

Vo Thanh Nguyen

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Objective

A highly motivated AI Engineer and Researcher specializing in **Cognitive AI**, **World Models**, and **AI Automation**, seeking to apply AI to **edge devices**, **robotics**, and **autonomous systems**. Passionate about building intelligent, efficient, and reliable solutions that work in real-world, resource-constrained environments.

Professional Experience

AI Engineer and Researcher, University Research Lab (HCMUTE) Dec 2024 – Present

- Co-authored 3 publications (2 accepted at **ECCV 2026 Workshop**, 1 accepted at **GTSD 2026**) focusing on traffic understanding and autonomous driving stacks.
- Led software stack development for an autonomous vehicle in the **Bosch Future Mobility Challenge**, securing **Top 9 Finalist Worldwide** and **Best Team from Vietnam & Asia** (2025).
- Implemented real-time perception modules for object detection, lane segmentation, and object tracking with ByteTrack, with accelerated inference for low-latency vehicle systems.
- Engineered a decision control system and drivable path generation for real-time obstacle avoidance and navigation on competition track maps.
- Key Learnings: Developed strong **scientific research capabilities** (literature review, paper writing); strengthened peer-to-peer collaboration to reach the Bosch global finals.
- Advisor: Dr. Bui Ha Duc (buihaduc@hcmute.edu.vn)

AI Researcher, 3DVision Lab (HCMUTE) Mar 2024 – Dec 2024

- Designed a deep-learning-based industrial vision pipeline for high-precision **PCB defect detection** (for BACKER), integrating anomaly localization and defect categorization, achieving **98.2% accuracy** on production lines.
- Researched on-device model optimization and driver monitoring, engineering multi-process zero-copy IPC via **Linux SharedMemory** bypassing Python GIL across **TensorRT**, **OpenVINO**, and **ONNX** backends, achieving **3.2x CPU throughput speedup** (up to +87.5% CPU).
- Key Learnings: Gained a deep theoretical understanding of **Deep Learning architectures** through extensive academic paper reading; mastered **OpenVINO**, **TensorRT**, and zero-copy IPC; enhanced industrial problem-solving under client deadlines.

Personal Projects

KnowledgeForge (Agent Operating System – AOS)



- Architected an **Agent Operating System (AOS)** in Python and **LangGraph** that decomposes complex tasks into a Directed Acyclic Graph (DAG) of subtasks, executing them concurrently using **Kahn's Topological Sort** with strict dependency tracking and deadlock prevention.
- Engineered a plug-and-play registry for heterogeneous specialist agents (browser, RAG, landmark, analysis) dynamically routed via a **sub-10ms semantic router**, integrating an **MCTS decision engine** for cognitive multi-step path planning.
- Pioneered a self-learning curation engine that dynamically extracts and synthesizes hybrid skills at runtime, implementing **AST-based safety validation** (node whitelisting), sandboxed execution with automated test generation, and non-destructive **AST-guided code consolidation** for hot-patching.
- Engineered an autonomous scheduling and delivery gateway supporting persistent cron jobs, routing agent outputs dynamically to **Zalo**, **Discord**, **Telegram**, **Slack**, and **Facebook**.
- Designed a reactive **SSE streaming gateway** backed by **Redis PubSub** to broadcast agent execution traces, instrumented with **Prometheus** and **OpenTelemetry (LangSmith/Langfuse)**, and implemented a **sub-5ms embedding-based Semantic Cache** to bypass redundant LLM calls.
- Key Learnings: Mastered **LangGraph**, **Redis PubSub**, and sandboxed execution; developed independent research and **software architecture design** skills.

Real-Time Driver Distraction Detection System



- Engineered a real-time driver state monitoring system on a **multi-process zero-copy IPC architecture** using **Linux SharedMemory**, fully bypassing Python's GIL across 3 worker processes.
- Implemented a multi-modal **Signal Fusion engine** combining 6 biometric indicators (EAR, MAR, SolvePnP 3D Head Pose, PERCLOS, Blink Rate, YOLO eye state) with a **temporal hysteresis state machine**.
- Integrated 4 hot-swappable inference backends (**TensorRT** async CUDA streams with pinned memory, **OpenVINO**, **ONNX Runtime**, PyTorch) and rendered a live PySide6 HUD with 478-point MediaPipe face mesh overlays.
- Key Learnings: Mastered **Linux SharedMemory IPC** and multi-backend model deployment (**TensorRT**, **OpenVINO**); deepened understanding of real-time sensor fusion.

Enterprise AI Workflow Automation

Contract Project

- Designed and deployed 10+ end-to-end **n8n workflows** for a media company, covering content production pipelines: AI-assisted article writing, social media copy generation, and scheduled auto-posting across platforms.
- Built automated document drafting and news analysis workflows that aggregate, summarize, and structure news feeds from multiple sources to accelerate editorial workflows via **vector search (Qdrant)**.

- Integrated **LLM APIs** and custom Python functions into reusable nodes with **retry-backoff error handling**, ensuring **99.8% workflow uptime** and cutting manual content-production time by **70%**.
- Key Learnings: Mastered **n8n automation**, **Qdrant vector databases**, and LLM API integrations; applied **client-facing communication** and project scoping skills to deliver a 70% efficiency boost.

Publications

Sim-to-Real Traffic Scene Understanding by Decoupling Semantics from Caption Gen. with V-JEPA

May 2026

Nguyen Hoai Thuong Bui*, **Thanh Nguyen Vo***, Trinh Tra Giang Nguyen*, Ha Duc Bui†
ECCV 2026 Workshop on AI City (10th AI City Challenge), Accepted (Oral).

JEPA Guided Diffusion: Predictive Vision-Language Conditioning for Generative Traffic Forecasting

May 2026

Trinh Tra Giang Nguyen*, **Thanh Nguyen Vo***, Nguyen Hoai Thuong Bui*, Ha Duc Bui†
ECCV 2026 Workshop on AI City (10th AI City Challenge), Accepted (Poster).

An Integrated Perception-to-Planning Framework for Autonomous Driving using YOLOv11 and Frenet Coordinate Waypoint Gen.

June 2026

Nguyen-Vo Thanh, Giang-Nguyen Trinh Tra, Khoi-Le Lu Anh, Duc-Bui Ha†
Int. Conf. on Green Technology and Sustainable Development (GTSD 2026), IEEE Proceedings, Accepted.

* Equal contribution / Co-first authors † Corresponding author

Technical & Soft Skills

Programming Languages: Python, C + +, C#, Go, TypeScript

AI & Machine Learning: PyTorch, TensorFlow, Scikit-learn, OpenCV, Hugging Face, Diffusers, LangChain, LangGraph, TensorRT, ONNX

Specializations: Computer Vision, Natural Language Processing, Generative AI, RAG Systems, Multi-Agent Systems, Autonomous Driving, Model Optimization

Application & Dev Tools: n8n, FastAPI, Next.js, Streamlit, Gradio, PyQt6, WebSocket, SSE, RESTful API, Real-time Messaging, Docker

Databases & Tools: PostgreSQL, Neo4j, Redis, Qdrant, ChromaDB, Faiss, Firebase, Git, MLflow, Weights & Biases, Linux

Soft Skills & Methodologies: Teamwork, Peer-to-Peer Coordination, Scientific Research & Literature Review, Time Management, Problem-solving, Project Management, Client-facing Communication, Software Architecture Design

Education

Ho Chi Minh City University of Technology and Education

2022 – 2026 (Expected)

Bachelor of Engineering in Robotics and Artificial Intelligence.

Le Quy Don High School for the Gifted

2019 – 2022

Specialized in Informatics.

Honors & Awards

- 2026 – 2027: Semi-finalist & Recipient of 150M VND Bosch Sponsorship (Team “Drive Beyond”) in Bosch Future Mobility Challenge (BFMC 2026); deferred to the Romanian Semi-finals in 2027.
- 2026: Winner (Top 1) Track 2 & Top 3 Track 5 in the 10th AI City Challenge (ECCV 2026 Workshop).
- 2026: Top 5 Finalist overall (out of 200+ teams) in Datathon 2026: The Gridbreakers (VinUniversity).
- 2025 – 2026: AI VIET NAM AIO2025 (All-In-One) AI & Data Science Program Certificate.
- 2025: Top 9 Finalist Worldwide in Bosch Future Mobility Challenge (Best Team from Vietnam & Asia).
- 2024: Third Prize ICPC Vietnam National Contest.
- 2023: Bronze Medal Mastering Intelligent Talent Competition.
- 2022 – 2023: Talent Scholarship Recipient.
- 2022, 2023: Second Prize Vietnamese Student Informatics Olympiad (OLP).