Development of convolutional neural network algorithm on ships detection in Natuna Islands-Indonesia using land look satellite imagery

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Abstract	Indonesia's vast waters require much time and energy to monitor illegal fishing. Utilizing remote sensing technology is the right solution for monitoring, controlling, and surveying (MCS) systems. The phenomenon of particular concern to the ship detection process using a remote sensing system is the form of images with various positions due to the ship's rectangular and narrow dimensions and the high viewing angle from space. This condition differs if the shooting is carried out close to objects on the earth's surface. Considering the situation of recording data from a very far position, refining the convolutional neural network (CNN) method for processing remote sensing image data continues to be developed, primarily related to detecting ships. The latest development of the CNN algorithm shows its ability to see vessels by taking into account the orientation factor of objects at sea level with almost perfect accuracy. The problem is that the system needs to be able to detect in detail the movements and types of ships recorded by remote sensing satellite sensors. Therefore, an automatic ship detection instrument is needed based on Land look USGS base map high-resolution image data to maintain maritime sovereignty in Indonesia. Image data were acquired from the waters of the Natuna islands and taken at a scale of 1: 2000. The data obtained from the acquisition are five high-resolution image data 1680 x 840 pixels, in which there are 32 ship image data and 3100 non-ship image data 80 x 80 pixels. The ship image data is then processed by color and geometry augmentation to produce 1440 new data. The image processing stage afterward is reading and splitting the dataset, creating a CNN, and training and testing the CNN model. Based on the results of the ship and non-ship objects detection with the CNN model, the accuracy results are 99.78% and 99.24%, respectively.
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