

WHAT IF AI COULD HELP US BETTER UNDERSTAND PLASTIC POLLUTION IN RIVERS ?

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SURFNET is our AI system designed to detect macro-waste on riverbanks using mobile phone video captured from a kayak.

1 Computer vision

We choose a branch of AI to detect objects in images.
We prioritise :

1. Model size
2. Open-source and portability
3. Model efficacy for small object with limited dataset

YOLOv8-s

2 Unique dataset

The performance of AI models is heavily dependent upon both the quality and quantity of their training data. As there was no dataset available for our context :

- Thousands of photos were gathered then manually annotated
- ~ 5,000 labeled images and 10 categories of litter used to train in multiclass
- Data augmentation and synthetic data generation were tested

Training

3 Video tracking

Video are analysed with tracking engine to avoid false positives or false négatives. 4 processing steps :

1. Initial detection on images
2. Motion prediction for the next frame
3. Search within the prediction zone and association
4. Uncertainty management

Inference

(Chagneux, 2023)

RESULTS

3 différents riverbanks were analysed with 3 methods :

	Section 1: moderate current with dense but non-obstructive vegetation	Section 2: strong current with low-lying vegetation	Section 3 : moderate current with tall, sparse vegetation
Manual counts with 20 volunteers on site (μ , Sd, %Coef var)	109 25 23%	36 10 29%	49 13 27%
Expert count from a video	133	26	28
IA count from the same video (% detection)	86 (65%)	11 (42%)	25 (89%)

While AI reduces human error and improves data reliability, optimizing models and ensuring consistent volunteer input remain key to achieving greater accuracy.



KEY TAKEAWAYS

Boost citizen science

Simplify protocols & show real-time results to increase engagement and data quality.

Develop eco-friendly AI

Optimize lightweight models for smartphones (balancing performance and sustainability).

Open data for collaboration

All project data is available online to encouraging transparency, reuse, and sustainable innovation.

The full report



CHAGNEUX, M., LE CORFF, S., GLOAGUEN, P., OLLION, C., LEPÂTRE, O., and BRUGE, A. «Macrolitter Video Counting on Riverbanks Using State Space Models and Moving Cameras.» Computo, 2023.