Autonomous Rapid Disaster Damage Assessment Using Machine Learning Techniques

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As natural disasters are becoming more frequent and greater in intensity, effective disaster damage assessment has become crucial to save human lives and minimize economic impact. The current methods for damage assessment are not very effective as they are slow and require the assistance of human personnel. In this project, we propose a fast, fully autonomous, disaster assessment method using image processing and machine learning techniques. The proposed method involves 3 steps. In the first step, satellite images of the disaster area are collected and fed into a convolution neural network. Second, the convolutional neural network finds all the buildings in the image. In the third and final step, for each building, another convolutional neural network predicts how damaged it is on a scale of 1 to 4 with 1 being undisturbed, 2 being minor damage, 3 being major damage and 4 being destroyed. Both neural networks were developed and trained extensively in this project. The proposed method is generic in nature and can work with any variety of disasters. As a case study, we applied and tested this method on the Santa Rosa wildfire in 2017. The satellite images span 1051 sq km and include thousands of buildings. The proposed method predicted the damage of buildings with 90.46% accuracy within 5 minutes.

Awards Won:
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