13B.4 - Application of the Machine Learning to Tropical Cyclone Formation Detection

Thursday, May 12, 2022

11:30 AM - 11:45 AM

Galerie 3 (New Orleans Marriott)

Abstract

Searching for dominant large-scale conditions that govern tropical cyclone (TC) formation plays a key role in operational TC forecasting as well as the understanding of TC formation processes. Using various deep neutral network (DNN) architectures, it is found that UNet, a well-known machine learning approach for medical image segmentation applications, could provide a promising capability in capturing TC formation from climate dataset. To detect TC formation, we propose in this study a radial basis function (RBF) built from the IBTrACS best track data the UNet algorithm and apply it to the 2010-2020 TC seasons in the western and eastern Pacific basins. With a set of large-scale environments from the NCEP/NCAR reanalysis, our attempt to detect TC formation based on the Intersection-over-Union (IoU) ratio shows that UNet is optimized at the 12-24h forecast lead time and gradually deteriorated at longer lead times, with the maximum IoU score of ~ 0.14. Some false negative and false positive issues with UNet, however, still remain that require further tuning of the UNet algorithm as more data is available. Our proposed approach opens a new direction in the application of machine learning methods to detecting extreme events beyond the current classification techniques.

Co-Authors

N

Quan Nguyen (Presenter)
Indiana University Bloomington
Bloomington, IN
USA

K

Chanh Kieu
Indiana University Bloomington
Bloomington, IN
USA