EvaDB Project 1 Report

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Github Link, Google Colab Link

Topic: Integrate EvaDB with AWS Rekognition services

Amazon Rekognition stands as a cloud-based computer vision platform leveraging deep learning to interpret images, offering a diverse spectrum of image and video analysis functionalities. EvaDB enables software developers to build AI apps in a few lines of code. Its powerful SQL API simplifies AI app development for both structured and unstructured data. In this project, we integrate Amazon's Rekognition Service with EvaDB. **One can compare faces, detect faces, detect labels, detect texts with a simple SQL instruction.**

Implementation details

Follow the instructions on Writing a custom function in EvaDB. Modify the input / output signature and process the result to fit the format of AWS Rekognition Services.

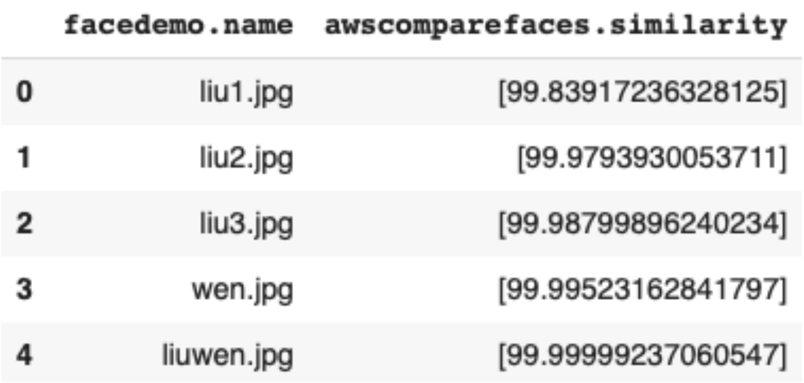
Sample Input / Output

We first load the images into `faceDemo`. There are photos from 3 people: liu, chen and wen.

- `liu1.jpg`, `liu2.jpg`, `liu3.jpg` contains only liu's photo
- `chen.jpg` contains only chen's photo
- `liuwen.jpg` have both liu and wen inside

We use liuwen.jpg as target. We successfully retrieve all images with liu or wen from a simple SQL query.

```
SELECT name, AWSCompareFaces(data, Open('./liuwen.jpg'))
FROM faceDemo
WHERE AWSCompareFaces(data, Open('./liuwen.jpg')) > [80.0]
ORDER BY AWSCompareFaces(data, Open('./liuwen.jpg'));
```



	facedemo.name	awscomparefaces.similarity
0	liu1.jpg	[99.83917236328125]
1	liu2.jpg	[99.9793930053711]
2	liu3.jpg	[99.98799896240234]
3	wen.jpg	[99.99523162841797]
4	liuwen.jpg	[99.99999237060547]

There are 4 more examples on Github, Google Colab. In conclusion, we can easily perform face comparison, face detection, label detection and text detection with a simple SQL instruction.

Metrics

Time

We measure the execution time with Python's `time.time()` module

For the dataset we use, the result is as following:

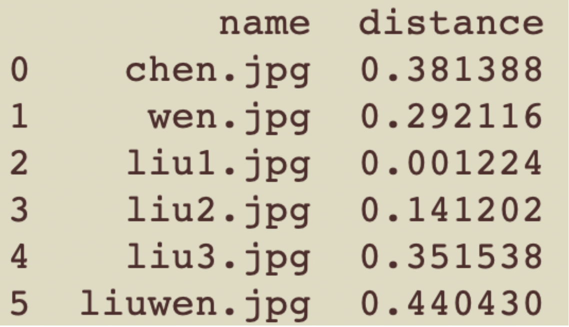
- Compare 1 image with 6 images (awsCompareFaces): 19 ms
- Detect faces on 6 images (awsDetectFaces): 4 ms
- Detect labels on 1 image (awsDetectLabels): 5.8 ms
- Detect text on 1 image (awsDetectText): 7.5 ms

As a reference comparison, we also measure the time for Similarity function in evaDB in same setting :

To be more specific, we measure the following instructions

```
 SELECT name,Similarity(
  SiftFeatureExtractor(Open('liu1.jpg')),
  SiftFeatureExtractor(data)
) FROM faceDemo
```

Result =



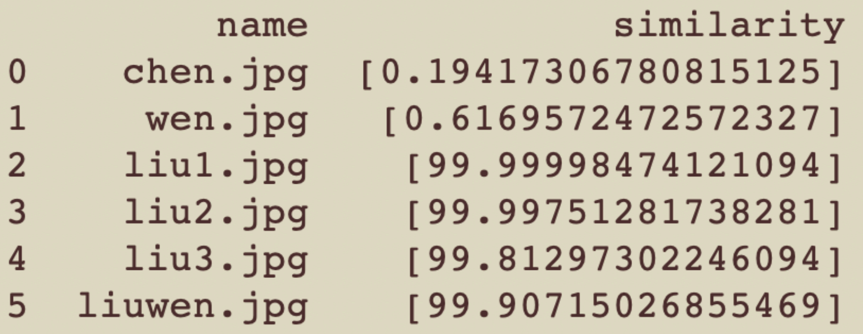
```
         name  distance
0    chen.jpg  0.381388
1     wen.jpg  0.292116
2    liu1.jpg  0.001224
3    liu2.jpg  0.141202
4    liu3.jpg  0.351538
5  liuwen.jpg  0.440430
```

, Exexution time = 575 ms

As for our implementation, the instructions are

```
SELECT name, AWSCompareFaces(data, Open('./liu1.jpg'))
FROM faceDemo
```

Result =



```
         name              similarity
0    chen.jpg  [0.19417306780815125]
1     wen.jpg   [0.6169572472572327]
2    liu1.jpg    [99.99998474121094]
3    liu2.jpg    [99.99751281738281]
4    liu3.jpg    [99.81297302246094]
5  liuwen.jpg    [99.90715026855469]
```

, Execution time = 10 ms

Conclusion:

- If your application requires face comparison, such as facial recognition for face search, **our implementation can deliver the desired results in just 1/50th of the time.**

- However, please be aware that this comparison is somewhat simplistic due to the differences in output. A more rigorous benchmark is necessary for thorough analysis. Nonetheless, it does indicate that AWS Rekognition can generate the desired output quickly.

Budget

- The pricing of AWS rekognition is approximately $0.0010 per image.
- Details can be found on Pricing

Lessons Learned

- EvaDB is a highly versatile service capable of seamlessly integrating a wide range of AI functionalities.
- AWS Rekognition is a user-friendly service adept at executing intricate computer vision tasks with ease.
- Combining these two results in a powerful AI-powered database.

Challenges

- Input/Output Format: The AWS Rekognition service accepts input as bytes, while EvaDB's forward function requires input in the form of a numpy array. I spent some time in understanding these two formats and implementing the necessary conversions.
- There is an existing issue with the compare_faces function in the AWS Rekognition service, as detailed in this link. If there is no face detected in the image, calling the compare_faces function will lead to an error. It took me some time to identify this issue.

References

1. AWS Rekognition Documents
2. EvaDB Document