Identifying Research Gap and Opportunities in the use of Multimodal Deep Learning for Emergency Management

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Introduction - Background

- People are now increasingly using mobile devices during disasters. There are also other sources which provide disaster-related data.

- As a result, an overwhelming amount of data is generated in different modalities (text, audio, video and images) during an emergency.

- Different modalities of data are characterized by different features (e.g., images having colour, texture & shape, voice having pitch).

- Extracting, pre-processing, analysing and interpreting a huge variety of multimodal data within a short period of time is a major challenge faced by emergency responders.

Applications of MMDL

- The challenge in MMDL is to relate different features into a single joint feature space.

- MMDL have successfully used in affect recognition, event recognition, media description, multimedia retrieval, speech recognition and visual classification.

How MMDL can be used in Disaster Research

- Disasters have characteristics that makes developing general software tools to integrate multiple data streams in real-time disaster situations challenging (E.g., unpredictable, different, disaster-related data are heterogeneous, time-sensitive and lack common terminology, disaster management may take from a few hours to a few years to complete, lessons learned from one disaster cannot be easily generalized to another)

- Deep learning techniques outperform traditional fusion techniques in analysing a huge amount of data.

- Applying MMDL techniques on disaster data and implementing an integrated computer system has the potential to help decision-makers by:
  - improving their access to data
  - reducing uncertainty in decision making
  - supporting more consistent and well-informed decision making across individuals
  - reducing the time taken to analyse data and associated cognitive load.

Multimodal Deep Learning (MMDL)

- MMDL have recently demonstrated promising results in learning features over multiple modalities.

- The idea behind Artificial Neural Networks (ANN) was inspired by the functioning of brain neurons.

References


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