NUTRA OceanSensor — Whitepaper v1

# 1. Executive Summary

The NUTRA OceanSensor is a modular, passive underwater detection system designed to identify environmental anomalies (such as fuel, chemical, or seismic disturbances) and autonomously deploy a buoy to transmit alerts. Built with simplicity, scalability, and stealth in mind, the system can be deployed in large numbers with minimal infrastructure.

# 2. Project Mission

To create a decentralized, cost-effective, and energy-efficient sensor network capable of monitoring oceans in real time, providing early warnings of ecological and tactical threats.

# 3. System Architecture

- Seabed Passive Sensor: Detects specific physical or chemical changes.  
- Trigger Module: Includes AI microcontroller to interpret signals.  
- Buoy Launcher: Releases a surface buoy when conditions are met.  
- Surface Buoy: Contains GPS or radio transmitter.  
- Dashboard/API: External interface for monitoring alerts.

# 4. Components Overview

- Microcontroller (ESP32 / STM32)  
- Chemical/thermal sensors (MQ-135, BME688, MLX90614)  
- Passive membrane for pollutant detection  
- Buoy structure (PLA/ABS + foam)  
- GPS/LoRa transmitter module

# 5. Use Cases

- Oil spill detection  
- Underwater sabotage alert  
- Monitoring protected marine zones  
- Earthquake or seismic precursors

# 6. AI Trigger Module

An optional embedded AI module processes real-time sensor data. Using threshold-based or lightweight neural models, it determines whether the system should deploy the buoy.  
- Event filtering  
- Local classification  
- Energy efficiency

# 7. TRL and Roadmap Summary

Currently at TRL 3–4  
- Prototype assembly: 10 days  
- Field testing: Month 1–2  
- Relevant environment test: Month 3–4

# 8. Environmental & Technical Advantages

- No need for cables or surface equipment  
- Uses inert or biodegradable components  
- Passive by default, undetectable until triggered  
- Rapid deployment, reusable or disposable variants possible

# 9. Risks & Mitigation

- False triggers: mitigated via AI logic and testing  
- Ocean conditions: waterproofing and design adaptation  
- Detection loss: multi-unit network redundancy

# 10. Author

Alexander Shakhov — Founder of the NUTRA Concept  
Project repository: https://github.com/alexs749266/NUTRA\_OceanSensor  
Open for collaboration and demonstration