PPE Watcher

Real-Time Detection

of Safety Gear

SAVING LIVES !

Executive Summary

PPE Watcher is an **AI-driven safety monitoring system** designed to protect construction workers and save lives.

- Deployed on **Jetson Orin Nano**, it uses **real-time computer vision** to detect six types of personal protective equipment — helmets, vests, masks, gloves, boots, and goggles — directly on-site.
- When any missing gear is detected, the system **instantly triggers an alert** and can **lock down the affected working zone** to prevent accidents.
- By combining **AI accuracy**, **edge computing efficiency**, and **smart alert automation**, PPE Watcher builds a safer, smarter, and more compliant industrial environment.

Saving Lives with Real-Time AI Safety Monitoring!

motivation

1. Saving Lives:
In 2023, nearly **3 million workers died** from work-related causes — many due to missing or improperly worn protective gear (International Labour Organization, 2023).

2. Reducing Human Error:
Traditional manual inspections are slow, costly, and prone to oversight, leaving critical safety gaps in high-risk environments.

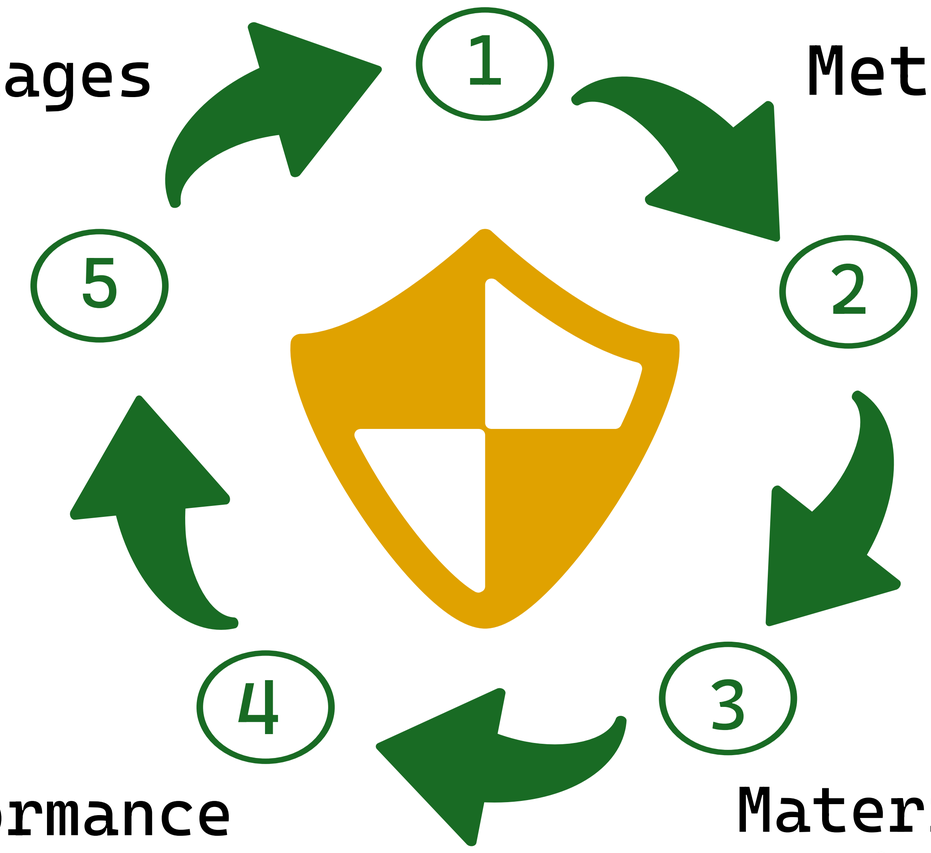
Our Mission:
PPE Watcher aims to build an **AI-powered, real-time safety supervision system** through edge deployment, enabling automatic detection, instant alerts, and data retention **to minimize human error and save lives**.

Every Second Counts – Let AI Watch Over Safety.

Advantages

Smarter • Faster • Safer –
AI That Protects Workers.

1. **High-Quality Model**: All 7,000 training images were verified and re-labeled, ensuring high detection accuracy and strong generalization.
2. **Real-Time & Precise Detection**: Achieves 84% accuracy with <1 s latency, instantly identifying missing PPE in complex environments.
3. **Easy to Use & Fully Automated**: Designed for non-technical users — the system automatically detects, alerts, and logs safety events without manual setup.
4. **Privacy & Safety Protection**: All data is processed locally on edge devices, protecting worker privacy while improving overall safety compliance.

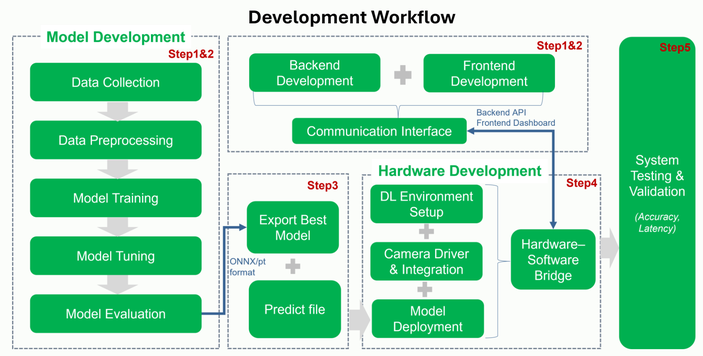


Methods

From Lab to Field –
Turning AI into Real-World Safety !

Five-step development process integrating AI, software, and hardware.

- YOLOv8 was trained and optimized, then deployed on Jetson Orin Nano with real-time camera input.
- Backend and dashboard systems were connected through a hardware–software bridge, enabling live alerts and data validation.



Performance

System Accuracy, Speed, and Reliability Evaluation

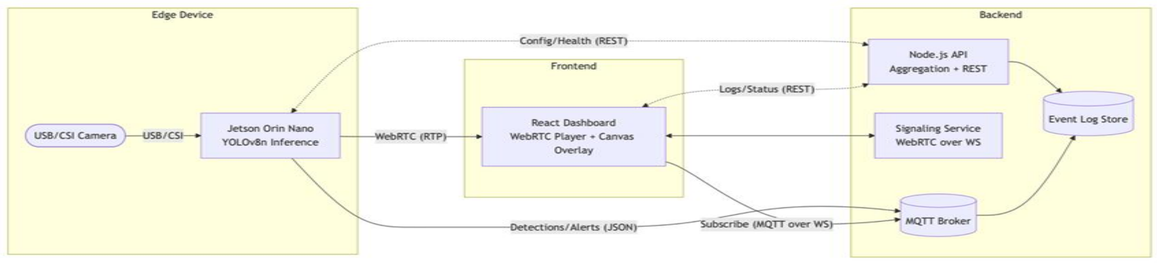
Metric	Achieved	Remarks
Detection Accuracy	**84 %**	Target ≥ 80 %
Latency (end-to-end)	**0.7 – 0.9 s**	Meets < 1 s goal
Stability (continuous run)	**10 h verified**	Target ≥ 8 h
False Positive Rate	**7.8 %**	Within 10 % limit

Reliable real-time detection with 84 % accuracy and < 1 s latency.

Materials

From components to an operational safety system –
built for real-world safety.!

- **Hardware**: Jetson Orin Nano, IMX219 camera module, custom 3D-printed casing
- **Software**: YOLOv8, TensorRT, Fastify, Prisma, React, SQLite
- **Dataset**: PPE image dataset (helmet, vest, mask, gloves)
- **Deployment**: Deployable on local network or cloud (e.g., AWS EC2 + S3)



Impact & Value

1. **Saves Lives, Builds Trust**: Real-time AI safety monitoring prevents workplace accidents and strengthens company reputation for worker protection.
2. **Cuts Costs, Boosts Efficiency**: Replaces manual inspections with automated AI detection, reducing labor costs and minimizing downtime.
3. **Scales with Your Growth:** Deployable on any site — from single construction zones to enterprise-level safety networks — ensuring long-term value.

PICK US!

✓ Reference:
International Labour Organization (2023). World Day for Safety and Health at Work 2023: A Safe and Healthy Working Environment as a Fundamental Principle and Right at Work. Geneva: ILO. Retrieved from https://www.ilo.org/safework

✓ Acknowledgements