



## AI SORTS IT OUT!!

**Plastic, plastic, plastic: In the soil, in the stomachs of animals, and especially in rivers and oceans. This is really serious! But how do we get this waste problem back under control?**

This learning station simulates in a simplified way how an AI system detects and sorts garbage in the ocean or rivers.

This is how it works:

### 1. Training process

First, the **AI system has to be programmed and trained.**

For this, information about trash and non-trash is scanned. The **AI system collects features that indicate trash or non-trash.** The more information and different items are analyzed, the more accurate and correct the AI system can later recognize trash

### 2. Deployment: Scanning & Deciding

When the AI system is deployed, the items in the river are **scanned and immediately categorized based on their characteristics: Trash or not.** Unlike our learning lab box, an AI system performs the analysis of all features simultaneously.

After scanning, everything identified as waste can be removed from the water.

In the first few months, many sorting errors can occur because the features for trash and non-trash are very complex.





## A solution to the station:

› In Box 1, only items with a consistently smooth surface were allowed to be placed. Both Vape (e-cigarette) and SIM card must be sorted out. For example, an AI system would not sort out the piece of wood or the stone because they have multiple edges and protrusions.

› In Box 2, only elongated and transparent items, as well as those with red areas and sharp edges, were allowed to be placed. Only the water bottle meets these criteria. Both plastic bag and bubble wrap are not elongated. The red brick has red areas and sharp edges.

› In Box 3, only items with many small creases and at the same time (slightly) shiny spots were allowed to be placed. Plastic bag, bubble wrap, and can have such slightly shiny spots. Also, all three items are heavily wrinkled and have many folds.

› In Box 4, only items with frayed, i.e., no smooth edges, were allowed. The piece of wood is heavily frayed due to its many splinters and is sorted out. All other items have smooth edges except for cracks.

› **What remains in the end:** Rocks and plants

With our programming, the AI system would also have sorted out the piece of wood, even though it is not garbage. Such „errors“ often occur in application and are corrected by further training of the AI system. It scans more and more trash and non-trash and looks for common features.



*A beach full of garbage - unfortunately not a rare sight.*





## Current Applications

Plastic pollution in the oceans is a global problem. **Some garbage patches are so huge that the ocean is no longer visible.** Seabirds, fish, and many other animals eat plastic, die from it, or accumulate it in their bodies. Images of entire mattresses found inside the bodies of whales or sharks are well known. As a result, plastic waste – fragmented into tiny pieces – eventually finds its way into the human body as well.

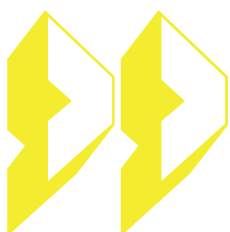


*Plastic kills: A belly filled with garbage does not feed.*

And the extent is becoming more dramatic: The WWF estimates that between four and 12 million tons of plastic waste end up in the oceans every year. Similar situations occur in rivers and lakes in every country of the world.

**The need to clean up the world's oceans is becoming increasingly urgent. Systems based on AI algorithms can make an important contribution in this area.**

Several scientific projects are currently working on AI-based detection systems. For example, scientists at the UK's Plymouth Marine Laboratory locate plastic with satellite images. Initial tests have been successful in Canada, Vietnam, Scotland, and Ghana. In this way, **the AI systems recognize plastic with an 86 percent success rate, even if it is only a few millimeters in size.** But it will surely take some time before the removal of garbage from the oceans can begin. The German research project „Plastic Obs+“ aims to determine how much and what kind of plastic waste is currently floating in the oceans. In the long term, surveillance aircraft with AI-based sensors will monitor the oceans.



**But honestly: Shouldn't we humans just stop throwing any garbage into the ocean in the first place? Or simply avoid products that use too much plastic packaging?**





## **SOURCES / RESEARCH PROJECTSE**

University of Plymouth / School of Biological and Marine Sciences (Faculty of Science and Engineering)

Professor Richard Thompson OBE FRS, Director of the Marine Institute

<https://www.plymouth.ac.uk/research/marine-biology-and-ecology-research-centre/plastics-in-the-marine-environment>

Plastic Obs+

Deutsches Forschungsinstitut für Künstliche Intelligenz (DFKI) in Oldenburg

Forschungsbereich Marine Perception

Project Owner Christoph Tholen.

<https://www.dfki.de/web/news/ki-fuer-flugzeuggestuetzte-erfassung-von-meeresmuell>

Photo "Plastic kills"

U.S. Fish and Wildlife Service Headquarters, Fotograf: Chris Jordan, „Albatross at Midway Atoll Refuge“, CC BY 2.0, <https://www.flickr.com/photos/usfwshq/8080507529/>

Photo "Beach full of plastic"

<https://pixabay.com/de/photos/verschmutzung-m%C3%BCII-ozean-plastik-4855508/> ,  
Bild von Sergei Tokmakov, Esq. <https://Terms.Law> auf Pixabay

The idea for this learning station was developed by Pauline Kopp during her Volunteer year at the FAU School Museum. Thank you very much!

