# UAV-Based Pavement Crack Detection Using Deep Convolutional Neural Networks

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## SUMMARY

Pavement maintenance and rehabilitation are vital to safe driving. Conventional manual crack detection is costly, time-consuming, and subjective. Recently, unmanned aerial systems (UASs) have shown great potential for pavement crack detection and monitoring. This study proposes a UAS-based pavement crack detection model using a deep convolutional neural network (DCNN). For the purposes of this research, a DJI Matrice-600 UAV equipped with the Sony a7Rii camera is used. The proposed model combines the advantages of image classification and segmentation of VGG-16 and U-net DCNNs. Firstly, the VGG-16 is applied to classify the crack sample images to two classes, namely crack and non-crack. Then, the images that are classified as crack are fed into the U-net segmentation network to precisely segment the pavement cracks. To overcome the limitations in the number of available crack samples in the collected data and to improve the segmentation results, the network is pre-trained using the CRACK500 dataset. Subsequently, to optimize the hyperparameters, the transfer learning technique is used to train the network on the crack samples. It is shown that the proposed approach has the potential to provide accurate classification and segmentation for pavement cracks form UAV-based images.

UAV-Based Pavement Crack Detection Using Deep Convolutional Neural Networks (11620)
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FIG Congress 2022
Volunteering for the future - Geospatial excellence for a better living
Warsaw, Poland, 11–15 September 2022