Abstract

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# A Complete AI Emergency System: Detection, Analysis and Evacuation Planning

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## Abstract

Deep Learning has been successfully used in various applications, and recently, there has been an increasing interest in applying deep learning in emergency management. However, there are still many significant challenges that limit the use of deep learning in the latter application domain. In this thesis, we address some of these challenges and propose novel deep learning methods and architectures.
The challenges we address fall in these three areas of emergency management: Detection of the emergency (fire), Analysis of the situation without human intervention and finally Evacuation Planning. In this thesis, we have used computer vision tasks of image classification and semantic segmentation, as well as sound recognition, for detection and analysis. For evacuation planning, we have used deep reinforcement learning. The detection phase involves detecting whether there is a fire emergency or not. Previous methods proposed for the detection problem have been prone to overfitting, large inference times and requiring tremendous amounts of training data. To overcome these issues, we propose to use state-of-the-art CNNs with pre-trained weights. These are trained to distinguish between fire and normal images, by fine-tuning their parameters on our own custom dataset. To further reduce inference time and reduce required training time, we also propose a CNN-ELM hybrid model. Finally, we propose a more general-purpose emergency detection method using audio signals. For this, we use multiple features extracted by signal processing methods, proposing a novel attention-based deep architecture.

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## Biography

Jivitesh Sharma holds a PhD in Artificial Intelligence with expertise in deep learning. He has experience in research for developing deep neural networks for computer vision, reinforcement learning, sound recognition etc. He has published research articles in top AI conferences and journals. He currently holds the state-of-the-art models in sound recognition and network intrusion detection. His research interests lie in deep learning, neural network architectures, learning algorithms, computer vision and deep reinforcement learning in signal processing methods.