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Predictive AI saves our planet

'It's estimated that illegal or unregulated fishing is as much as 20% of what's caught globally' says David Kroodsma, head of research team of Global Fishing Watch.

This project aims to use the power of Predictive AI to combat illegal fishing, a growing global issue that threatens marine ecosystems and sustainable fisheries.

By utilizing advanced artificial intelligence with current monitoring systems- satellite imagery and data- this project will develop a system capable of predicting and detecting illegal fishing activities before they occur.

With the ability to analyze large amounts of data from various sources, including illegal vessel movement history, the AI system will inform authorities, so they are able to take swift action, more efficient fishing regulations and ultimately preserving marine biodiversity for future generations.

01 Why is marine life so important?

Marine life has an important role in keeping the dynamic equilibrium of the world. Around 80% of life on Earth relies on the oceans for things like oxygen, food and habitats.

The loss of marine ecosystems would disrupt food security, livelihoods, and climate stability. Therefore, it essential to protect them for a sustainable future.

However, with the fishing industry being worth around $700 billion, profits and demands seem to prioritize the environmental needs.

02 What is problem of illegal overfishing?

A study titled "Impacts of Biodiversity Loss on Ocean Ecosystem Services", led by Boris Worm, concluded that by 2048, the way we're going, there will be no marine life left in the oceans.

You may believe plastic pollution to be the biggest killer of marine life, however, plastic pollution is only 10-20% of the problem whereas, overfishing accounts for 40% of marine mortality according to the Food and Agriculture Organization (FAO).

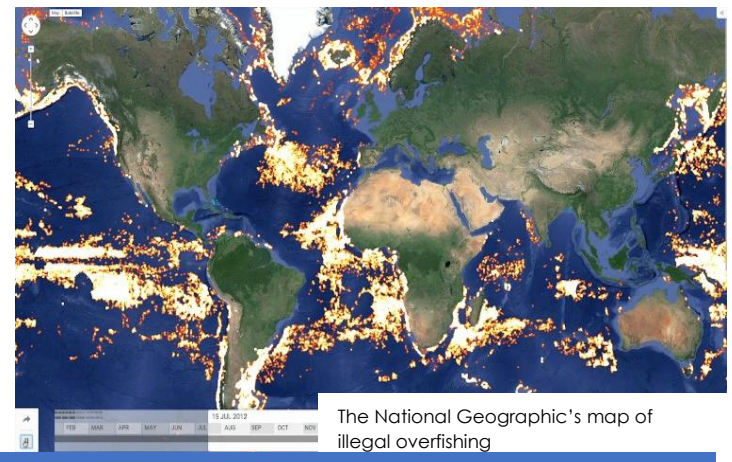
Saving our oceans goes hand in hand with combatting overfishing and therefore illegal and unregulated fishing activities.

03 How can Preventive AI stop illegal overfishing?

We believe Predictive AI (PAI) has the potential to monitor, predict and prevent all illegal fishing in the world with minimal human input.

We have discovered there are already AI-based monitoring methods however, the research into how this can go on to predict future scenarios is limited.

This means that methods now are very much reactionary rather than proactive, and not precise. This means masses of marine life are illegally slaughtered every year, which goes under the radar.



The National Geographic's map of illegal overfishing

04 Methodology: Our aims

Satellite Imagery

- Satellite imagery plays a crucial role in identifying illegal fishing vessels by monitoring ocean activity in real-time. Through high-resolution images, satellites can spot vessels operating in restricted or protected waters (Marine Protected Areas), especially in areas where human regulations are little or limited.
- By using PAI to analyze past satellite data, including the locations and timestamps of previously detected illegal vessels, patterns can emerge that show common routes or times when illegal activity is more likely.
- Using PAI and machine learning, authorities can predict where and when these vessels are likely to appear in the future. This predictive capability enables law enforcement to deploy resources more effectively, intercepting and capturing illegal vessels before they can carry out their illegal activities.

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Illegal Fishing Prediction System
Enter search criteria (leave blank if not applicable):
Enter vessel ID:
Enter Longitude:
Enter Latitude:
Enter Timestamp (YYYY-MM-DD HH:MM:SS):

Result:
     vid            timestamp  ...  distance_from_shore  prediction
8     20  2020-03-09 11:01:00  ...                   55     0.56225
13    26  2024-09-15 06:40:00  ...                   12     0.56804
14    61  2020-06-01 06:40:00  ...                   24     0.60104
16    65  2024-01-30 10:49:00  ...                   35     0.57441
22    86  2021-01-17 03:56:00  ...                   29     0.60131
..   ...                  ...  ...                  ...         ...
989   18  2023-01-05 02:56:00  ...                   77     0.59230
990    5  2020-06-05 07:59:00  ...                   20     0.58899
993   12  2023-02-25 11:25:00  ...                   42     0.55646
994   75  2024-05-24 05:37:00  ...                   73     0.56585
997   48  2021-05-08 03:47:00  ...                   14     0.55749

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Our model PAI code

05 Methodology: Our plan

Satellite & PAI influenced coding

- We've created a sample data set from The Global Fishing Watch, and we've used this with the Predictive AI model. Our model is a Random Forest Regressor which is a PAI.
- We've trained this model on 1000 ships features: where they were fishing, what time, the speed of the vessel and the vessel's distance from shore, knowing which ones were legal and which were not.
- We created mock data where we didn't know if they were illegal or not and our AI generator gave us a prediction based of the target features on how many it thought were illegal.
- This number turned out to be 226 predicated incidents of illegal fishing. The sample of illegal fishing boats out of 1000 is around **22.6%** which is a similar number to the estimate from The Global Fishing Watch: '*illegal or unregulated fishing is as much as 20% of what's caught globally*'.

06 Prospects

We believe in the future, having other forms of marine monitoring alongside PAI can increase accuracy and effectiveness of tracking and controlling illegal fishing. We researched that the following additional methods would be economically viable and practical.

- Ariel drones- PAI can analyze patterns of AI-identified illegal vessel movement from drone footage. Patterns like typical fishing season trends, and geographical areas of concern, can be used to forecast when and where illegal fishing is most likely to happen next.
- Underwater acoustics- AI algorithms recognize specific acoustic patterns (like an increase in engine noise at certain and repeated periods), but PAI can forecast areas, times and quantities of illegal fishing, based on past acoustic data, even in the absence of direct sightings.
- Synthetic data analyzing- Some sources of real time data on illegal fishing is sparse or incomplete, so synthetic data not only helps to fill the gaps but also predicts what could happen in the future using Predictive AI and the artificial synthetic patterns.
- Dark web and social media analyzing- PAI can not only scan for hidden signs of illegal fishing activities such as: posts, transactions and conservations, but it can flag potential sites and times-based on online information and data- to predict the illegal activities.

Overall, our idea of PAI in the fishing industry has great potential and could change the way we regulate our oceans, preserving the only world we have and the beautiful life within it.