Rayyan Ridwan

AI/ML Engineer & Student Researcher

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About Me

Systems-minded. Performance-driven. Real-world impact.

Early-career engineer and student researcher at the intersection of autonomy, artificial intelligence, and human-aligned systems. Passionate about building intelligent platforms that learn, adapt, and explain; from embedded UAVs to interpretable medical diagnostics.

At age 14, I have co-architected autonomous UAV systems, published novel research in explainable AI, and developed open-source tools for high-impact, transparent machine learning. My goal: advance the future of intelligent, ethical technology.

Education

Beaconhouse School System, Karachi, Pakistan *2022–Present*
Grade IX Student, Computer Science 2210 + Add Maths 4037
Advanced coursework in Mathematics, Physics, and Computer Science.
Honors: Consistently ranked in top percentile throughout the years.
Subjects: Mathematics 4024, Additional Mathematics 4037, Physics 5054, Chemistry 5070, Urdu Language 3247, English Language 1123, Pakistan Studies 2059, Islamiyat Studies 2058, Computer Science 2210.
Academic Focus: Self-directed studies in AI, machine learning, embedded systems, and theoretical computer science.

Experience

NEXAM Systems *May 2025–October 2025*
AI/ML Engineer (Intern – Software and AI System, Early-Career)

- Co-architected autonomous UAV systems, integrating perception, closed-loop control, and operator interfacing.
- Developed a vision-based tracking mechanism enabling persistent visual alignment using onboard feedback, without mechanical stabilization.
- Built an integrated mission interface fusing live video, real-time telemetry, and system diagnostics for dynamic, in-flight decision-making.

Selected Projects

- **XAIus** *2025*
  Designed an interpretability benchmarking platform for machine learning models, enabling model ranking based on explainability metrics in high-stakes domains such as medical imaging and autonomous systems.
- **GreenGrad** *2024*
  Developed an energy-aware ML training optimization system that monitors GPU utilization and dynamically adapts training schedules to reduce compute costs and carbon footprint.
- **ReFly** *2024*
  Built a deep reinforcement learning framework for autonomous UAV navigation in cluttered and dynamic environments using simulation-to-real transfer techniques.

- **CuraSet** *2023*
  Created a dataset preprocessing pipeline that detects and corrects mislabeled samples through uncertainty estimation, boosting model generalization and training efficiency.

Publications & Research

- Ridwan, R. (2025). *XAI-Guided Analysis of Residual Networks for Interpretable Pneumonia Detection in Pediatric Chest X-rays.* arXiv:2507.18647 [cs.CV].
  Proposed a Bayesian Grad-CAM enhanced ResNet-50 achieving 95.9% accuracy and 98.91% AUC-ROC on pediatric X-ray datasets with interpretable saliency maps.

Technical Skills

- **Languages & Frameworks:** Python, C++, JavaScript (Node.js), PyTorch, OpenCV, ROS2, NumPy, Scikit-learn, Matplotlib
- **Machine Learning:** Supervised & Unsupervised Learning, Transformers, CNNs, RNNs, XAI, Self-Supervised & Generative Modeling, Reinforcement Learning
- **Computer Vision:** Object Detection, Visual Tracking, Semantic Segmentation, Saliency Mapping, Visual Servoing
- **Robotics & Autonomy:** UAV Guidance, Real-Time Inference, Differentiable Control, Sensor Fusion, Simulation-to-Real Transfer
- **Model Optimization:** Feature Engineering, Hyperparameter Tuning, Evaluation Metrics (AUC, Kappa)
- **Development Tools:** Modular Design, Git, Experiment Tracking, Reproducible Pipelines, CI/CD Integration

Leadership & Outreach

- Presented at the International LEARNER'S AGENCY PARADIGM (ILAP) Conference on interpretable AI in medical imaging.
- Served on the student council across multiple academic years (As Proctor and Deputy Head Boy), contributing to school-wide initiatives and student representation.
- Shared open-source contributions and research updates via personal portfolio and GitHub to promote transparency and reproducibility.

Extracurriculars

- Presented independent AI research on explainable pneumonia detection at the ILAP Conference.
- Published a research preprint on interpretable medical AI on arXiv (arXiv:2507.18647).
- Developing a modular AI architecture inspired by Global Workspace Theory.
- AI/ML Engineering Intern at NEXAM Systems working on real-time computer vision and UAV perception systems.
- Runner-up in Logic Wars (debate competition) at SciVision 5.0.
- Runner-up in CyberScope (video-making competition) at SciVision 5.0.
- Participant in BISC RoboQuest robotics competition (2025).
- Contributor to open-source machine learning projects including XAIus, GreenGrad, ReFly, and CuraSet.
- Organized a Ramadan charity drive raising donations for Indus Hospital (Grade VIII).
- Panelist at Talentorama 2.0 (2025. Grade VIII)
- Independent study of machine learning and AI systems through advanced lectures and research literature.
- Built and maintain a technical portfolio showcasing AI research and engineering projects (rayyanridwan.netlify.app).