# Multi-Model Joint All-Day Ship Detection for SDGSAT-1 Thermal Imager

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## Abstract

With the development of space-based infrared remote sensing detection technology, wide-swath, high-resolution, and highsensitivity thermal infrared data can achieve high-precision radiation measurements and day-night monitoring of large ship. However, due to the negative effects of clouds of various scales on ship detection and the wide spatial distribution of ships, it is difficult to detect them as the contrast changes with the alternation of factors such as air temperature, ship temperature, and water temperature during day and night. To address the issue of high false alarms caused by small fragmented clouds in spacebased infrared remote sensing ship detection, a compact attention mechanism cloud detection network model is proposed. Based on a fully convolutional network and adding residual connections to eliminate network degradation, selective kernel convolution is designed in the encoder to achieve an adaptive receptive field according to target size, highlighting key texture features and effectively extracting high-level context feature maps. Aiming at the real-time satellite detection demand for medium-resolution and low signal-to-clutter ratio ships in wide areas, a lightweight one-stage ship detection model is proposed. Dilated convolution is used at the top of the network to achieve fine extraction of small targets. The backbone network and feature fusion network are improved to adaptively recalibrate the channel's feature response. Depthwise separable convolution is employed during downsampling to reduce complexity. For the 300-kilometer wide SDGSAT-1 thermal infrared remote sensing image, multiple models are combined to effectively detect ship targets from complex environments such as clouds, sea surfaces, and ground. The accuracy is 98.68%, achieving wide-area search for ship targets in medium-resolution thermal infrared remote sensing images.

# **Keywords**

Thermal infrared remote sensing, ship detection, clouds remove.

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