MISSION BRIEFING: Code Red Classification

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Subject: Automating Satellite-Based Extreme Weather Detection

The Crisis: Every Second Counts

When major environmental catastrophes or strong storms strike, such as Hurricanes, large Wildfires, or Dust Storms, the speed of detection is absolutely paramount. Currently, a significant portion of critical monitoring relies upon human analysts examining satellite feeds manually. This approach is demonstrably slow and introduces an unacceptable margin for human error, especially considering the massive data volumes we process today. We must expedite this process; the development of an automated system is required.

Your Mission: Become a Deep Learning Meteorologist

We are challenging you to engage with a substantial, real-world satellite imagery repository (over 9,000 images!) and apply **Deep Learning (specifically Convolutional Neural Networks)** to fully automate this classification process. Your primary objective is to construct a predictive model capable of instantaneously differentiating between hazardous **Extreme Weather** (e.g., cyclones, active wildfires) and **Normal Weather** (standard cloud cover formations).

This assignment moves beyond basic coding. You will confront the operational complexities of data science, requiring you to make difficult decisions regarding data cleansing, class imbalance mitigation, and the effective utilization of advanced architectures like **Transfer Learning** (via models such as MobileNetV2). The resulting framework needs to possess the necessary robustness and reliability to be deployed for genuine emergency weather prognostication.

The Deliverable

You are tasked with replicating and improving upon the initial **Extreme Weather Image Classification** project by a previous DS 4002 team. Your final deliverable is a documented codebase, a clear explanation of your model's inner workings (using **Grad-CAM**), and a report summarizing your validation strategy and results. The detailed specifications and grading criteria are provided in the accompanying Student Rubric.

Are you ready to build the early warning system of the future?

Access the Repository and Data Here:
https://github.com/AryanThodupunuri/extreme-weather-classification