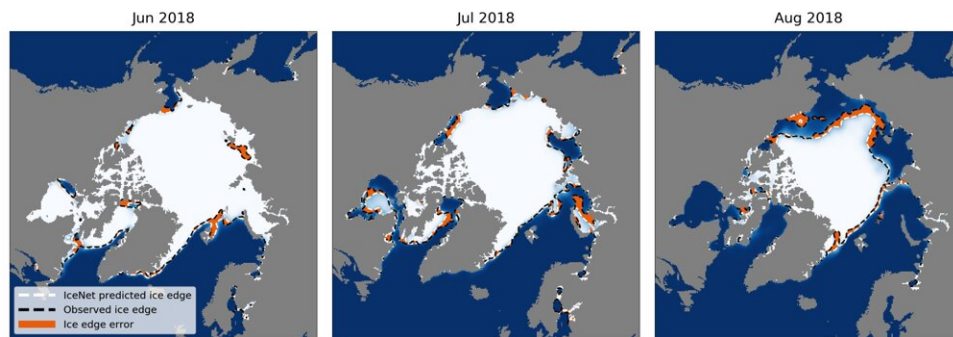


Artificial intelligence to help predict Arctic sea ice loss

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IceNet figure. Credit: British Antarctic Survey

A new AI (artificial intelligence) tool is set to enable scientists to more accurately forecast Arctic sea ice conditions months into the future. The improved predictions could underpin new early-warning systems that protect Arctic wildlife and coastal communities from the impacts of sea ice loss.

Published this week in the journal *Nature Communications*, an international team of researchers led by British Antarctic Survey (BAS) and The Alan Turing Institute describe how the AI system, IceNet, addresses the challenge of producing accurate Arctic sea ice forecasts for the season ahead—something that has eluded scientists for decades.

Sea ice, a vast layer of frozen sea water that appears at the North and South poles, is notoriously difficult to forecast because of its complex relationship with the atmosphere above and ocean below. The sensitivity of sea ice to increasing temperatures has caused the summer Arctic sea ice area to halve over the past four decades, equivalent to the loss of an area around 25 times the size of Great Britain. These accelerating changes have dramatic consequences for our climate, for Arctic ecosystems, and Indigenous and local communities whose livelihoods are tied to the seasonal sea ice cycle.

IceNet, the AI predictive tool, is almost 95% accurate in predicting whether sea ice will be present two months ahead—better than the leading physics-based model.

Lead author Tom Andersson, Data Scientist at the BAS AI Lab and funded by The Alan Turing Institute, explains: "The Arctic is a region on the frontline of climate change and has seen substantial warming over the last 40 years. IceNet has the potential to fill an urgent gap in forecasting sea ice for Arctic sustainability efforts and runs thousands of times faster than traditional methods."

Dr. Scott Hosking, Principal Investigator, Co-leader of the BAS AI Lab and Senior Research Fellow at The Alan Turing Institute, says: "I'm excited to see how AI is making us rethink how we undertake environmental research. Our new sea ice forecasting framework fuses data from satellite sensors with the output of climate models in ways traditional systems simply couldn't achieve."

Unlike conventional forecasting systems that attempt to model the laws of physics directly, the authors designed IceNet based on a concept called deep learning. Through this approach, the model 'learns' how sea ice changes from thousands of years of climate simulation data, along with decades of observational data to predict the extent of Arctic sea ice

months into the future.

Tom Andersson concludes: "Now we've demonstrated that AI can accurately forecast sea ice, our next goal is to develop a daily version of the model and have it running publicly in real-time, just like [weather forecasts](#). This could operate as an early [warning system](#) for risks associated with rapid sea ice loss."

More information: Seasonal Arctic sea ice forecasting with probabilistic deep learning, *Nature Communications* (2021).
[dx.doi.org/10.1038/s41467-021-25257-4](https://doi.org/10.1038/s41467-021-25257-4)

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