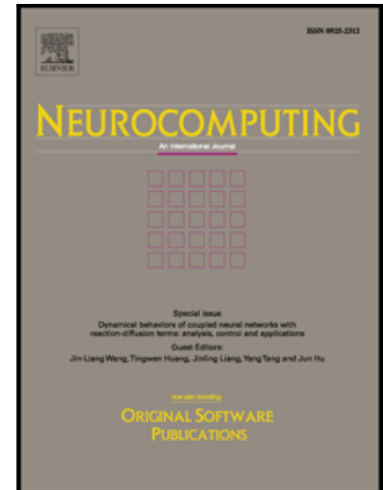


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Early Fire Detection using Convolutional Neural Networks during Surveillance for Effective Disaster Management

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Abstract—Fire disasters are man-made disasters, which cause ecological, social, and economical damages. To minimize these losses, early detection of fire and an autonomous response is important and helpful to disaster management systems. Therefore, in this article, we propose an early fire detection framework using fine-tuned convolutional neural networks for CCTV surveillance cameras, which can detect fire in varying indoor and outdoor environments. To ensure the autonomous response, we propose an adaptive prioritization mechanism for cameras in the surveillance system. Finally, we propose a dynamic channel selection algorithm for cameras based on cognitive radio networks, ensuring reliable data dissemination. Experimental results verify the higher accuracy of our fire detection scheme compared to state-of-the-art methods and validate the applicability of our framework for effective fire disaster management.

Keywords—Machine Learning, Image Classification, Learning Vision, Deep Learning, Surveillance Networks, Fire Detection, Disaster Management

1. Introduction

Disaster management as a hybrid research area, has attracted the attention of many research communities such as business, computer science, health sciences, and environmental sciences. According to federal emergency management agency policy, there are two main categories of disaster: 1) Technological such as emergencies related to hazardous materials, terrorism, and nuclear power plants etc., and 2) Natural such as floods, earthquakes, and fires on forests etc. Regardless of the nature of disaster, certain characteristics are necessary for effective management of almost all types of disasters. These features include prevention, advance warning, early detection, early notification to public and concerned authorities, response mobilization, damage containment, and providing medical care as well as relief to affected citizens [1]. Disaster management has four main phases including preparedness, mitigation, response, and recovery, each of them requires different type of data, which is needed by different communities during disaster management. Such data can be processed using data analysis

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