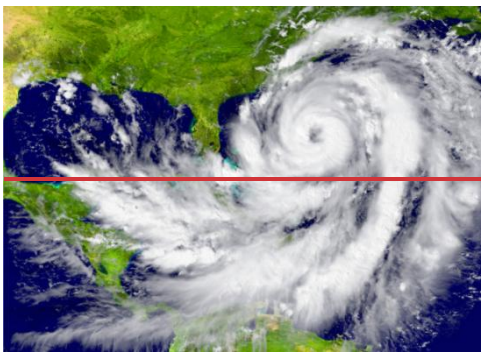
Detecting Types of Weather Using CNN Models

A case study by Joshua Yu from DS 4002 Fall 2025



Extreme weather events like hurricanes and wildfires impact communities across the nation and the world. They sweep away large residential areas, taking homes and lives in their wake, and causing billions of dollars in damage. Climate change has been increasing the severity and frequency of these weather catastrophes; therefore, it is growing more imperative to properly address them.

In addition to emergency response protocol and approaches to fight against climate change, early warning systems are critical for emergency response. Early warning gives local authorities crucial time to evacuate local people and residents critical time to move. However, a good majority of these systems rely on real-time workers monitoring data to detect any signs of an emergency and sound the alarm.

If machine learning was used to support their systems, machines could give workers greater visibility over the data, and potentially detect emergency situations earlier on, providing more time for authorities and locals to respond. That's why government authorities are now taking the initiative to adopt machine learning in their systems.

The Deliverable

You are a data scientist working within a government agency undergoing these initiatives. You've been given the task of building a system to identify types of weather events. To do determine types of weather, you will take a set of labeled satellite images and train convolutional neural networks (CNNs) to classify images based on their weather-event type. Then you will observe their performance to select the higher performing model to be adopted for the weather-event-identifying system.

GitHub Link: https://github.com/jjyu130/DS4002-CS3