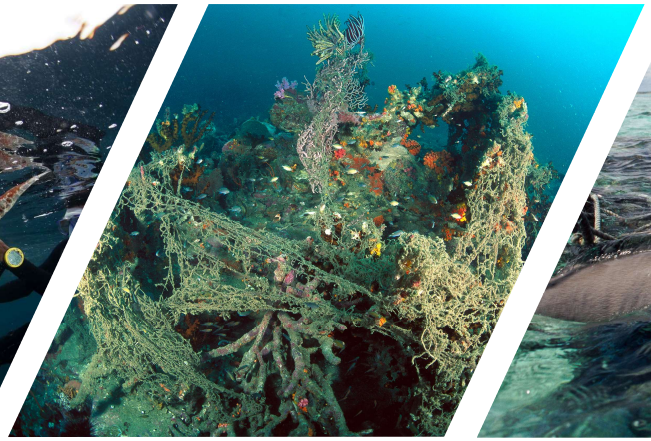
USING AI TO DETECT GHOST GEAR

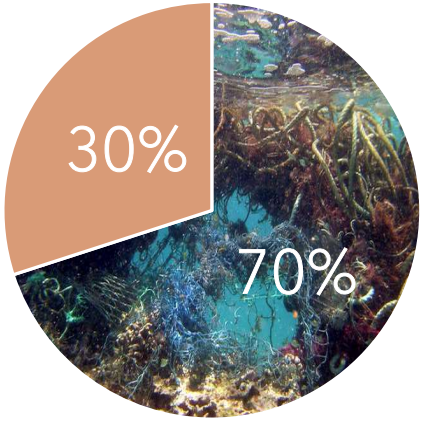
THE PUBLIC SERVICE DATA CHALLENGE

IDEA #28

This Photo by Francis Perez / The Ocean Cleanup



Macro-plastics in the ocean by weight



Caused by Ghost Gear Caused by other sources

CANADA'S COMMITMENTS

A CROSS-DEPARTMENTAL PRIORITY

Sources: [1], [2], [3]

We will accelerate our efforts to ensure Canada's marine and coastal areas remain healthy, clean, and safe for generations to come.

Our government is looking forward to continuing this important work to protect our coasts for the benefit of all Canadians.

Through our Ghost Gear Program, we're working with many organizations, communities and harvesters who want to be a part of the solution to protect and regenerate our marine ecosystems by removing this harmful waste.

Today's renewed Oceans Protection Plan gives ECCC the tools to continue to study priority species, keep our shorelines pristine and reduce oil spill impacts. Our government has accomplished a lot in just a few years, but there is more work to do.

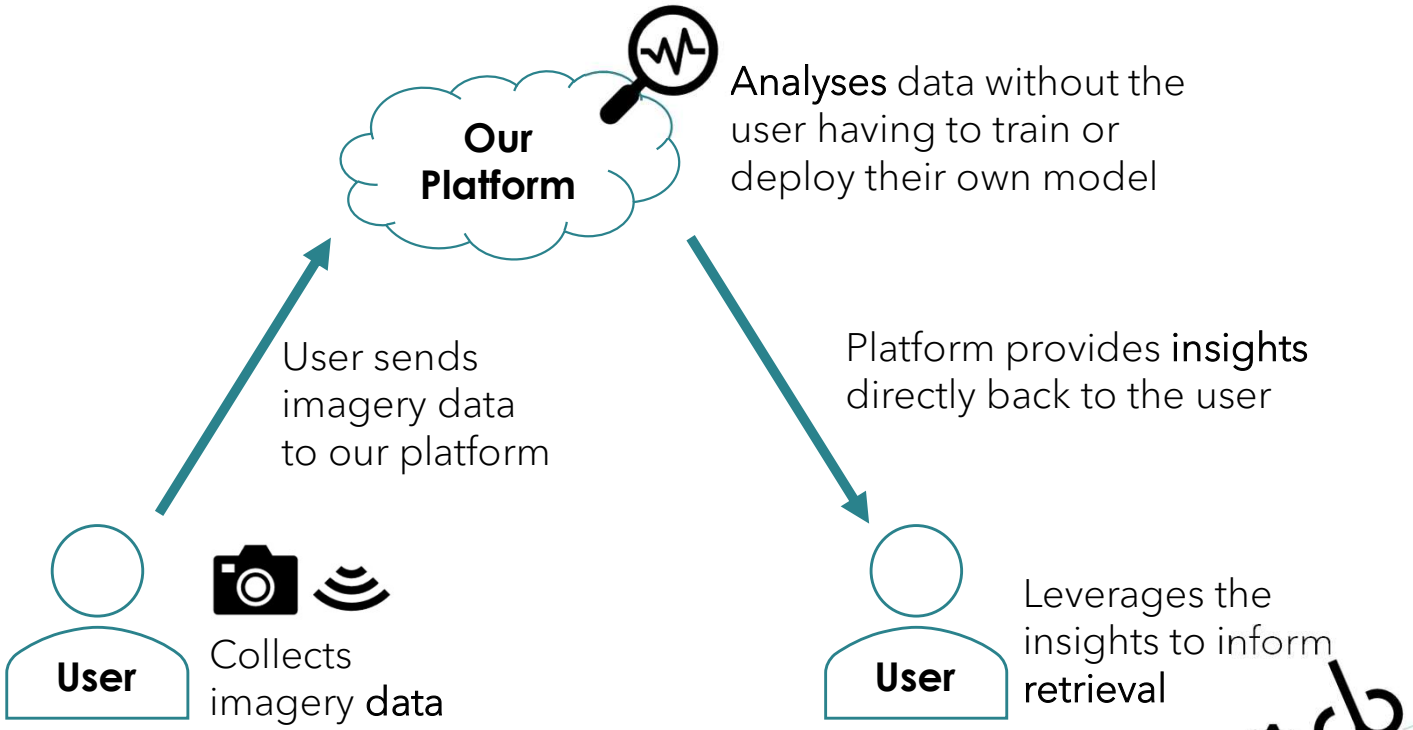
CHALLENGES WITH GHOST GEAR DETECTION

- Current Operating Model: Off-site and on-site **manual analysis** of digital imagery (camera, side sonar, drone, etc.)
- Pain Points:
  - Manual analyses are **time-consuming**, **hard to plan**, and **expensive**.
  - High rate of **false positives**.
  - External data/AI expertise comes at a premium.

OUR SOLUTION, FROM A USER PERSPECTIVE

GOALS

- Automate the ghost gear detection process
- Create efficiencies in analysis and planning
- Offer a user-friendly process

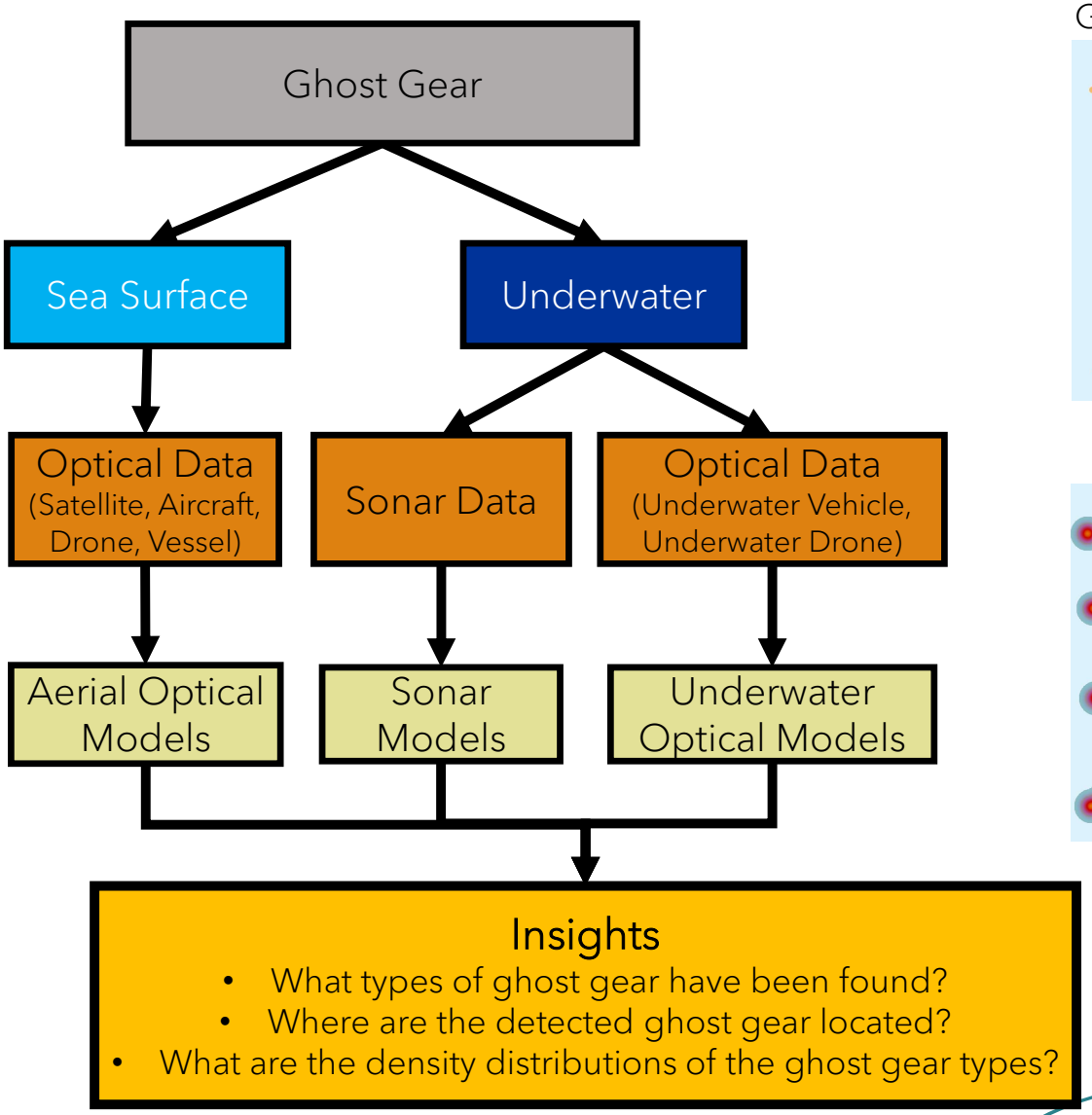


Targets:

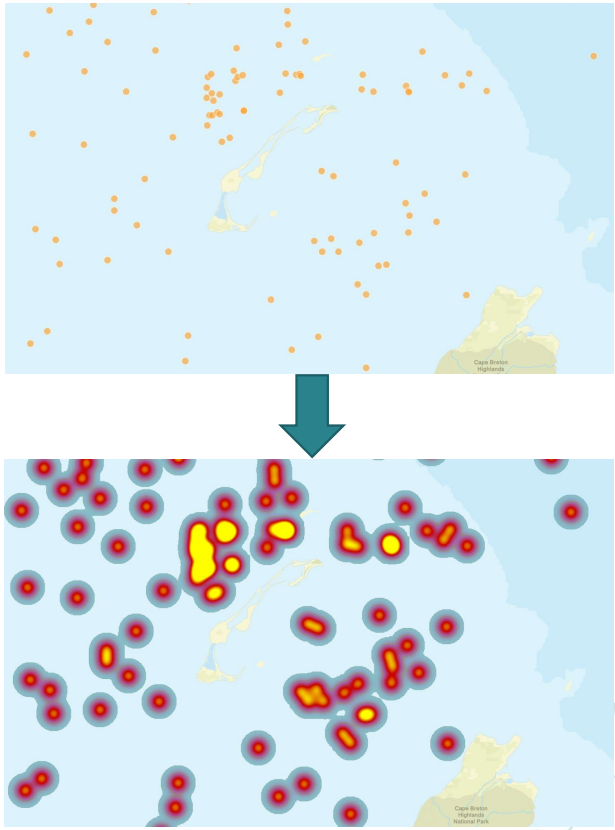
Locations:

Data:

AI:



Ghost gear detections (synthetic data)

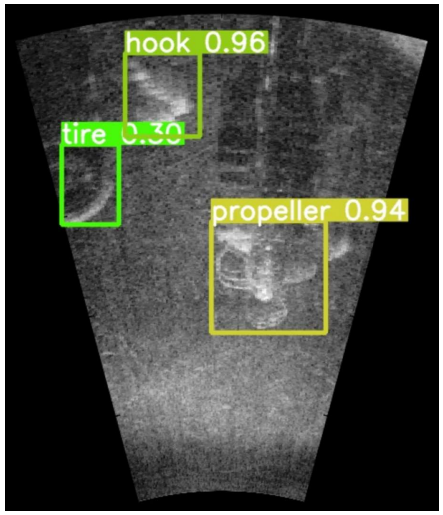


Detection density visualization

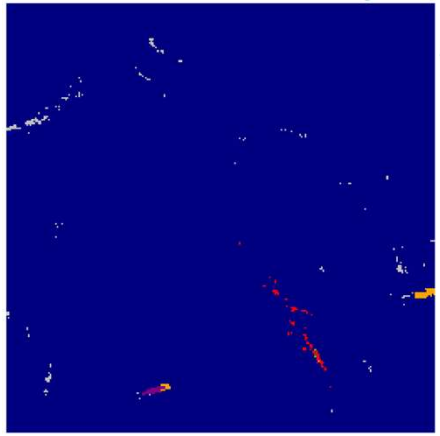
OBJECT DETECTION IN MARINE IMAGERY

- **Goal:** Automatically detect targets (ghost gear) in imagery
  - We need to answer the questions "**What** is in the image? and "**Where** in the image is it?"
- **AI solution:** Convolutional Neural Networks for object detection

Sonar detections using our prototype model



Satellite imagery of marine debris



Detection using an open-source model

- We have trained a prototype YOLOv8 model for detection on sonar imagery
  - We use transfer learning to mitigate the need for massive datasets

INTERNATIONAL LEADERSHIP

GLOBAL GHOST GEAR INITIATIVE®

SEPTEMBER 22, 2022

CANADA BECOMES FIRST COUNTRY TO CONTRIBUTE NATIONAL DATA TO GGGI DATA PORTAL

The GGGI has three key aims:

- To improve the health of aquatic ecosystems
- To safeguard human health and livelihoods
- To protect aquatic life from harm

PARTNERSHIPS AND ENGAGEMENTS

The Ghost Gear Program

> ***We support the work being proposed and look forward to identifying how we can use AI to further the successes of the Ghost Gear Program***

Marina Petrovic, Assistant Director, Fisheries Resource Management-National Programs, Fisheries and Oceans Canada

Ghost Gear Retrieval Organizations

FFAW | UNIFOR
Fish, Food & Allied Workers

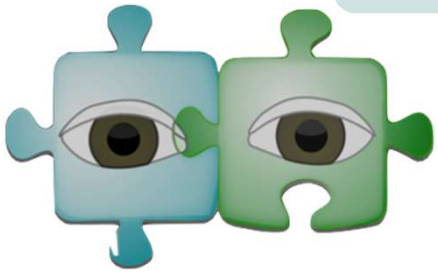
ZIP CÔTE-NORD DU GOLFE

GESGAPEGIAG

MEANINGFUL PARTICIPATION OF INDIGENOUS COMMUNITIES

Human centric

Responsible AI



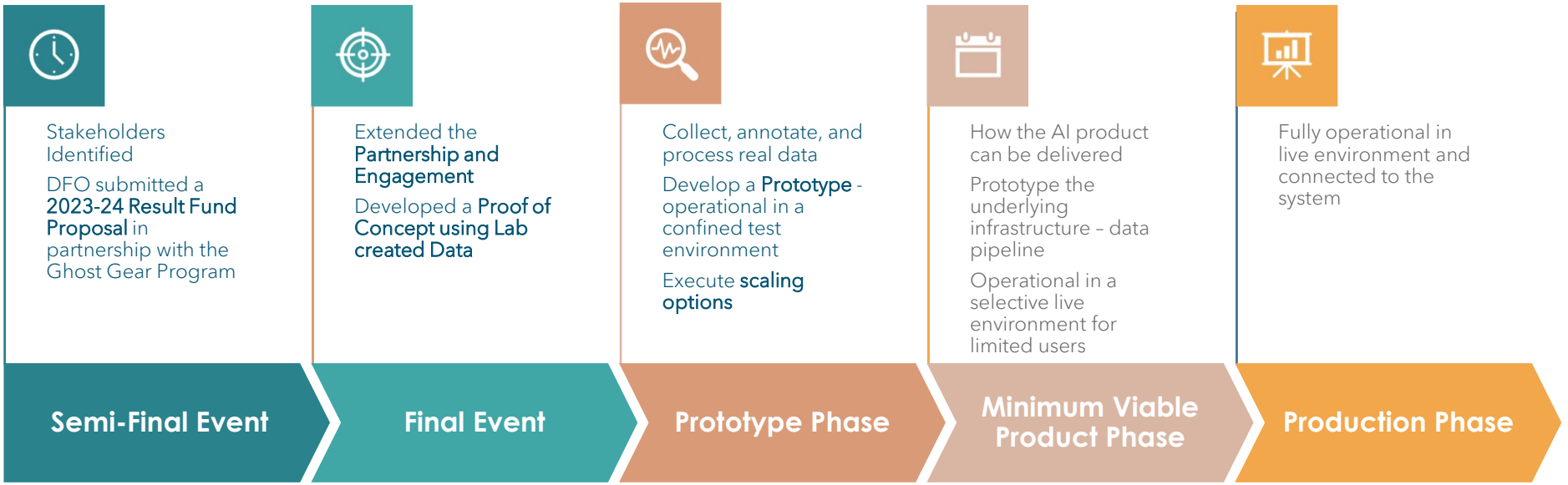
"Two-Eyed Seeing", Institute For Integrative Science & Health

Through discussions between BRFN and Seaforth Geosurveys (one of the industry partners working with BRFN on the GGF project), AI was considered as a potential solution to help make the side scan sonar "smarter" at identifying poorly reflective objects. As such, DFOs reach out regarding the potential to use AI to help make ghost gear search and retrieval more efficient is very timely. BRFN is excited to work with AI experts at DFO in an effort to advance our knowledge in this very important space. Everything we learn that makes us better at ghost gear retrieval will help clean up the environment and that is our mission.

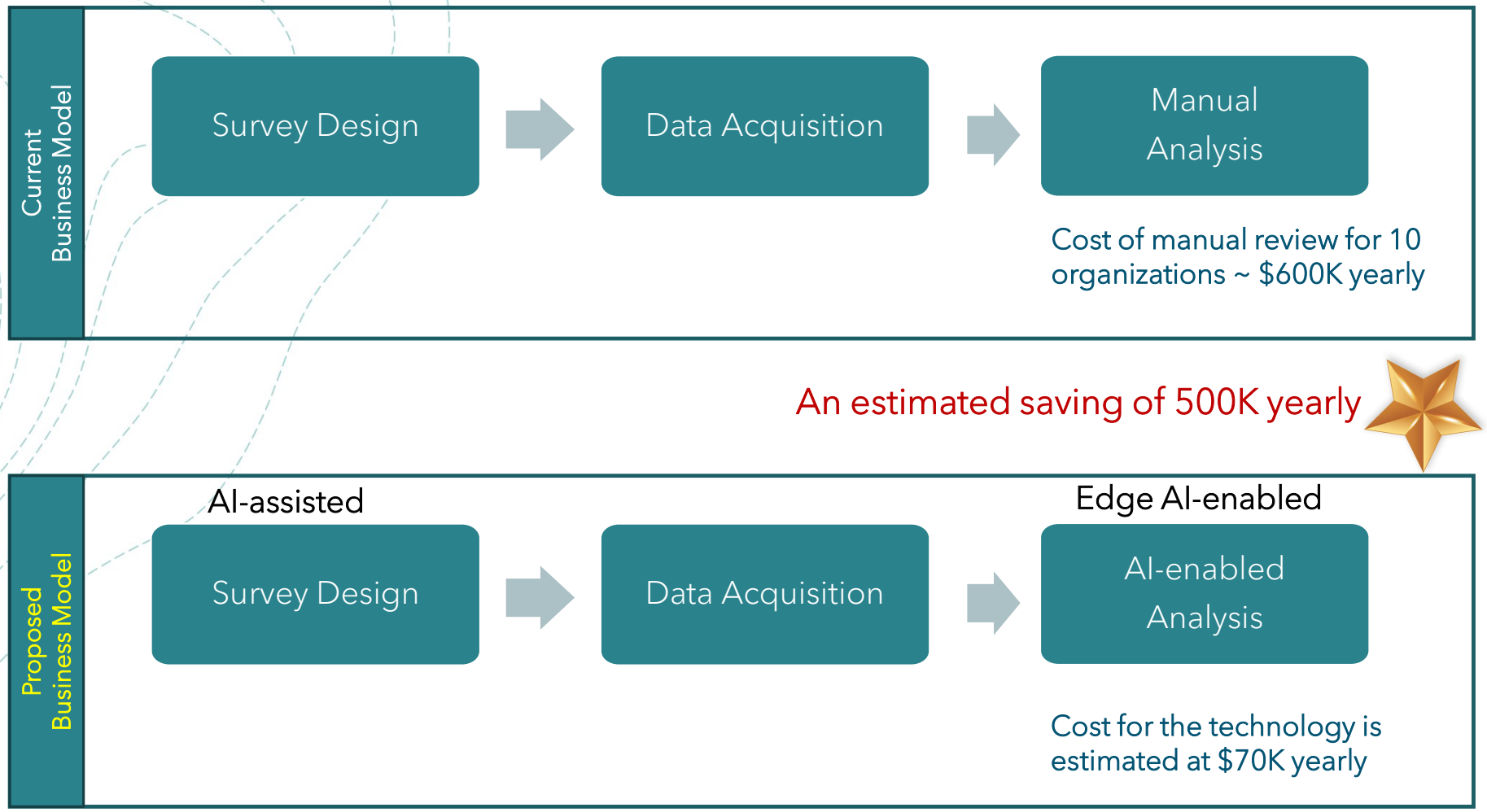
If you would like to speak further on this topic, please feel free to contact me at the above address or by email at carolannpotter@bearriverfirstnation.ca.

Sincerely,

PROJECT ROADMAP



COST-EFFECTIVENESS ANALYSIS




Develop an Effective and Scalable Solution
Use Data & AI to Conserve our Oceans
Collaborate with Ocean Stewards

TEAM MEMBERS

Alexandra Cabedoce, Employment and Social Development Canada

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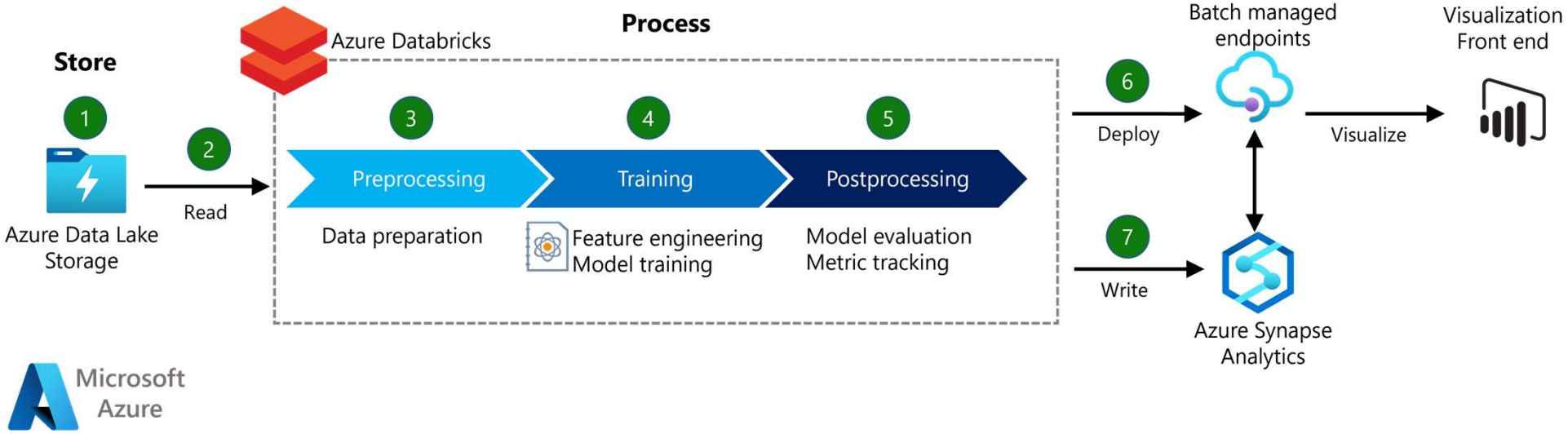
Melissa Martin, Environment and Climate Change Canada

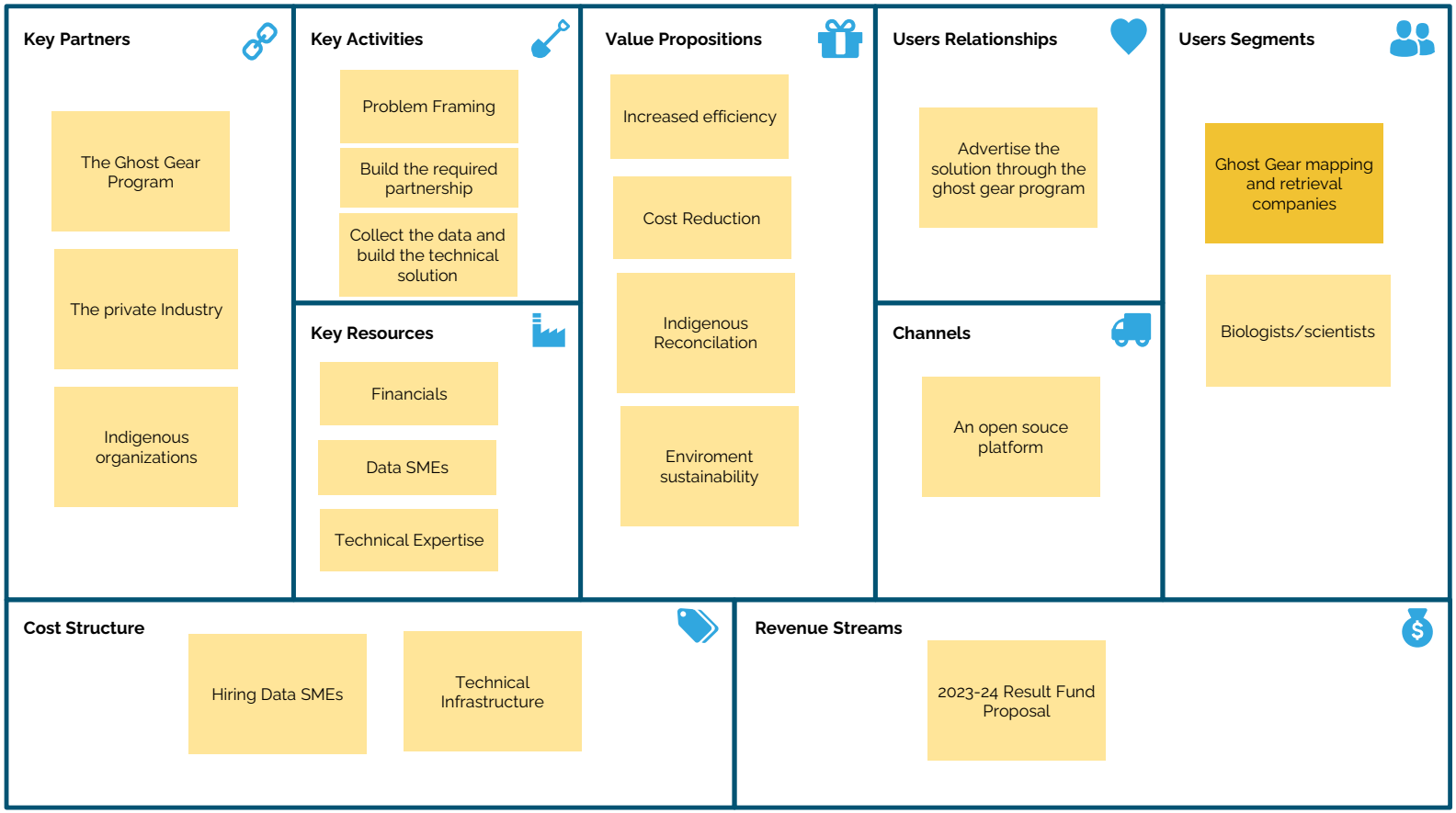
Chloe Pomeroy, National Defence

thank you


Store
Process
Azure Databricks
1
2
Read
Azure Data Lake Storage
3
4
5
Preprocessing
Training
Postprocessing
Data preparation
Feature engineering
Model training
Model evaluation
Metric tracking
6
Deploy
7
Write
Batch managed endpoints
Azure Synapse Analytics
Visualize
Visualization Front end
Microsoft Azure

The Business Model Canvas

Designed for:	Designed by:	Date:	Version:
An AI project to detect ghost gear from side sonar data	*The Public Service Data Challange Team – Idea #28*	*April 19th, 2023*	*2.0*



Original version: Strategyzer.com

THE BUSINESS MODEL ANALYST

businessmodelanalyst.com