A. Unsupervised anomaly detection

As we can only use normal videos to detect anatomy, it indicates that it is an unsupervised anomaly detection task.
My solution is similar to how we as humans perceive anomalies. To simplify the challenge, I'll consider anomalies in the highway from static cc camera footage.
On the highway, if any car is stopped (due to an accident or serious issues), that can indicate anomalies.

To detect this kind of anomaly, there are three major steps:

1. **Preprocessing:** Detects stationary objects detected in a video.
2. **Candidate Selection:** Removes misclassified stationary objects.
3. **K-means clustering:** Identifies potential anomalous region.
4. **Backtracking algorithm:** Finds the initial time of the anomaly.

1. Preprocessing:

As we'll consider the only stationary object, we'll remove moving vehicles using the **averaging technique**.
And stationary vehicles in parking or on the nearby roads may cause false positives, **segmented map** can help to focus on a busy road where the vehicle is always on move.
To detect moving vehicles, we'll use an object detection algorithm like **YOLO** (with transfer learning).

2. Candidate Selection:

Object detection sometimes misclassifies objects in the background and the background model fails to remove some slow-moving objects completely.
They tend to remain in the same location from beginning to end and form a cluster.

3. K-means Clustering:

We can eradicate them using the nearest neighbor algorithm (K-means. Number of K is chosen by the elbow method).

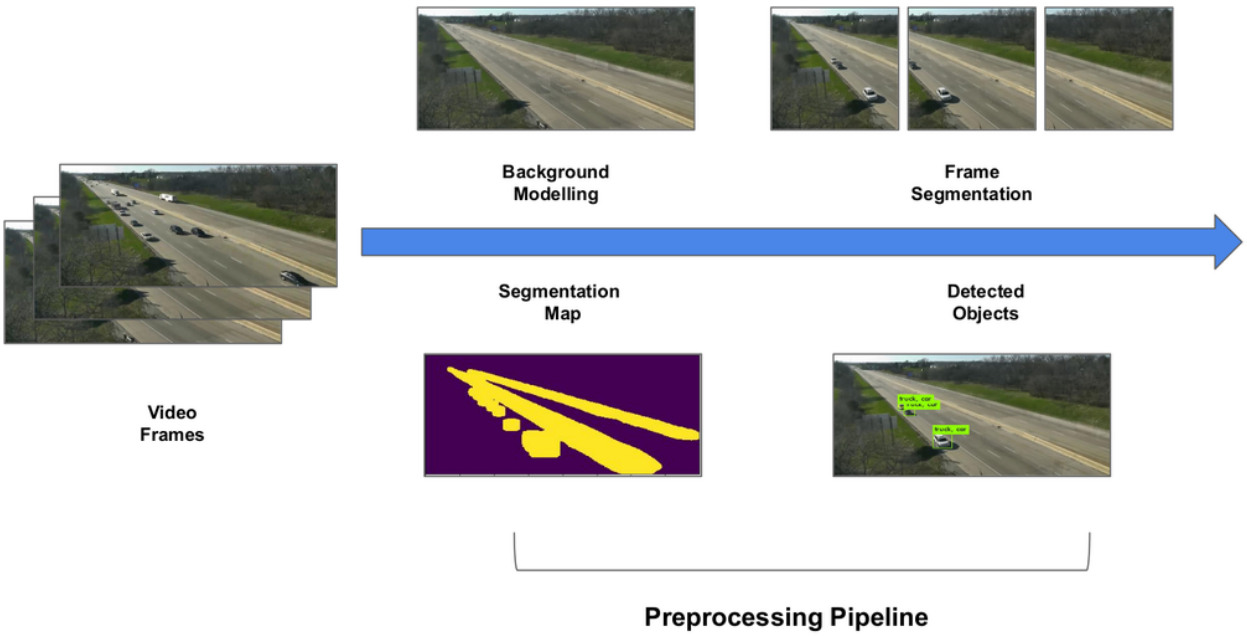
4. Backtracking Anomaly Detection:

Suppose we got an anomaly at the time of t for K-centroids and regions of interest (in the segmentation map). We calculate the structural similarity between the region of interest at time t and each instance between the start of the video.
When there is no static vehicle, the structural similarity is close to zero. As soon as a static vehicle is found on the frame, structural similarity increases dramatically.
If we notice any sudden increase in structural similarity, we can backtrace the time and region of interest to extract when and where anomalies occur.

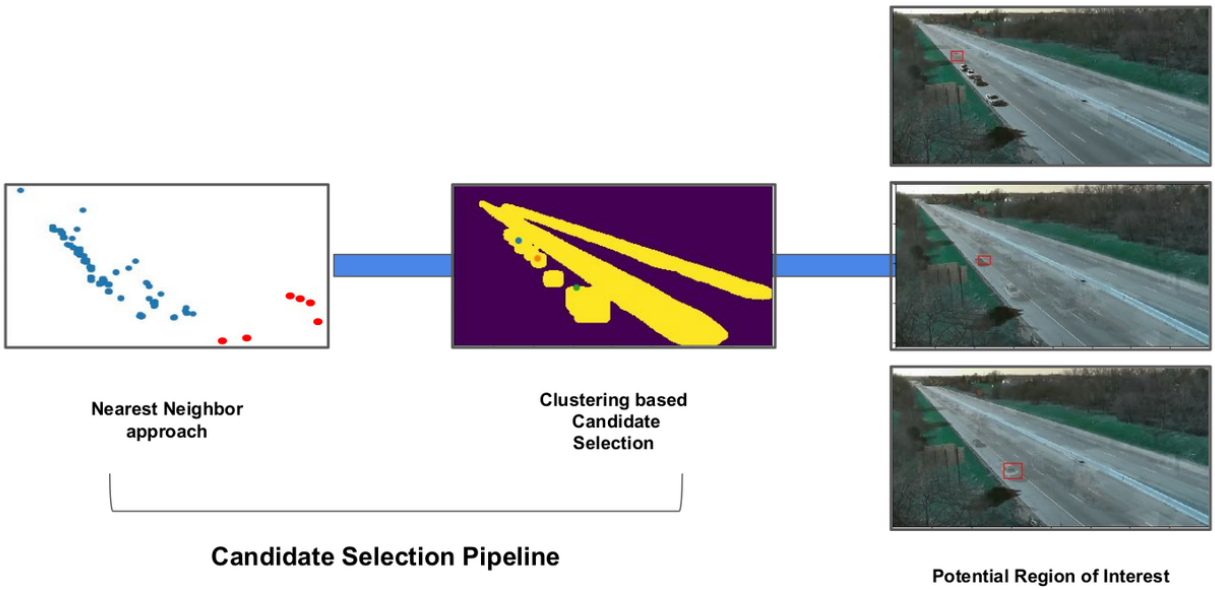
Reference: https://github.com/kevaldoshi17/NVIDIA_AICITY

Steps Visualization:

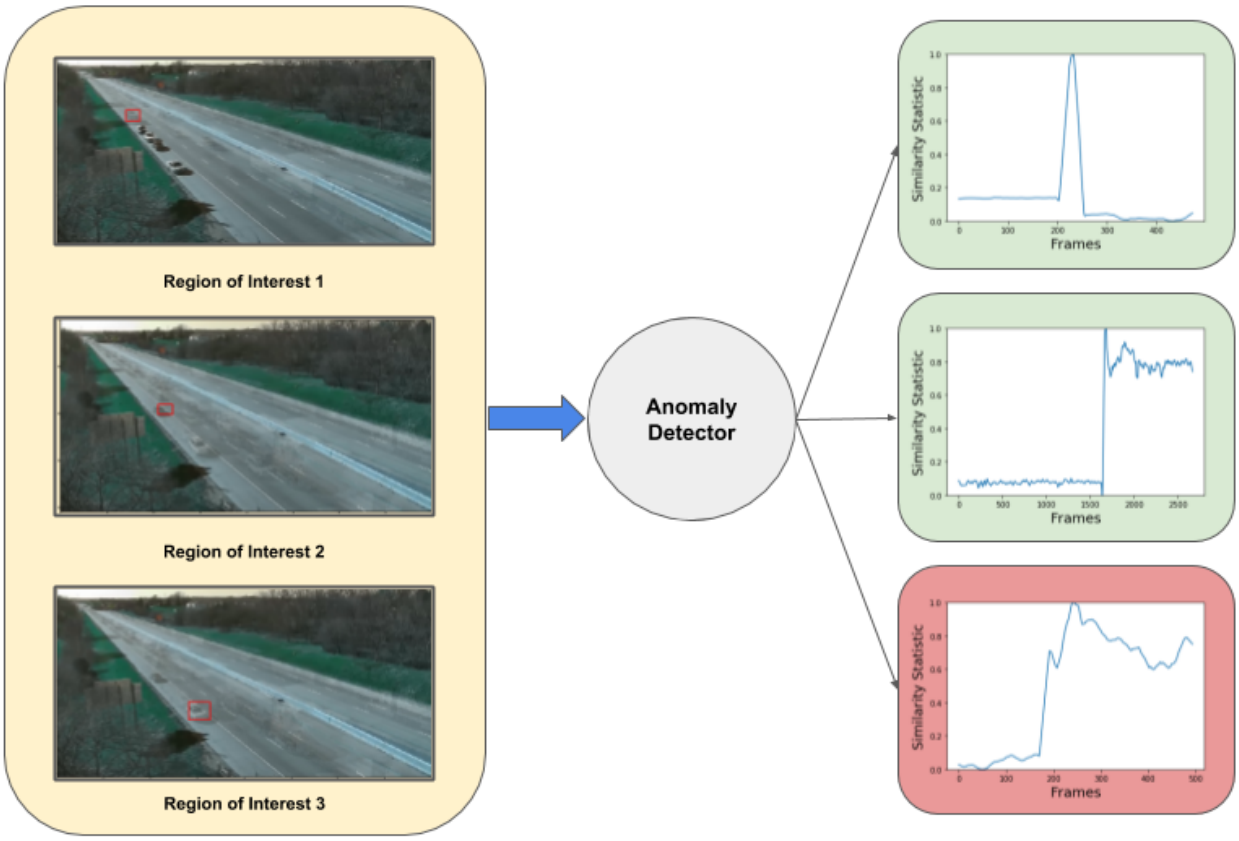
1. **Preprocessing:**



2. **Candidate Selection and K-means clustering:**



3. **Backtracking algorithm:**


Region of Interest 1
Region of Interest 2
Region of Interest 3
Anomaly Detector
Similarity Statistic
Frames
Similarity Statistic
Frames
Similarity Statistic
Frames