Biodiversity 'time machine' uses artificial intelligence to learn from the past

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Experts can make crucial decisions about future biodiversity management by using artificial intelligence to learn from past environmental change, according to research at the University of Birmingham. A team, led by the University's School of Biosciences, has proposed a 'time machine framework' that will help decision-makers effectively go back in time to observe the links between biodiversity, pollution events and environmental changes such as climate change as they occurred and examine the impacts they had on ecosystems.

In a new paper, published in Trends in Ecology and Evolution, the team sets out how these insights can be used to forecast the future of ecosystem services such as climate change mitigation, food provisioning and clean water.

Using this information, stakeholders can prioritize actions which will provide the greatest impact.

Principal investigator, Dr. Luisa Orsini, is an Associate Professor at the University of Birmingham and Fellow of The Alan Turing Institute. She explained: "Biodiversity sustains many ecosystem services. Yet these are declining at an alarming rate. As we discuss vital issues like these at the COP26 Summit in Glasgow, we might be more aware than ever that future generations may not be able to enjoy nature's services if we fail to protect biodiversity."

Biodiversity loss happens over many years and is often caused by the cumulative effect of multiple environmental threats. Only by quantifying biodiversity before, during and after pollution events, can the causes of biodiversity and ecosystem service loss be identified, say the researchers.

Managing biodiversity whilst ensuring the delivery of ecosystem services is a complex problem because of limited resources, competing objectives and the need for economic profitability. Protecting every species is impossible. The time machine framework offers a way to prioritize conservation approaches and mitigation interventions.

Dr. Orsini added: "We have already seen how a lack of understanding of the interlinked processes underpinning ecosystem services has led to mismanagement, with negative impacts on the environment, the economy and on our wellbeing. We need a whole-system, evidence-based approach in order to make the right decisions in the future. Our time-machine framework is an important step towards that goal."

Lead author, Niamh Eastwood, is a Ph.D. student at the University of Birmingham. She said: "We are working with stakeholders (e.g. UK Environment Agency) to make this framework accessible to regulators and policy makers. This will support decision-making in regulation and conservation practices."
The framework draws on the expertise of biologists, ecologists, environmental scientists, computer scientists and economists. It is the result of a cross-disciplinary collaboration among the University of Birmingham, The Alan Turing Institute, The University of Leeds, the University of Cardiff, The University of California Berkeley, The American University of Paris and the Goethe University Frankfurt.


Provided by University of Birmingham

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