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DOMINGO 27 DE AGOSTO / 2023

PRUEBA TÉCNICA ARKANGEL AI

REQUIREMENTS

 # AI-Challenge
This is a repo for an open AI challenge held by Arkangel AI. The problems stands as follows:

*> As a **Machine Learning Engineer at Arkangel AI**, you receive a project from a biometric data company. This project aims to develop a computer vision model to be able to recognize the workers of a company while detecting the emotion or feeling of each individual. The biometric data company that hires Arkangel AI only imposes two requirements, which are: First, the number of workers will be fixed and to obtain a database, each individual can be asked for several photographs with which to develop the model. And as a second, the developed model must be deployed in the cloud to be able to make inferences to it, from any physical point where the system is deployed. However, this deployment can be done programmatically or through a UI, as Arkangel AI provides.*

REQUIREMENTS

Three main tasks:

- Detection of faces on images.
- Identification of the persons to which the face corresponds.
- Identification of the emotion the person might me experimenting.

DETECTION OF FACES ON IMAGES

- Taking advantage of pre-trained models over large datasets which have been proven to have high performance, I implemented the *facenet_pytorch MTCNN* model's pretrained models.

- Additionally, a score threshold of 0.9 is used in order to discard most of the false positives that could be present.

IDENTIFICATION OF THE PERSONS TO WHICH THE FACE CORRESPONDS.

This task is the one which presents most of the limitations:

- We don't posses a dataset.
- We don't know how many people are desired to recognize.
- Training a deep learning model from scratch, depending on the size of the dataset, the resolution of the images, the number of parameters of the network, and the available GPU and CPU resources, could take a lot of epochs and a lot of time. Which currently was very limited.
- **One of the best methods to apply would be to use a model with pre-trained weights over a large dataset such as MSCeleb-1A or VGGFace2 and fine tune it over the desired dataset.**

IDENTIFICATION OF THE PERSONS TO WHICH THE FACE CORRESPONDS.

- There are three main different types of technologies that could be used: traditional methods such as k-nearest neighbors, CNNs and transformers.
- To identify different faces and just for illustrative purposes I built a small dataset of five of the candidates for mayor of Bogotá with eight examples of each.
- A script *(preprocess_dataset.py)* was made to save just the faces instead of the whole images.
- Additionally, the two first techniques were implemented and trained (kNN and a simple CNN) from scratch.

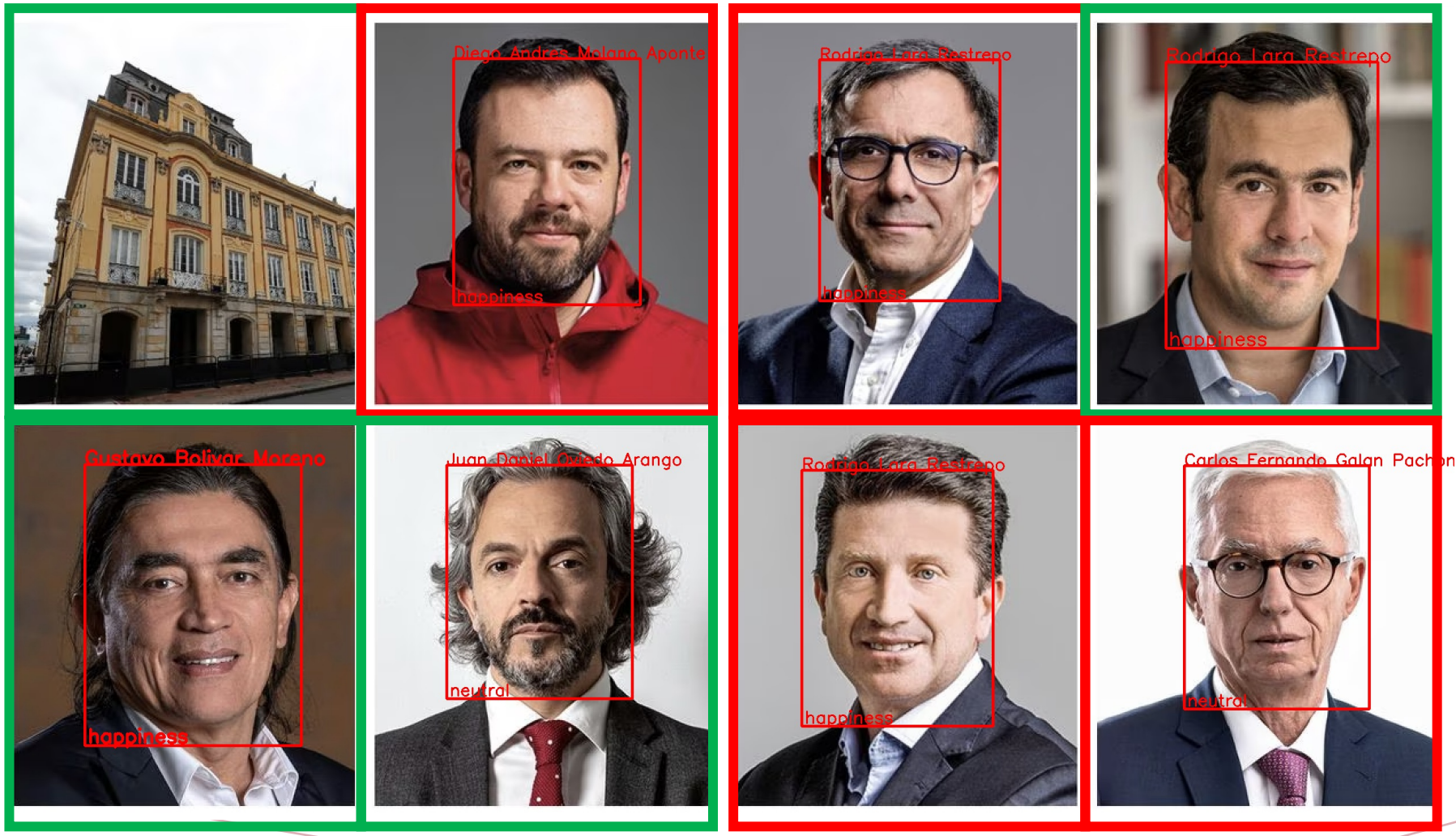
IDENTIFICATION OF THE EMOTION THE PERSON MIGHT BE EXPERIMENTING.

Just as for the detection of faces, a model with pre-trained weights is used in order to exploit the learnt parameters over large datasets:

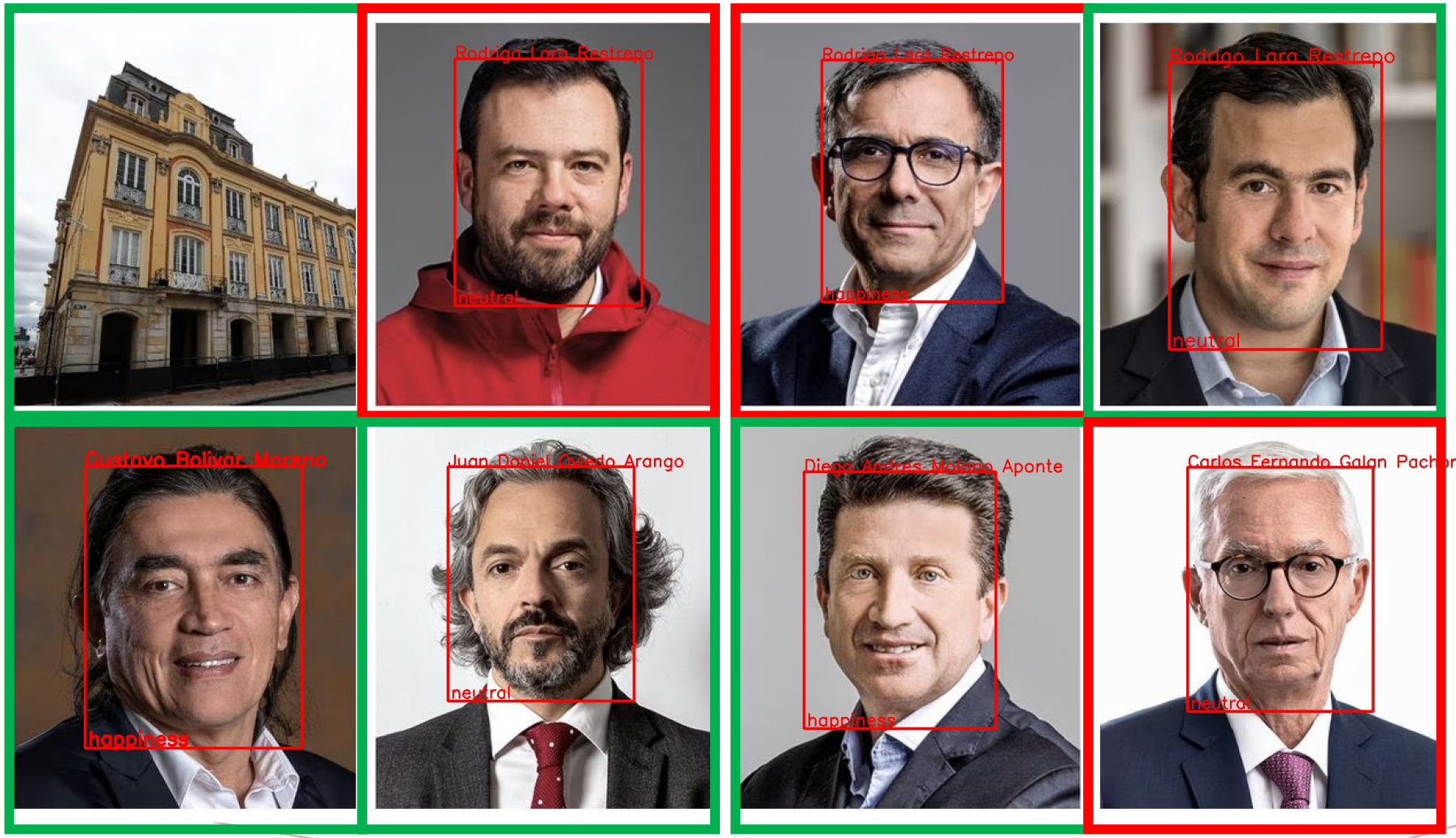
- It is the fer+ model taken from https://github.com/Emilien-mipt/fer-pytorch .

- The detected emotions are: neutral, happiness, surprise, sadness, anger, disgust, fear.

RESULTS (5-NN)


Diego Andres Molano Aponte
happiness
Rodrigo Lara Restrepo
happiness
Rodrigo Lara Restrepo
happiness
Gustavo Bolivar Moreno
happiness
Juan Daniel Oviedo Arango
neutral
Rodrigo Lara Restrepo
happiness
Carlos Fernando Galan Pachon
neutral

RESULTS (CNN TRAINED FOR 20 EPOCHS)



PROGRAMATICALLY DEPLOYABLE

- Using an AWS EC2 instance I developed the project and in the same way it can be deployed to obtain the predictions from anywhere through ssh connection.

- You can do so by connecting by terminal:
  - ssh -i "arkangelAI_test.pem" ec2-user@ec2-18-117-70-122.us-east-2.compute.amazonaws.com

- To test it you can just run the *tecTest_ArkangelAI.py* script which by default will load the CNN pre-trained model *(face_identification_model.pth)* and run it over the *candidatos.png* image which is not part of the dataset and has the faces of all five candidates. The result is an image named *result_candidatos.png.*