



XXVII FIG CONGRESS

11-15 SEPTEMBER 2022
Warsaw, Poland

Volunteering
for the future –
Geospatial excellence
for a better living

Mapping Small plastic Pieces of Floating Plastic in Near Real Time

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ORGANISED BY

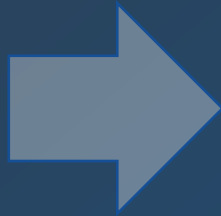


PLATINUM SPONSORS

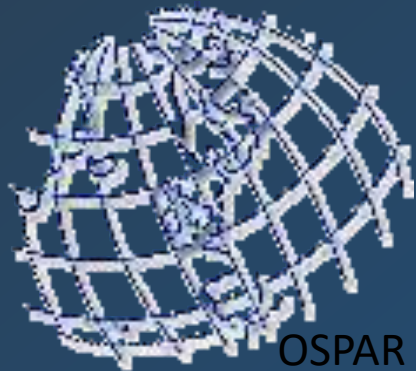
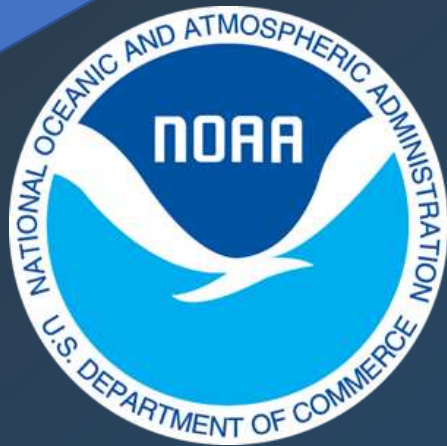


Water is life!





2,5 x 2,5 cm



OSPAR



United Nations
Educational, Scientific and
Cultural Organization



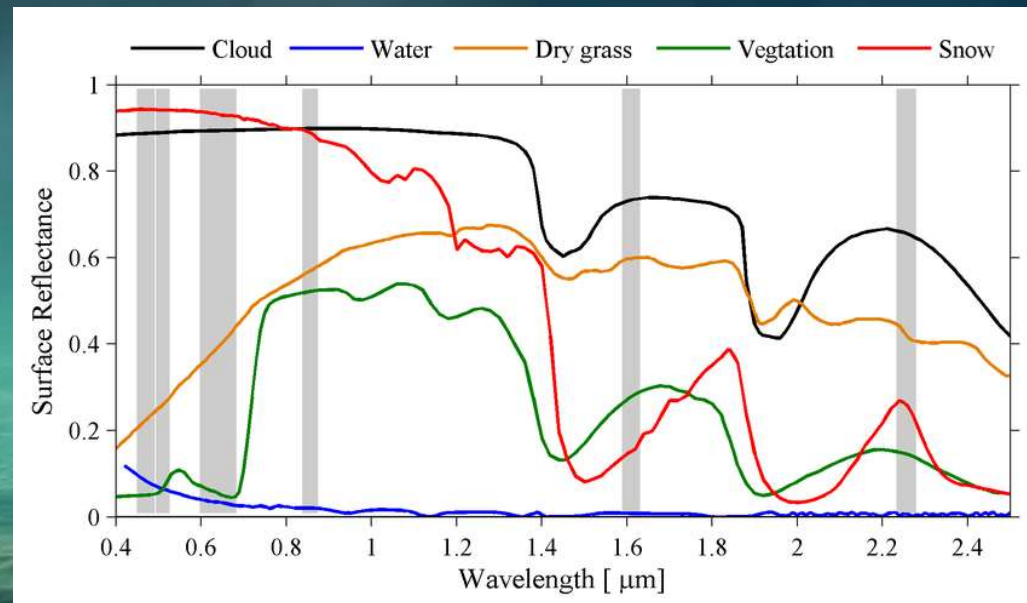
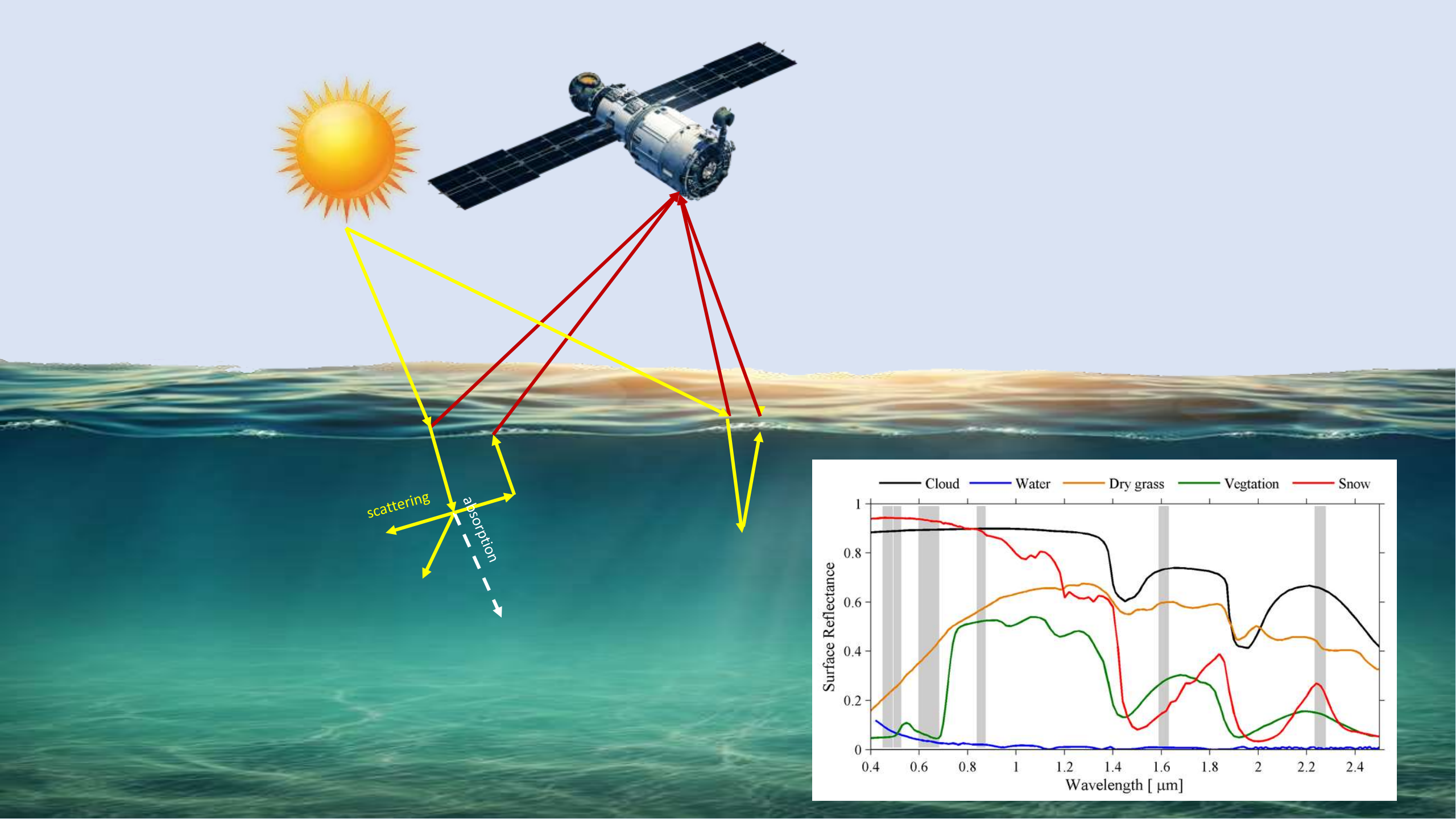
Intergovernmental
Oceanographic
Commission

1 x 1 cm





<https://blog.csiro.au/plastic-pollution-on-our-beaches/>



AUTOMATION

PROCESSING PROCEDURES

Artificial intelligence

refers to the simulation of human intelligence in machines that are programmed to think like humans and mimic their actions.

GEOAI

is the use of artificial intelligence methods, including machine learning and deep learning, to produce knowledge through the analysis of spatial data and imager

CNN

- **State-of-the-art accuracy**
- **Grid structure**
- **Idea: filtering before training**
- **Layers**
 - 1. Convolution**
 - 2. Pooling**



Convolution



0	64	128
48	192	144
142	226	168

-1	0	-2
0.5	4.5	-1.5
1.5	2	-3

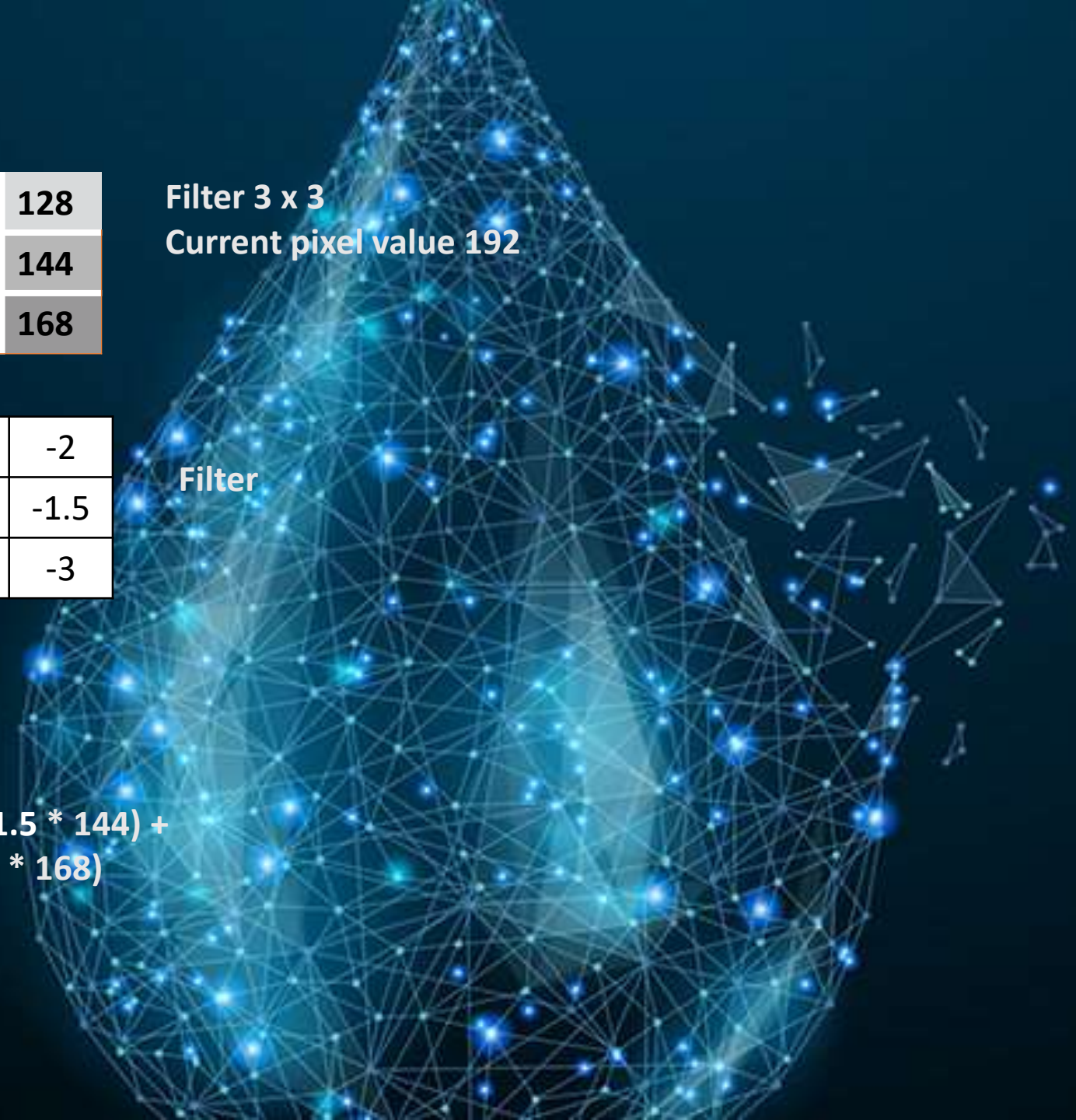
Filter 3 x 3

Current pixel value 192

Filter

Current pixel value 192

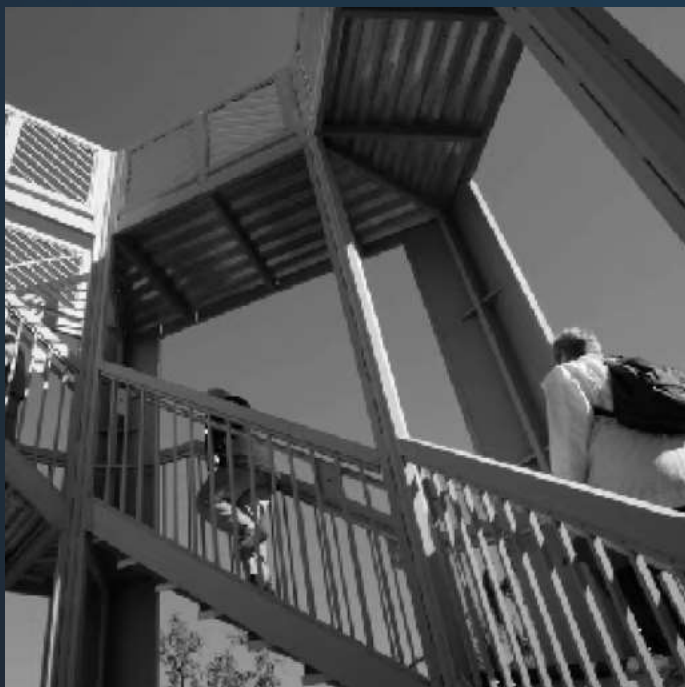
$$\begin{aligned} \text{New pixel value} = & (-1 * 0) + (0 * 64) + (-2 * 128) + \\ & + (0.5 * 48) + (4.5 * 192) + (-1.5 * 144) + \\ & + (1.5 * 142) + (2 * 226) + (-3 * 168) \end{aligned}$$



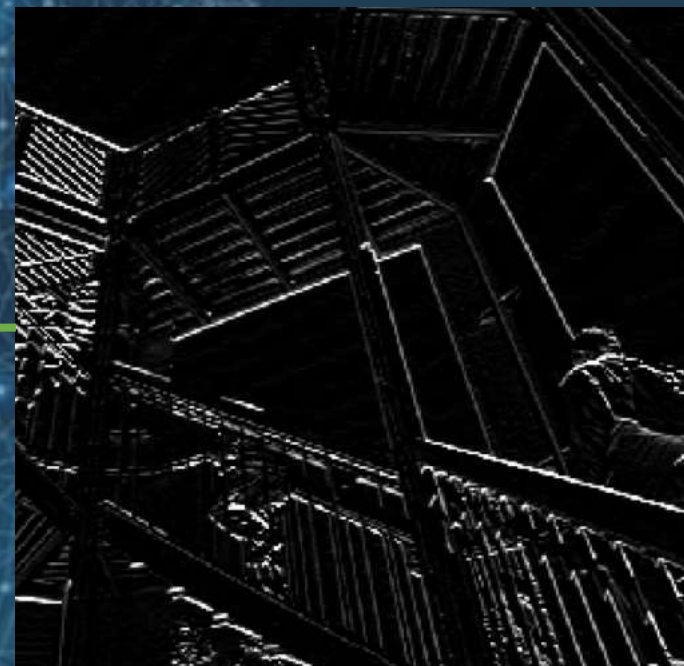


-1	0	1
-2	0	2
-1	0	1

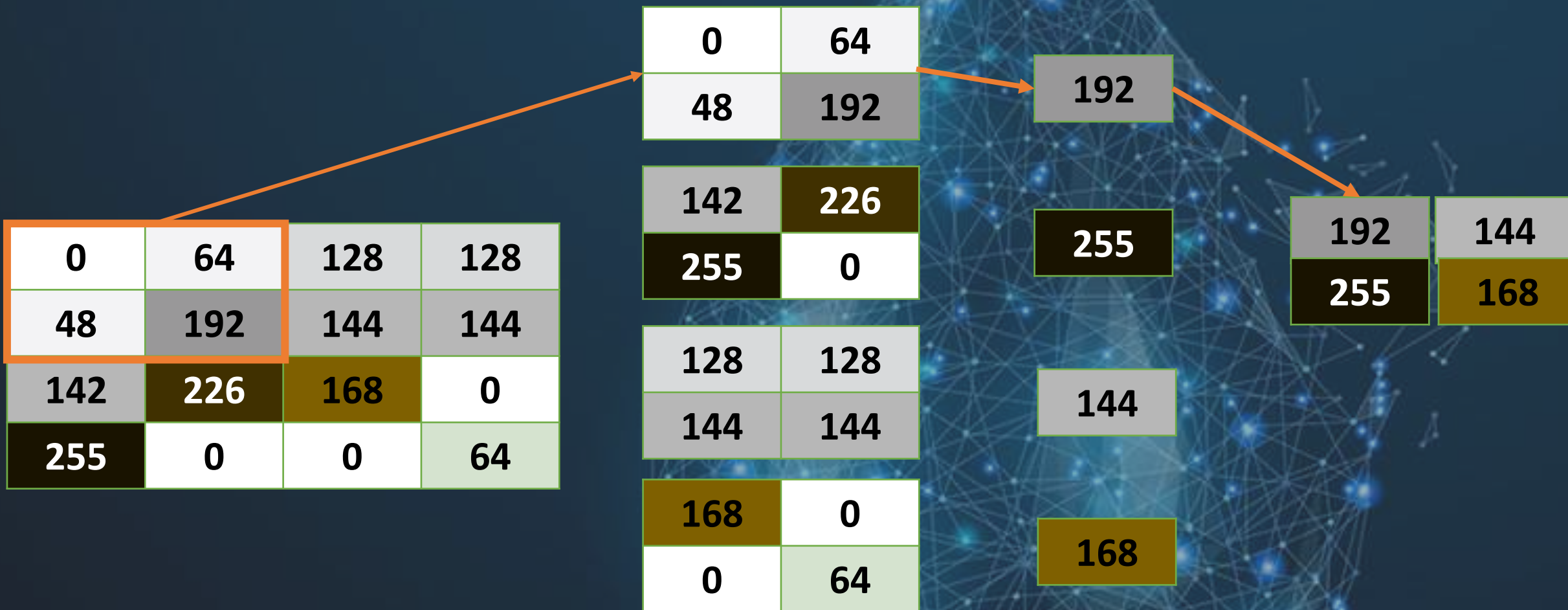




-1	-2	-1
0	0	0
-1	2	1



POOLING

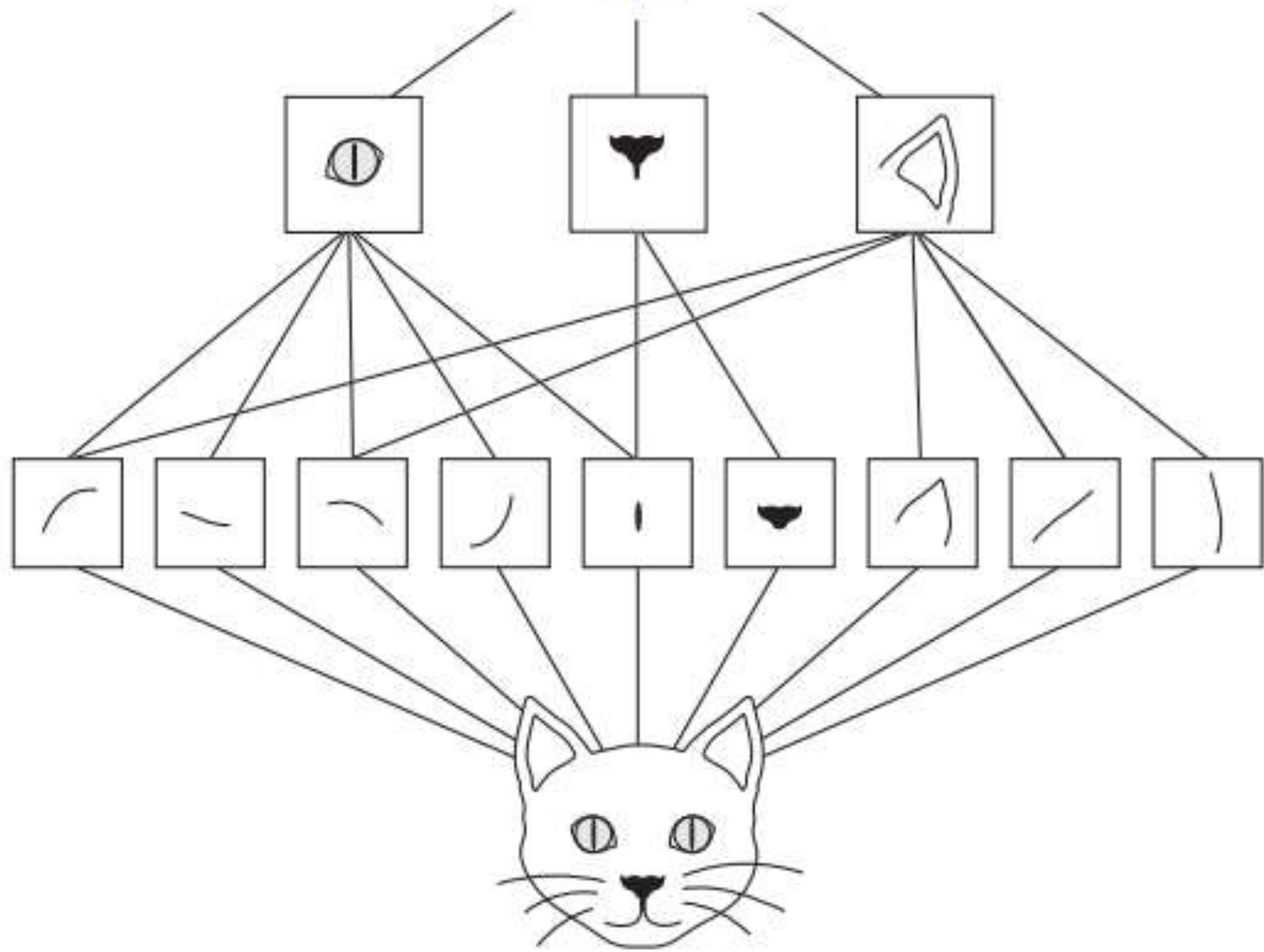


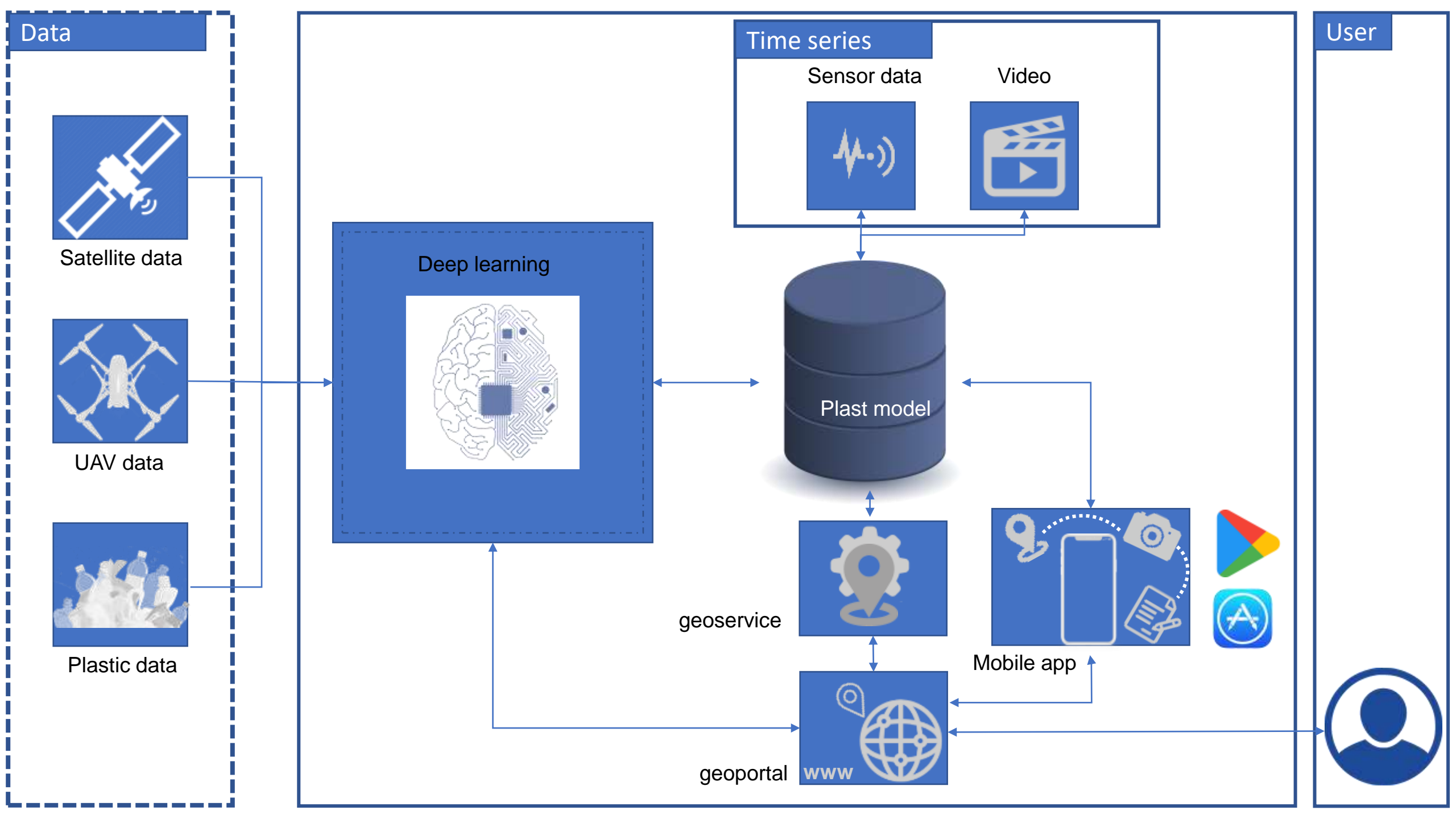


MAX POOLING
2 X 2



“cat”

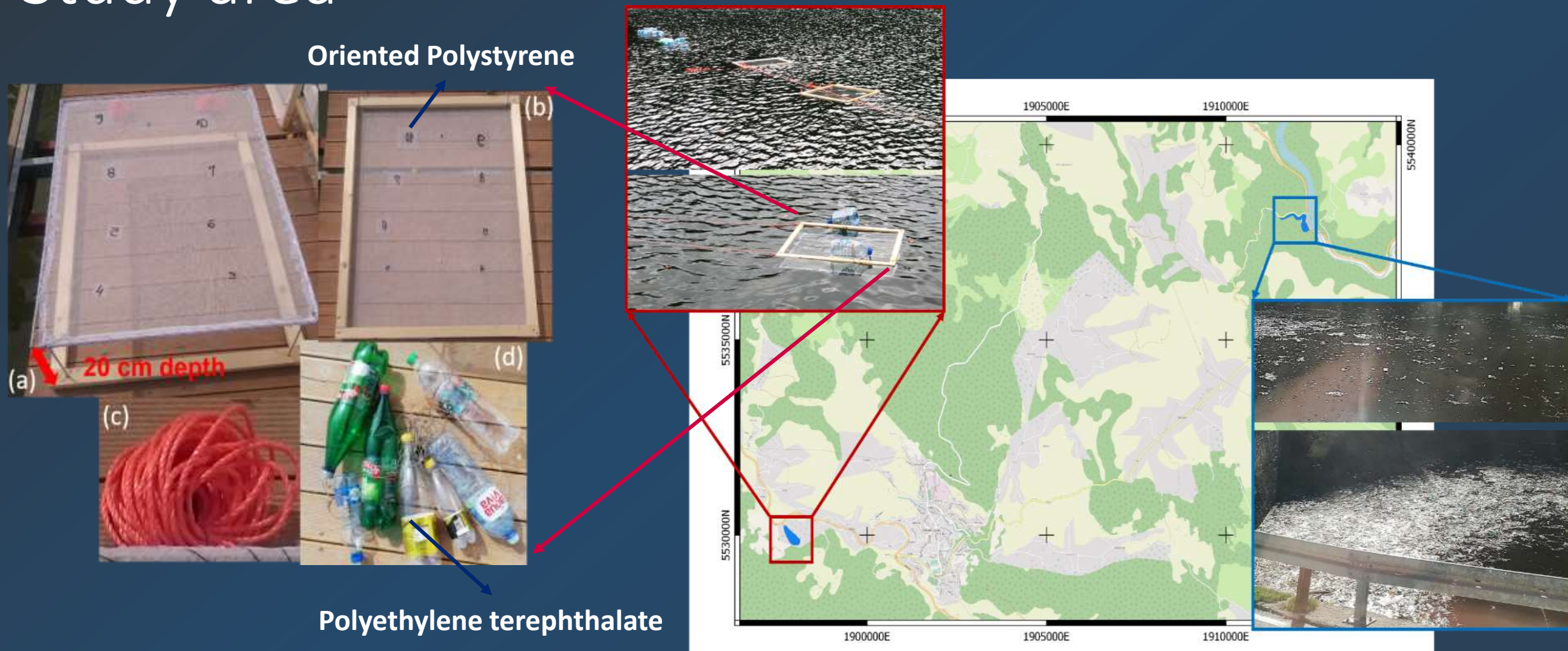




An underwater scene showing various pieces of plastic waste, including bottles and bags, floating in the water. The scene is dimly lit with a blue tint. A white rectangular box is overlaid in the center, containing the text "DATA COLLECTION".

DATA COLLECTION

Study area



Study areas: Lake Balkana (left) and Crna Rijeka River (right). EPSG:3857.

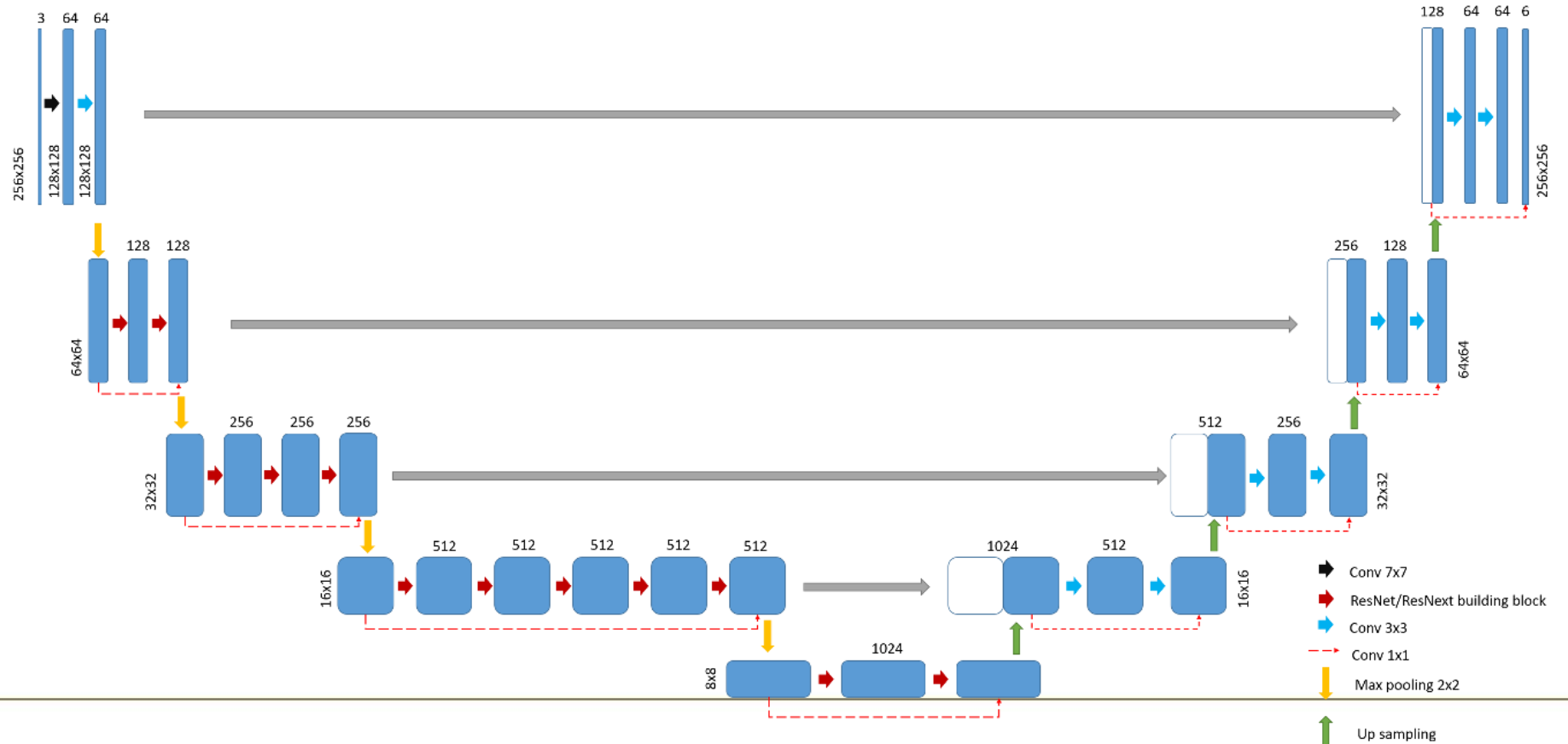
An underwater scene showing various pieces of plastic waste, including bottles and a large bag, floating in the water. The scene is dimly lit with a blue tint. A white rectangular box is overlaid in the center, containing the text "PROCESSING DATA".

PROCESSING DATA

Deep learning



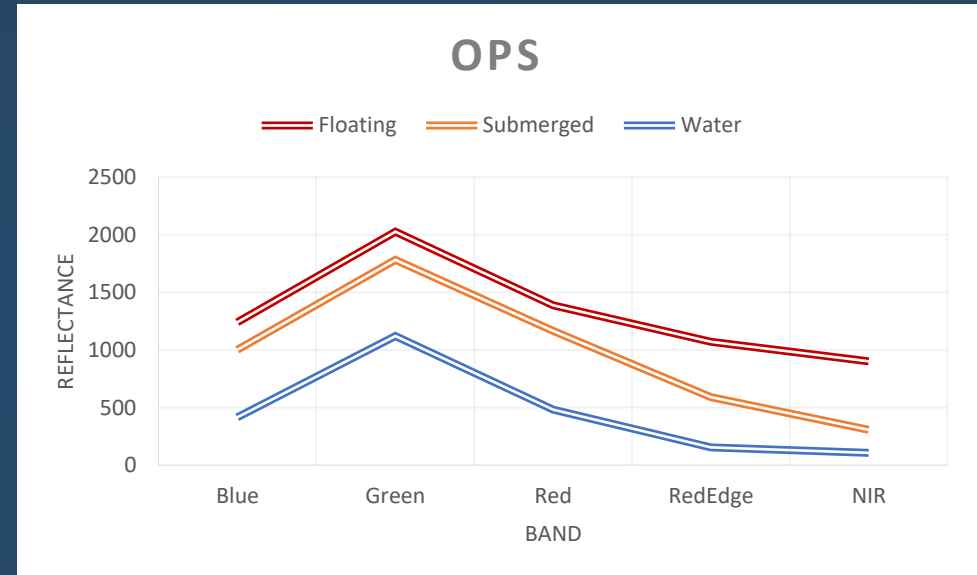
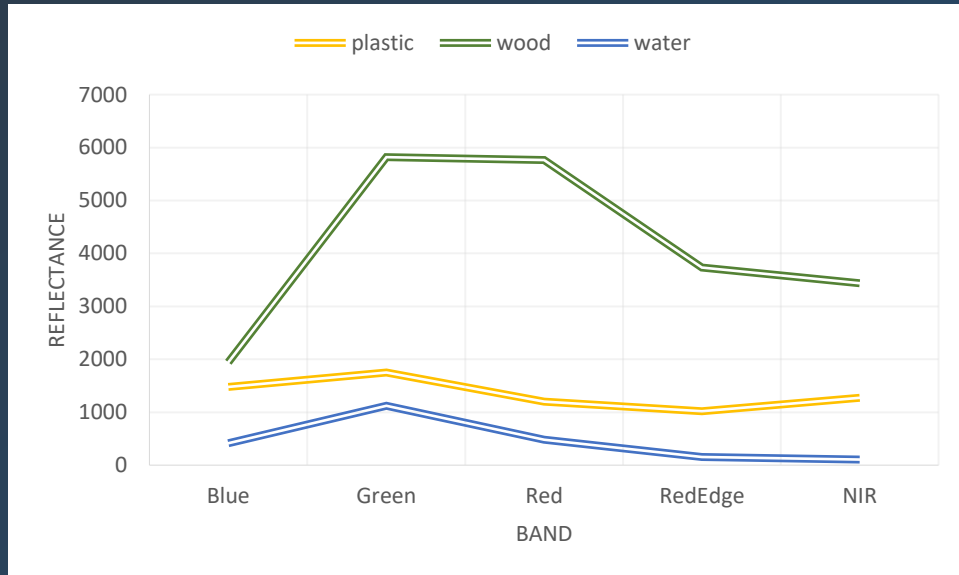
ResUNet 50 architecture



An underwater scene showing various pieces of plastic waste floating in the water. The items include a clear plastic bottle, a white plastic bag, a blue plastic bottle, and other unidentifiable plastic fragments. The water is a deep blue color, and the scene is lit from above, creating a somber and environmental atmosphere.

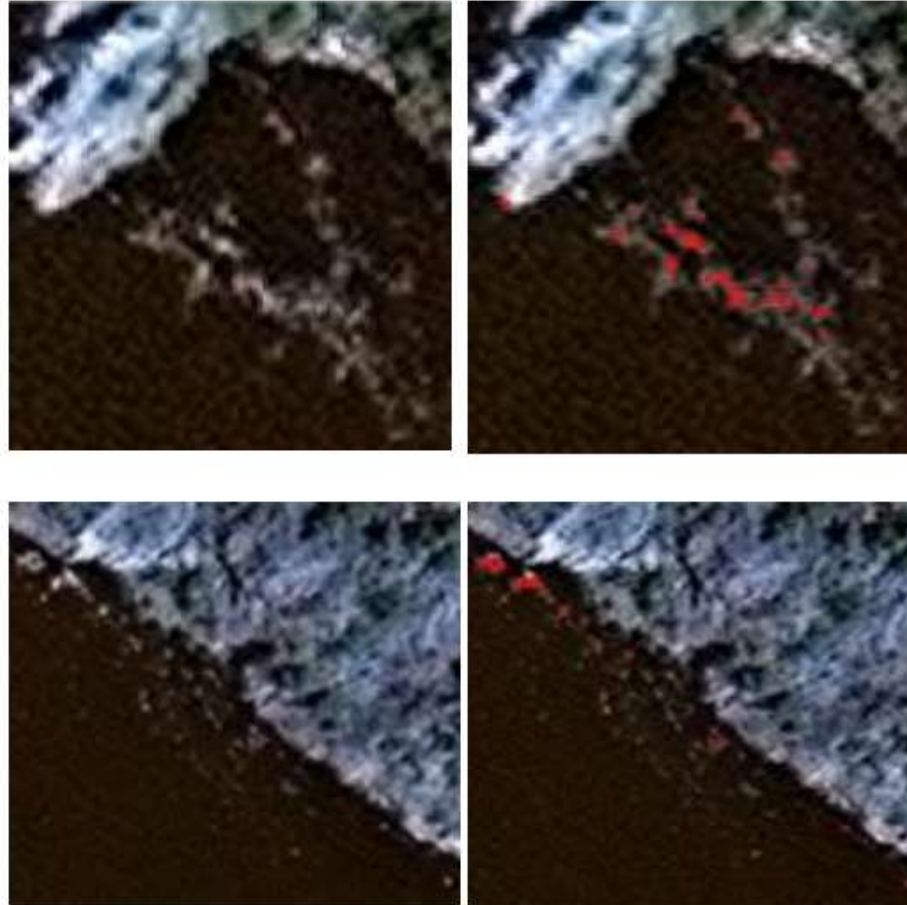
RESULTS

Spectral characteristics



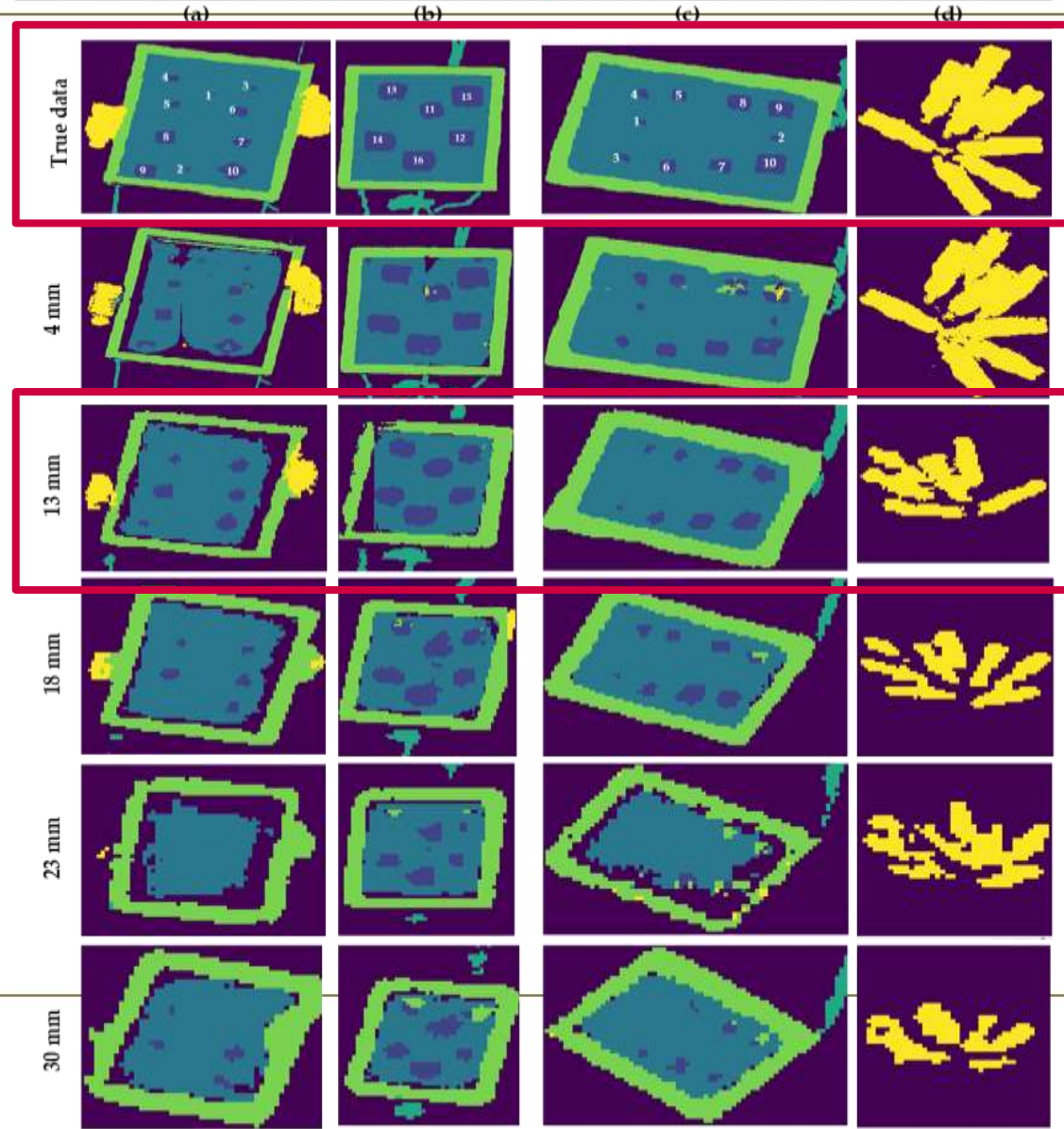
Visual inspection of results

WorldView 2



Visual inspection of results

Legend: ■ water ■ OPS ■ gauze ■ nylon ■ wood ■ PET

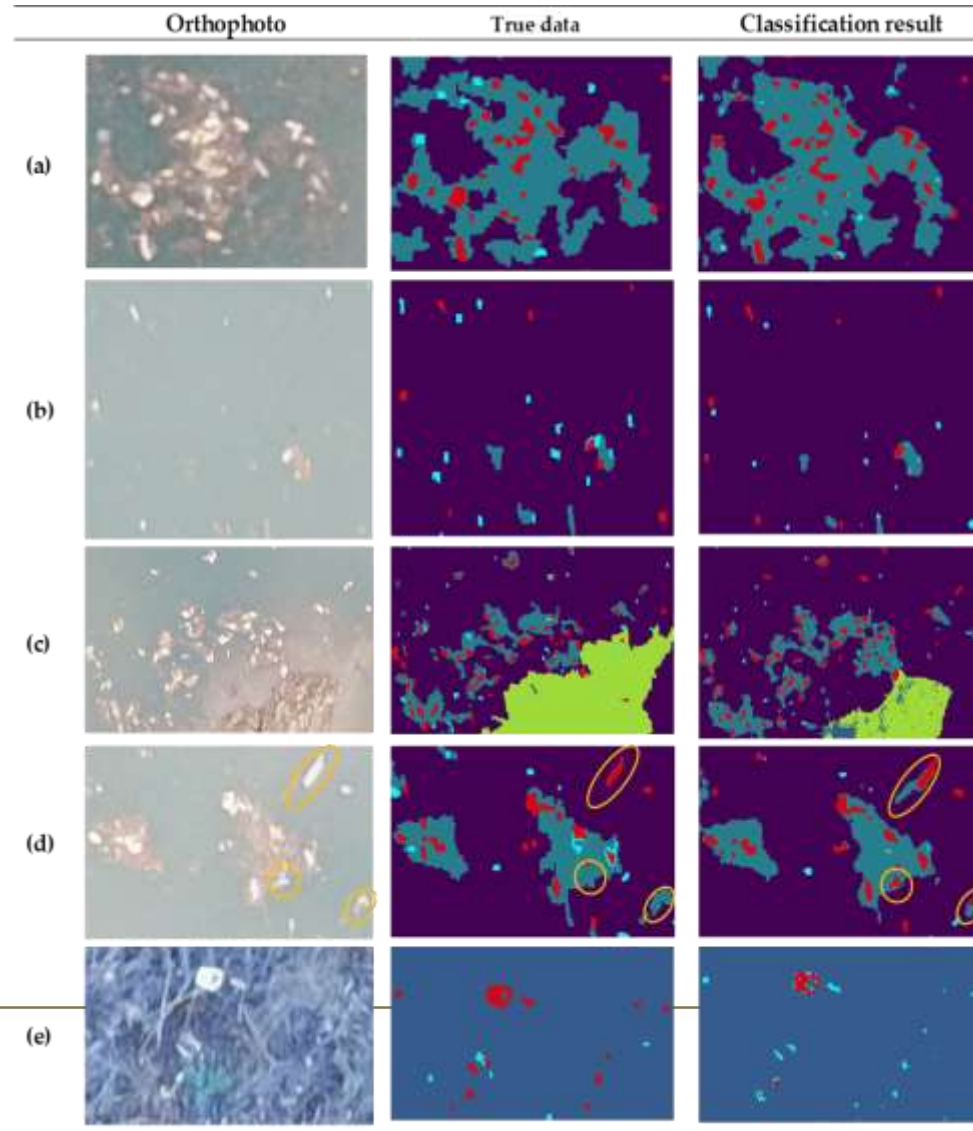


CSIRO
(1 cm²)

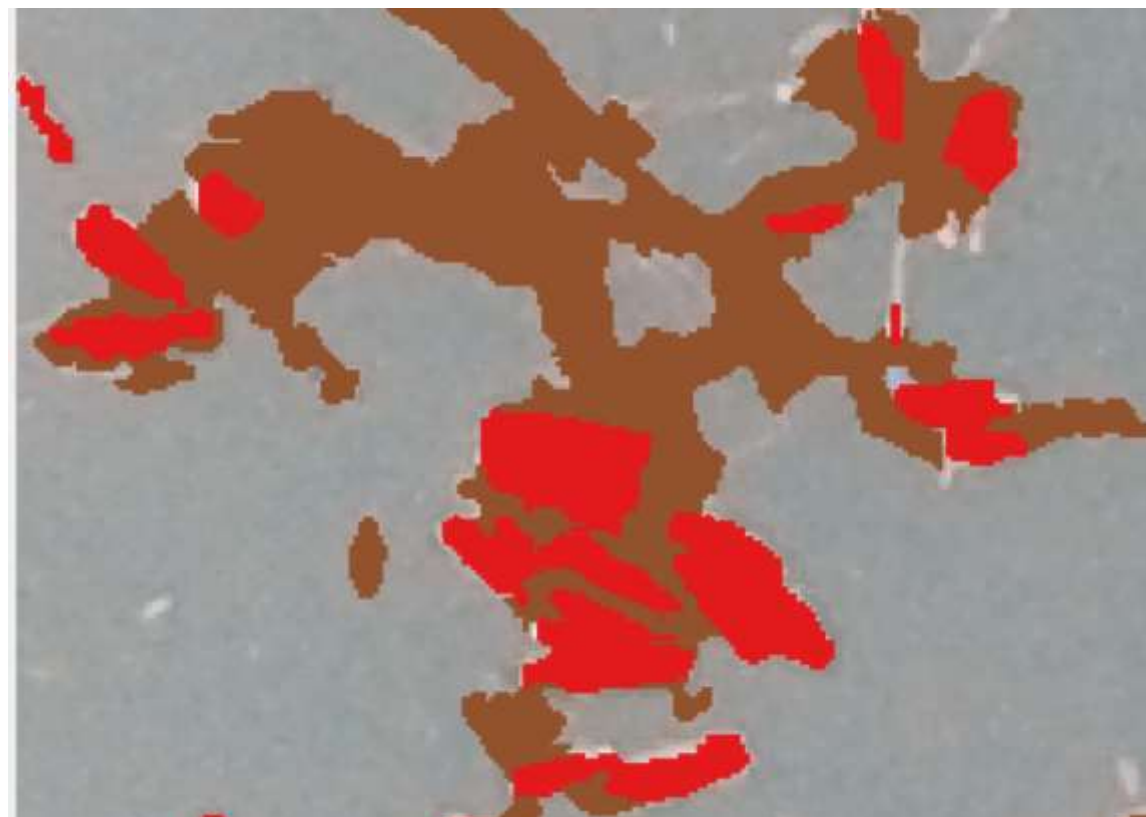
NOAA, OSPAR
(2.5 cm²)

Visual inspection of results Plastic debris

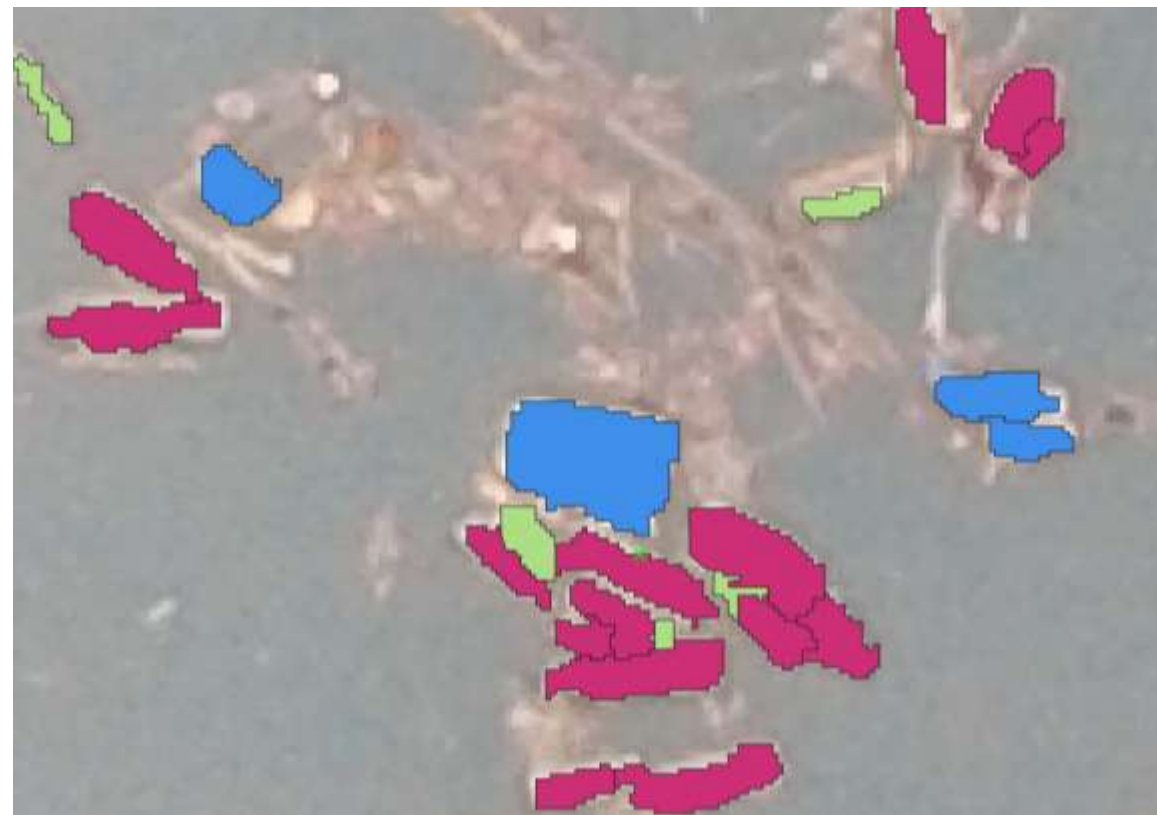
Legend: ■ water ■ OPS ■ gauze ■ nylon ■ wood ■ PET











 plastic
 wood



-  bottle
-  food containers
-  food packaging
-  other

An underwater scene showing various pieces of plastic waste, including bottles and a large bag, floating in the water. The water is a deep blue color. A semi-transparent white rectangular box is overlaid in the center of the image.

USER

TRADITIONAL BEACH SURVAY

Covered area



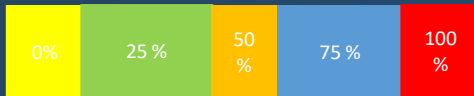
Data collection



Data processing



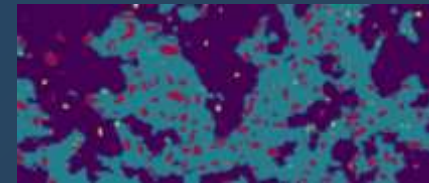
Results



OUR APPROACH



Near real time



Thank you for attention!

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www.plasticpollution.ags.on