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Thesis Title: An Analytical Framework Based on Microblogged Communications for Disaster Management

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Catastrophic disasters have been striking more often in recent years forcing researchers to emphasize managing disaster information and establishing state-of-art technologies to minimize the losses. During any natural or man-made disaster, microblogging platforms are increasingly used to share time-sensitive information. Among several social media platforms, Twitter is most prevalent during natural disasters.

Firstly, a novel Deep Convolutional Neural Network (DCNN) based on the concept of Unsupervised Domain Adaptation (UDA) that can classify unlabeled data for a new disaster (target domain) using the labeled data available from the previous disaster (source domain) is proposed. The proposed UDA method using the Maximum Mean Discrepancy (MMD) metric outperforms different state-of-the-art methods even without having labeled data for the new disaster.

An end-to-end deep convolutional neural network, CoV-SSDA is proposed, that is trained on the labeled images of the related previous infection with two classes {Normal, Pneumonia}, unlabeled images of the new infection with three classes {COVID19, Normal, Pneumonia} and a small batch of labeled images of the new infection such that the trained model acquires the knowledge about the novel class COVID19 and adapts to achieve an accuracy of 93.92% when tested for the new infection on the target domain.

A Multi-Source Domain Adaptation framework for Disaster Management (MSDA-DM) for classifying disaster images posted on social media based on unsupervised DA with adversarial training is proposed. Another **C**ross-**A**ttention **M**ulti-**M**odal (CAMM) framework is proposedfor classifying multimodal disaster data.

Thus, this thesis presents an analytical framework of deep learning techniques for classifying disaster-related messages posted on the microblogging site Twitter.