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26 January 2018

Algorithms that Help Save the Planet

Biology | Machine learning

Ventana al Conocimiento (Knowledge Window)
Scientific journalism

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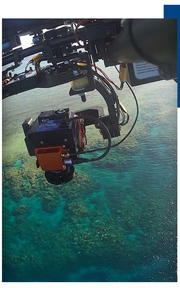
In many respects, 2017 was the year of artificial intelligence. **The advances in machine learning and algorithms with capacities superior to human ones have brought the benefits of this technology to the daily lives of ordinary people.** But the power of algorithms also allows us to solve issues more serious than the organization of a schedule or the management of a home security system. Scientists around the world are also using algorithms to deal with global problems, such as the loss of biodiversity or other threats to the environment.

In Australia, where a coral bleaching phenomenon **has affected 93% of the Great Barrier Reef in recent years**, researchers from the Queensland University of Technology (QUT) and the Australian Institute of Marine Science have developed **an algorithm and a range of technologies to map and help protect this ecosystem**. The team uses drones combined with machine learning to fly over the Great Barrier at an altitude of 60 metres, collecting and analysing data to classify the levels of bleaching. The measurements obtained from the air are compared with the surveys made underwater.



A drone fly over the Great Barrier Reef collecting and analysing data. Credit: *QUT*

The reef is roughly the size of Japan, with more than 3,000 individual corals stretching over 2,300 kilometres, **but the system is able to monitor it quickly and effectively**. "The algorithm allows the comparison of large databases that can be used to identify other areas of risk. And the more data scientists have during a bleaching event, the better they can deal with it," says Felipe Gonzalez, leader of the project at QUT. The researcher explains that each coral emits "unique hyperspectral fingerprints" and that each individual coral colony emits different hyperspectral signatures as its level of bleaching changes, so the system is able to track those individual changes over time. Our goal is to **mitigate the destruction of the Great Barrier Reef** by identifying the regions most at risk, in order to allocate resources and methods of protection more effectively," says Gonzalez.

The researchers use the aerial laboratory of the Carnegie Institution of Washington to fly over the Amazon with a telescope. Credit: *Carnegie Institute*

AN AERIAL LABORATORY FLY OVER THE AMAZON

Greg Asner and his team of global ecology researchers do something similar to help preserve the world's main ecosystem: the Amazon. The researchers use the aerial laboratory of the Carnegie Institution of Washington to fly over the region with a telescope, whose **images are processed with an algorithm to generate highly detailed maps** of tree diversity and the survival strategies of each species. Thanks to this technique, scientists have not only discovered 36 previously unknown forest groupings, they **have also found more than six million hectares threatened by mining and logging**.

La ONG ambiental The Nature Conservancy està creando un algoritme capaz de identificar si se captura una tortuga y se libera. Crédito: *Doug Helfrey, NOAA/NOS/ORR/ERD*

The team's goal is **to bring that technology to a global scale**. "We want to employ the system in a satellite in Earth orbit to map the planet every month, which will give the best possible view of how the world's biodiversity is changing and where to put the necessary protections," says Asner.

FACIAL RECOGNITION AT SEA

The next frontier for facial recognition technology and deep learning **may be distinguishing tuna from other fish**. The Nature Conservancy, an environmental NGO, works with different islands in the Pacific Ocean (Palau, Marshall Islands, Solomon Islands and Micronesia) in the implementation of artificial intelligence techniques to reduce the number of protected animals, such as sharks and turtles, accidentally captured by tuna boats The NGO has installed electronic monitoring systems (cameras, sensors and GPS) in a dozen vessels to record all the activity that occurs on them and is creating an algorithm capable of identifying if there is a tuna or a turtle on board the ship, and to alert scientists if shark finning (the practice of slicing off the shark's fins and throwing the rest of its body back into the ocean) occurs. "**We want to know how many seabirds, sharks and turtles are captured** in those vessels and how many are released alive," said Matt Merrifield, chief technology officer at The Nature Conservancy.

The system will facilitate the work of scientists and ecologists who fight against illegal fishing. After 70 days of travel, each tuna boat returns with 800 hours of video, which human observers take approximately 480 hours to examine. "The algorithm does it more quickly and the final result will facilitate the localisation of when and where the fishing activities are carried out. It will also allow us, in the near future, to carry out real-time analysis based on satellites and the immediate detection of irregular activities," Merrifield explains.

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