Nicholas A. Goberville, Ph.D.

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PROFESSIONAL SUMMARY

Ph.D. Research & Software Engineer with 7+ years of experience architecting end-to-end perception pipelines for autonomous systems. Proven track record of deploying real-time ML models onto embedded hardware (NVIDIA Jetson) and leading multi-organizational technical initiatives. Expert in sensor fusion (Camera, LiDAR, Radar), object tracking, semantic segmentation, simulation-based validation (VIL/HIL), and track-based testing. Combining deep theoretical knowledge with the software engineering rigor to productionize robust & value-driven solutions for complex, real-world environments.

TECHNICAL SKILLS

Languages & Infrastructure: Python, Bash, C++, CMake, SQL, ROS 1/2, CI/CD, GitLab/GitHub, Docker, Google Cloud, AWS.

Perception & ML: Computer Vision, Semantic Segmentation, Object Detection (YOLO, DETR), Sensor Fusion (Kalman Filter, GOSPA), PCL (Point Cloud Library), DeepSORT, Eigen, PyTorch, Scikit-learn, OpenCV.

Embedded Optimization & Hardware: ONNX, Numba, NVIDIA Jetson (Nano & AGX), CAN/CAN FD, UDP, GNSS/RTK, V2X, Camera, LiDAR, Radar.

Testing & Validation: Vehicle-in-the-Loop (VIL), Hardware-in-the-Loop (HIL), 3D Simulation (CARLA, dSPACE AURELION), Dynamometer & Track Testing, pytest, ASAM OpenSCENARIO.

PROFESSIONAL EXPERIENCE

Argonne National Laboratory   Lemont, IL
Connected and Automated Vehicle Research Engineer   *Jan 2022 – Present*

- **Perception & Sensor Fusion Leadership:** Lead Technical Architect for the Connected and Automated Vehicle (CAV) track of a $6M U.S. Department of Energy (DOE) program, defining sensor fusion standards (e.g., EKF, Bayesian) for 13 distributed engineering teams. Enforced validation via GOSPA metrics to benchmark tracking performance across diverse hardware stacks.
- **Embedded Architecture & Business Impact:** Architected the **Longitudinal Automated Replay System (LARS)**, a ROS 2-based vehicle-agnostic platform deployed on heterogeneous fleets (Cadillac LYRIQ / Toyota Prius). Achieved deterministic path replay with <0.15 m/s MAE, establishing the standard validation tool for 6+ high-impact U.S. DOE research projects.
- **Systems Integration:** Engineered a standardized **Vehicle-in-the-Loop (VIL)** interface for dynamometer testing. Wrote custom low-latency UDP drivers in **C++** for sensor object injection, achieving **0% packet loss** at 100Hz and enabling 100% integration success across 16 disparate software stacks.
- **ML Data Pipeline:** Engineered a closed-loop training pipeline fusing LiDAR and Camera data to quantify sensor degradation. Automated the extraction of beam attenuation features to train real-time precipitation estimators (Random Forest), achieving 0.5 mm/hr accuracy without manual labeling.
- **Deep Learning at Scale:** Developed an automated ground-truth generation pipeline for 2,000+ miles of highway data. Implemented a **Spatial CNN (SCNN)** to auto-label lane geometries, reducing manual annotation effort by ∼95% while maintaining high-confidence detections.

Revision Autonomy LLC   Kalamazoo, MI
Co-Founder & Lead Perception Engineer   *Nov 2019 – Jan 2022*

- **ML Product Launch:** Led full-stack perception development from concept to field deployment. Secured **$250,000 in funding** (NSF I-Corps, MTRAC) by demonstrating technical viability of camera-only navigation in visually degraded environments.
- **Real-Time Optimization:** Developed and optimized a semantic segmentation model for tire track detection on snow-covered roads. Deployed the model onto an **NVIDIA Jetson Nano**, leveraging **ONNX Runtime** to achieve **83.2% mIoU** at **100+ FPS** (95x speedup over non-optimized inference).
- **Data Engineering:** Built a supervised MLOps pipeline (Python/CVAT) for data ingestion and versioning. Wrote scripts to auto-filter corrupt frames and balance class distributions, streamlining the training loop for a custom 15k+ image dataset.
- **Algorithm Design:** Designed a hierarchical perception state machine that dynamically expands the Operational Design Domain (ODD). System autonomously transitions between lane-line tracking and unstructured tire-track following based on real-time **snow coverage estimation**.

Western Michigan University   Kalamazoo, MI
Graduate Research Assistant (Ph.D.)   *May 2018 – Jan 2022*

- **Sim-to-Real Deployment:** Deployed a simulation-trained **End-to-End Reinforcement Learning (RL)** agent onto a Kia Niro for lateral control. Bridged the sim-to-real gap, achieving **92% trajectory adherence** on physical test tracks without retraining.

- **HD Mapping:** Developed a mapping pipeline fusing Mobileye vision semantic objects with RTK-GPS. Generated HD lane-level maps for **140 miles** of highway with <10cm global accuracy.
- **RL Training Infrastructure:** Engineered a custom training loop for lateral control agents, bypassing standard library overhead. Utilized **Numba** JIT compilation to accelerate policy updates, reducing experiment iteration time by **15x** and enabling the learning of robust lane-keeping behaviors.

EDUCATION

Ph.D. Mechanical Engineering | Western Michigan University   2022
Dissertation: Cost-Effective Enablement of Automated Driving Systems on Snow-Covered Roads
B.S. Mechanical Engineering (Minor in Mathematics) | Western Michigan University   2019
Cum Laude, Tau Beta Pi Inductee

SELECTED PUBLICATIONS & PATENTS

- **Patent Pending:** Asher, Z.D., **Goberville, N.A.**, Kadav, P. (2024). *Automation in Inclement Weather*. U.S. Patent Application No. 18/494,839.
- **Goberville, N.A.**, et al. (2025). "Modular Dynamometer Testing Framework to Evaluate Energy Impacts of Longitudinal Automated Driving Systems." *SAE Technical Paper*.
- **Goberville, N.A.**, et al. (2023). "Snow Coverage Estimation Using Camera Data for Automated Driving Applications." *Transportation Research Interdisciplinary Perspectives*.
- **Goberville, N.A.**, et al. (2022). "Tire Track Identification: A Method for Drivable Region Detection in Conditions of Snow-Occluded Lane Lines." *SAE Int. J. Adv. & Curr. Prac. in Mobility*.
- **Goberville, N.A.**, et al. (2020). "Analysis of LiDAR and Camera Data in Real-World Weather Conditions for Autonomous Vehicle Operations." *SAE Int. J. Adv. & Curr. Prac. in Mobility*. (50+ Citations)

HONORS & AWARDS

- **Impact Argonne Award (2024 & 2025):** Recognized for excellence in CARB CAV Testing and Collaborative Vehicle Deployments.
- **LDRD Innovate Awardee (2023):** Recipient of competitive Laboratory Directed Research & Development funding at Argonne National Lab.
- **Commercialization Grants (2020 – 2021):** Awarded $250k+ in funding via MTRAC and University of Michigan Translational Research.
- **NSF I-Corps (2020):** Selected as Entrepreneurial Lead for the National Science Foundation Summer Cohort 3.