Sea Ice Outlook
2019 August Report
Individual Outlook

Name of contributor or name of contributing organization:

NASA GSFC (Sewnath)

Is this contribution from a person or group not affiliated with a research organization?

Name and organization for all contributors. Indicate primary contact and total number of people who may have contributed to your Outlook, even if not included on the author list.

Primary contact: Akira Sewnath
Organization: GSFC

Do you want your June contribution to automatically be included in subsequent reports? (If yes, you may still update your contribution via the submission form.)

This is a new submission.

What is the type of your Outlook projection?

Statistical

Starting in 2017 we are accepting both pan-Arctic and pan-Antarctic sea ice extent (either one or both) of the September monthly mean. As in 2016, we are also collecting Alaskan regional sea ice extent. To be consistent with the validating sea ice extent index from NSIDC, if possible, please first compute the average sea ice concentration for the month and then compute the extent as the sum of cell areas > 15%.

a) Pan-Arctic September extent prediction in million square kilometers.

4.18

b) same as in (a) but for pan-Antarctic. If your method differs substantially from that for the Arctic, please enter it as a separate submission.

c) same as in (b) but for the Alaskan region. Please also tell us maximum possible extent if every ocean cell in your region were ice covered.

"Executive summary" of your Outlook contribution (using 300 words or less) describe how and why your contribution was formulated. To the extent possible, use non-technical language.

This contribution originated from a desire to leverage modern statistical methods to create sea ice extent predictions. Though there is a historical, underlying linear trend in the data itself, its recent nonlinear nature demands a statistical model that could represent this nonlinearity while taking into consideration the relative scarcity of usable data. Through experimentation of different statistical models, the Convolutional Neural Network (CNN), when formulated for a "pixel-wise" regression, could create a compelling nonlinear model by leveraging both time information (in the layers of the input data), as well as spatial information about individual grid cells by including data from each grid cell along with a border of cells around it.

Brief explanation of Outlook method (using 300 words or less).

To train the CNN, a collection of 3D volumes representing information about a particular grid cell along with information about its neighboring grid cells is used as input data. Each 3D volume is made up of layers representing the ice concentration for a given month along with information from the two months prior. A couple of layers representing the coordinates for the grid cells are also added to these volumes. These inputs are fed in a CNN model made up of 4 convolutional layers, one pooling layer, and two dense layers with dropout. The output of the model returns predictions for the ice concentration at the particular grid cell for the next two months.

Tell us the dataset used for your initial Sea Ice Concentration (SIC).

NSIDC NASA Team, https://nsidc.org/data/nsidc-0081

Tell us the dataset used for your initial Sea Ice Thickness (SIT) used. Include name and date.

If you use a dynamic model, please specify the name of the model as a whole and each component including version numbers and how the component is initialized:

Not Specified

If available from your method.
a) Uncertainty/probability estimates:

Median

Ranges

Standard Deviations

b) Brief explanation/assessment of basis for the uncertainty estimate (1-2 sentences).

c) Brief description of any post processing you have done (1-2 sentences).