ECE501_2025_12_Group_2

Project name: **Image Tampering Detection (Forgery Localization)**

Team Details:

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Work done till week 5:

- We tried another approach at image forgery identification, since our last attempt did not yield correct results.
- This week we tried to identify a better digital image processing pipeline, that would help us identify the forged regions in an image.
- The new pipeline is as follows:

```
def keypoint_pipeline(gray,
                    orb_nfeatures=5000,
                    ratio_thresh=0.75,
                    ransac_thresh=3.0,
                    dbscan_eps=5,
                    dbscan_min_samples=5):
   """
   Steps:
   1. Detect ORB keypoints + descriptors (fast, rotation-aware to some extent)
   2. Match descriptors to themselves using BFMatcher + kNN (k=2) and ratio test (Lowe)
```

```
    3. Remove trivial self-matches (same location or extremely small displacement)
    4. Use RANSAC to filter matches that don't follow a consistent affine transform
    5. Cluster displacement vectors via DBSCAN to find coherent copy-move groups

    Returns: keypoints list, list of good matches, dict: label->list(matches), displacement_vectors, mask(initial binary)
    """
```

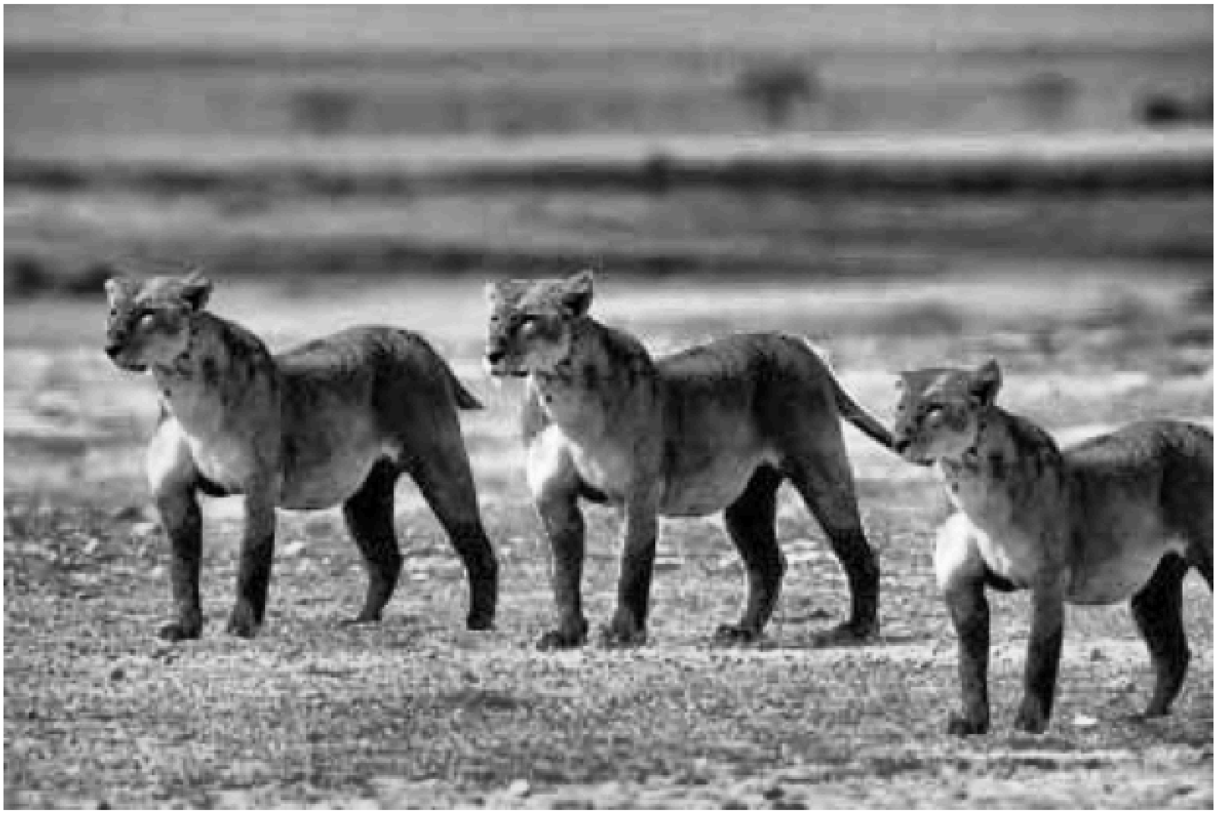
- Detectors that are used to extract keypoints such as ORB.
- A local feature vector characterises every keypoint.
- A Brute-force Matcher (BFMatcher) matches all the descriptors with one another by k-Nearest Neighbors (kNN) algorithm to identify similar areas in the same image.

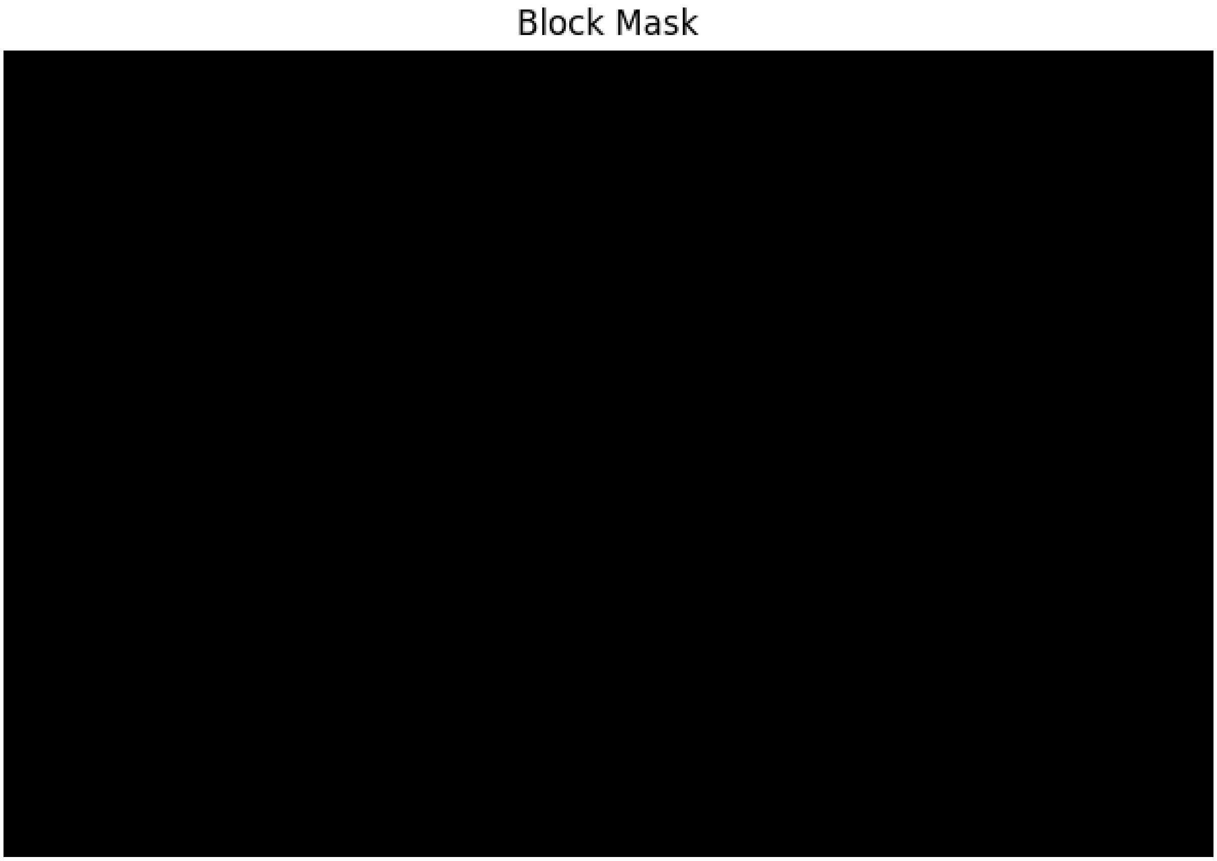
Errors faced:

- This pipeline in the first iteration did not produce the expected results.
- We still got a wrong detection in the image, and hence we still need to modify our current algorithm.
- The sample image, processed image, truth mask are as below:

Original

Preprocessed Gray





Our current algorithm keeps missing the forged areas.

- The solutions that we have outlined for further improvement are
  - Improving sensitivity to the forged areas
  - Use a hybrid version of the model (SIFT + DCT)