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## **System Integration (ITIS-6177) Final Project**

### **Topic – Microsoft Azure Face API**

The Azure Face service provides AI algorithms that detect, recognize, and analyze human faces in images. Facial recognition software is important in many different scenarios, such as identity verification, touchless access control, and face blurring for privacy.

### **Implementing Two Endpoints:**

#### **1) Face Detection (/detect)**

- Face detection is used to successfully detect the faces of the persons in an image.
- The Detect API detects human faces in an image and returns the rectangle coordinates of their locations.
- It returns a unique face ID that represents the stored face data.
- It also displays the face landmarks and face attributes.

**Input:** Give the URL of the image consisting of any human faces

**Output:** It returns the rectangular coordinates of the detected faces, a unique face ID, face landmarks and also the face attributes.

### **Sample Input:**

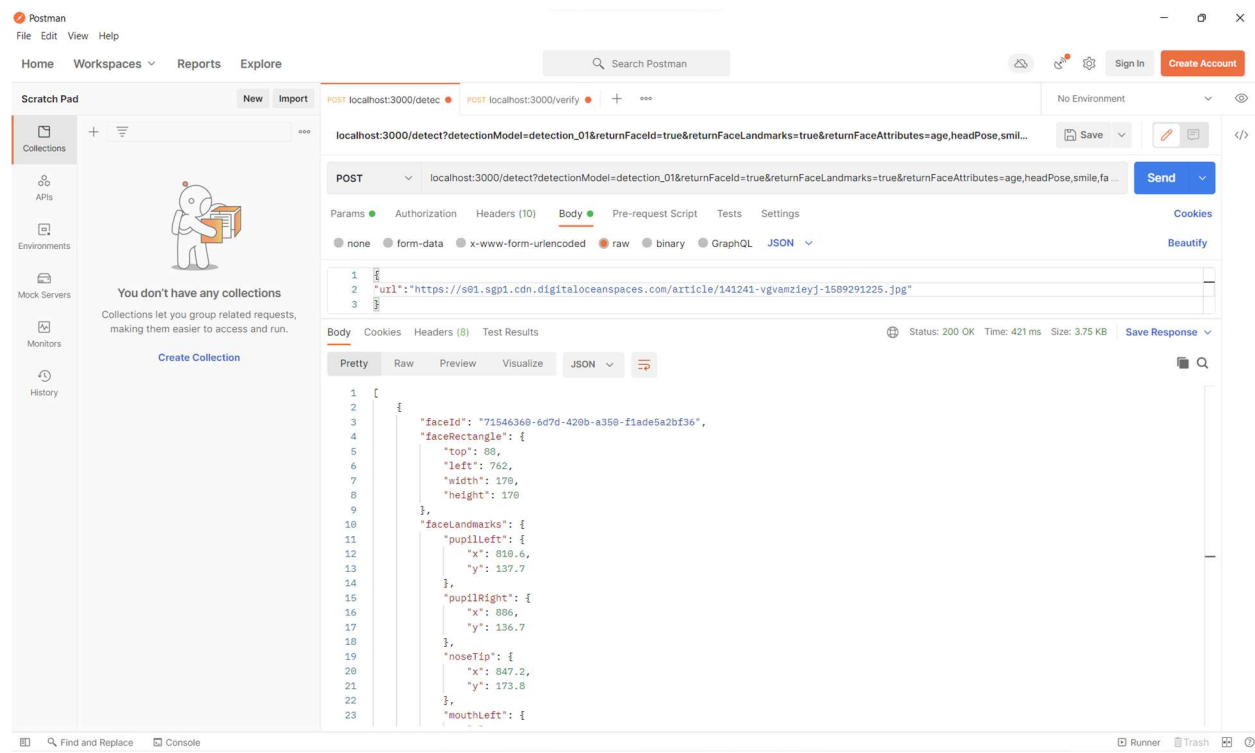
```
{  
  "url": https://s01.sgp1.cdn.digitaloceanspaces.com/article/141241-vgvamzieyj-1589291225.jpg  
}
```

### **Sample Output:**

```
[{"faceId":"71546360-6d7d-420b-a350-flade5a2bf36","faceRectangle":{"top":88,"left":762,"width":170,"height":170},"faceLandmarks":{"pupilLeft":{"x":810.6,"y":137.7},"pupilRight":{"x":886,"y":136.7},"noseTip":{"x":847.2,"y":173.8},"mouthLeft":{"x":808.8,"y":212.7},"mouthRight":{"x":885.2,"y":214},"eyebrowLeftOuter":{"x":773.2,"y":125.7},"eyebrowLeftInner":{"x":831.7,"y":120.1},"eyeLeftOuter":{"x":794.1,"y":139.9},"eyeLeftTop":{"x":806.2,"y":133.1},"eyeLeftBottom":{"x":807.3,"y":144.1},"eyeLeftInner":{"x":821.3,"y":140.5},"eyebrowRightInner":{"x":862.8,"y":119.4},"eyebrowRightOuter":{"x":921,"y":123.3},"eyeRightInner":{"x":872.1,"y":139.6},"eyeRightTop":{"x":885.2,"y":131.7},"eyeRightBottom":{"x":885.7,"y":143},"eyeRightOuter":{"x":898.7,"y":138.3},"noseRootLeft":{"x":834.5,"y":140.2},"noseRootRight":{"x":859.2,"y":139.2},"noseLeftAlarTop":{"x":828.4,"y":167.3},"noseRightAlarTop":{"x":863.3,"y":165},"noseLeftAlarOutTip":{"x":818.9,"y":178.2},"noseRightAlarOutTip":{"x":875.8,"y":175.4},"upperLipTop":{"x":844.1,"y":205.3},"upperLipBottom":{"x":844.1,"y":213.6},"underLipTop":{"x":846.2,"y":228.9},"underLipBottom":{"x":846.5,"y":240}},{"faceAttributes":{"smile":1,"headPose":{"pitch":4.2,"roll":-2.6,"yaw":-3.8},"age":30,"facialHair":{"moustache":0.6,"beard":0.6,"sideburns":0.6},"glasses":"NoGlasses","emotion":{"anger":0,"contempt":0,"disgust":0,"fear":0,"happiness":1,"neutral":0,"sadness":0,"surprise":0},"blur":{"blurLevel":"low","value":0},"exposure":{"exposureLevel":"goodExposure","value":0.5},"noise":{"noiseLevel":"low","value":0},"makeup":{"eyeMakeup":false,"lipMakeup":false},"accessories":[{"type":"headwear","confidence":0.99}],{"occlusion":{"foreheadOccluded":true,"eyeOccluded":false,"mouthOccluded":false},"hair":{"bald":0,"invisible":true,"hairColor":[]}}},{"faceId":"cbe58d98-3838-4c6b-828e-de74a7af805e","faceRectangle":{"top":109,"left":363,"width":170,"height":170},"faceLandmarks":{"pupilLeft":{"x":413.6,"y":153.4},"pupilRight":{"x":492,"y":158.9},"noseTip":{"x":445.1,"y":200.6},"mouthLeft":{"x":408.7,"y":228.9},"mouthRight":{"x":480.3,"y":234.5},"eyebrowLeftOuter":{"x":385.4,"y":133.2},"eyebrowLeftInner":{"x":438.6,"y":140.7},"eyeLeftOuter":{"x":402.5,"y":153.8},"eyeLeftTop":{"x":413.5,"y":149.7},"eyeLeftBottom":{"x":413.6,"y":158.3},"eyeLeftInner":{"x":426,"y":155.5},"eyebrowRightInner":{"x":465.6,"y":142.7},"eyebrowRightOuter":{"x":527.4,"y":141.8},"eyeRightInner":{"x":480.2,"y":160.2},"eyeRightTop":{"x":493.6,"y":155.5},"eyeRightBottom":{"x":493.2,"y":164.8},"eyeRightOuter":{"x":506.4,"y":161.1},"noseRootLeft":{"x":439,"y":159.2},"noseRootRight":{"x":465.6,"y":161},"noseLeftAlarTop":{"x":439,"y":159.2},"noseRightAlarTop":{"x":465.6,"y":161},"noseLeftAlarOutTip":{"x":439,"y":159.2},"noseRightAlarOutTip":{"x":465.6,"y":161},"upperLipTop":{"x":444.1,"y":205.3},"upperLipBottom":{"x":444.1,"y":213.6},"underLipTop":{"x":446.2,"y":228.9},"underLipBottom":{"x":446.5,"y":240}}}]
```

```
431.4,"y":185.8},"noseRightAlarTop":{"x":471.3,"y":189.7},"noseLeftAlarOutTip":{"x":420.9,"y":197},"noseRightAlarOutTip":{"x":476.1,"y":203.5},"upperLipTop":{"x":443.8,"y":223.4},"upperLipBottom":{"x":443.7,"y":229.8},"underLipTop":{"x":441.5,"y":249.1},"underLipBottom":{"x":441.4,"y":259.6}},"faceAttributes":{"smile":1,"headPose":{"pitch":-5.1,"roll":4.3,"yaw":0.2},"age":31,"facialHair":{"moustache":0.6,"beard":0.6,"sideburns":0.6},"glasses":"NoGlasses","emotion":{"anger":0,"contempt":0,"disgust":0,"fear":0,"happiness":1,"neutral":0,"sadness":0,"surprise":0},"blur":{"blurLevel":"low","value":0.2},"exposure":{"exposureLevel":"goodExposure","value":0.34},"noise":{"noiseLevel":"low","value":0.03},"makeup":{"eyeMakeup":false,"lipMakeup":false},"accessories":[{"type":"headwear","confidence":0.98}],"occlusion":{"foreheadOccluded":true,"eyeOccluded":false,"mouthOccluded":false},"hair":{"bald":0,"invisible":true,"hairColor":[]}}}}
```

## In Postman:



**Request:**

Not secure | 159.203.185.164:3000/api-docs/#/Face%20Detection/post\_detect

Face Detection

POST /detect

Calls the Face Detection endpoint from Microsoft Azure

Parameters

Name	Description
<b>detectionModel</b> * required (query)	Specifying a Face Detection Model Version <input type="text" value="detection_01"/>
<b>returnFaceId</b> * required (query)	Returns faceids of the detected faces <input type="text" value="true"/>
<b>returnFaceLandmarks</b> * required (query)	Returns face landmarks of the detected faces <input type="text" value="true"/>
<b>returnFaceAttributes</b> * required (query)	Returns the face attributes of the detected faces <input type="text" value="age,headPose,smile,faceHair,glasses,emotion"/>
<b>body</b> * required string[string] (body)	Image URL to detect the faces present in the image <div><div>Edit Value   Mode</div><div><pre>{   "url": "https://ml.azure.com/artifacts/481241-qvms1ey-158025225-jpg" }</pre></div></div>

Cancel

Parameter content type

Execute

**Response:**

159.203.185.164:3000/api-docs/#/Face%20Detection/post\_detect

Responses

Response content type: application/json

```

Curl
curl -X 'POST' \
  https://159.203.185.164:3000/api-docs/#/Face%20Detection/post_detect \
  -H 'accept: application/json' \
  -H 'Content-Type: application/json' \
  -d '{
    "url": "https://nvl.ngsl.cdn.digitalscomposites.com/article/141341-qgweioy:1580281225.jpg"
  }'

Request URL:
https://159.203.185.164:3000/api-docs/#/Face%20Detection/post_detect
Server response:
200
Response body:
{
  "faceId": "71b180b-c0f4-4038-8f38-0101a0091",
  "faceDetection": {
    "type": "face",
    "x": 100,
    "y": 100,
    "width": 100,
    "height": 100
  },
  "faceEmbeddings": {
    "embedding": {
      "x": 100,
      "y": 100,
      "width": 100,
      "height": 100
    }
  },
  "faceLandmarks": {
    "landmarks": {
      "x": 100,
      "y": 100,
      "width": 100,
      "height": 100
    }
  },
  "faceAttributes": {
    "attributes": {
      "x": 100,
      "y": 100,
      "width": 100,
      "height": 100
    }
  }
}

Response headers:
access-control-allow-origin: *
connection: keep-alive
content-length: 305
content-type: application/json; charset=utf-8
date: Mon, 02 May 2022 02:09:34 GMT
etag: W/0ff-c0f4-4038-8f38-0101a0091
keep-alive: timeout=6
powered-by: Express

Responses
Code Details
200
Request body is invalid
401
Access denied due to invalid subscription key
408
Request Timeout

```

## 2) Face Verification (/verify)

- Verification is also a "one-to-one" matching of a face in an image to a single face from a secure repository or photo to verify that they're the same individual. Face Verification is used to verify the identity of the individuals.
- It takes as input the Face ID's of the detected faces and returns a boolean value "isIdentical" which will be True if the two faces are identical and False if the two faces are not identical.
- It also gives a "confidence" value which will range from 0 to 1. A Higher confidence value indicates that both the faces are more identical and the boolean value "isIdentical" will be returned as True. . By default, "isIdentical" is set to True if the confidence value is greater than or equal to 0.5.

**Input:** Give the Face ID's of the detected faces obtained from calling the face detection endpoint

**Output:** It returns a boolean value "isIdentical" which can be True or False and also a "confidence" value which would range from 0 to 1.

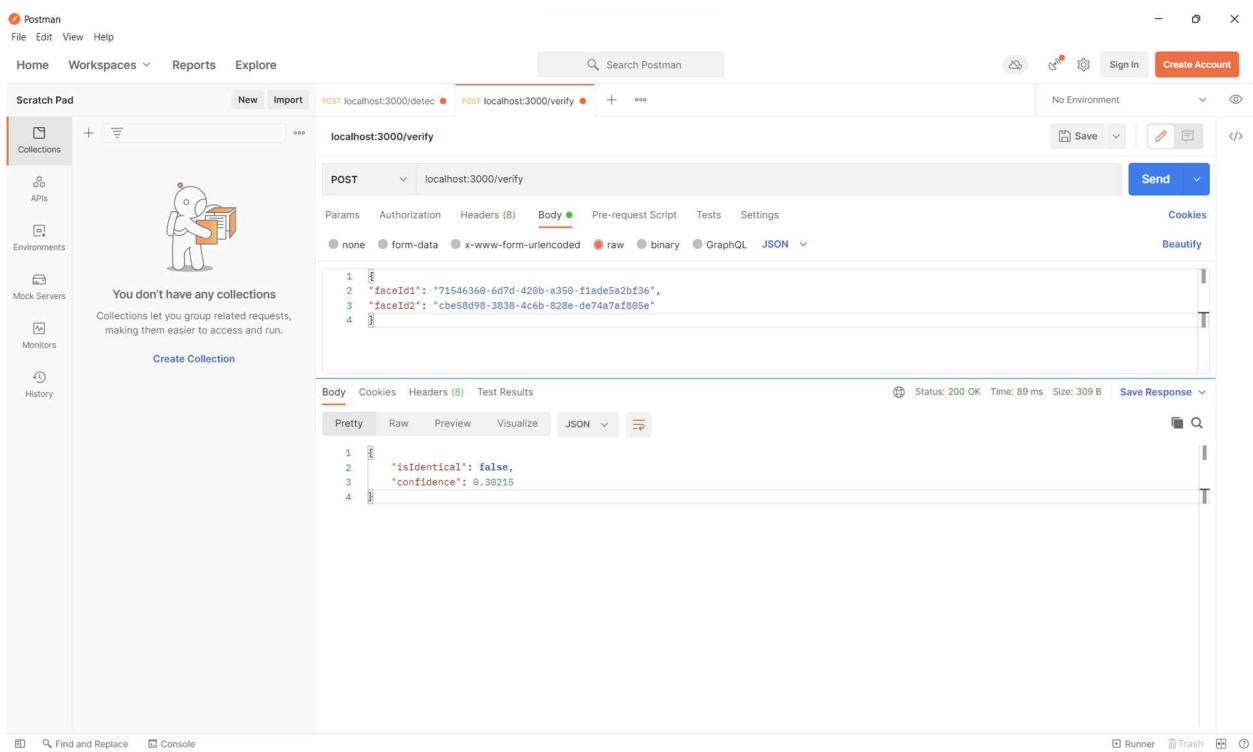
### **Sample Input:**

```
{  
  "faceId1": "71546360-6d7d-420b-a350-flade5a2bf36",  
  "faceId2": "cbe58d98-3838-4c6b-828e-de74a7af805e"  
}
```

## Sample Output:

```
{  
  "isIdentical": false,  
  "confidence": 0.30215  
}
```

## In Postman:



## Request:

Not secure | 159.203.185.164:3000/api-docs/#/Face%20Verification/post\_verify

### Face Verification

POST /verify

Calls the Face Verification endpoint from Microsoft Azure

Parameters

Name	Description
body * required array[string] (body)	Face ID's of the detected faces obtained from calling the Face Detection endpoint

Edit Value | Model

```
{  "faceId1": "71546360-6d7d-420b-a350-f1ade5a2bf36",  "faceId2": "cbe58d98-3838-4c6b-828e-de74a7af805e"}
```

Cancel

Parameter content type  
application/json

Execute

## Response:

Not secure | 159.203.185.164:3000/api-docs/#/Face%20Verification/post\_verify

### Responses

Response content type: application/json

Curl

```
curl -X 'POST' \  "http://159.203.185.164:3000/verify" \  -H 'accept: application/json' \  -H 'content-type: application/json' \  -d '{  "faceId1": "71546360-6d7d-420b-a350-f1ade5a2bf36",  "faceId2": "cbe58d98-3838-4c6b-828e-de74a7af805e"  }'
```

Request URL

http://159.203.185.164:3000/verify

Server response

Code	Details
200	<p>Response body</p> <pre>{  "isIdentical": false,  "confidence": 0.30215  }</pre> <p>Response headers</p> <pre>access-control-allow-origin: *  connection: keep-alive  content-length: 42  content-type: application/json; charset=utf-8  date: Mon, 02 May 2022 02:18:35 GMT  etag: W/"2a-1WwAO6/rJ4z3b27Up&lt;9SLMcM"  keep-alive: timeout=5  x-powered-by: Express</pre>

Responses

Code	Description
200	Successfully performed Face Verification
400	Request body is invalid
401	Access denied due to invalid subscription key

### **Tools, Languages and Frameworks Used:**

- **Node.js** - For implementing the API
- **Npm** - For dependencies in node.js application
- **Swagger** - For API documentation and testing
- **Git** - For code evaluation
- **Digital Ocean** - For deploying the project

### **References:**

**Microsoft Azure Documentation -**

**<https://docs.microsoft.com/en-us/azure/cognitive-services/face/overview>**

**Source Code - <https://github.com/Saketh240198/ITIS-6177-final-project>**

**URL to Live API - <http://159.203.185.164:3000/api-docs/>**