HABARI AI White Paper

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Abstract

HABARI (Holistic Animal Bioacoustic Response Interface) is a modular, self-learning, AI-powered system built to enable real-time cross-species communication...

Chapter 14: Hardware and Infrastructure Requirements

1. Core Sensing Modules:

- Microphone Arrays: Omnidirectional + directional with <20 Hz and >20 kHz range for infrasonic and ultrasonic detection (e.g., Sanken CO-100K)

- Seismic Sensors: Ground vibration pads or geophones for elephants (e.g., Raspberry Shake 4D)

- Thermal + Optical Cameras: Real-time gesture tracking (e.g., FLIR Boson, Intel RealSense)

- BCI Headsets: Non-invasive EEG readers (e.g., Emotiv Insight, OpenBCI)

2. Processing Hardware:

- AI Inference Modules: NVIDIA Jetson AGX Orin or Xavier for real-time edge processing

- Neuromorphic Chips (optional): Intel Loihi 2 for low-power pattern learning

- Environmental Sensors: GPS, magnetometer, anemometer, and humidity sensors (e.g., BME688)

- Wearable AI Devices: Arduino Portenta H7 + LoRa

3. Storage and Communication:

- Data Logging Servers: Synology NAS or SSD RAID setups

- On-Field Connectivity: Satellite routers (Starlink, BGAN Explorer)

- Mesh Network Devices: Helium LoRa devices

4. Deployment & Simulation Infrastructure:

- Drone Platforms: DJI Matrice 300 or quadcopters with payloads

- Virtual Testbeds: Unity + Habitat Simulator

- Cloud AI Training: NVIDIA A100 clusters

5. Control and Visualization:

- Touchscreen Dashboards: Raspberry Pi + 7 display

- AR Glasses: Hololens 2 or Meta Quest Pro

6. Ethical and Redundant Systems:

- Audit Trail Servers: Blockchain logs

- Secure Enclaves: Intel SGX or Pi HSMs

- Battery Banks: Solar-powered UPS (Anker, Bluetti)