

# ARTIFICIAL INTELLIGENCE FOR DISASTER AID AND RESCUE

## SUSTAINABLE DEVELOPMENT GOAL

**13 CLIMATE ACTION**

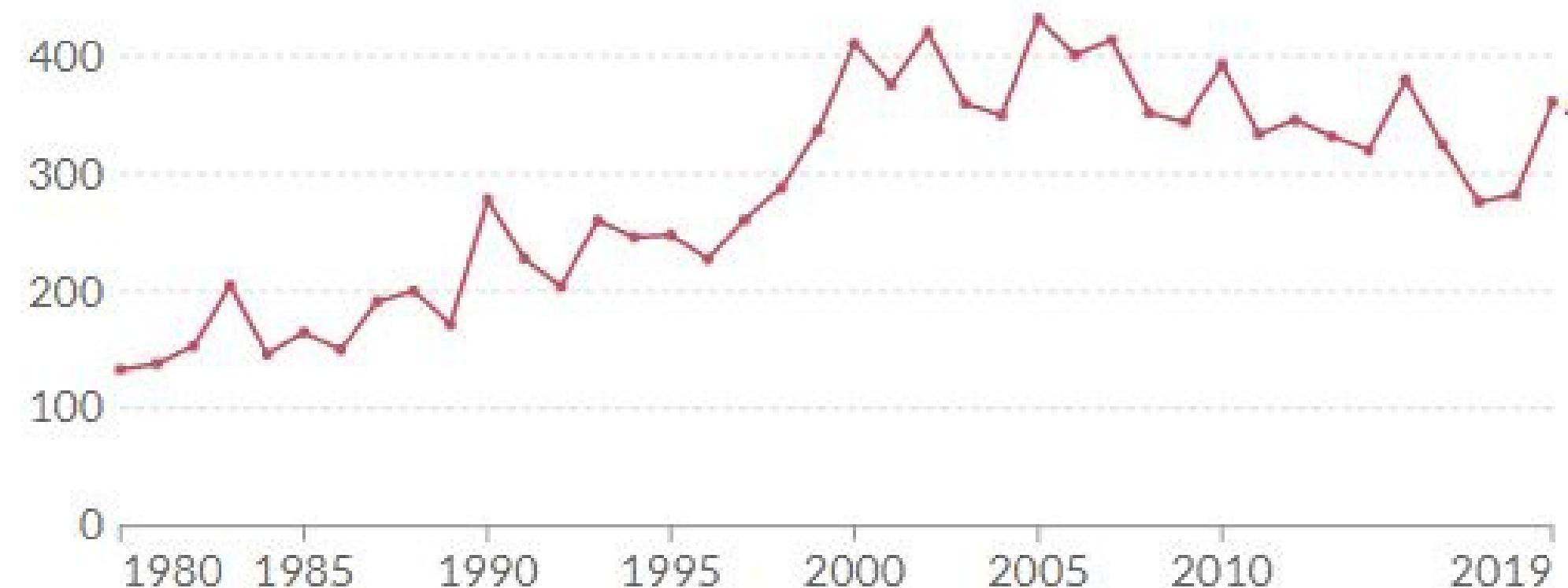


**TARGET 13.3**  
**BUILD KNOWLEDGE AND CAPACITY TO MEET CLIMATE CHANGE**

## INTRODUCTION

Natural and Man-made disasters are unexpected events that concern nations worldwide. Every year, disasters result in infrastructural damages, monetary costs, distress, injuries, and deaths. Unfortunately, climate change is strengthening the destructive power of natural disasters. Some extreme disaster scenarios includes flood, earthquake, forest fires, landslide and traffic accidents. For instance, the flood that hit Pakistan from June to August in 2022, over 33 million people have affected, 1.3 million houses destroyed , causing 1700 deaths, 12,867 injured victims, and estimated financial damage of about \$40 billion dollars.

When a natural disaster happens, search and rescue missions must take place immediately, in order to maximize the chance of rescuing survivors. Indeed, the first 72 hours after the occurrence of a natural disaster is critical for rescuing survivors. Traditionally, search and rescue missions are performed by government teams but their performance diminished by lack of suitable situational awareness and communication capabilities. The number of global reported natural disaster events in last few decades are illustrated below.



## PROBLEM

Lack of appropriate and rapid assistance to disaster victims due to ineffective identification and assessment of disaster-struck area. The problem threefold as:

### 1. Detection

Tardy identification of disaster caused widespread fatalities, infrastructural damages as well as monetary cost.

### 2. Localization

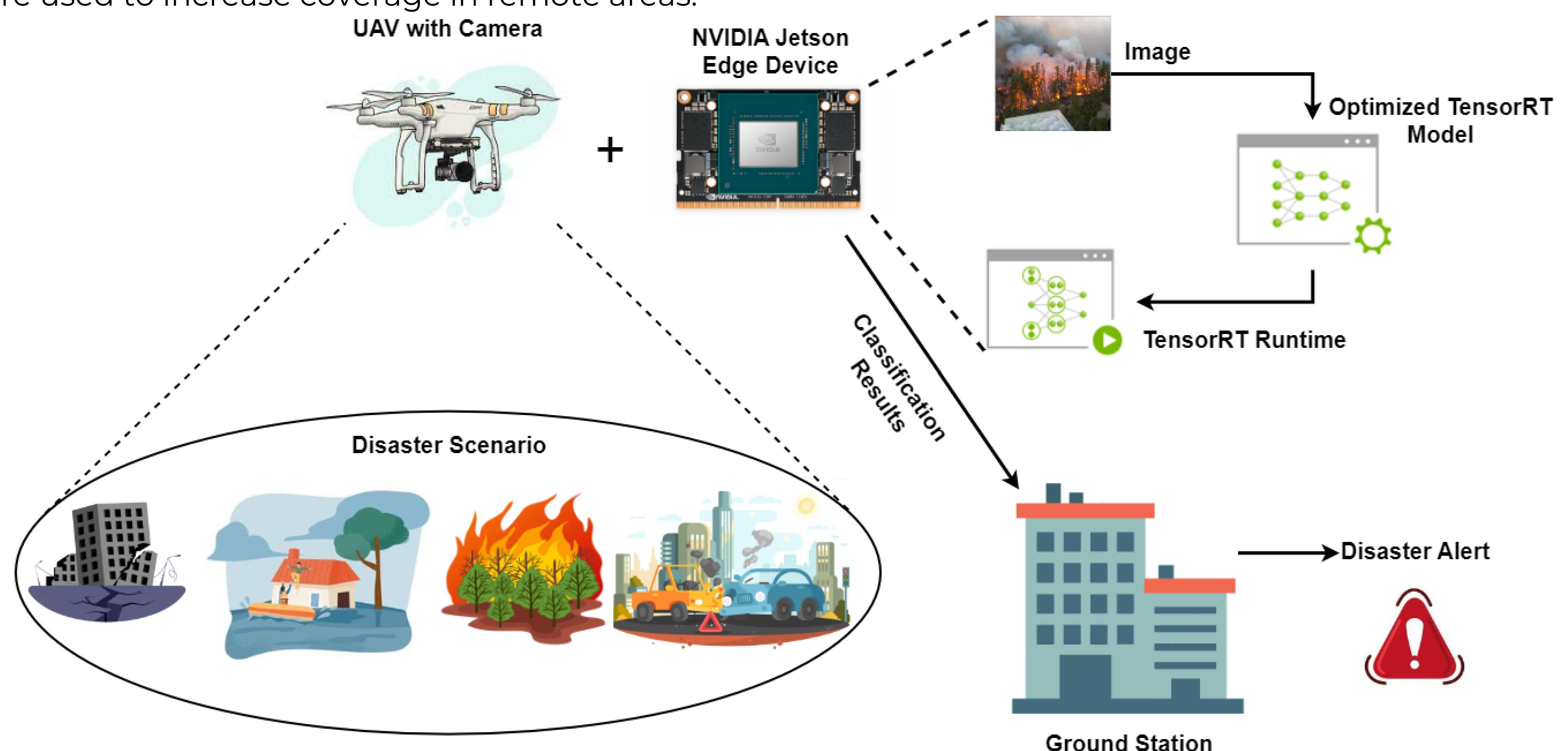
Time consuming for the emergency responders to locate victims and help them.

### 3. Communication

Communication breakdown and disconnection due to disasters.

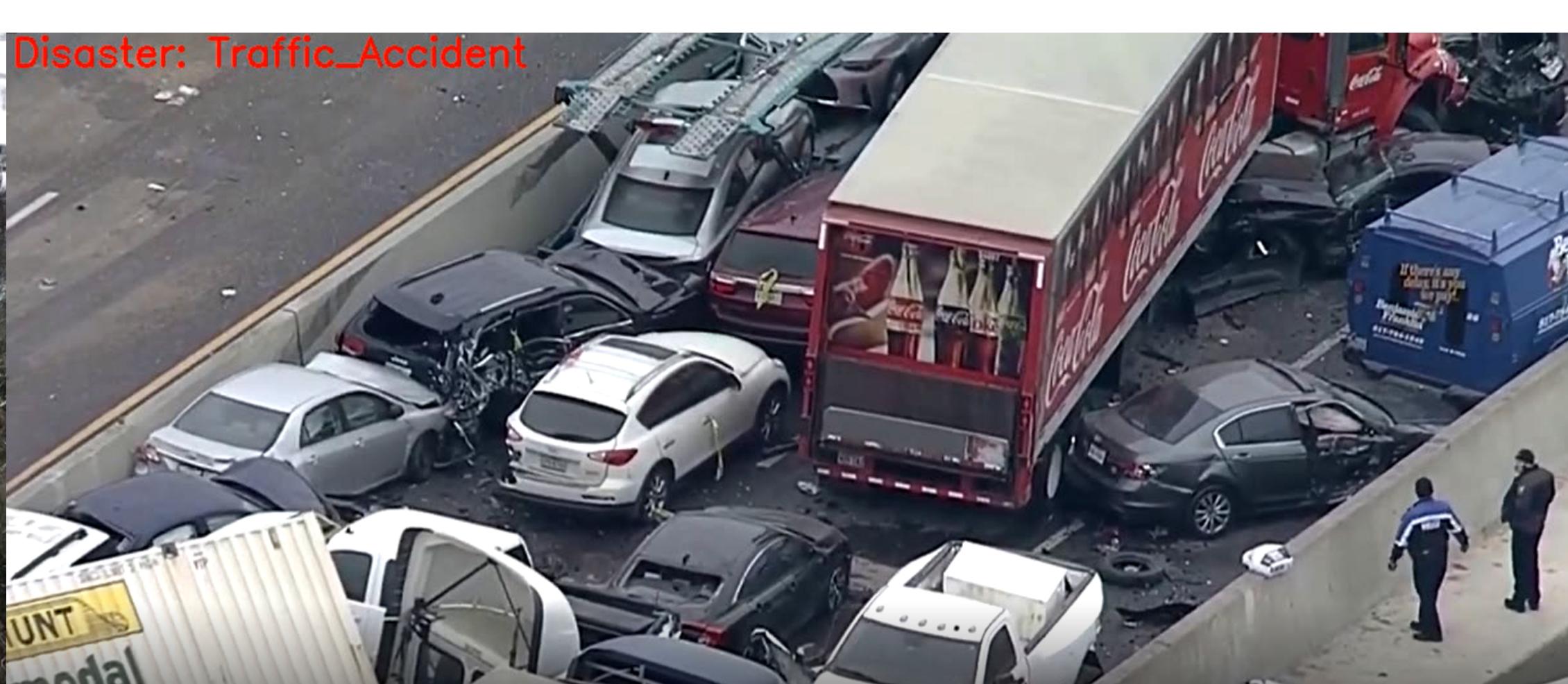
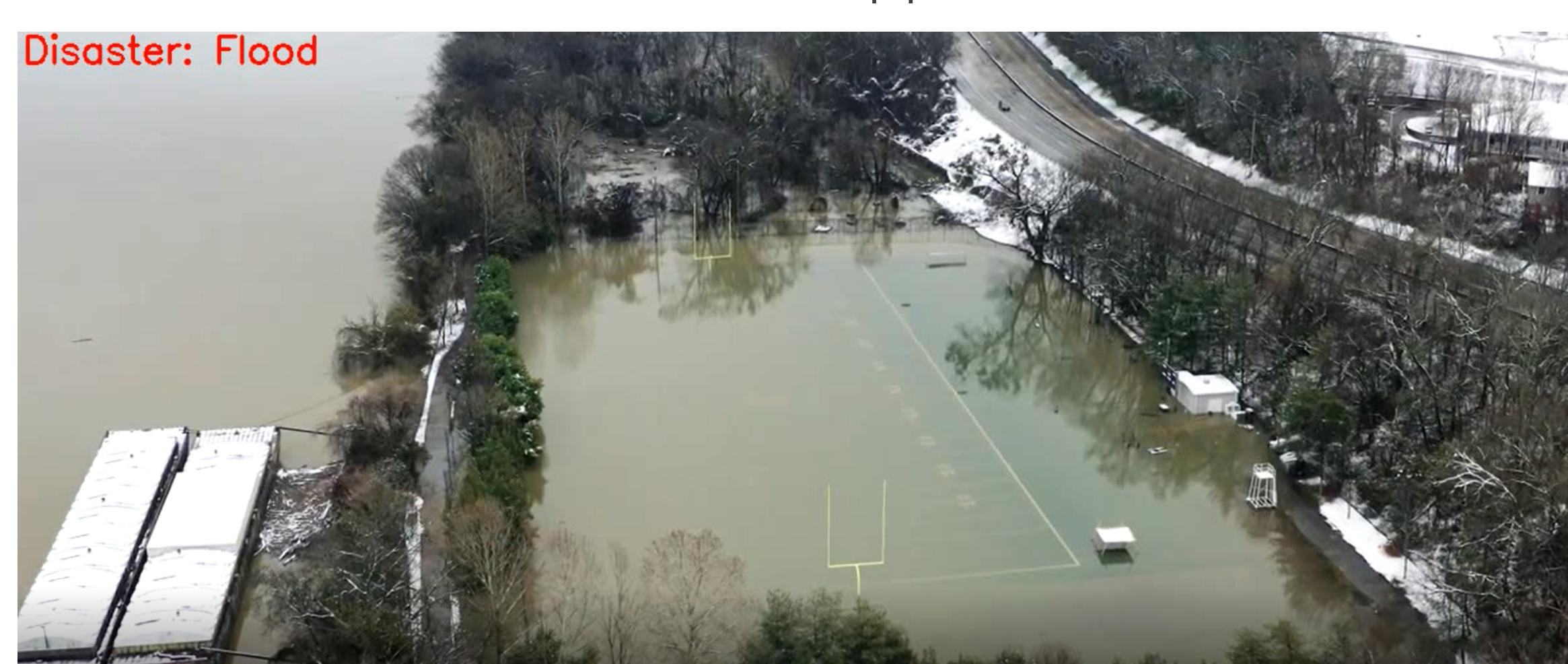
## METHODOLOGY

We proposed an AI-powered drone to quickly detect and locate humans and vehicles to assess the impact and provide rapid assistance to the victims. Also, wireless sensors integrated with drones provide communication channels through drones for emergency communication in remote areas. State-of-the-art deep learning classifier is implemented on the edge device. AI-powered drones are deployed in a disaster scenario. The camera integrated with the drone captures images which are then processed by an indigenous AI algorithm to classify disasters, detect and localize victims and convey useful insights to the ground control station to generate alerts to plan the rescue mission. Wireless ad-hoc networks provide the facility to communicate with victims where no fixed infrastructure is available. Relay drones are used to increase coverage in remote areas.



## RESULT

The proposed solution outperformed the traditional methods in terms of latency, throughput and resources consumption and is 99x faster. Sophisticated AI algorithms also achieves state-of-the-art accuracy in classifying disaster. For illustration, real-time implementation is depicted in the pictures below, where four different disasters are classified to provide enhanced situational awareness. The real-time scenario is classified by the edge device and it also mention the disaster in upper left corner.



## CONCLUSION

Disaster occurs everywhere in the world. Timely management of the catastrophe helps in minimizing losses. This study provides appropriate and rapid assistance to disaster victims by timely and effective identification and assessment of disaster-struck area. AI power disaster detection system provides useful insights to plan and execute search and rescue missions during disaster response. Identify post-disaster hazards, localize injured people, and provide a communication channel.

Our novel solution will help disaster management departments and authorities in planning and executing rescue mission for disaster victims.