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Deep learning for surrogate modelling of neXtSIM

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A novel generation of sea-ice models with Elasto-Brittle rheologies can represent the drift and deformation of sea-ice with an unprecedented resolution and accuracy. To speed-up these computationally heavy simulations and to facilitate subgrid-scale parameterizations, we investigate supervised deep learning techniques for surrogate modelling of large-scale, Arctic-wide, neXtSIM Lagrangian simulations. We tailor convolutional neural networks to emulate the sea-ice thickness for 12 hours in advance. In our most successful approach, the U-Net learns to make beneficially use of information from multiple temporal and spatial scales, an important feature of the neural network for sea-ice prediction. Consequently, cycling the neural network performs in average 36% better than persistence on a daily timescale and up to 43 % on a monthly timescale. These promising results therefore demonstrate a way towards surrogate modelling of Arctic-wide simulations.