and supervised interns in structured data collection and reproducible evaluation workflows.

Work Experience

Adventure 33 Toronto, Canada
Software Engineering Intern June 2024 – August 2024

- Prototyped Angular web portals with user authentication, developing PHP API endpoints integrated with MySQL, laying the groundwork for secure and streamlined access
- Built data ingestion pipelines using Linux command-line utilities and Python, incorporating real-time XML parsing and AWS EC2 storage for efficient, scalable data processing

Orbital Arc Knoxville, Tennessee
Software Development Intern May 2024 – June 2024

- Developed a C++ algorithm for precise stepper motor control for a throttle valve in a prototype ion engine, enabling accurate control of fuel output
- Determined stable fuel line pressure and mass flow rate for space; projected expected fuel tank pressure values to facilitate future validation of flow measurement accuracy and potential fuel leak detection using sensor simulations

Awards and Honors

- Leadership Alliance SR-EIP Program
- National Merit Scholarship
- Ned McWherter Scholarship
- UT Andy Holt Alumni Award
- John Tummins Memorial Scholarship
- Trimble Inc. Scholarship for Computer Science

Relevant Coursework

- Introduction to Machine Learning
- Deep Learning
- Reinforcement Learning
- Linear Algebra I/II
- Multivariable Calculus
- Probability and Statistics
- Stochastic Processes
- Data Structures and Algorithms

Skills

- Languages: C++, Python, SQL, Java, PHP, TypeScript, Bash
- Technologies: PyTorch, Keras, TensorFlow, Matplotlib, Pandas, NumPy, Git, SLURM, Angular