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Very deep learning for ship discrimination in synthetic aperture radar imagery

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ABSTRACT

Efficient and effective ship discrimination across multiple Synthetic Aperture Radar sensors is becoming more important as access to SAR data becomes more widespread. A flexible means of separating ships from sea is ideal and can be accomplished using machine learning. Newer, advanced deep learning techniques offer a unique solution but traditionally require a large dataset to train effectively. Highway Networks allow for very deep networks that can be trained using the smaller datasets typical in SAR-based ship detection. A flexible network configuration is possible within Highway Networks due to an adaptive gating mechanism which prevents gradient decay across many layers. This paper presents a very deep Highway Network configuration as a ship discrimination stage for SAR ship detection. It also presents a three-class SAR dataset that allows for more meaningful analysis of ship discrimination performances. The proposed method was tested on this SAR dataset and had the highest mean accuracy of all methods tested at 96.67%. The proposed ship discrimination method also provides improved false positive classification compared to the other methods tested.