FACE CUP

Endeavour – second challenge

CLUSTERING ALGORITHM — efficient clustering algorithm, satisfy constraints

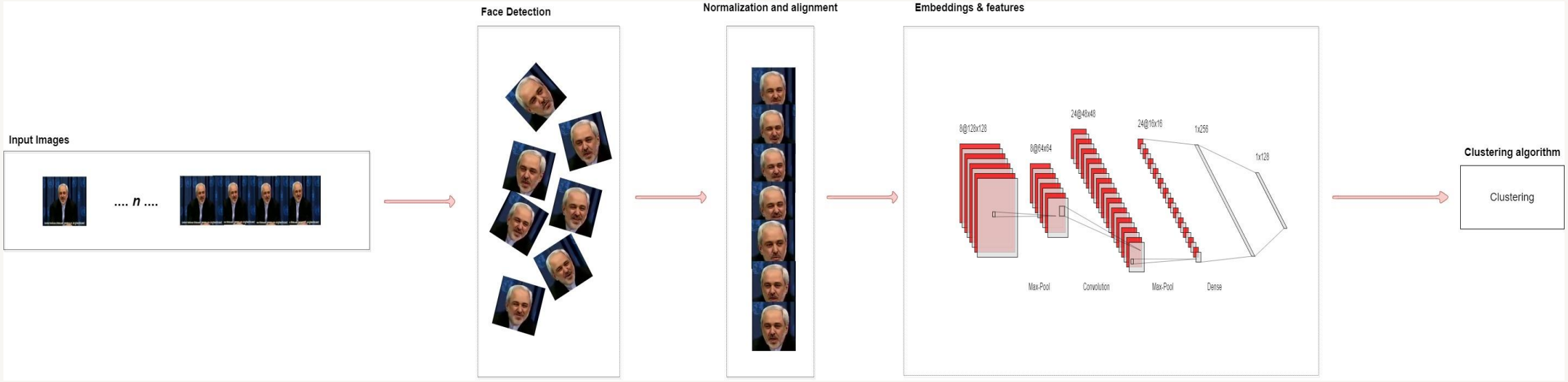
CHALLENGING DATASET — Illumination, makeup, gesture, occlusion, head pose variant, degenerated

COSTS — Memory consuming, time, trade off

OPTIMIZATION — Hardware optimization, inference optimization, I/O optimization

PROBLEM

FRAMEWORK


Input Images
.... n ....
Face Detection
Normalization and alignment
Embeddings & features
8@128x128
8@64x64
24@48x48
24@16x16
1x256
1x128
Max-Pool
Convolution
Max-Pool
Dense
Clustering algorithm
Clustering

IMPLEMENTATION OVERVIEW

Development Cycle

Idea, experiment, test

Face Detector

MTCNN, Retina Face detector

Normalization and Alignment

Normalize and align detected faces to a certain predefined template

Embedding

Get feature from each face

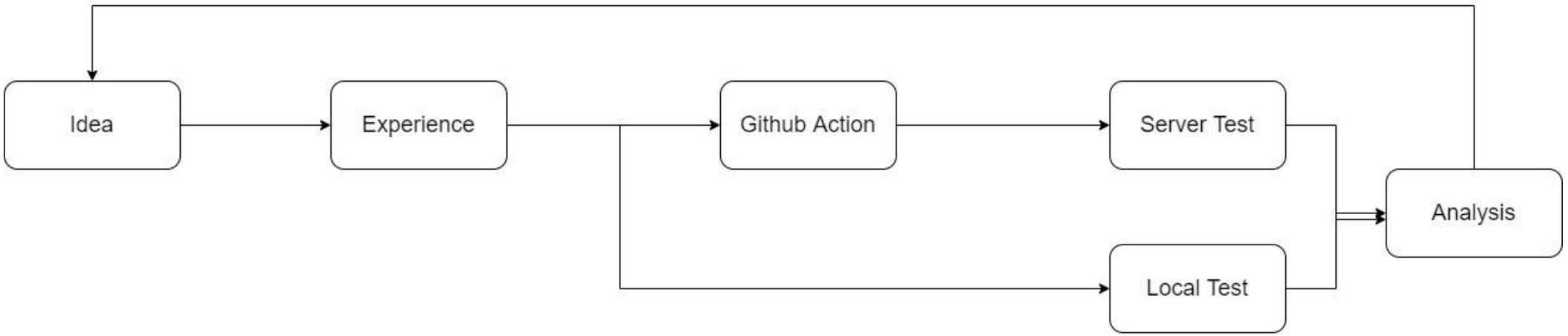
Clustering

Our clustering algorithm

Optimization

Memory, time, inference optimization

DEVELOPMENT CYCLE



FACE DETECTOR

. RETINA FACE

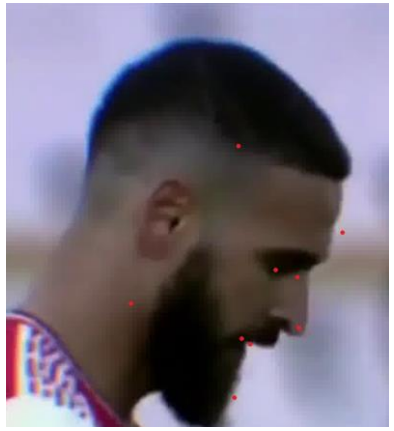
- Detect more faces in variant gestures
- Take lower time to run
- Higher performance in various light condition
- Detect smaller faces in proportion to the frame size
- Accurate bounding box and key points

. MTCNN

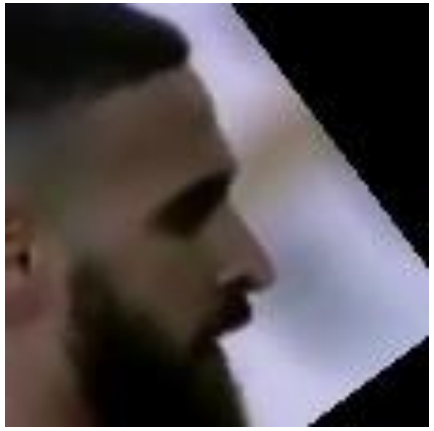
- Problem in detecting none frontal faces
- Take more time in runtime
- Lower performance in difference light conditions
- Unstable key points

NORMALIZE & ALIGNMENT

- Use detected landmarks
- Create an affinity matrix
- Use affinity matrix for rotation and transformation
- Set border value to zero
- Resize the image based on embedding Net inputs



Raw image



Aligned image

EMBEDDING

. ARCFACE

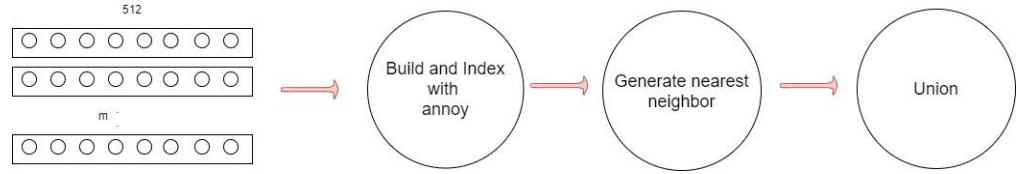
- Improve the discriminative power
- Stable training process
- Normalized weights and features
- Just depend on the angle between weights and features
- Trained on WebFace dataset
- 512 encode

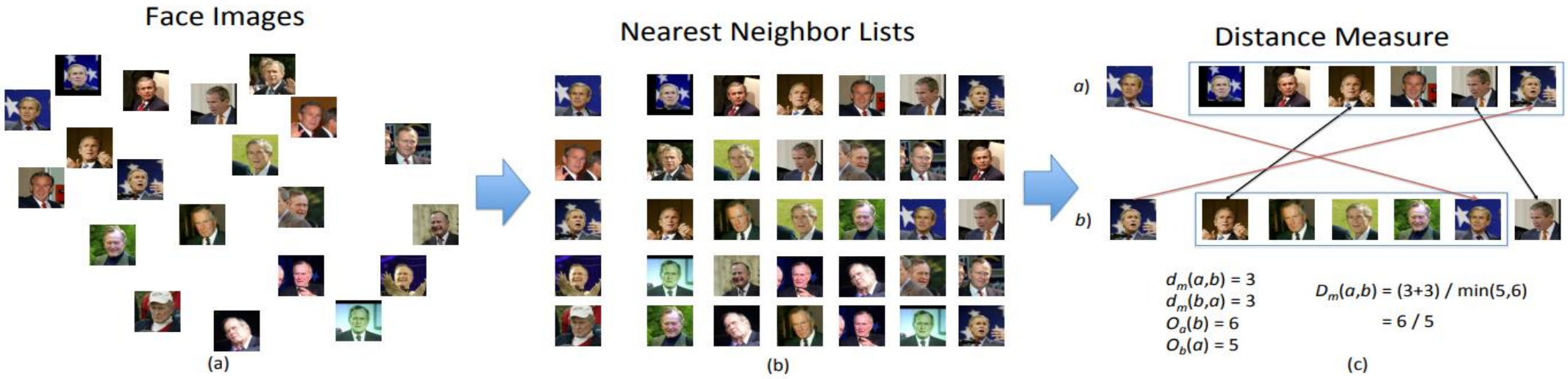
. FACENET

- Traditional Center loss
- Not explicitly normalized the features
- Trained on MegaFace
- 512 encode

CLUSTERING

. APPROXIMATE RANK ORDER





OPTIMIZATION

. HARDWARE OPTIMIZATION

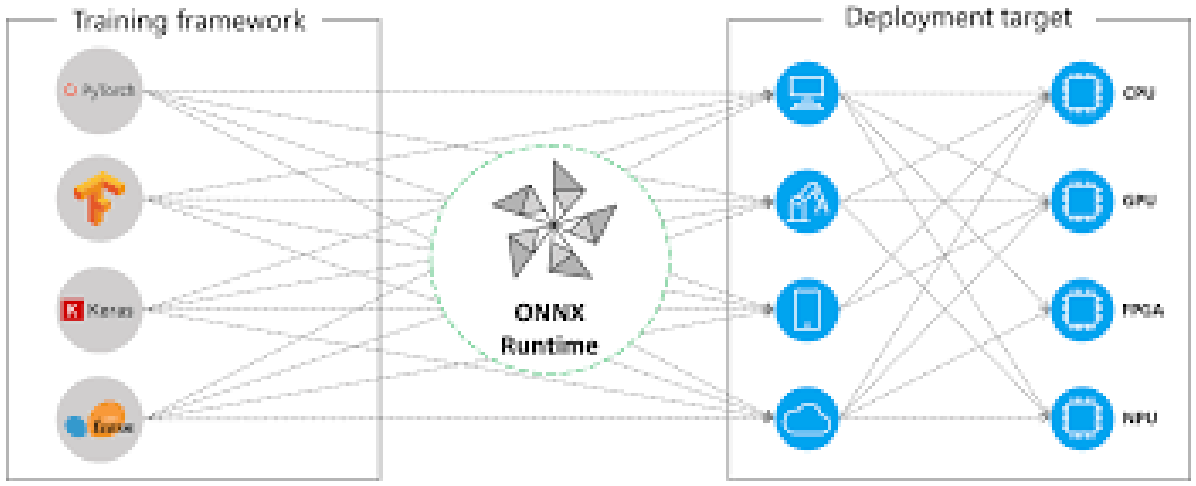
- Nvidia Tesla series
- Nvidia Jetson series

. INFERENCE OPTIMIZATION

- Onnx runtime
- Cuda / TensorRT

. IO OPTIMIZATION

- GStream
- DeepStream



THANK YOU

Endeavour Team