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# A daily to seasonal Arctic sea ice forecasting AI

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Arctic sea ice forecasting is a major scientific effort with fundamental challenges at play. To address such challenges, we have developed a physics-informed, data-driven sea ice forecasting system, IceNet, which outperformed a leading dynamical model (ECMWF SEAS5) in monthly-averaged forecasts of pan-Arctic sea ice concentration. IceNet adopted a U-Net deep learning architecture and was trained on over 2,000 years of CMIP6 climate simulation data. Despite its state-of-the-art seasonal forecasting skill at lead times of 2-6 months, IceNet has two main limitations. First, it could not outperform the dynamical model in short-range (1-month) forecasts. This is partly caused by IceNet operating on monthly-averages, which smears the initial conditions and weather phenomena that can dominate predictability at short time scales. Second, IceNet is afflicted by the 'spring predictability barrier' that affects all long range forecasts of summer. This predictability barrier arises primarily due to the importance of melt-season ice thickness conditions on summer sea ice. Here we present our early findings from IceNet2, which attempts to alleviate these issues by operating on daily-averages and including sea ice thickness as an input variable. IceNet2 paves the way for our efforts to aid the Arctic conservation community by developing the first public, operational sea ice forecasting AI.