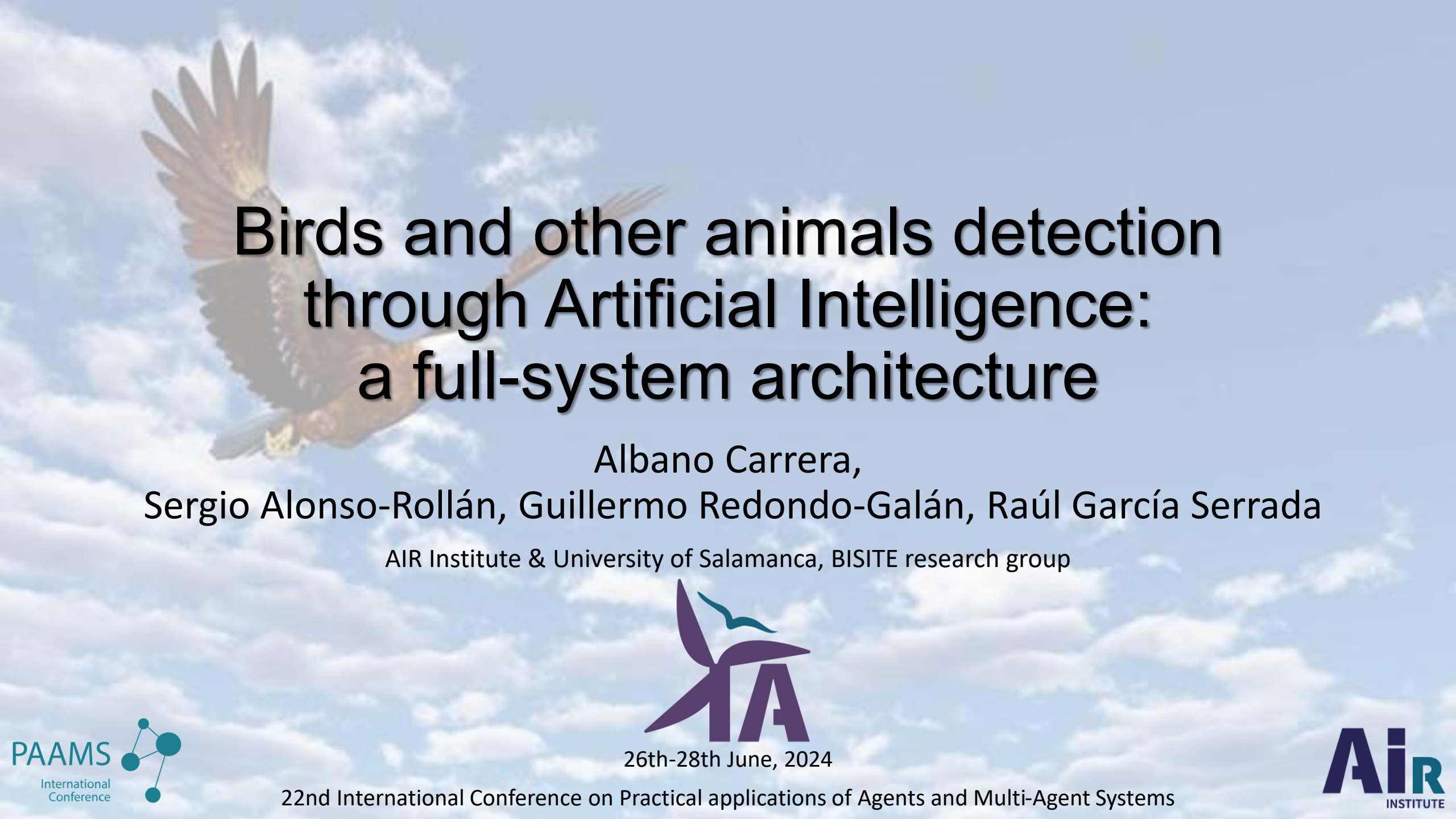




Birds and other animals detection through Artificial Intelligence: a full-system architecture

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26th-28th June, 2024

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Introduction

- Renewable energy installations
 - General wide spreading
 - Advantages
 - Negative impact
 - Landscape
 - Animal species
 - Studies before the farm installation
 - Flora and fauna
 - Short-term and long-term effects
 - Anticipation

Introduction

- Points of interest
 - Animal habitats
 - Displacement
 - Migration routes
 - Distant areas are affected
 - Factors affecting development
 - Population decimated
- Animals
 - Guides for at-risk species
 - Makers of biodiversity
 - Impact of renewable energy

Introduction

- Monitoring
 - Mathematical models
 - Algorithms for bird detection
 - Video
 - Up to 95%
 - Audio
 - Close to 100%
 - Radar
- Poor information
 - Hardware setup

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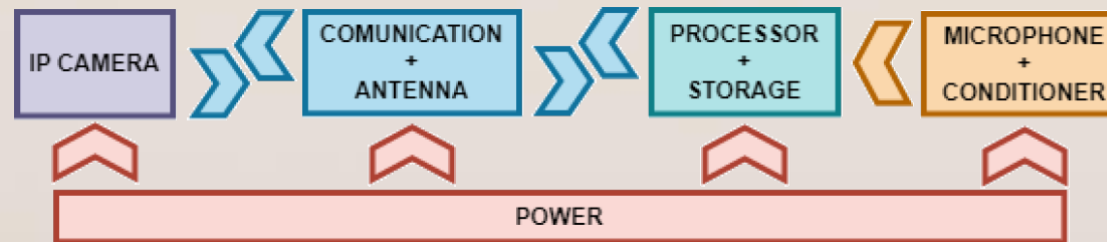
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Objectives

- Filling the gap regarding the hardware
 - Not common to share details on this part
- Presenting a high-capacity HW system
 - Monitoring birds and flying mammals
 - Video and audio functionalities
 - HW ready for high-performance AI
 - Analysing several key parameters
 - Existence
 - Number
 - Habits
 - Movements in their habitat
 - Remote data transmission
 - Power supply for grid-less environments
 - Weather resistant architecture

Results

- Systematic market review
 - Trade-off
 - Performance
 - Cost
 - Power consumption
 - Compatibility
 - Autonomous operation
 - Remote environments
- Block diagram



Results

- Video detection
 - Axis Q6225-LE
 - Pan Tilt Zoom (PTZ) Camera
 - Versatility
 - Endless 360-degree turns
 - 180-degree vertical movements
 - 31x optical zoom
 - Long-range infrared illumination spotlight
 - Military grade
 - Low energy PoE connection
 - Ethernet and several protocols supported



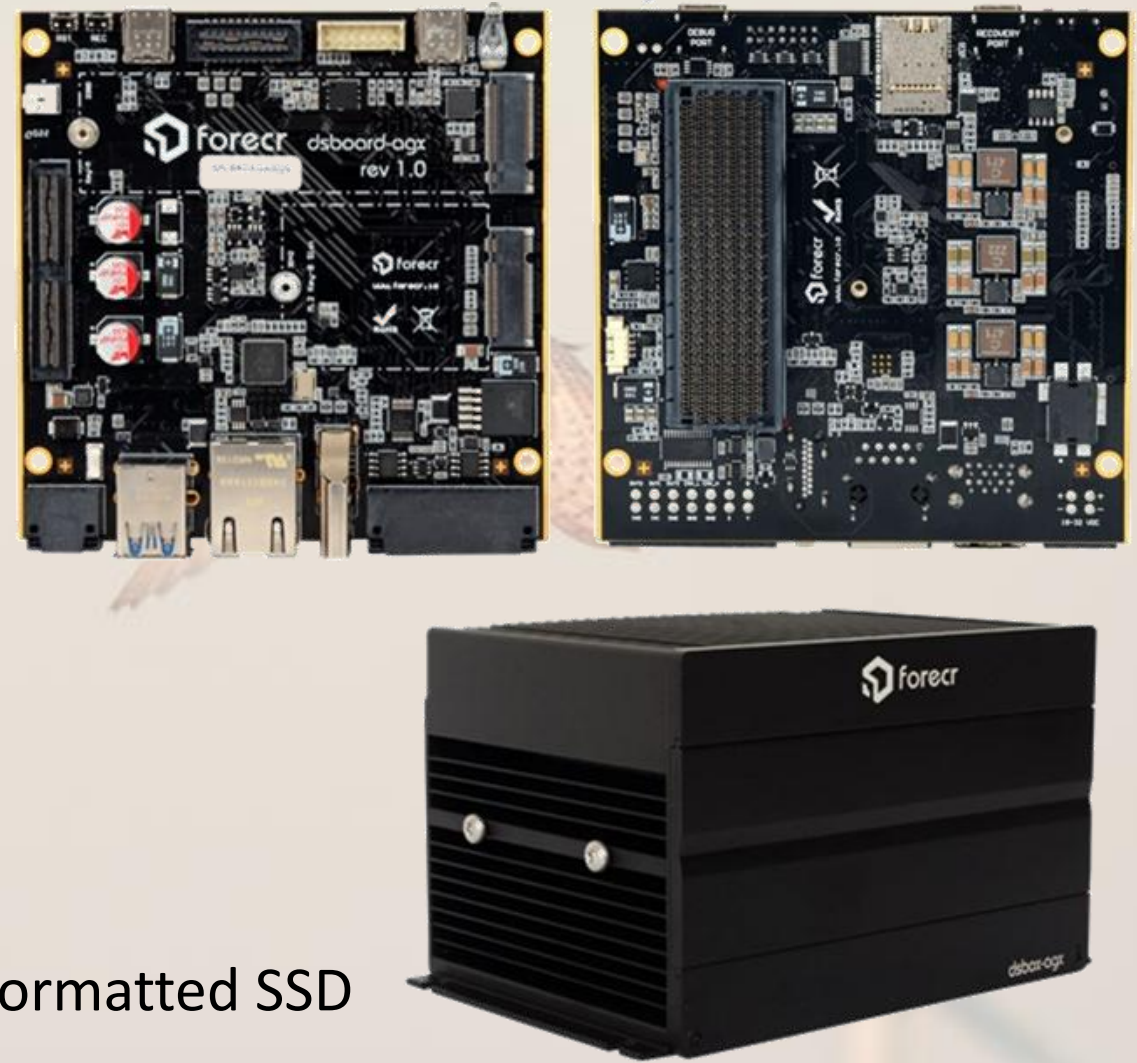
Results

- Audio detection
 - Open Acoustic AudioMoth
 - Omnidirectional detection
 - Sensor MEMS
 - Knowles SPU0410LR5H-QB
 - High sensitivity -38 dBV/Pa
 - Range from 100 Hz to 80KHz
 - Good frequency response
 - USB connection



Results

- Processor
 - NVIDIA Jetson AGX Orin 32GB
 - High-demand computational AI algorithms
 - Compatible with used protocols
 - Connected to peripheral devices
 - Power efficiency at high-performance
 - High reliability
 - Forecr DSBOX-AGX
- Storage
 - Western Digital Red SN700 2TB NVMe-formatted SSD
 - Robust and exceptional performance



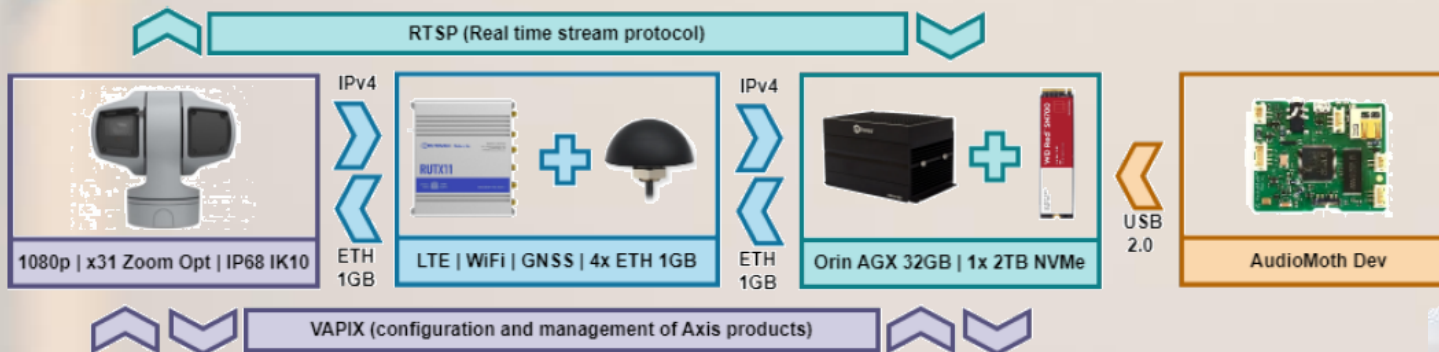
Results

- Communication
 - Teltonika RUTX11 router
 - 4G cellular networks
 - WiFi and Bluetooth
 - GNSS location
 - Ethernet
 - Teltonika PR1KC028 antenna
- Power Supply
 - 24 V power supply
 - Without weather conditioning 160 W
 - 120A battery @ 24V
 - 18 hours
 - Solar panel 550 W
 - Fully recharged < 9 hours



Results

- Final Solution



Conclusions and future work

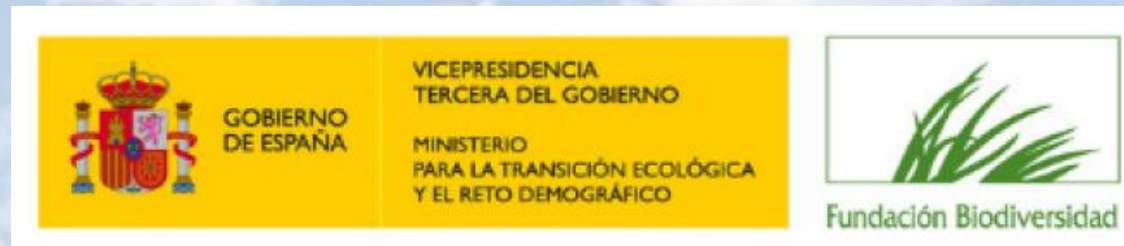
- Real need
 - Preserve biodiversity in the natural habitat
- Lack of commercial systems
- Sharing the architecture is uncommon
 - Fill the gap between AI algorithms and real world applications
- Video and pictures
 - PTZ camera
 - Nocturnal application
- Audio
 - Well-known and characterised device
 - Accepted by the scientists
- Promising results from preliminary tests
 - Ready for relevant environment tests

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IA4birds: Plataforma de IA Explicable para la predicción y protección de aves en espacios destinados a ser parques eólicos

Fundación Biodiversidad, FSP (Ministry for Ecological Transition and the
Demographic Challenge)



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