Scanning Radar Sea-clutter Mitigation using Deep Neural Networks

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Office of Science
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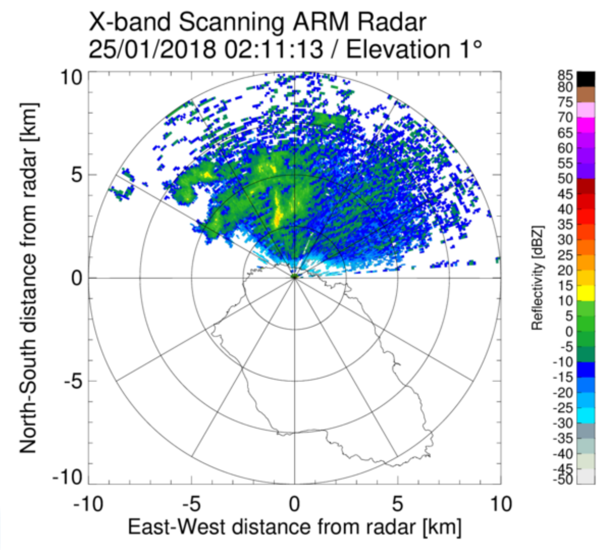
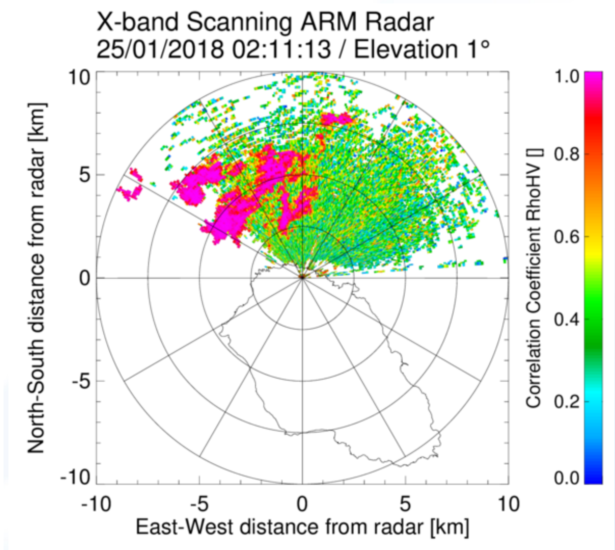
ARM/ASR PI Meeting 2019, Bethesda, MD

Introduction

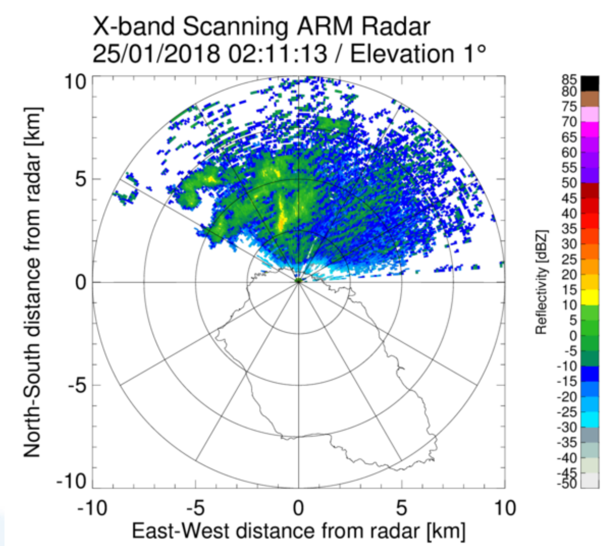
The quality of radar measurements performed by ARM at the ENA site is subject to significant impacts from **sea clutter**, non-meteorological echoes that are a concern for both **X-band** and **Ka/W-band** scanning radars at low elevation angles.

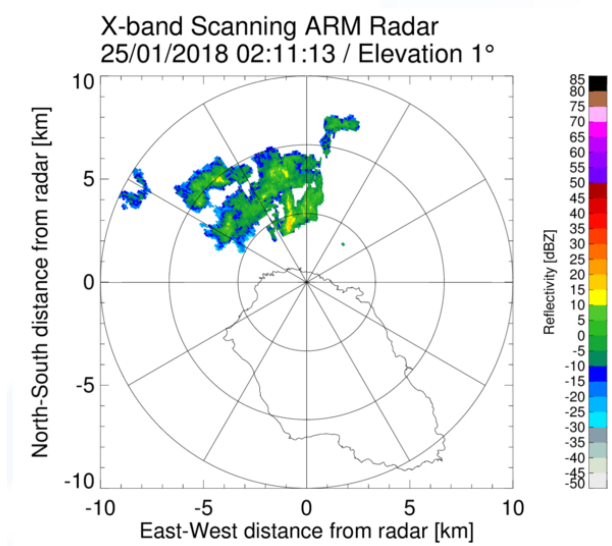




Introduction

Techniques based on thresholding of polarimetric returns, particularly **correlation coefficient** (RhoHV), have significant skill in identifying the presence of hydrometeors embedded within sea-clutter.

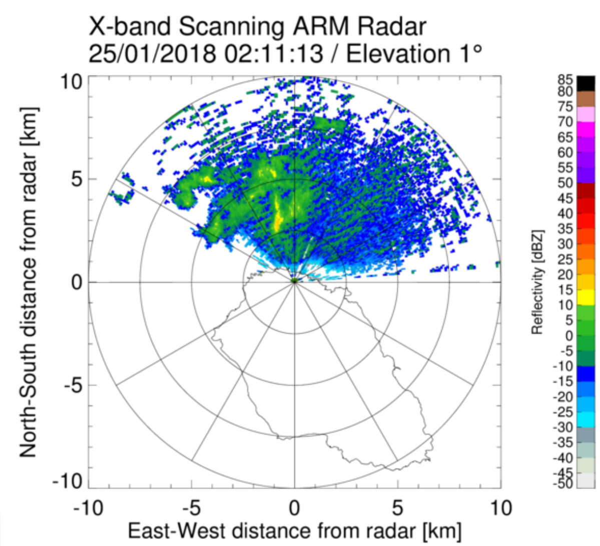


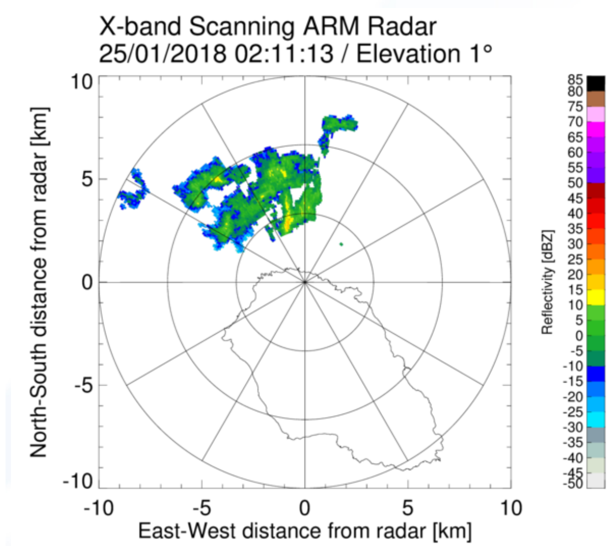


Bernat Puigdomenech

Introduction

However, efficacy **declines** for weaker returns, and the relative contributions of signal and clutter become increasingly **ambiguous**. Machine learning promises some interesting possibilities.





The Past

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1990 IJCNN International Joint Conference on Neural Networks

A multi-layer neural network classifier for radar clutter

C. Deng ; S. Haykin

Publication Year: 1990, Page(s): 241 - 246 vol.1

Cited by: Papers (8)

Abstract (507 Kb)

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computer for distinguishing several major categories of rada
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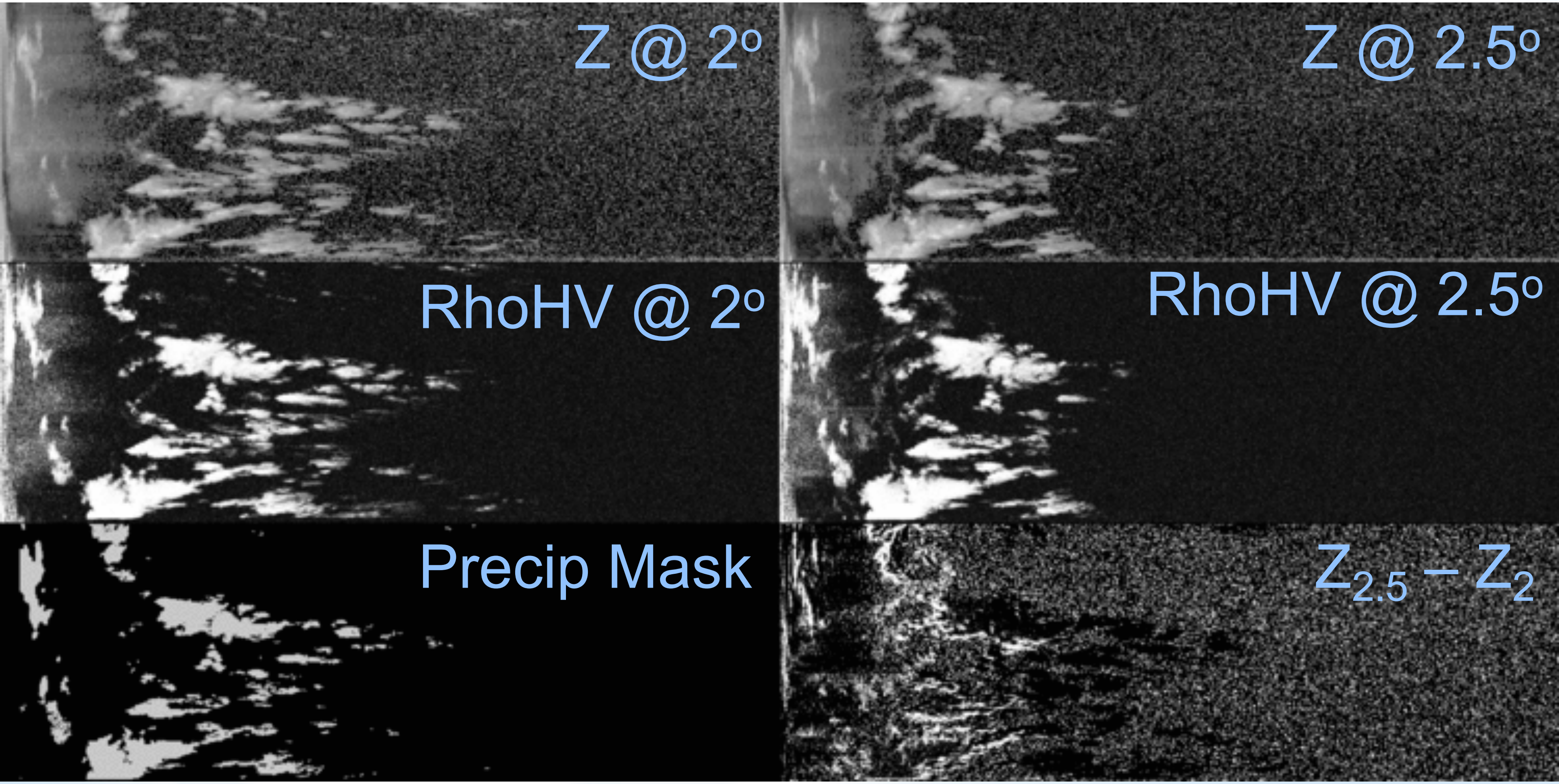
A centerpiece of our work is the **convolutional neural network** (CNN), a key part of the **deep learning** (Lecun 2015) paradigm, which has enabled dramatic progress in **image analysis** applications.

Lecun, Y., Bengio, Y., & Hinton, G. (2015). Deep learning. Nature, 521(7553), 436-444. DOI: 10.1038/nature14539

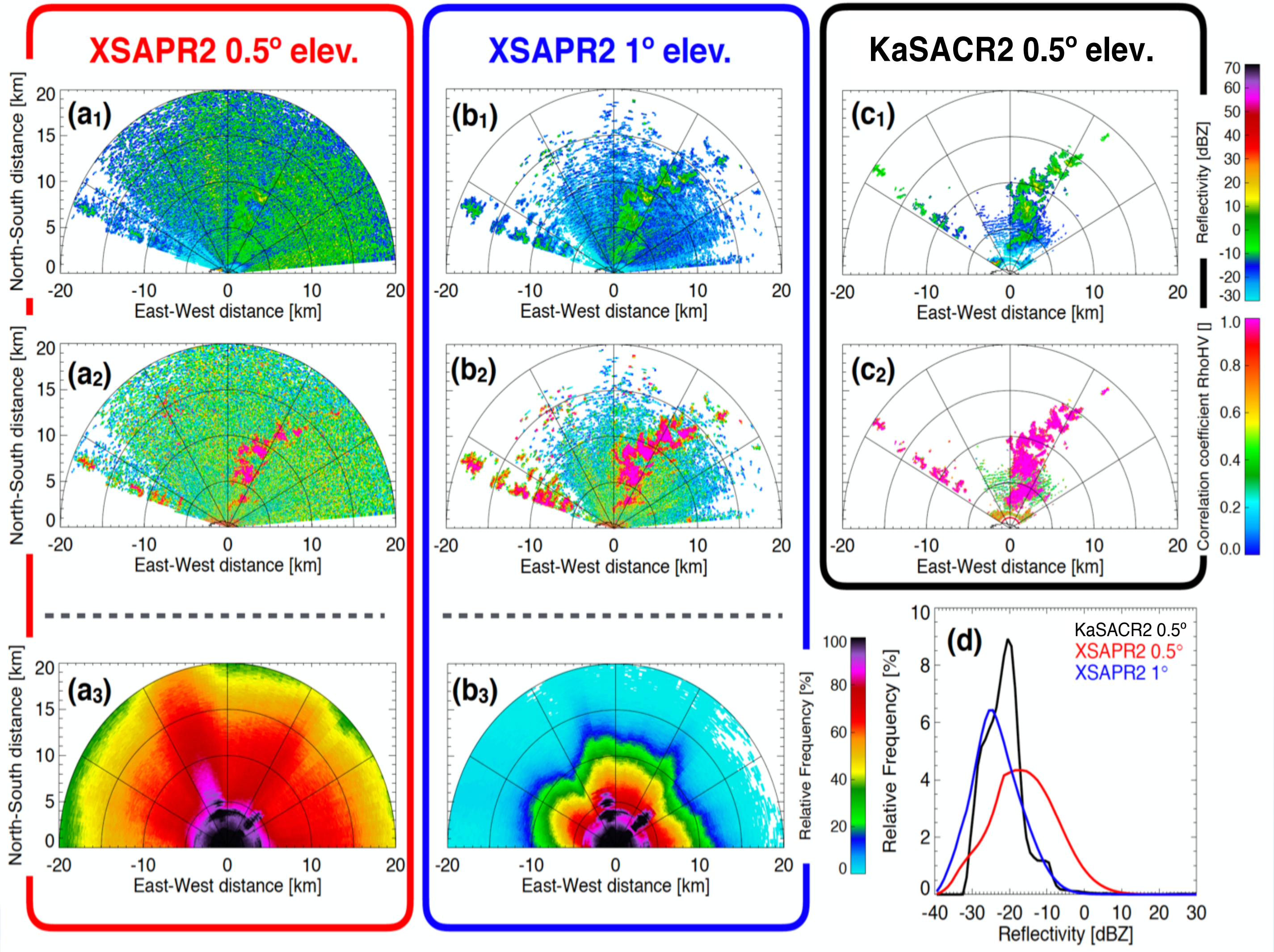
Strategy

- ❑ Transitioned from **Caffe** to **PyTorch** as our working platform.
- ❑ Supervised learning using a RhoHV-based dataset.
- ❑ X-SAPR2 dataset with 87,000 **labeled** scans.
- ❑ Incorporate **spatial** and **temporal** NN analysis to improve skill and separate signal from noise.
- ❑ Generate derivative products, such as surface wind fields at sea.

Dataset with 87,000 labeled scans



Derivative Applications



Katia Lamer