Capgemini

INSIGHTS & DATA

Global Data Science Challenge

Edge extraction, Embeddings, Cosine Similarity

Team: Overwhaleming Data

Vu Nguyen

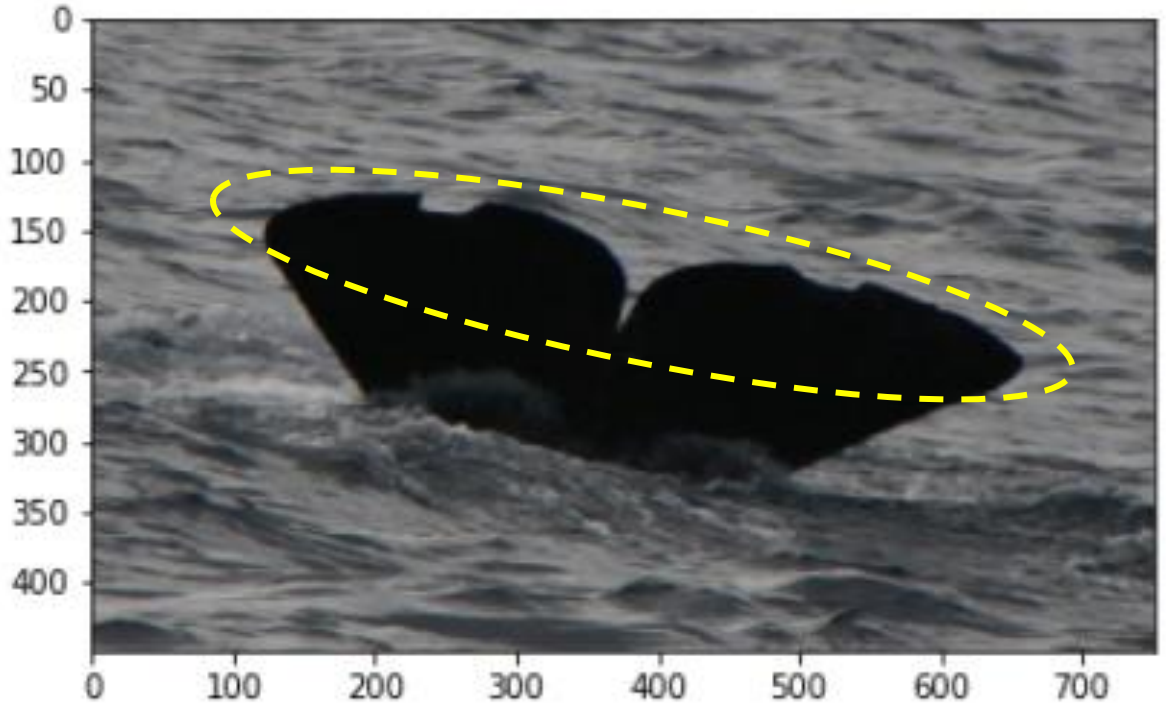
General ideas

Approach

- Tail color and white markings are not reliable features to identify whales
- Focus on shape of fluke edges to assess similarity between 2 pictures

Useful methods

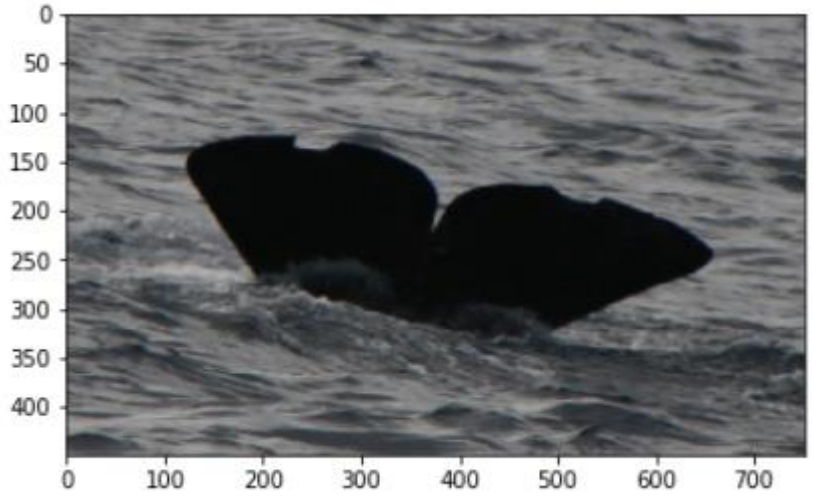
- *skimage.color.rgb2hsv*
- *skimage.filters.threshold_li*
- *skimage.measure.find_contours*



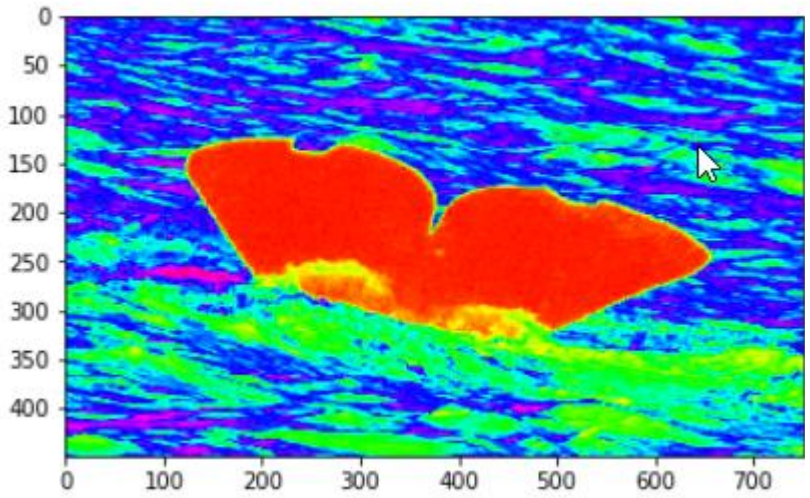
Edge extraction (1/5)

HSV filter

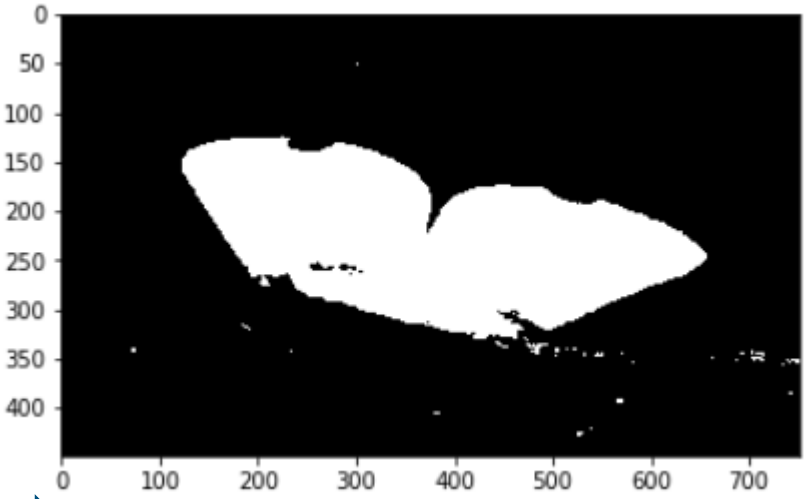
- Convert the raw RGB image to HSV color system
- Keep only V (Value) channel
- Apply Li threshold on V channel, result is a masking to remove water background



1. Raw image



2. HSV filter

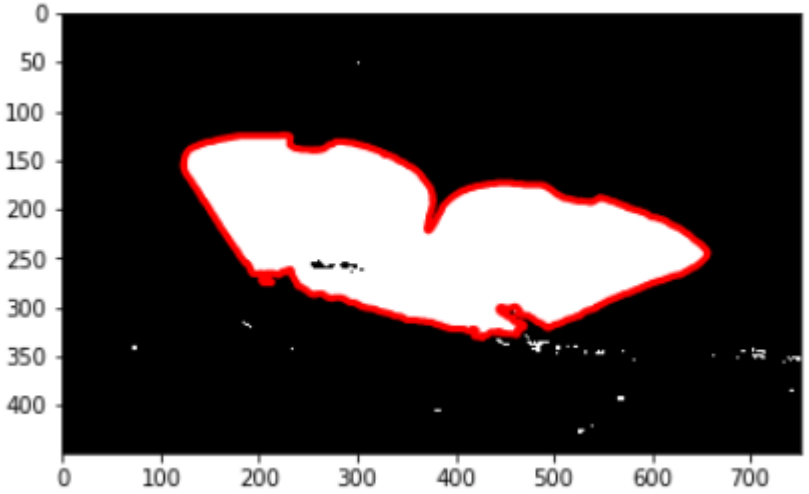


3. Mask

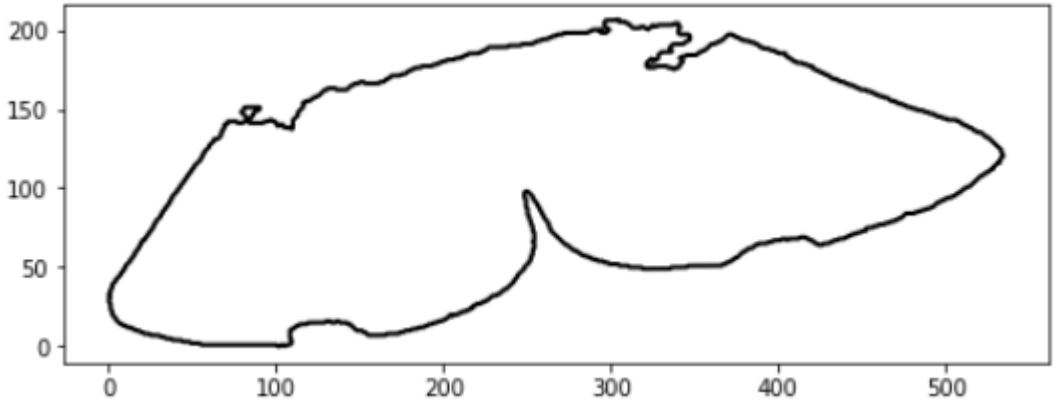
Edge extraction (2/5)

Finding contour

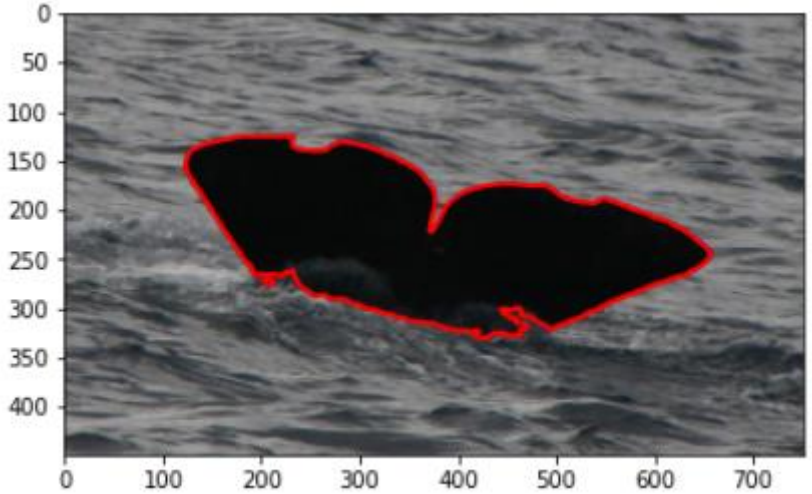
- Apply contour function on image mask
- Take the largest contour found



4. Find contour on mask



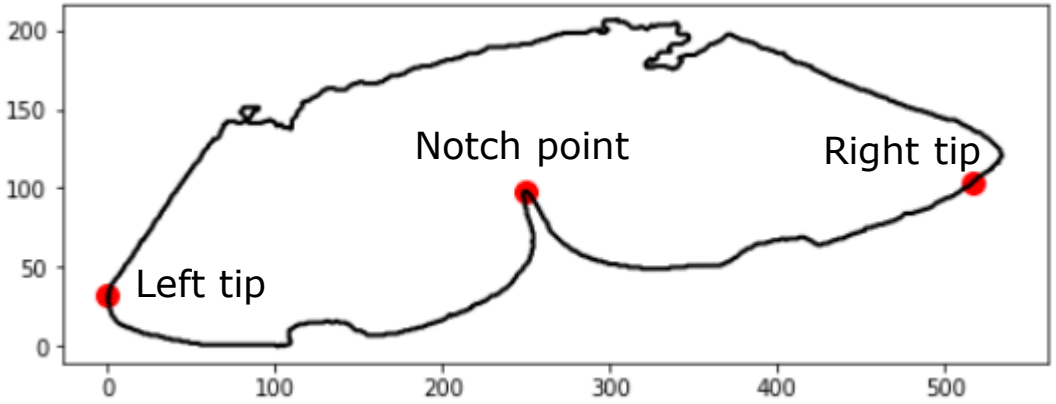
5. Contour extracted



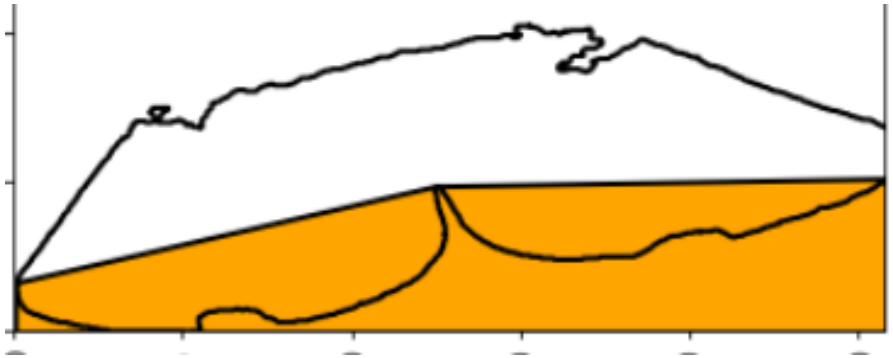
Edge extraction (3/5)

Extracting edge line

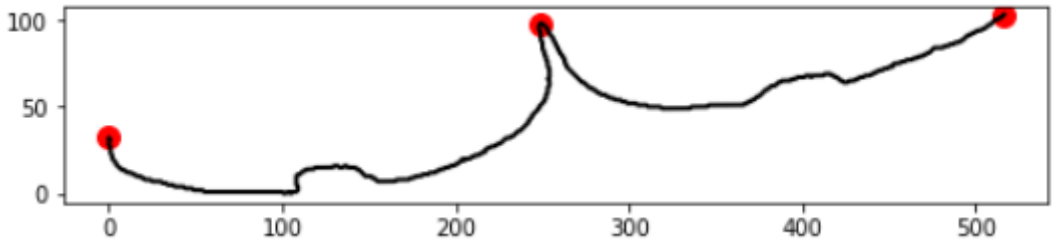
- Find notch point, left & right tips on the contour line
- Edge line = contour limited by (left tip – notch point – right tip)



6. Identify notch point, left & right tips



7. Filter contour line by these 3 points

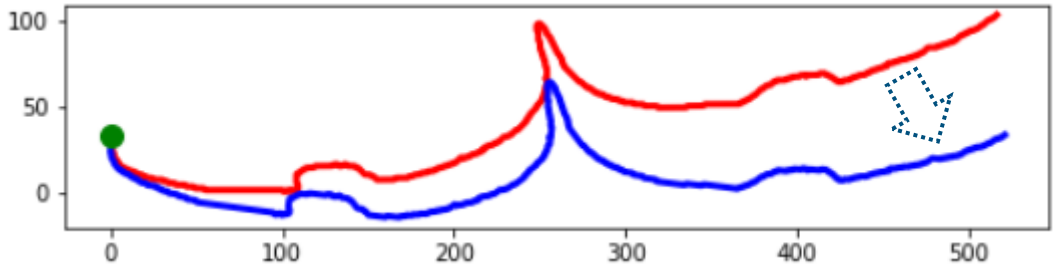


8. Edge line extracted

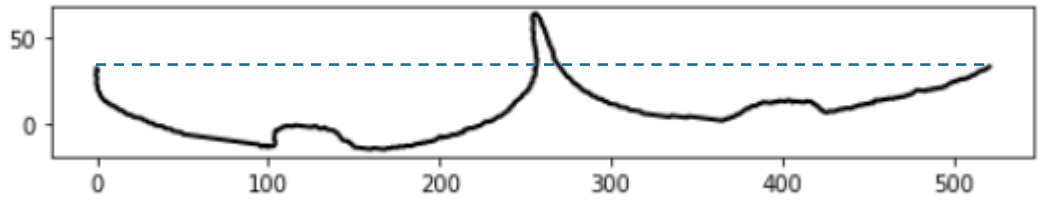
Edge extraction (4/5)

Rotating edge line horizontally

- Normalize photo angle by rotating the edge line so that left and right tips align horizontally



9. Rotate edge line

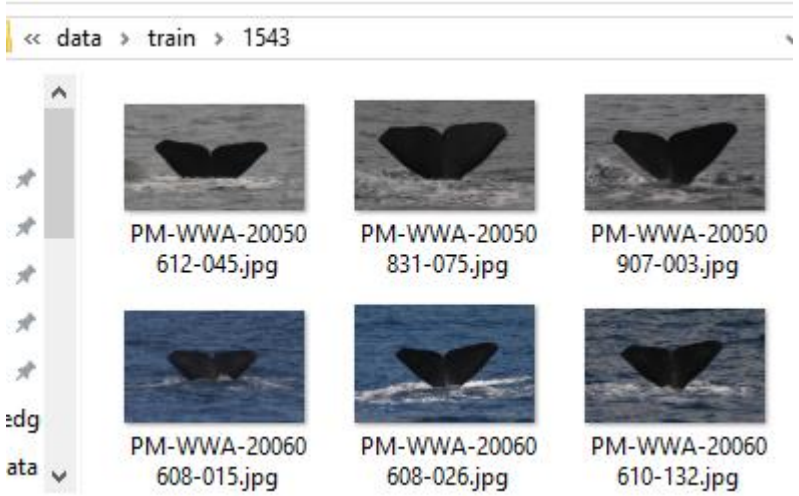


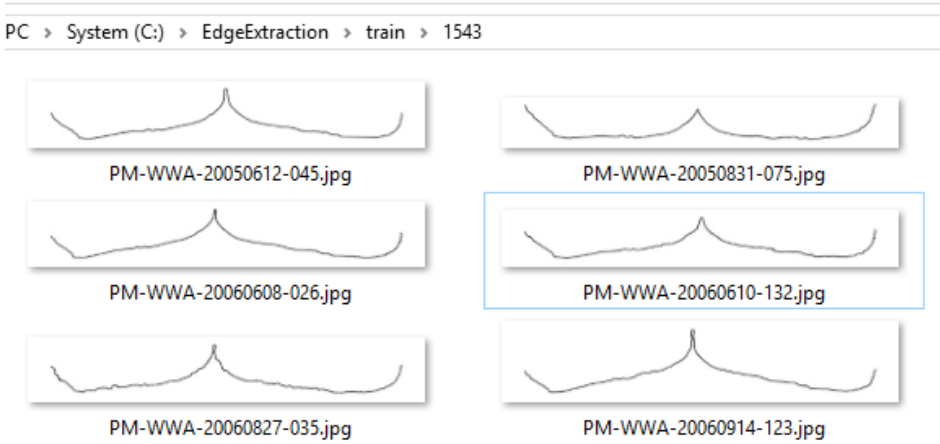
10. Final edge line

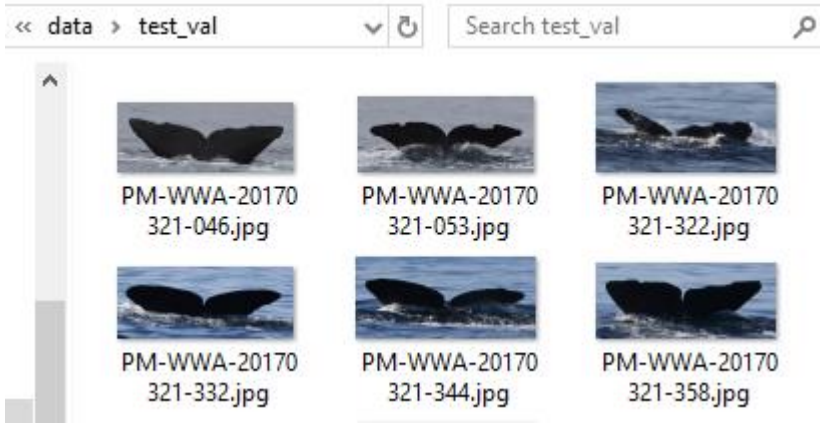
Edge extraction (5/5)

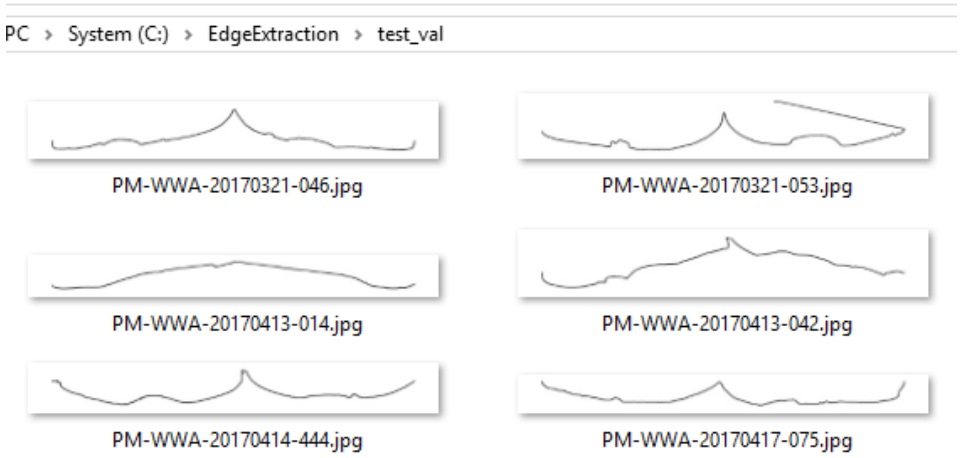
Applying edge extraction on all images

- Apply edge extraction to all train & test_val images
- Save edge images to disk, keep the same folder structure









Embeddings and Similarity measure

- Follow Tutorial 2 – Baseline model
- Fetch edge images instead of raw images
- Use MobileNet to encode all edge images to feature vectors
- Similarity measure: Cosine distance