Automated Bolide Classification Part 1

Vincent Quintero
Jean-Pierre Derbes
Charles Derbes

What is a Bolide?

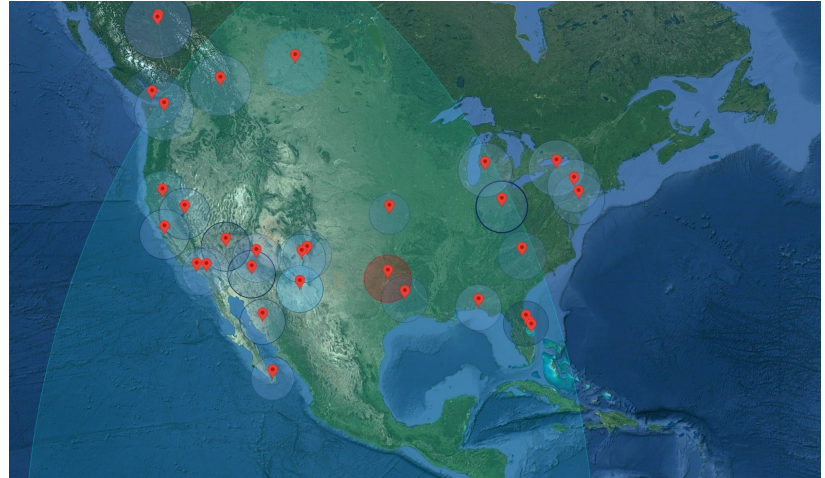A large meteor (Fireball) especially one that explodes

A brilliant meteor that may trail bright sparks

Why do we care?

- Our Senior Design Project is focused on sending out cameras across the country to detect bolides and other astronomical events

- The researchers performing the science are currently identifying all events manually

Data Collection

- Events must be extracted from videos that span the entire night via augmentation:
    - Gaussian Blurs
    - Erosion
    - Thresholding
    - Background subtraction
- We have preexisting videos labeled by researchers available from the past.
- These videos are spread across multiple devices and are hard to move in bulk due to their size (high resolution, high frame rate).

Data Collection (cont.)

- Much of the newly collected and archived data still needs to be labeled appropriately

- Labeling can realistically only be performed by the researchers - we are not experts in this field

Object Extraction
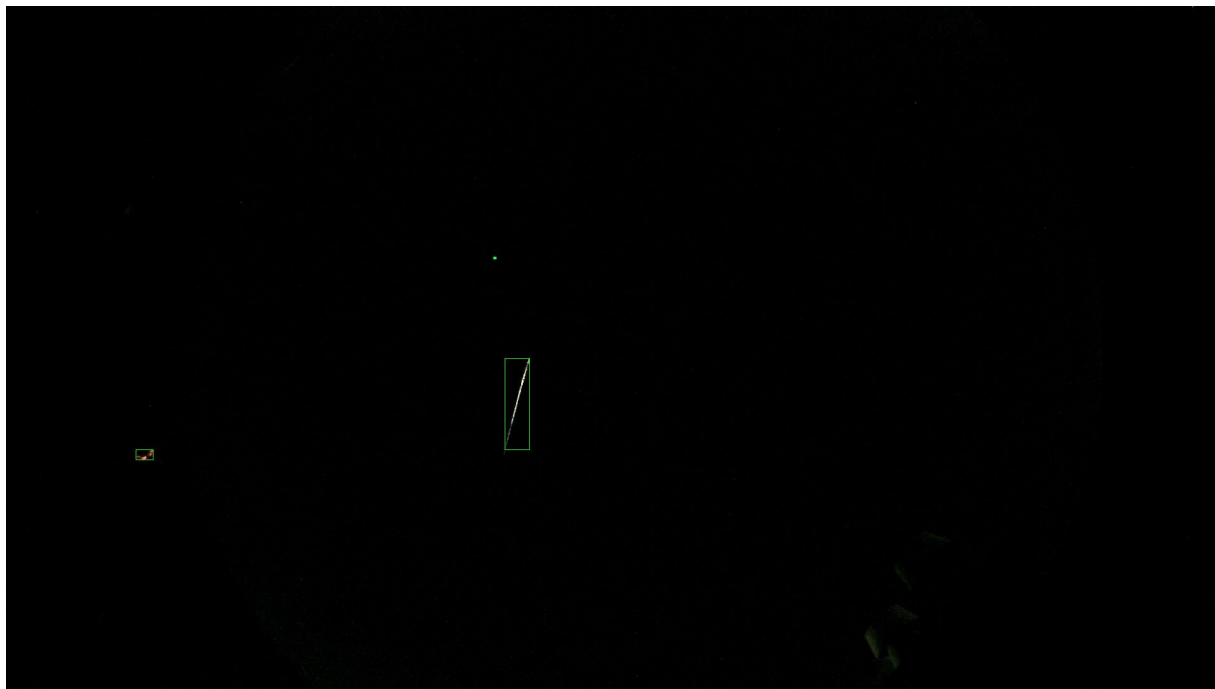
Data Augmentation

- For events, multiple transformations of the same images have been performed, including:
  - Random horizontal flips
  - Random vertical flips
  - Random rotations
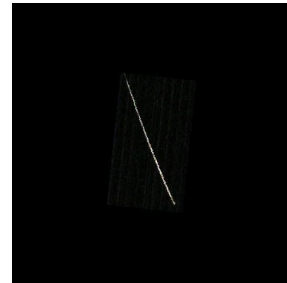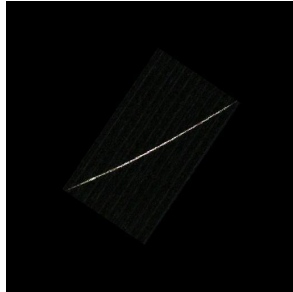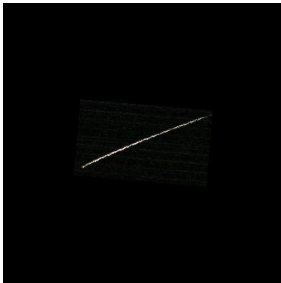
Data Augmentation (cont.)

- Events are captured at 1920x1080 and downscaled significantly to 512x512 and placed on a black background

- Events are captured and passed to the network in RGB

Data Augmentation: Challenges

Planes, flies, lights, UFOs can cause challenges we need to address. On the right are two planes our nodes captured as events.

Planes are the hardest to distinguish because they follow a similar path to bolides, however their blinking lights usually give them away in the composite.
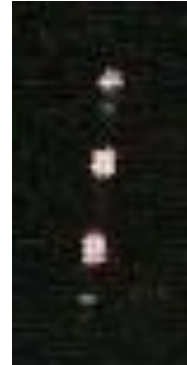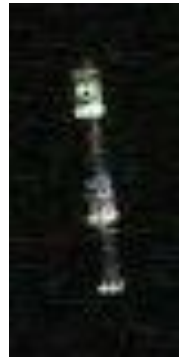
Future Plans

- Continue processing new data

- Build and refine model, tune hyperparameters

- Optimize data processing pipeline scripts
  - compositer -> proposer -> molder -> augmenter

Thanks ❤️