IMAGE RECOGNITION TO PROTECT OUR SEAS

Green AI project

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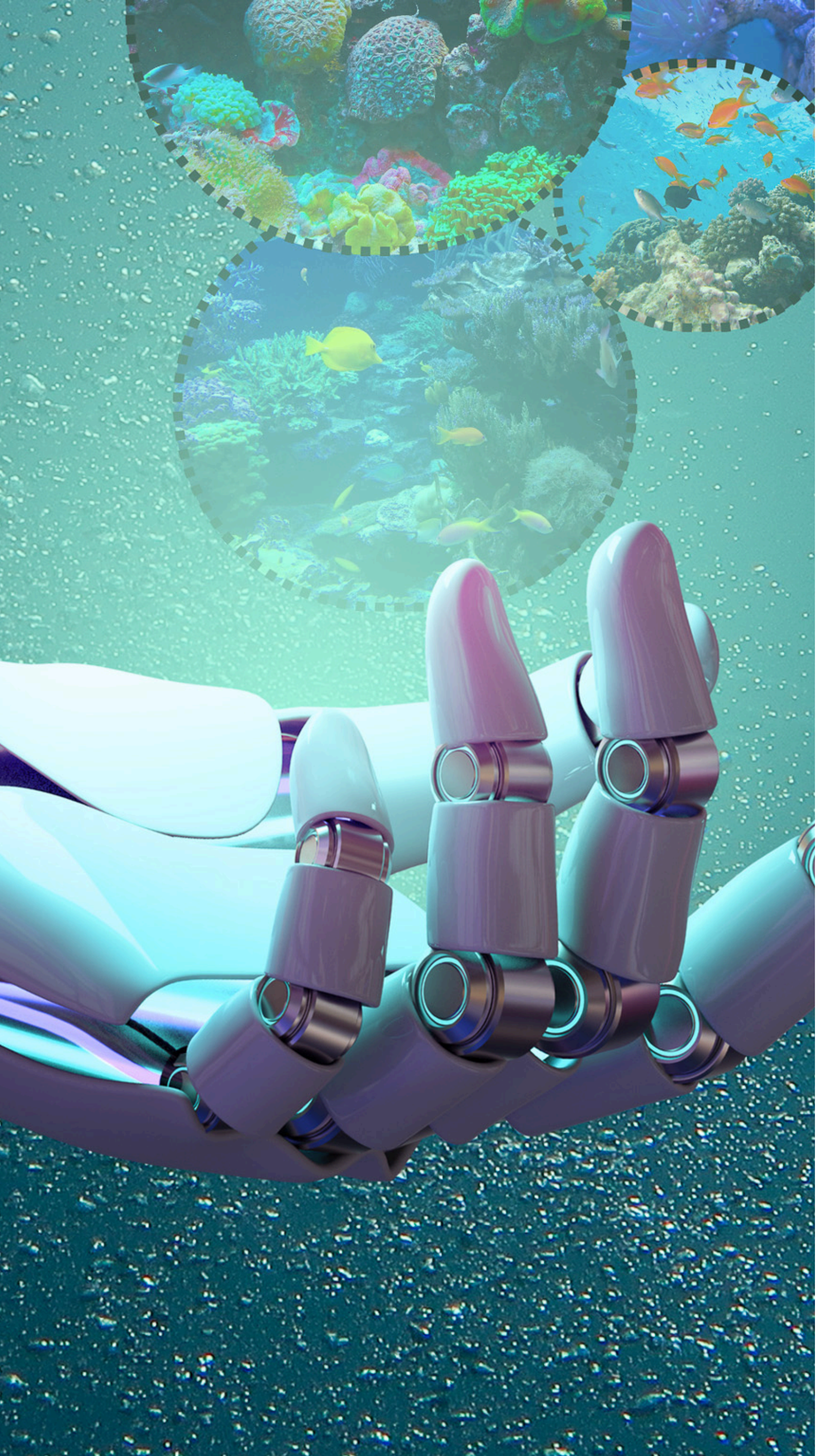
CONTEXT AND DEFINITION OF OUR PROBLEM

- Real ecological crisis caused by humans.
- The more time passes, the more species disappear/are at risk.
- Thanks to advances in AI, we can attempt to slow down this disaster.



CONTEXT AND DEFINITION OF OUR PROBLEM

- **Our idea:** to use AI to improve the living conditions of marine species.
- **Our challenge:** using image recognition to prevent trash from getting in the way of turtles.
- **Why?** As a thriving technology, it will enable other problems to be solved using the same technology.

SUMMARY

- Presentation of our datasets
- Data preprocessing
- First Model
- Second Model
- Potential use cases

DATASETS

Tiling, Manual Slection, Datasets Creation




DATA PREPARATION

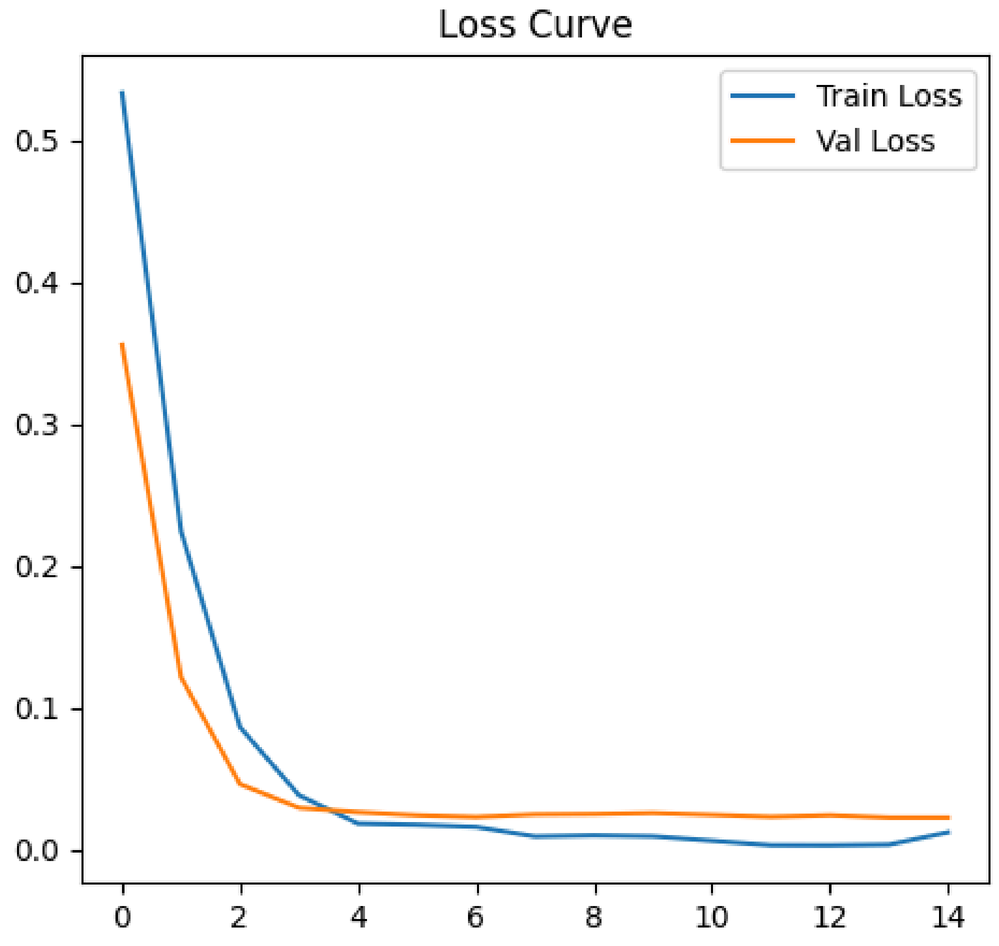
Binary Classification Turtle vs. Nothing

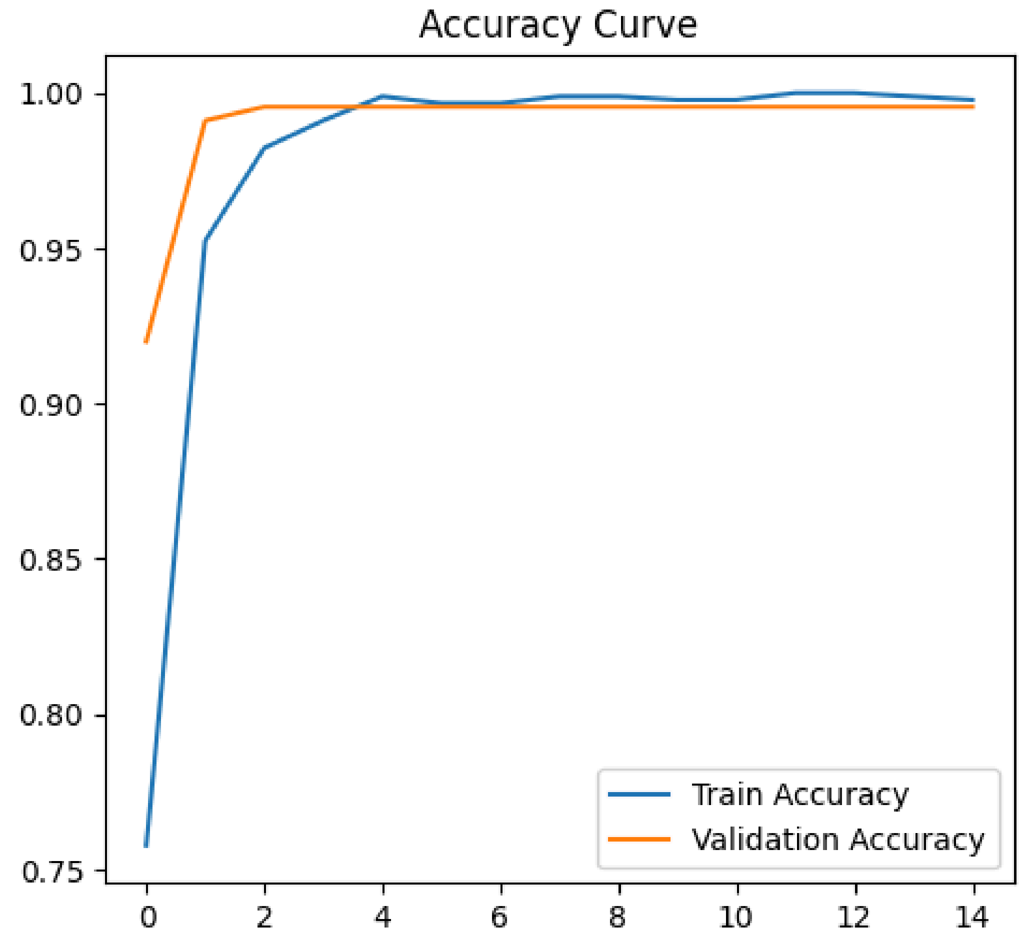
- Dataset preparation (train/val split)
- Data augmentation
- Model selection: EfficientNet-B0
- Training configuration

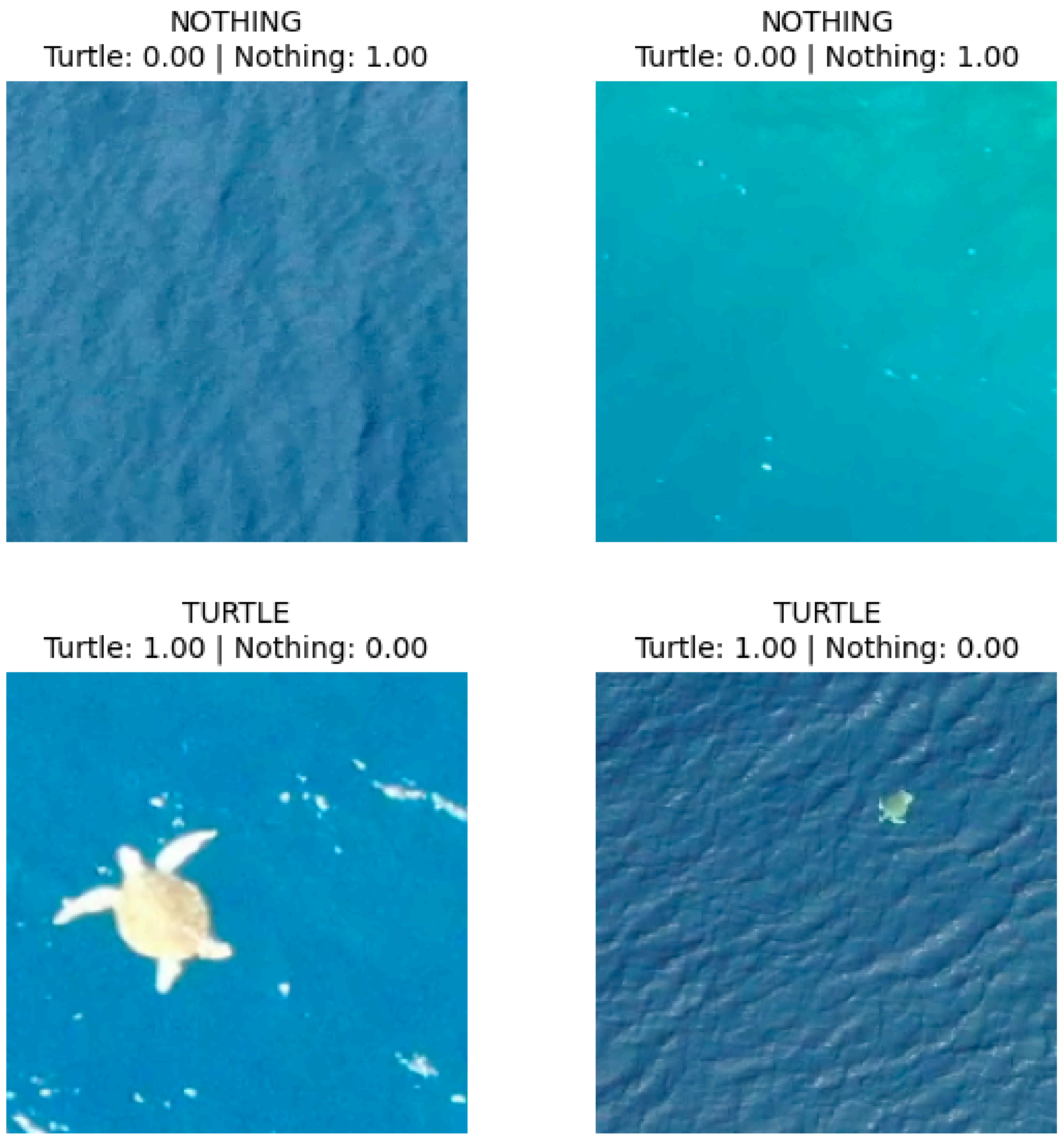
```
Class 'turtle': 534 images → 428 train, 106 val

Class 'nothing': 595 images → 476 train, 119 val
```

FIRST MODEL

Binary Classification (Turtle vs. Nothing)







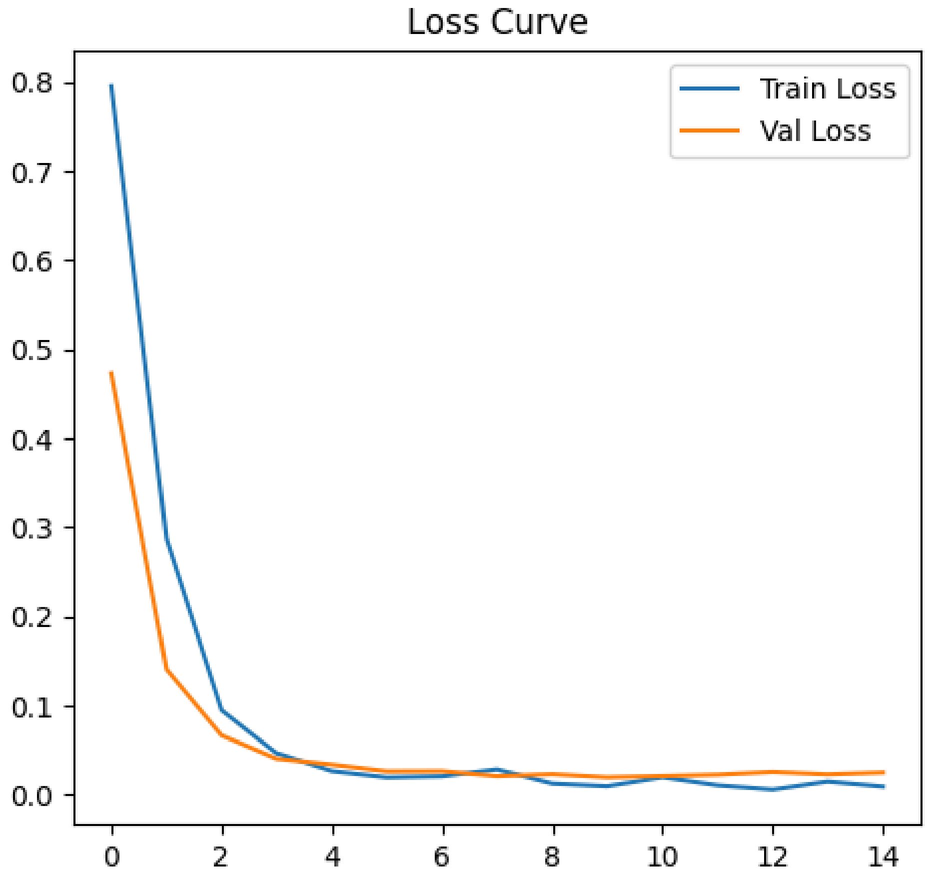
DATA PREPARATION

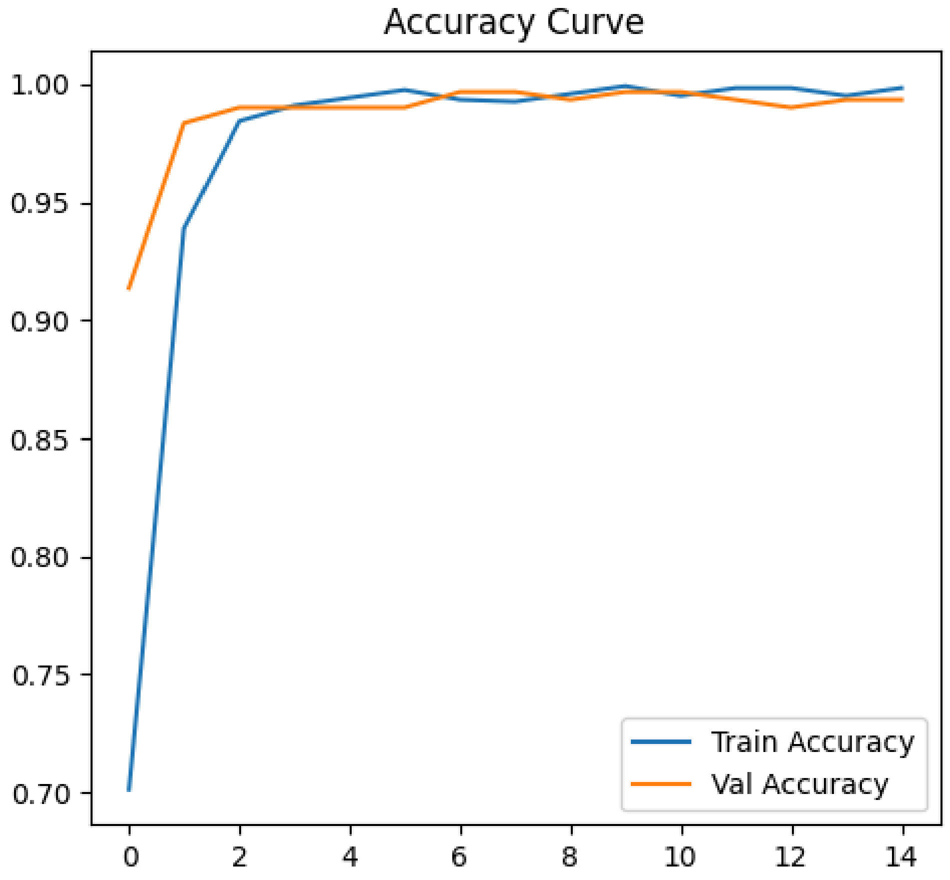
- Dataset preparation (train/val split)
- Data augmentation
- Model selection: EfficientNet-B0
- Training configuration

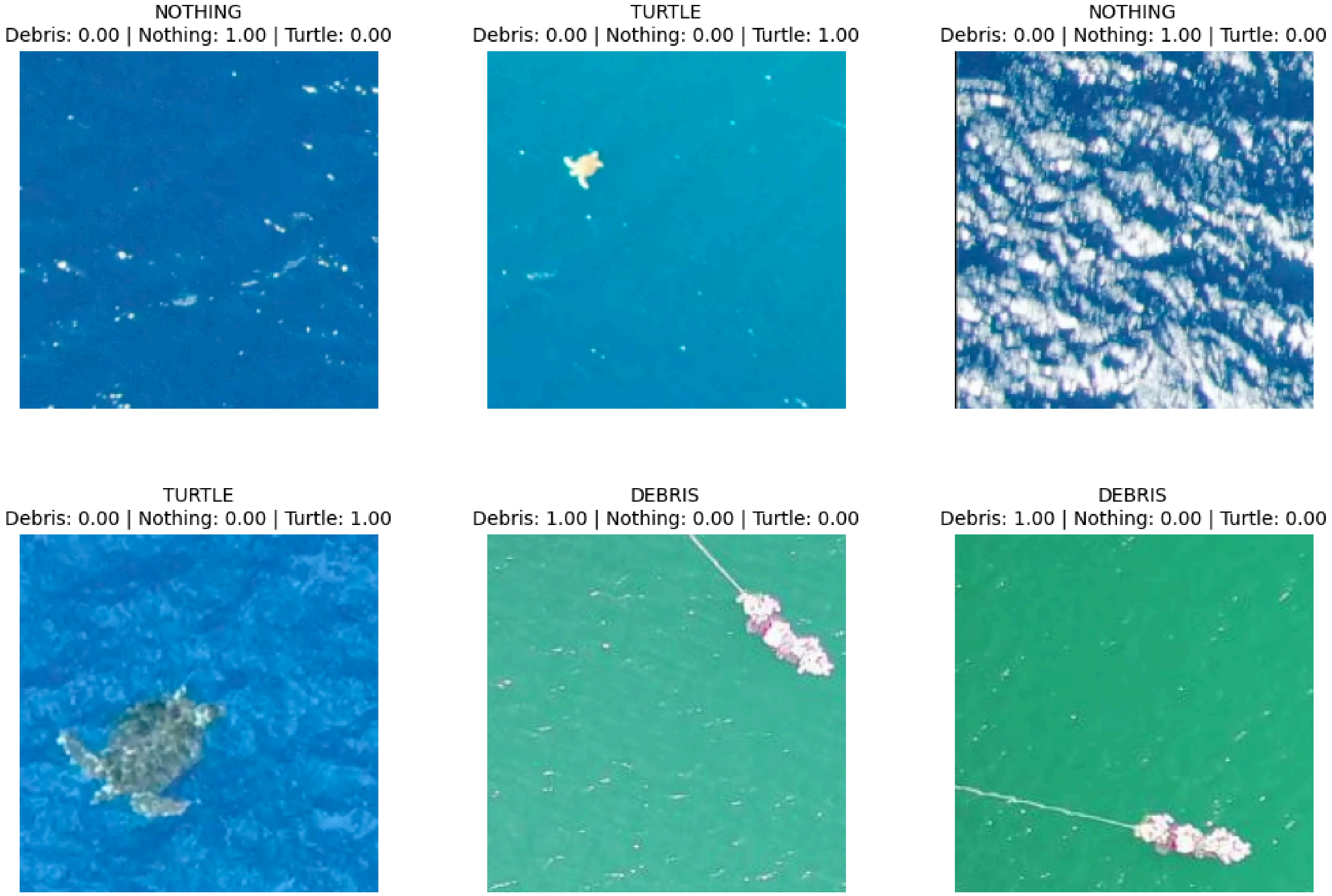
```
Class 'turtle': 534 images → 428 train, 106 val

Class 'nothing': 595 images → 476 train, 119 val

Class 'debris': 380 images → 304 train, 76 val
```

SECOND MODEL

Multi Class Classification (Turtle vs. Nothing vs. Debris)







POTENTIAL USE CASES

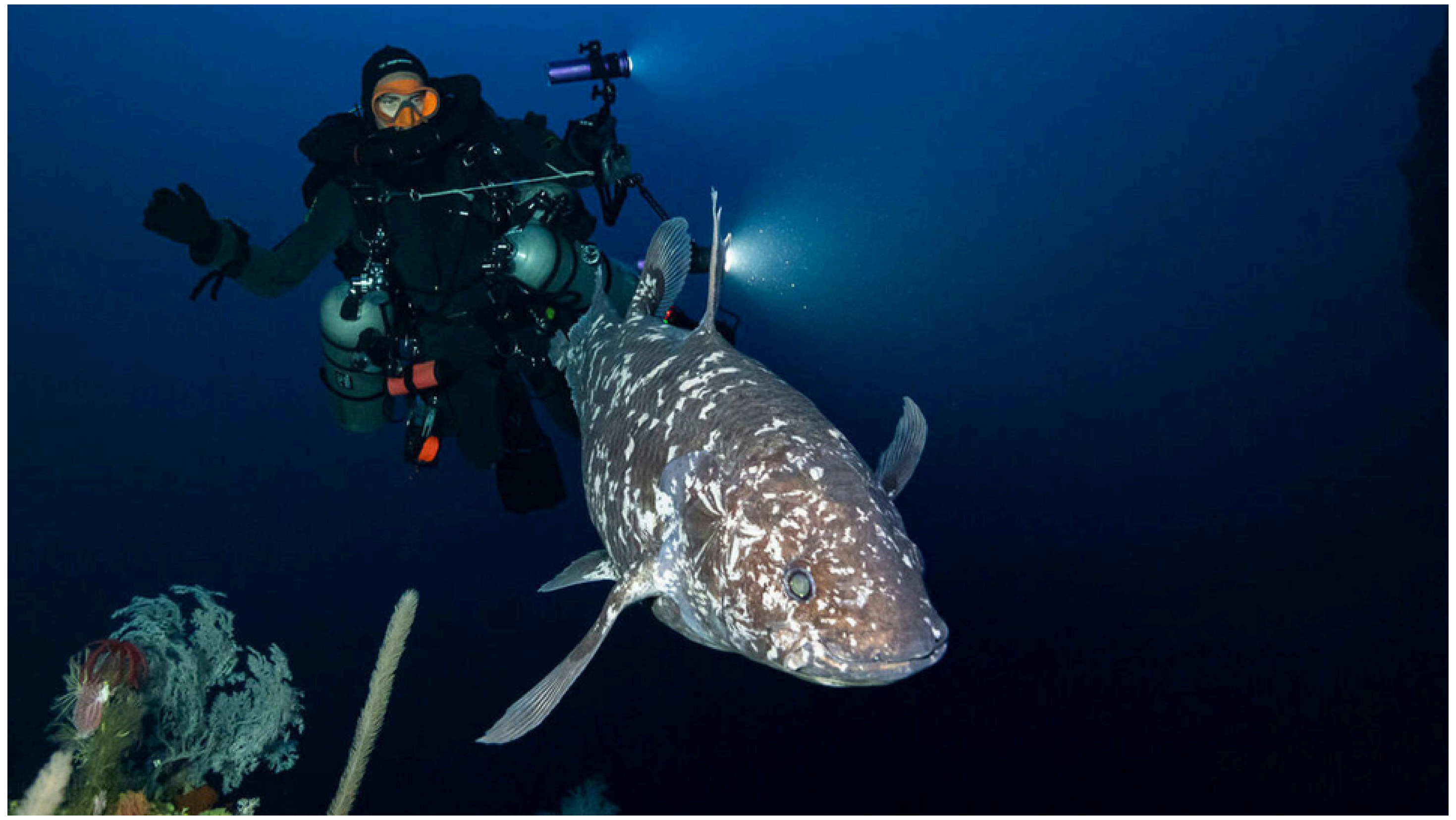
Other potential use cases:

- **Automated ecological monitoring**
- **Floating pollution detection**
- **Marine conservation support / real-time alerts**

POTENTIAL USE CASES

Search & Rescue:

- Locating people/animals or debris (e.g., plane crash) over vast areas.
- Same mathematical challenge as the turtle
- Prioritize Recall, we cannot afford to miss a single target.



Maritime Security (Dark Vessels)

- **The Challenge:** Identifying undeclared vessels in Marine Protected Areas
- Visual Detection + No GPS/AIS Signal = Suspect Alert.

LIMITATIONS & PERSPECTIVES

- **Biased datasets (picture selection)**
- **Algorithmic challenges**
- **Operational deployment (drones)**

CONCLUSION

- **Validated the proof of concept**

Demonstrated the feasibility of detecting small marine objects (20px) using Deep Learning.

- **Other objects possible**

The core model is **agnostic**: adaptable via Transfer Learning to other critical domains (search and rescue, *plastic pollution*, maritime security)

- Futur of the project → **industrialization**

THANK YOU

1. INTRODUCTION
- PROBLÉMATIQUE ENVIRONNEMENTALE
- OBJECTIF DU PROJET
- APPROCHE GÉNÉRALE (UAV → IMAGERIE → IA)

2. DONNÉES ET PRÉPARATION
- SOURCE ET TYPOLOGIE DES IMAGES
- POURQUOI LES IMAGES DOIVENT ÊTRE DÉCOUPÉES EN TUILES
- PROCESSUS DE TILING (192×192, OVERLAP)
- SÉLECTION MANUELLE DES EXEMPLES PERTINENTS
- CONSTITUTION DU DATASET (CLASSES : TURTLE, DEBRIS, NOTHING)

3. MÉTHODOLOGIE
- PRÉPARATION DU DATASET (TRAIN/VAL SPLIT)
- DATA AUGMENTATION
- CHOIX DU MODÈLE : EFFICIENTNET-BO
- CONFIGURATION DE L'ENTRAÎNEMENT

4. MODÈLE 1 : CLASSIFICATION BINAIRE (TURTLE VS NOTHING)
- ENTRAÎNEMENT
- COURBES DE LOSS/ACCURACY
- VISUALISATION DES PRÉDICTIONS
- ANALYSE DES PERFORMANCES

https://www.sciencedirect.com/science/article/pii/S1574954125000184#da0005

Modèle 2 : Classification Multiclasse (Turtle vs Debris vs Nothing)
Motivation
Entraînement
Courbes de loss/accuracy
Visualisation des prédictions
Analyse des résultats et limites

6. Cas d'Usage Potentiels
Comptage automatique de tortues
Surveillance écologique automatisée
Détection de pollution flottante
Aide à la conservation marine / alertes en temps réel

7. Limites & Perspectives
Variabilité des conditions marines
Taille des objets vs résolution
Besoins en données supplémentaires
Extensions possibles : YOLO, segmentation, détection continue sur flux vidéo

8. Conclusion
Résumé des résultats
Portée environnementale
Ce que le projet démontre
Prochaines étapes