SwarmGuard: Low-Cost Autonomous Mesh System for Wildlife Protection

What is SwarmGuard?

SwarmGuard is a modular, solar-powered mesh of cheap autonomous sensor nodes designed to detect poaching threats:

- Gunshots
- Predator roars
- Human speech

Each node is like a tiny guardian that listens, thinks, and sends alerts when something dangerous is heard.

Core Components per Node:

- ESP32-CAM (or ESP32-WROOM for audio-only)
- MAX9814 microphone module
- LoRa SX1278 module
- TP4056 charging board
- 18650 Li-ion battery
- 5V solar panel (120mA+)
- Waterproof enclosure

How it Works:

- Node sleeps to save energy
- Wakes on loud sound
- Classifies sound using TinyML (Edge Impulse)
- Sends alert via LoRa to neighboring nodes
- Alerts travel to base station or drone
- Optional: captures photo (ESP32-CAM)

Use Cases:

- Forests with no mobile coverage
- Wildlife corridors
- Parks with limited patrol

- Anti-poaching operations

Benefits:

- Very low cost ($20-40)
- Solar-powered
- Mesh, no internet needed
- Optional image capture
- Easy to build
- Open source

Limitations:

- Needs training for sound patterns
- Trees and hills affect LoRa range
- No GPS unless added
- Not weatherproof without care

Why Share?

This is a non-commercial open idea. If you can use it to help protect wildlife, feel free to adapt, copy or extend it. I'm happy to support developers and conservationists.

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