

Human Wildlife Conflict

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E O L A S

MOTIVATION

- Scottish startup founded in 2020 to develop AI for wildlife and environmental monitoring
- Initial focus on replacing helicopter counts of Red Deer in Scotland
- ESA supported extending this work to animal census in Africa
- This has led to a new ESA funded project mapping risks of humanwildlife conflict

ONE DEER, TWO DEER, THREE DEER ...

Helicopter, foot, and drone counts of deer in Scotland face reliability challenges. Among other things, limited funding often hinders comprehensive monitoring efforts and make informed decision making difficult The golden dots (data points by NatureScot) show the most prevalen deer distribution over Scotland

The challenges above are precisely what fuel our innovations. We detect deer with a to create better in costs and with bet those responsible populations and v

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Detected Dee

and Aerial Ima

Moo-saic. **EOLAS Detecting Cows**

(the white dots on the maps) and other Livestock from Satellite Imagery

> **Animal Detection** in Africa

Elephants

Animals

EOLAS detect a large variety of animals from space not only to mitiaate poachina, but also to forese human-animal conflicts, seek wildlife corridors and deepen our knowledg of animal behaviour for ecosystem preservation

The lighter the "animal point" the higher the animal pr Data Source: FOLAS Map author: Sarah Robin Daniels Basic terrain hillshade by ESRI Living Atla



CHALLENGES FOR AMIMAL CENSUS AT SCALE

- Regular census is vital for understanding health of populations
- Helicopter counts widely used, but expensive and can be risky
- Satellite imagery has potential, but there are limitations:
 - Max resolution ~30cm
 - Small image footprints (e.g. 20km swath)
 - Expensive
 - Manual counts very time consuming
 - Al algorithms need quality training data





Al for Habitat Monitoring and Animal Census

AI4AC

EOLAS

- Funded through the ESA EO Science for Society funding call
- Investigated environmental and biodiversity factors within the Maputo National Park in Mozambique
- Project developed satellite imagery and machine learning pipelines for:
 - Census of large, land herbivores (elephants, giraffes, zebras, etc).
 - Habitat classification
 - Habitat fire risk assessment





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- Key learnings from Peace Parks:
 - Sophisticated monitoring, GIS and data management in place
 - Attempts made to have rangers collect and share data, but struggling with uptake.
 - Human wildlife conflict, particularly with elephants, a key concern
 - Elephants damage crops
 - Frequently killed by villagers or poached

LESS COST. MORE INSIGHT.

USER REQUIREMENTS



DEMONSTRATION SERVICES

Animal detection using convolutional deep learning algorithm



Brush mapping using semantic segmentation



Monthly fire risk using random forest classifier





Project Mali Elephants

- Small project commissioned project by Wild foundation
- Aim to conduct elephant census to understand the impact of poaching on the previously tracked groups.
- Mopti region chosen as elephant patterns well understood



Project Mali Elephants



EXPANDING ELEPHANT DETECTION ALGORITHM TO MALI

Iterative training data collection



EDLAS



Elephant detections



Animal Heatmaps

MALI ELEPHANTS







Heatmap showing the distributions of different classes of animals accross the AMB3 AoL $\,$

The size is based on the number of pixels in the images, however a broad estimation of the classification for understanding utilisation could be taken as:

Small - sheep / goats Medium - cattle Large - elephants or camels

Data Credit: Map data copyrighted OpenStreetMap contributors and available from https://www.openstreetmap.org

AMB3 Small Animal Detections (Red - Left)

AMB3 Medium Animal Detections (Blue - Centre) AMB3 Large Animal Detections (Green - Right)

Derived from Airbus Pleaides Neo satellite imagery

Legend

4 6 8 10k



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Analysis found poor correlation between Al detections and ground survey counts.

Why?

- Data collected during dry season with satellite overpass times centred around midday
- Animals were often taking cover under vegetation or sheltering in water
- Animals in open had sun overhead reducing strength of shadows





Human Wildlife Conflict

Park Mozambique Harare Quelimane Parque Nacional da abwe Mutare Gorongosa Beira Vilankulos ark GAZA PROVINCE Inhambane Kruger National Park Sabi Sand Nature Reserve UMALANGA

ESA funded project (Apr 2024 - May 2025)

• Aim:

 Develop a data portal for managing human wildlife conflict (HWC) at landscape scale

Project overview

- Bring together our distinct AI / analytics pipelines into a smarter whole
- Objectives:
 - Create datasets that map HWC risk factors for the study area
 - Create a combined HWC risk layer
 - Create a portal that provides risk layer and datasets for conservation managers



EXISTING DATA

- Peace Parks have data on human activity and animal census within parks
- Wildlife corridor less well mapped
- Elephant collar data also available
- Seasonality is a key driver of animal movement



Human Wildlife Conflict Risk Layer



USER REQUIREMENTS

- Two main types of use envisioned:
 - Support rangers to plan monitoring activities day to day
 - Help land managers understand and plan new interventions such as planning watering, resettlement, fences and livestock management
- Risk layers must reflect seasonality, we need to characterise risks in dry and wet season as dryer = higher risk of conflict
- Interactive risk weighting would allow for data exploration
- Animals don't spend long in highest risk areas of the corridor, so detection as they move through will be difficult
- Multiple methods of data delivery needed- web portal for wider dissemination and data layers for PPF GIS team to support field teams



Where Next for EDLAS?



GEOSPATIAL CONSULTANCY

Provision of customer bespoke mapping for their particular problem and area.



BESPOKE GEOSPATIAL PLATFORMS

Full build services for bespoke geospatial platforms.

EXPANDING OUR OFFER



THEIA AUTOMATED MAPPING

Creation of a toolkit of automated mapping functions available through Theia.



DEVELOPING NEW SERVICES

NATURAL CAPITAL ASSESMENT



BIODIVERSITY NET GAIN





RISK ANALYSIS



PEATLAND CONDITION MAPPING





THANK YOU FOR LISTENING





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