Natanael Sebastian Simanjuntak

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Education

Universitas Gadjah Mada (UGM) **Yogyakarta, Indonesia**
Undergraduate in Information Technology *2024 – Expected 2028*

- **Relevant Coursework:** Operating Systems, Computer Networks, AI, Machine Learning, Computer Vision, Distributed Systems.

Technical Skills

Programming & ML: Python, C++, PyTorch, OpenCV, YOLO, RF-DETR, ROS2

Digital Forensics & Security: Cilium/eBPF, Tetragon, Kyverno, Cosign, Zeek, DFIR, nftables, OPNsense

Infra & Networking: Linux, Docker, Kubernetes, Ansible, FRRouting, Argo CD

Tools: Git, React, Tailwind

Experience

Gadjah Mada Robotics Team (Humanoid Robot) **Yogyakarta, Indonesia**
Computer Vision Engineer *November 2025 – Present*

- Developed ball detection module for the robot's ROS2 perception, achieving **97.7% mAP@50**, **97.1% precision**, and **97.0% recall** on a held-out split of a 2,684-image multi-ball dataset with RF-DETR (Large) fine-tuned via Roboflow, plus YOLO.
- Developed field segmentation module identifying playing field and boundary lines from live feed, achieving **∼12 FPS inference** with YOLO segmentation trained on 10,233 annotated images across venues and lighting, benchmarked against RF-DETR Small.

Projects

Tetris Deep Reinforcement Learning Research | *Python, PyTorch, Gymnasium, Numba JIT* | github *October 2026*

- Showed that state representation, not the learning algorithm, determines whether an RL agent can learn Tetris: **55,169.2 IQM score** on Dellacherie features vs. **0.0** on raw boards across CEM and DQN (5 seeds), **∼138×** a linear TD(0) baseline and **89.8%** of the literature heuristic, via a 2×2 factorial design with `rliable` evaluation.
- Scaled CPU-only simulation to **>25,000 steps/sec** (66 passing unit tests) with a Numba-accelerated Gymnasium environment, and found via linear probing that a DQN hidden layer encodes board geometry (held-out $R^2 = 0.958$ for height, **0.886** for holes).

Data Center Microsegmentation & DFIR Lab | *OPNsense, nftables, Ansible, FRRouting, Zeek* | github *October 2026*

- Cut the internal attack surface exposed to the web DMZ by **85.71%** (14 → 2 endpoints), blocking **3/3 SSH pivots** and **0 of 42 records exfiltrated**, by combining an OPNsense stateful firewall with nftables microsegmentation deployed via Ansible.
- Built a 14-node virtualized Spine-Leaf EVPN/VXLAN fabric (FRRouting, KVM) with **81.85 Gbps** intra-zone switching and **<100 ms zero-loss failover**, plus an ISO/IEC 27037-aligned DFIR pipeline with **2.36 s live triage** staged in RAM (vs. 30 s target) and **100% true-positive Zeek detection** (56/56 anomalies).

Hardened Kubernetes Platform | *Cilium eBPF, Tetragon, Kyverno, Cosign, Argo CD* | github *October 2026*

- Secured a k3s platform against container escapes, credential theft, and supply-chain tampering, passing **9/9 automated checks** (6 attack scenarios mapped to MITRE ATT&CK, 3 control checks), via three layers: Cilium eBPF, Tetragon, Kyverno + Cosign.
- Halted ServiceAccount token exfiltration and shell breakouts with **in-kernel** `SIGKILL` (exit 137) via Tetragon TracingPolicies, and enforced integrity by dropping unauthorized inter-pod traffic (Cilium default-deny), rejecting unsigned images (Kyverno + Cosign), and self-healing drift (Argo CD App-of-Apps).

WiFi Network Performance Simulator | Live Demo | github *April 2026*

- Modeled multi-class WLAN blocking with an NHPP-driven $M(t)/M/K/K$ engine: **0.20% empirical vs. 0.21% Erlang-B** blocking at light load ($\rho = 0.59$, $K = 30$), with **8–19% deviation under overload**, validated over 5-run Monte Carlo.
- Protected real-time traffic during bulk-download surges (**+299.6%** collaboration and **+470.7%** transaction-class throughput vs. Best Effort) via a GPS/WFQ scheduler, and shipped a public React/Vercel demo with **60+ FPS Canvas rendering** ($K = 30$) and **100/100 Lighthouse Best Practices**.

Certifications

AWS Certified AI Practitioner | *AWS*, 2026 *AI/ML basics, generative AI, foundation models*

CCNA: Introduction to Networks | *Cisco*, 2026 *IP addressing, subnetting, switching, network security*

AWS Academy Cloud Web Application Builder | *AWS Academy*, 2026 *Cloud-native web app infrastructure on AWS*