AI for Good:
Recent and upcoming opportunities to learn & share, and resources

August 27
Webinar: AI Primer

- What is AI, ML, Big Data?
- What are the types of ML?
- What are key AI capabilities?
- What is the process for developing & using AI/ML?

Sept 19
Webinar: Practical Implementations in Conservation Context
- Protection Assistant for Wildlife Security – Carnegie Mellon University
- Mapping Ocean Wealth – The Nature Conservancy

Oct 21
- Session: Ethical AI (80min, NetHope members only, partners by invitation only)
- Session: Demos of AI/ML tools & services

Oct 23
- Session: Practical Implementations (The Carter Center, Plan International)
- Session: Learn how to evaluate AI for your programs (hands-on session).
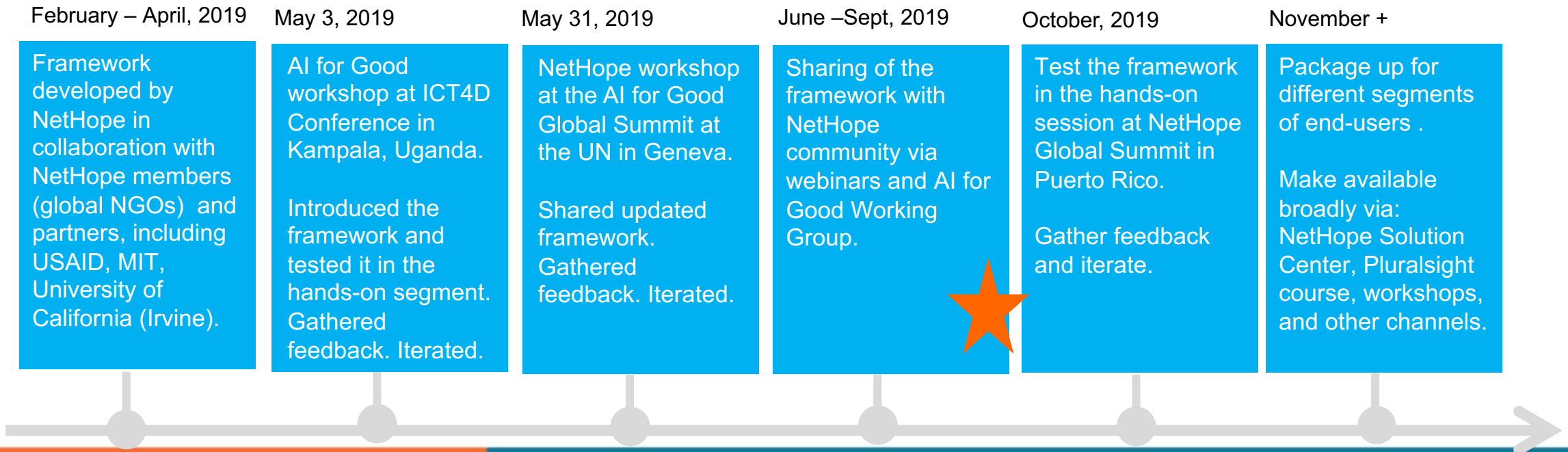
Package up content from the Summit sessions and make it available via webinars and Solution Center.

Ongoing (Monthly meetings):
AI Working Group meetings (NetHope members only)

AI for Good Framework

- **Purpose:** This framework is designed to guide nonprofits and supporters through the evaluation process to determine suitability of AI for international development programs and to plan for sustainability.
- **Approach:**
  - Driven by the need of the sector for practical tools.
  - Developed through an iterative and consultative process.
  - Designed to be used by different stakeholders: Practitioners, Technologists, Donors.

February – April, 2019

Framework developed by NetHope in collaboration with NetHope members (global NGOs) and partners, including USAID, MIT, University of California (Irvine).

May 3, 2019

AI for Good workshop at ICT4D Conference in Kampala, Uganda.

Introduced the framework and tested it in the hands-on segment. Gathered feedback. Iterated.

May 31, 2019

NetHope workshop at the AI for Good Global Summit at the UN in Geneva.

Shared updated framework. Gathered feedback. Iterated.

June –Sept, 2019

Sharing of the framework with NetHope community via webinars and AI for Good Working Group.

October, 2019

Test the framework in the hands-on session at NetHope Global Summit in Puerto Rico.

Gather feedback and iterate.

November +

Package up for different segments of end-users .

Make available broadly via: NetHope Solution Center, Pluralsight course, workshops, and other channels.

SAMPLE QUESTIONS.

1-WHAT PROBLEM ARE YOU TRYING TO SOLVE?
2-HOW IS THE PROBLEM BEING ADDRESSED TODAY?
3-WHY IS AI BETTER THAN THE CURRENT SOLUTION?
4-WHAT IS THE SOLUTION?
5-WHAT KINDS OF DATA DOES YOUR SOLUTION NEED?
6-WHAT RESOURCES DO YOU NEED TO SUPPORT THE DEVELOPMENT, IMPLEMENTATION, AND MAINTENANCE OF THE SOLUTION?
7-WHAT ARE THE POTENTIAL BIASES THAT AI MAY INTRODUCE OR AMPLIFY IN YOUR CONTEXT?
8-WHAT IS YOUR APPROACH TO MAINTAINING THE SOLUTION?

http://bit.ly/AI4Gframework

PAWS

Protection Assistant for Wildlife Security

What problem are you trying to solve?

Save the Wildlife from Poaching

Wildlife conservation agencies and national parks lack quality tool to design effective patrol routes to prevent poaching of wildlife in large size national parks.

Today $\approx$ **3,200**

100 years ago $\approx$ **60,000**

How is the problem being addressed today?

Human Designed Patrol Routes

- Only use paper maps and past patrol routes and findings visualized in SMART etc
- Need to account for many different variables

Limitations

"In most parks, ranger patrols are poorly planned, reactive rather than pro-active, and habitual in their deployment"-- Emma Stokes (Conservation Scientist)

- Time consuming
- Human bias
- Once designed, no frequent update (used for months or years)
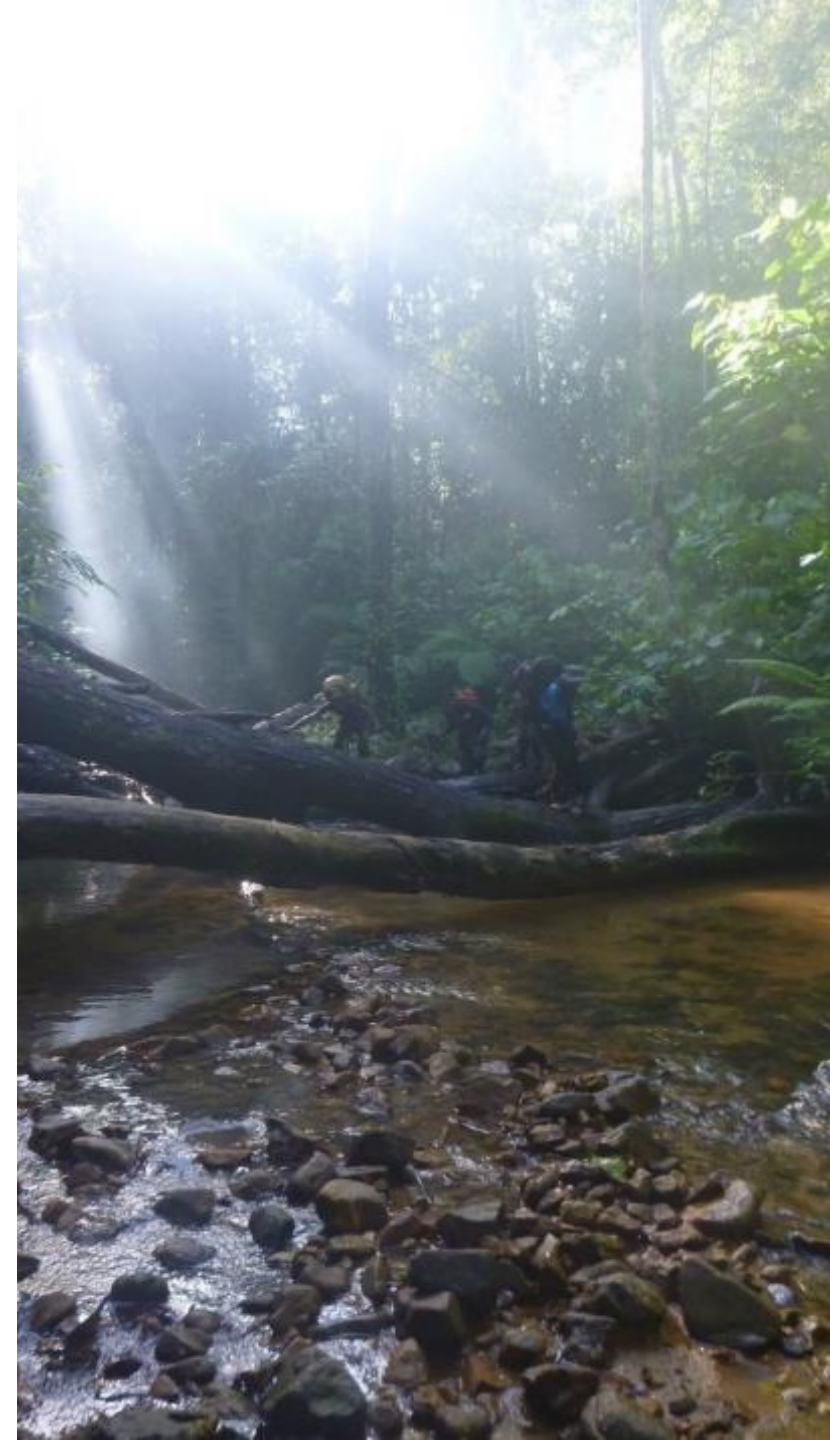
Why is AI better than the current solution?

Reduce Cognitive Burden

- Make more informed decision and design based on more information and analysis
- Less time needed
- Even less experienced manager can handle the task

Make the Most Out of the Patrols

- Exploits existing data to find patterns in poaching activities (Machine Learning)
- Account for the poachers' adaptation to patrols and design targeted, proactive patrol routes (Game Theory)

Artificial Intelligence

Machine Learning

Game Theory

Anti-Poaching
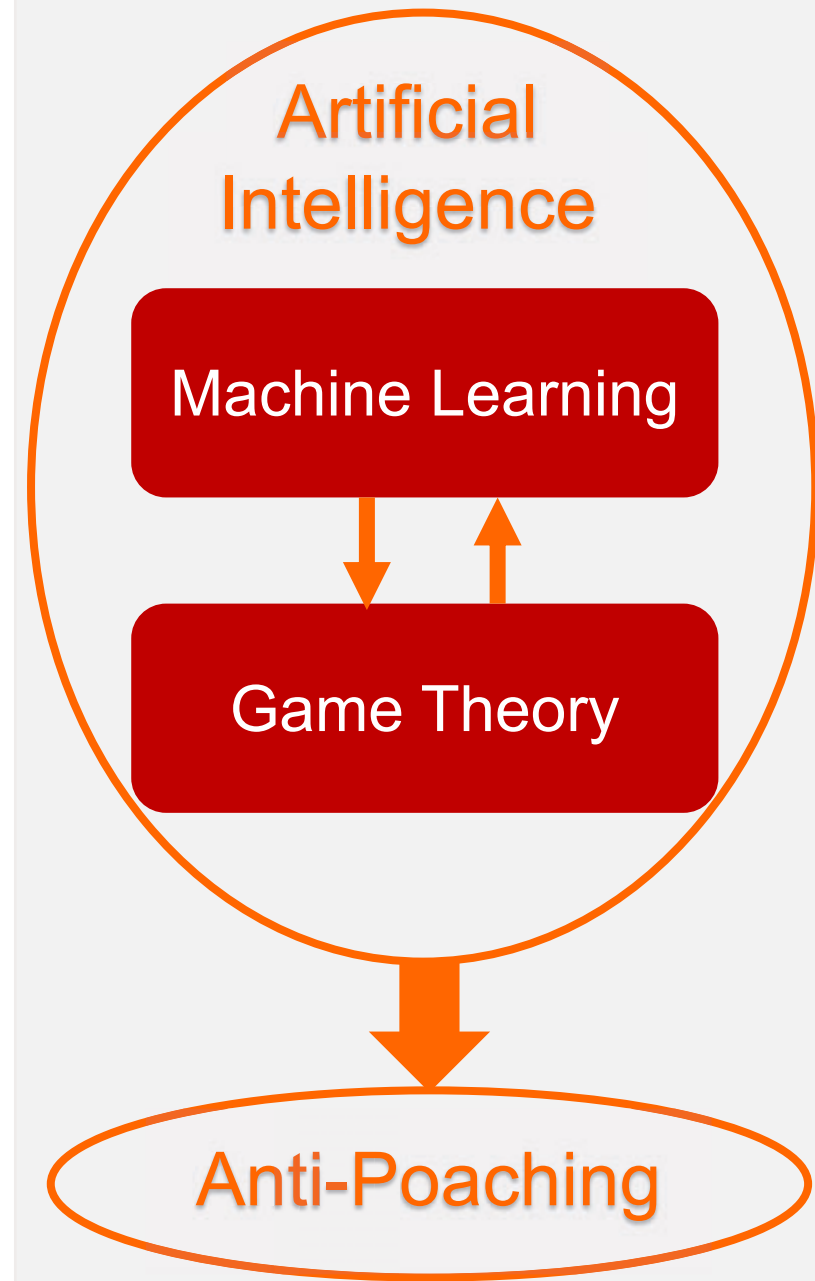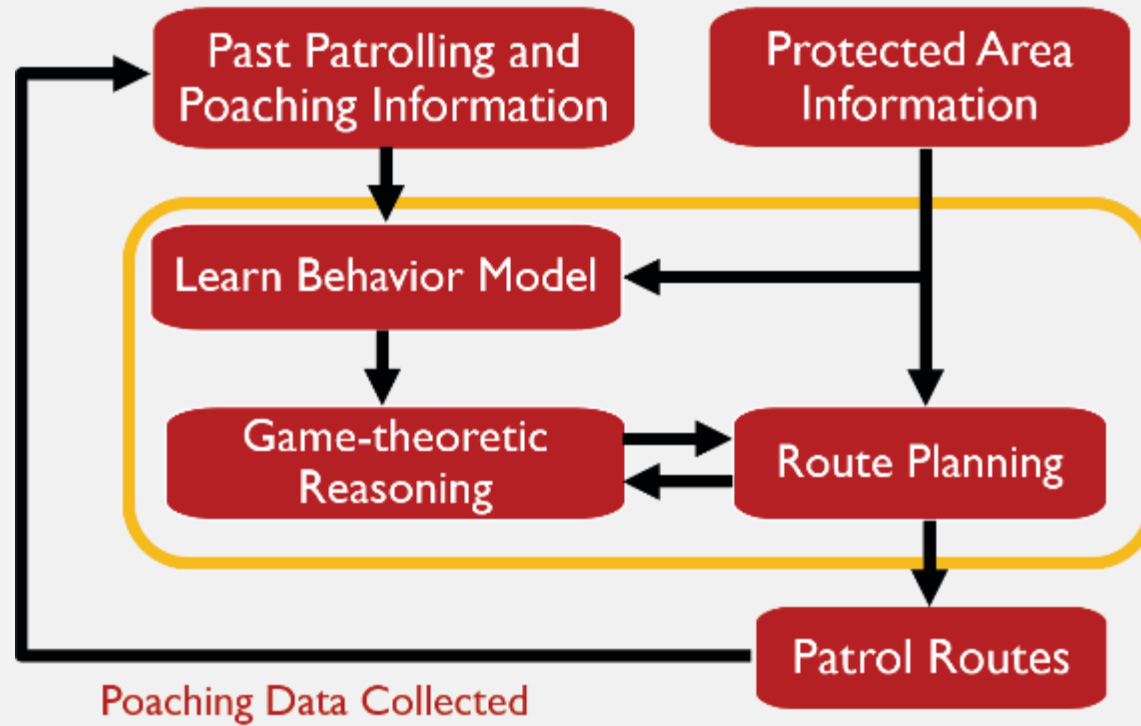
What is the solution?

An AI system that helps park rangers design effective patrol routes to prevent poaching of wildlife in large size national parks.

What kinds of data does your solution need?

Patrol Data + Geospatial Data

- Past patrol routes and findings of poaching signs
- Location of villages, roads, rivers, etc
- Slope, elevation, land cover
- Animal distribution

Where and how are you getting these data?
- For conservation sites that use SMART software to record the patrols and findings, patrol data can be extracted from there
- Geospatial data can either be provided by GIS experts or publicly available data source (often less accurate or less fine-grained)
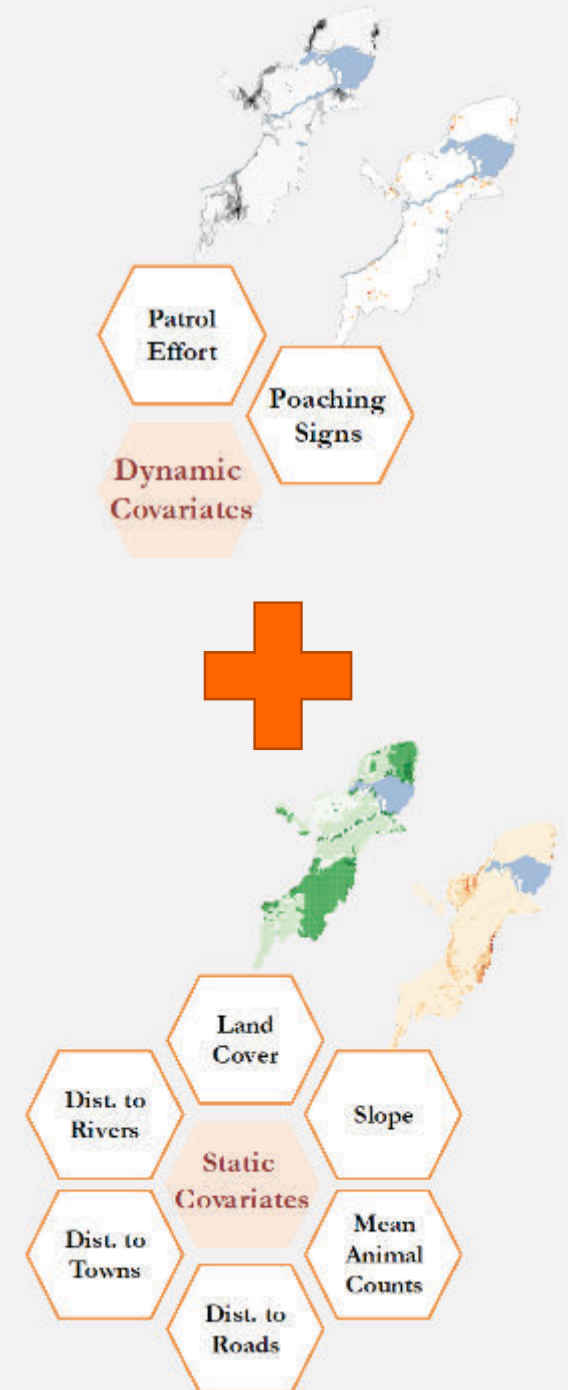
What resources do you need to support the development, implementation, and maintenance of the solution?

Technical

GIS expert who can provide data and import the solution of PAWS

Data analyst to process the data

Computing resources to train the model and compute patrol route

Non-Technical

Domain experts to convey domain knowledge and provide feedback
- What kind of poachers they are facing? What factors do they consider?
- Which parts of the prediction/suggested route are not reasonable? Why?

We are fortunate to collaborate with people WWF, WCS, Panthera, UWA, Rimba.

What are the potential biases that AI may introduce or amplify in your context?

Biased Historical Patrol

Some areas have been patrolled much more frequently than others. As a result, AI's prediction is more reliable for those areas and areas that have similar features, and less reliable for others.

Balance Exploration and Exploitation

In the design of patrol routes, the AI-based solution should take into account the tradeoff between exploration and exploitation.(Need to address in the future)
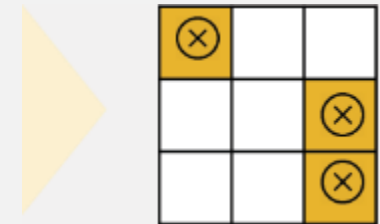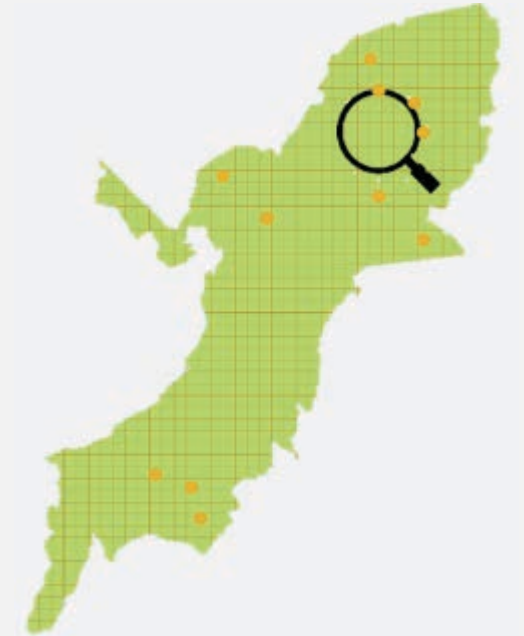
What is your approach to maintaining the solution?

Long-Term Collaboration

Continued collaboration with WWF. Test on more sites.

Explore and address more problems.

Open Source Code Repository

https://github.com/AIandSocialGoodLab/PAWS

Light-weighted & open-sourced

Collaborate with Industry for Further Maintenance

- Microsoft Research is leading the development of an API.
- SMART software development team is adding PAWS as a new feature in the next generation of the software.
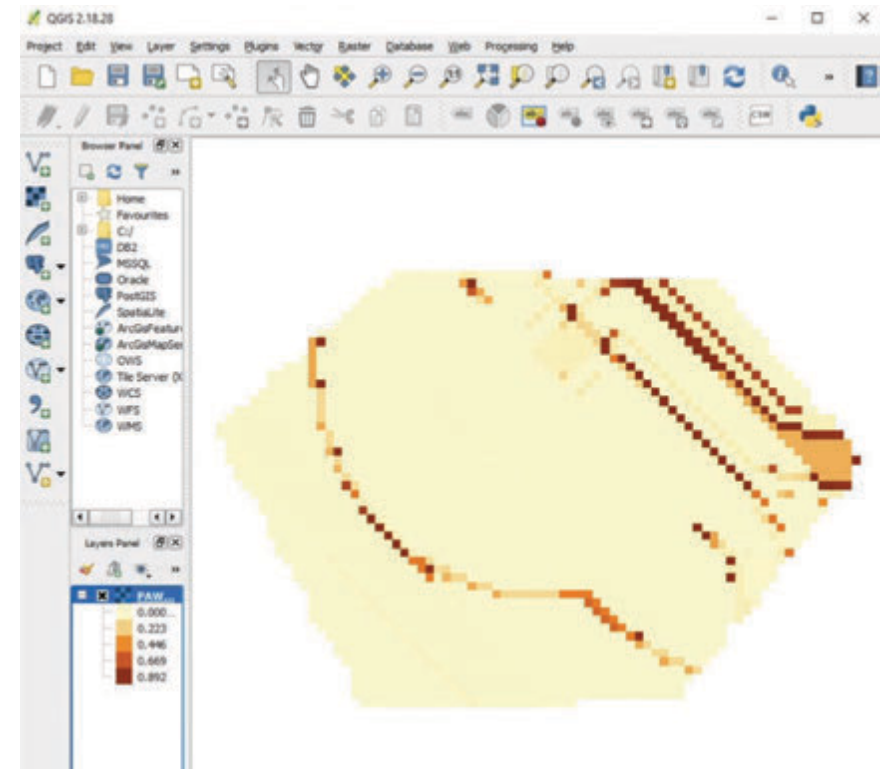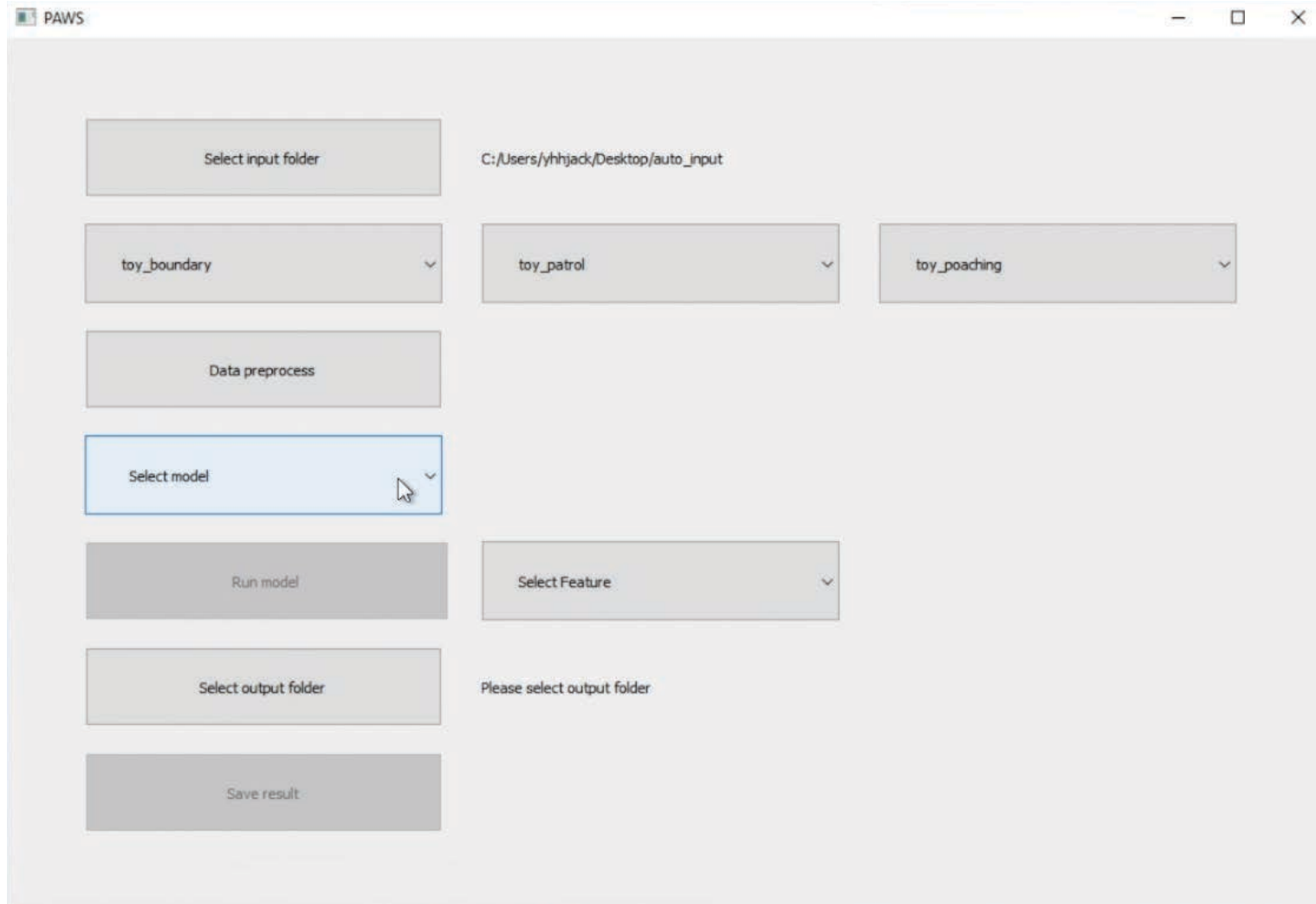
Field Tests

China (with WWF)

Uganda (with WCS)

Malaysia (with Panthera and Rimba)

Video Demo (Open Source Version)

Call for Actions

- Help us spread the word about PAWS - please share this resource with your network especially those focused on conservation
- Contact me if you are interested in collaboration
- We're looking for high-resolution satellite imagery data for detecting (illegal) mining and logging sites, which contributes to the problem of poaching. Please contact us if you are interested in contributing data or using the resulting detection tool.

MAPPING CONSERVATION AND TOURISM VALUE OF MARINE ECOSYSTEMS USING DEEP LEARNING

The Nature Conservancy

What problem are you trying to solve?

ENSURE THAT OUR MARINE ECOSYSTEMS CONTINUE TO PROVIDE GOODS AND SERVICES IN A SUSTAINABLE WAY

We must **harness the scientific knowledge, innovations, tools and applications of marine conservation, restoration and management**

MAPPING OCEAN WEALTH

Mapping Ocean Wealth **(MOW)** moves us from broad global numbers to specific local details, allowing us to **evaluate nature in marine and coastal settings as an economic asset**. The data then become actionable and inform engineering, financial and policy language that lead to better planning, conservation and investment decisions

How is the problem being addressed today?

TRADITIONAL DATA SOURCES

- Govt. stats and reports on tourism spending and visitation (tabular, written)
- Global databases (location of hotels, diving sites, shops)
- Manual key word searches from crowd-sourced platforms

LIMITATIONS

- Intensive data cleaning, integration, and validation required
- Data bias: inconsistencies in reporting details across different geographies
- Patterns in tourism: difficult to capture at the activity level (e.g. diving, snorkeling, kayaking, etc.)
- Privately-owned datasets: data sharing restrictions, privacy issues

# Why is AI better than the current solution?

INFORMATION EXTRACTION FROM BIG CROWD-SOURCED DATA

- Despite being a major driver of economies in the Caribbean, **data on patterns of tourism and recreation can be difficult to capture**
- Crowd-sourced platforms (e.g. Flickr) provide information on **specific types of activities**, **where** they are taking place, and the **perceptions** around these activities

COGNITIVE BURDEN

- Computer vision (AI) automates the task of human recognition and classification of images → solve issues of scalability and bias in the analysis of photo
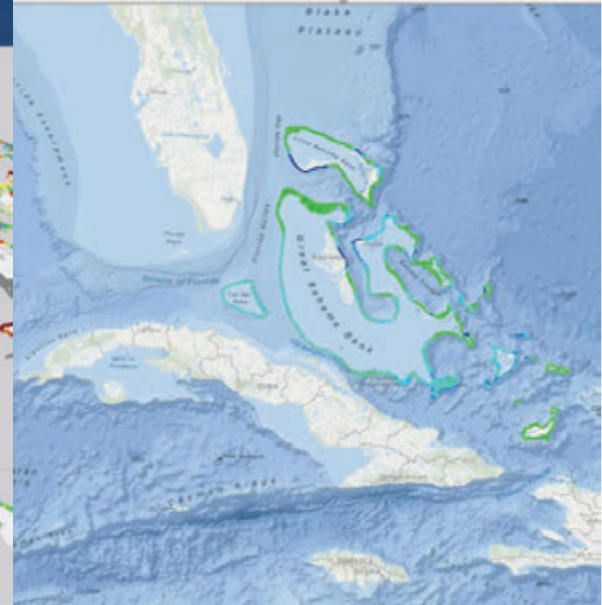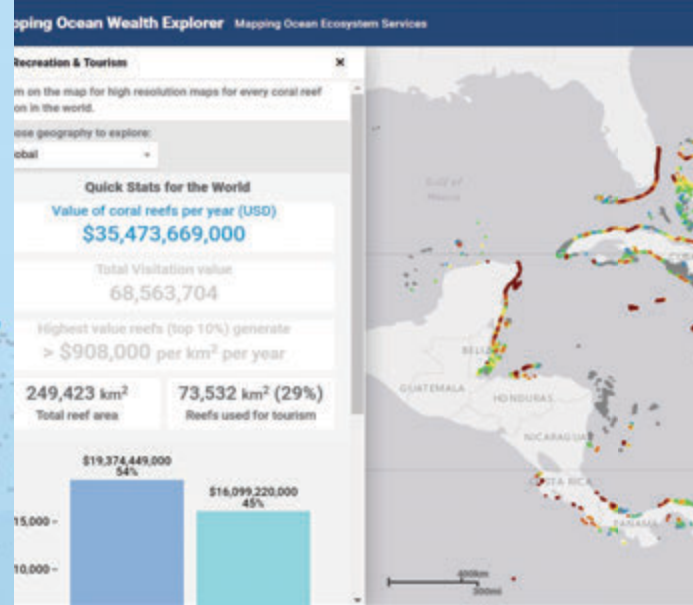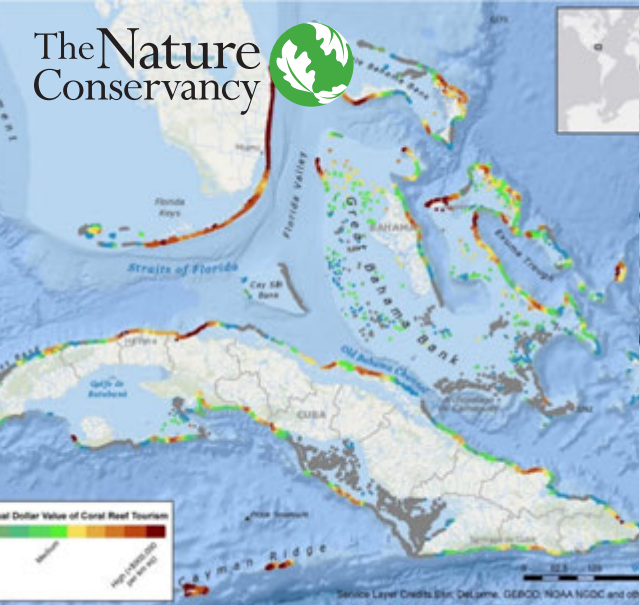
What is the solution?

Enhanced maps of culturally and economically important tourism activities to better inform **conservation planning and management of marine ecosystems**

What kinds of data does your solution need?

GEO-REFERENCED PHOTOS FOR ACTIVITIES OF INTEREST

- Set of **spatially-explicit points** (either lat/lon or locations which can be georeferenced) that point to the locations of each of the activities of interest
- Point densities giving an indication of use intensity (activity-based **photo-user-days or PUDs** derived from **date** and exact **location** of photos)

Where and how are you getting these data?

- Photos downloaded programmatically using Python [Flickr API](#) to automate metadata search by date range and location of interest

What resources do you need to support the development, implementation, and maintenance of the solution?

TECHNICAL

- AI/ML platforms and tools (e.g. Microsoft Azure – Cognitive Services)
- GIS expertise for mapping and basic spatial analysis
- Code repository (e.g. GitHub) for reproducibility and methodology documentation

NON-TECHNICAL

- Stakeholder engagement to validate model results + add complementary data context (participatory exercise, review)
- Project management
- Scientific expertise/local knowledge

What are the potential biases that AI may introduce or amplify in your context?

DATA SOURCE BIAS

- Crowd-sourced platforms cannot be expected to cover the entire range of tourists visiting an area and **may favor the preferences of users likely to use those platforms**

AI CLASSIFICATION BIAS

- **False positives** (Type I error) and **false negatives** (Type II error) arising from ML classification

TRUE POSITIVE - underwater

FALSE POSITIVE - NOT underwater

What is your approach to maintaining the solution?

INTERNAL SUPPORT AT TNC

- GitHub repository maintenance and documentation
- Microsoft Azure Sponsorship administration
- Outreach and partnerships with local governments and stakeholders in coastal planning and management in the Eastern Caribbean

SUPPORTING PARTNERS & COLLABORATORS

+ Organisation of Eastern Caribbean States (OECS), GEF, World Bank – Project funding

+ University of California Santa Cruz (UCSC) – AI/ML support

+ Critigen – Web-tool development

+ Microsoft Azure Sponsorship – Architecture and Custom Vision API

+ NetHope – In-kind Azure Grant donation
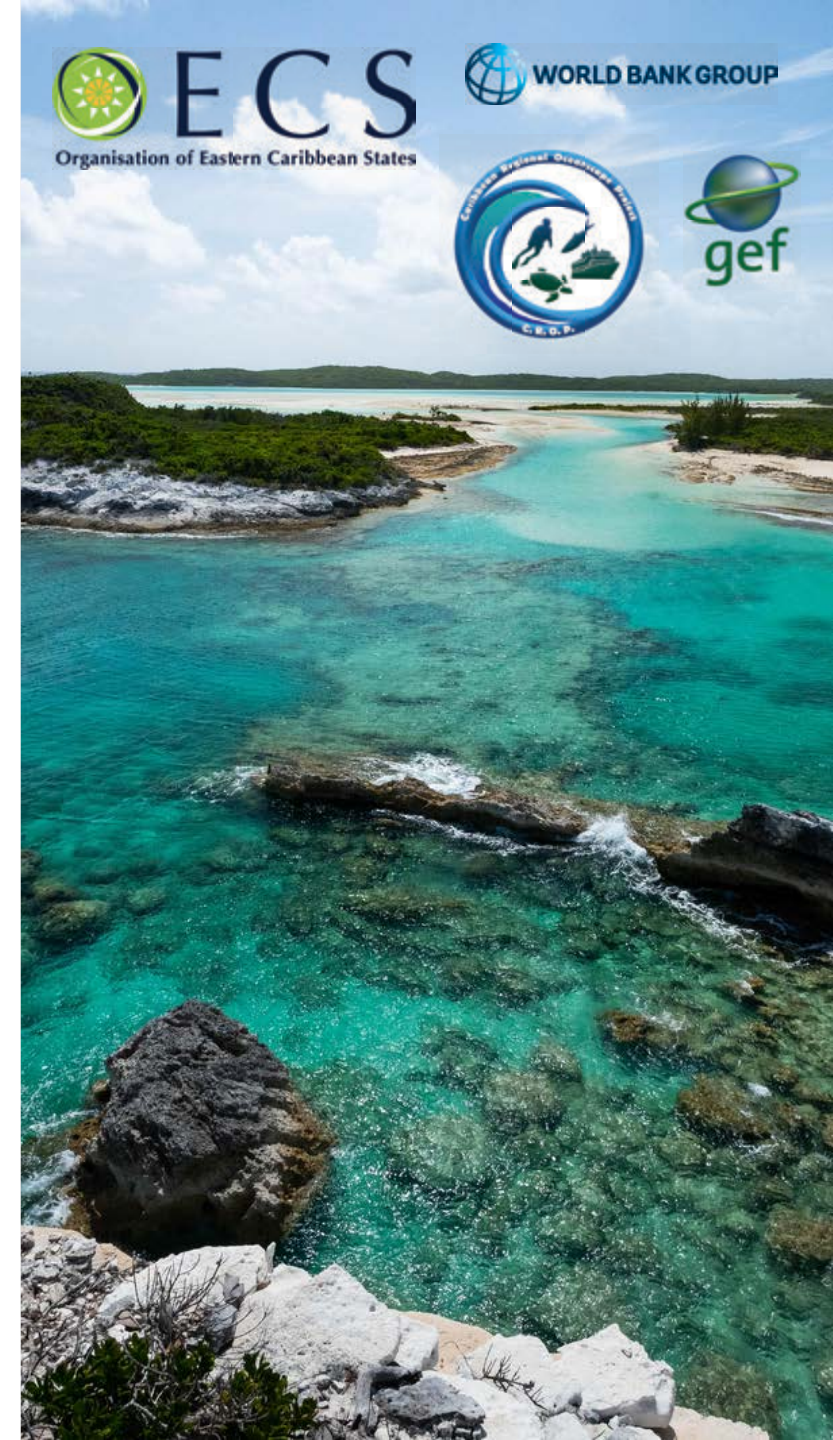
LIVE DEMO
http://maps.oceanwealth.org/

CTA & Online Resources

- [The Nature Conservancy](#)
- **Project Home Page**: [Mapping Ocean Wealth](#)
- **Project Publications**:
  - Spalding et al. (2017). Mapping the Global Value and Distribution of Coral Reef Tourism. *Marine Policy*. 82, pp 104-113. https://doi.org/10.1016/j.marpol.2017.05.014
  - Spalding et al. (2019). Estimating Reef-Adjacent Tourism Value in the Caribbean. [Report](#).
- **Videos**:
  - [Transforming Our World: Mapping Ocean Wealth](#)
  - [Mapping Ocean Wealth With The Power of AI](#)

Call to Action: please share these resources with your network, especially those working on conservation, ecosystem services, and sustainability issues. Use the resources provided here for more details and ongoing project updates.