Code Blog

4 Machine Learning Object Detection Solutions

maxbox4 July 29, 2024 Data Science, Machine Learning, maXbox, Trains
Machine Learning, maXbox5, python Edit

Object Detection APIs and Libraries provides a fast and accurate image object recognition using advanced neural networks developed by machine learning experts and models. It also supports object detection, video detection and object tracking using RetinaNet, YOLOv3 and TinyYOLOv3 pre-trained on datasets.

Solution Script:
https://github.com/maxkleiner/HttpComponent/blob/main/1316_detector25_integrate4solutions.txt

We deliver 4 showcases with the same image to compare and evaluate:

- 1. Integrate Python ImageAI /PyTorch
- 2. THttpRequestC RestClient / https://api-ninjas.com/api/objectdetection
- 3. THttpConnectionWinInet WinInet API / https://api.apilayer.com/image_to_text/
- 4. Integrate Python4Delphi / Apilayer

As we can see the algorithm, data and the result is distributable and scalable:

	Algorithm (model)	Data (image)	Result (Json)	Tech
1.	local -	local -	local	python core
2.	cloud -	local -	local/cloud	post API
3.	cloud -	cloud -	local/cloud	get API
4.	cloud -	cloud -	local	rest API

The **first** solution starts with **tiny-yolov3.pt** model from **imagai**:

```
'#using the pre-trained TinyYOLOv3 model,
detector.setModelTypeAsTinyYOLOv3()
detector.setModelPath(model_path)
'#loads model path specified above using setModelPath() class method.
detector.loadModel()
custom=detector.CustomObjects(person=True,laptop=True,car=False,train
```

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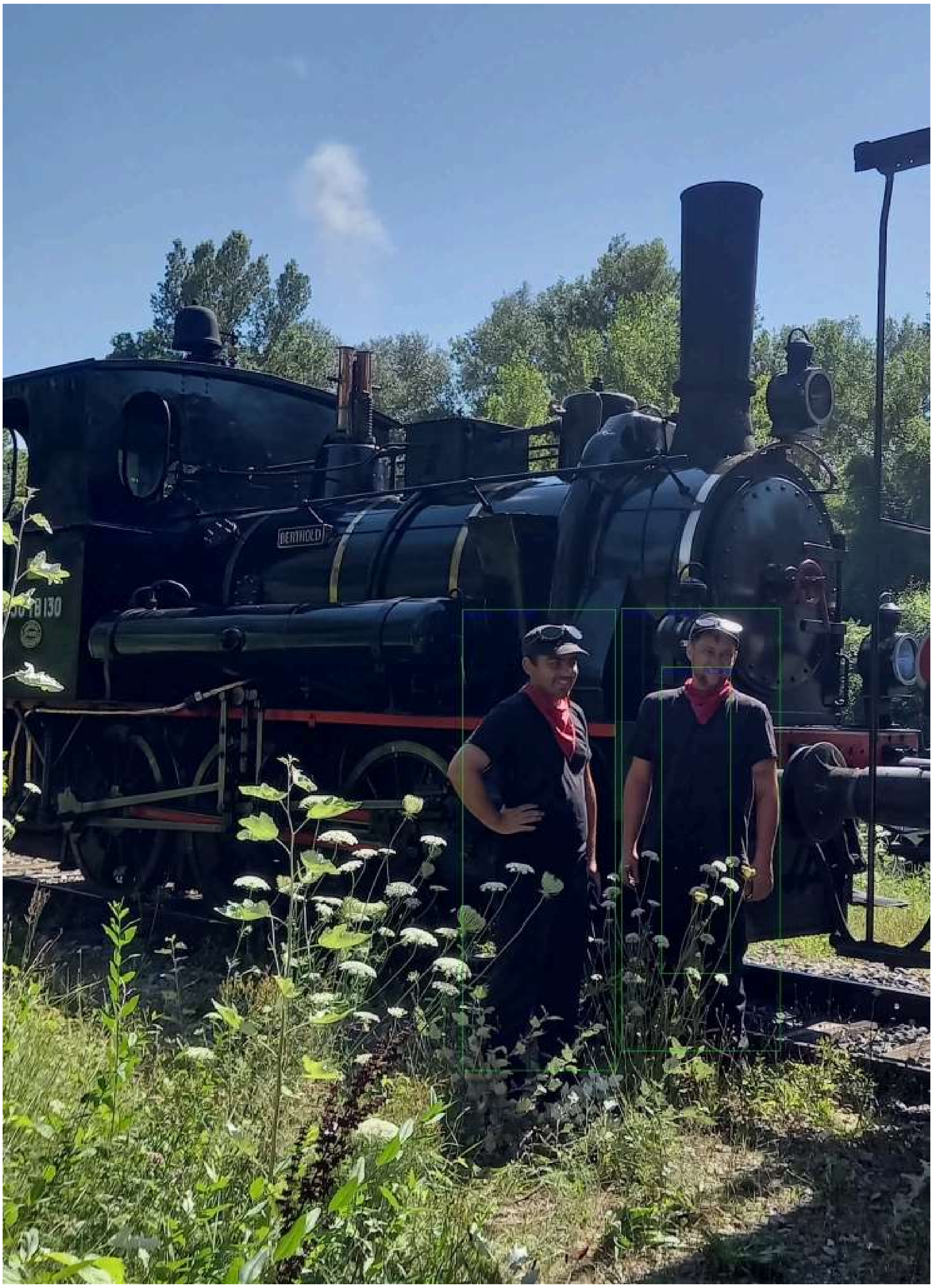


The reference image for the solutions

Result: Start with maXbox5 ImageAI Detector —>
train : 80.25 %
integrate image detector compute ends…

elapsedSeconds:= 4.879268800000 no console attached..
mX5🐞 executed: 29/07/2024 09:53:49 Runtime: 0:0:8.143 Memload: 75% use

The we asked why the model can't see the persons? It depends on the frame, so by cutting the image (crop) it sees persons but no train anymore!

```
input_path=r"C:\maxbox\maxbox51\examples\1316_elsass_20240728_161420crop.jpg"
```

Result: Start with maXbox5 ImageAI Detector —>
this first line fine
person : 99.29 %
person : 99.58 %
person : 98.74 %
integrate image detector compute ends…
elapsedSeconds:= 4.686975000000 – no console attached..
mX5🐞 executed: 29/07/2024 10:09:30 Runtime: 0:0:7.948 Memload: 77% use

You can see one false positive in the green bounding box above!

The **Second** Solution is an API from URL_APILAY_DETECT = '**https://api.api-ninjas.com/v1/objectdetection/&#8217**;;

The Object Detection API provides fast and accurate image object recognition using advanced neural networks developed by machine learning models.

https://api-ninjas.com/api/objectdetection

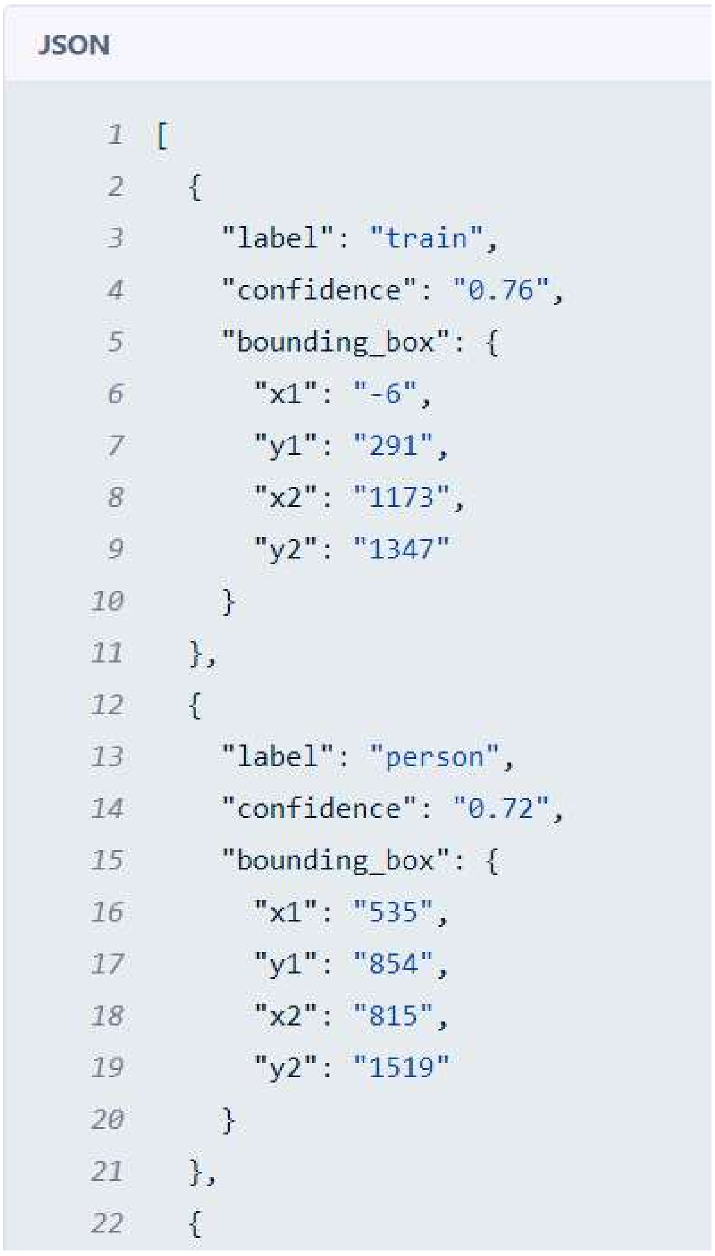
```
const URL_APININ_DETECT= 'https://api.api-ninjas.com/v1/objectdetect

function TestHTTPClassComponentAPIDetection2(AURL, askstream, aApike
var HttpReq1: THttpRequestC;
    Body: TMultipartFormBody;
    Body2: TUrlEncodedFormBody;  //ct: TCountryCode;
begin
  Body:= TMultipartFormBody.Create;
  Body.ReleaseAfterSend:= True;
  //Body.Add('code','2','application/octet-stream');
  //Body.AddFromFile('image', exepath+'randimage01.jpg');
  Body.AddFromFile('image',
                              'C:\maxbox\maxbox51\examples\1316_elsass_

  HttpReq1:= THttpRequestC.create(self);
  httpreq1.useragent:= USERAGENT3;
  httpReq1.headers.add('X-Api-Key:'+AAPIKEY);
  httpReq1.headers.add('Accept:application/json');
  hthtpReq1.SecurityOptions:= [soSsl3, soPct, soIgnoreCertCNInvalid]
  try
    if HttpReq1.Post1Multipart(AURL, body) then
       result:=HttpReq1.Response.ContentAsString
    else Writeln('APIError '+inttostr(HttpReq1.Response.StatusCode2)
  finally
    writeln('Status3: '+gethttpcod(HttpReq1.Response.statuscode2))
    HttpReq1.Free;
    sleep(200)
    // if assigned(body) then body.free;
  end;
end;
```

This result is a post from a multipartform body stream and you need an API key, then the result is a JSON back, as you can see, we need a call to `HttpReq1.Post1Multipart` for uploading files.:
POST data using the Content-Type multipart/form-data

```
Result Status3: SC_OK
back [ {
  "label": "train",
  "confidence": "0.76",
  "bounding_box": {
    "x1": "-6",
    "y1": "291",
    "x2": "1173",
    "y2": "1347"
  }
},
{
  "label": "person",
  "confidence": "0.72",
  "bounding_box": {
    "x1": "535",
    "y1": "854",
    "x2": "815",
    "y2": "1519"
 }
},
{
  "label": "person",
  "confidence": "0.69",
  "bounding_box": {
    "x1": "823",
    "y1": "790",
    "x2": "1055",
    "y2": "1350"
  }
},
```


JSON

```
[
  {
    "label": "train",
    "confidence": "0.76",
    "bounding_box": {
      "x1": "-6",
      "y1": "291",
      "x2": "1173",
      "y2": "1347"
    }
  },
  {
    "label": "person",
    "confidence": "0.72",
    "bounding_box": {
      "x1": "535",
      "y1": "854",
      "x2": "815",
      "y2": "1519"
    }
  },
  {
```

as JSON back

The **third** solution wants to get the text back from the image. The Image to Text API detects and extracts text from images using state-of-the-art optical character recognition (OCR) algorithms. It can detect texts of different sizes, fonts, and even handwriting on pictures or draws.

```
URL_APILAY_IMG2TEXT = 'https://api.apilayer.com/image_to_text/url?ur

function Image_to_text_API2(AURL, url_imgpath, aApikey: string): str
var httpq: THttpConnectionWinInet;
    rets: TStringStream;
    heads: TStrings; iht: IHttpConnection; //losthost:THTTPConnectio
begin
  httpq:= THttpConnectionWinInet.Create(true);
  rets:= TStringStream.create('');
  heads:= TStringlist.create;
  try
    heads.add('apikey='+aAPIkey);
    iht:= httpq.setHeaders(heads);
    httpq.Get(Format(AURL,[url_imgpath]), rets);
    if httpq.getresponsecode=200 Then result:= rets.datastring
      else result:='Failed:'+
              itoa(Httpq.getresponsecode)+Httpq.GetResponseHeader('me
  except
    writeln('EWI_HTTP: '+ExceptiontoString(exceptiontype,exceptionpa
  finally
    httpq:= Nil;
    heads.Free;
    rets.Free;
  end;
end;                    //}
```

And the model is able to read the **name** of the Locomotive!:

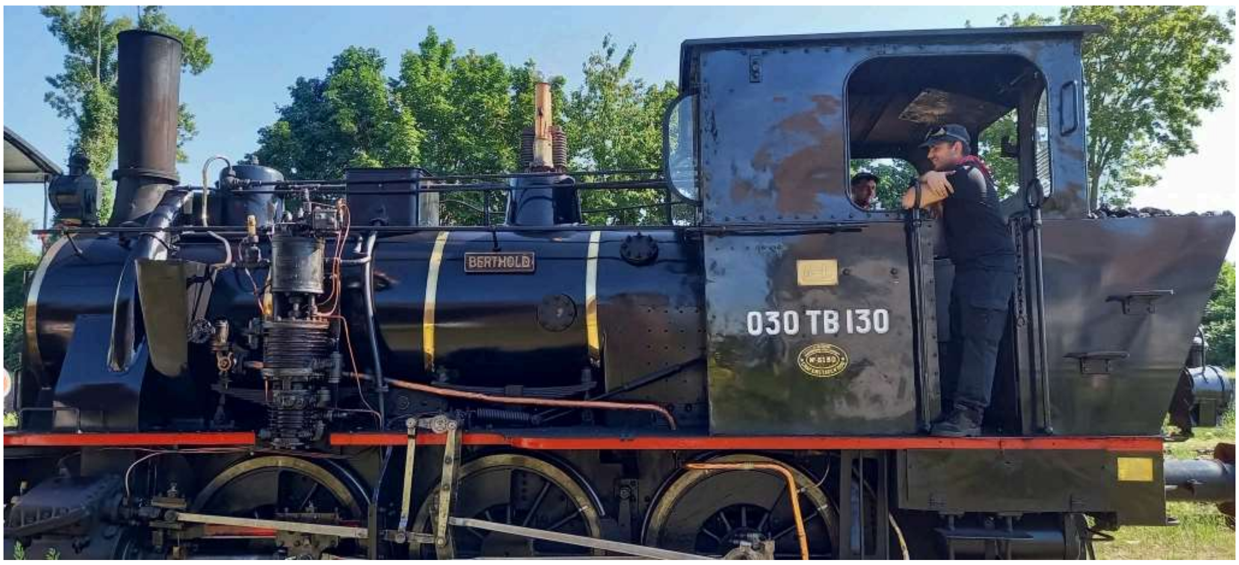
Result_: {"lang":"en","all_text":"18130\n**BERTHOLD**","annotations":["18130","**BERTHOLD**"]}
mX5🐞 executed: 29/07/2024 11:04:12 Runtime: 0:0:3.527 Memload: 81% use

The **forth** and last solution in this machine learning package is a Python one as in Python for maXbox or Python4Delphi available:

```
procedure PyCode(imgpath, apikey: string);
begin
  with TPythonEngine.Create(Nil) do begin
  //pythonhome:= 'C:\Users\User\AppData\Local\Programs\Python\Python3
  try
    loadDLL;
    autofinalize:= false;
    ExecString('import requests, sys');
    ExecStr('url= "https://api.apilayer.com/image_to_text/url?url='+
    ExecStr('payload = {}');
    ExecStr('headers= {"apikey": "'+apikey+'"}');
    Println(EvalStr('requests.request("GET",url,headers=headers, data
    Println('Version: '+EvalStr('sys.version'));
  except
    raiseError();
  finally
    free;
  end;
 end;
end;
```

{“lang”: “en”, “all_text”: “18130\nBERTHOLD”, “annotations”: [“18130”, “**BERTHOLD**“]}

Version: 3.12.4 (tags/v3.12.4:8e8a4ba, Jun 6 2024, 19:30:16) [MSC v.1940 64 bit (AMD64)]
mX5🐞 executed: 29/07/2024 11:18:13 Runtime: 0:0:4.60 Memload: 79% use



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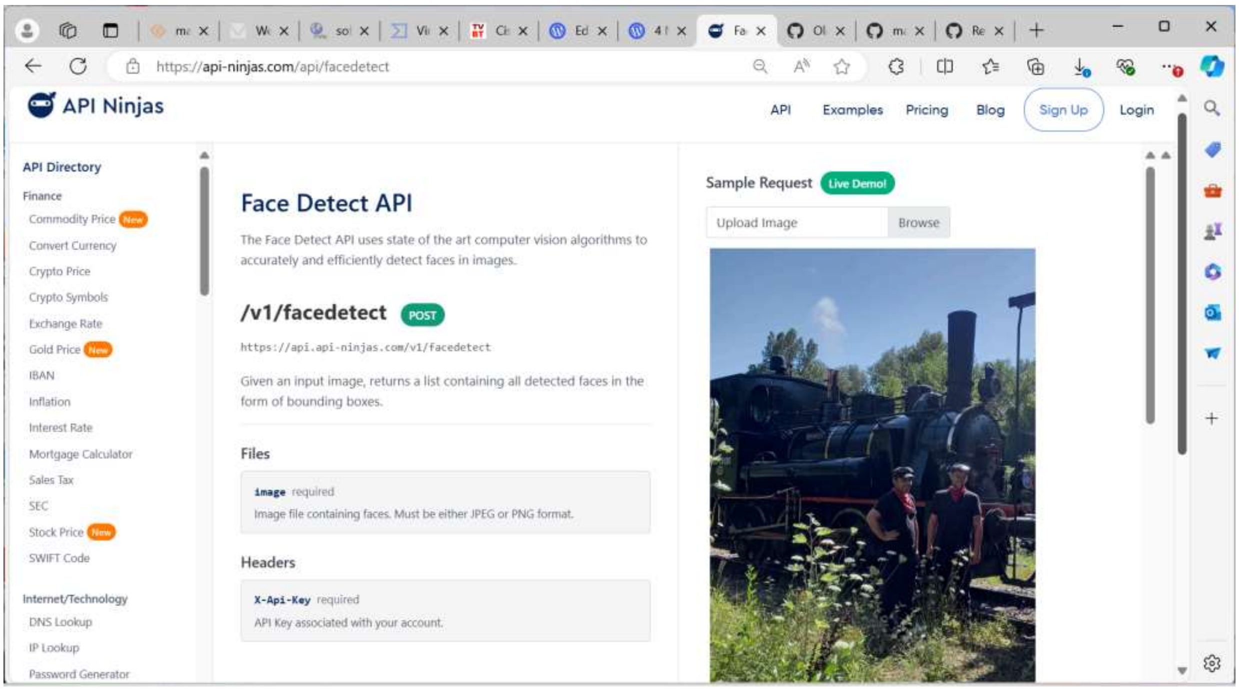
Conclusion and Summary

1. Built with simplicity in mind, **ImageAI** supports a list of state-of-the-art Machine Learning algorithms for image prediction, custom image prediction, object detection, video detection, video object tracking and image predictions trainings. ImageAI currently supports image prediction and training using 4 different Machine Learning algorithms trained on the ImageNet-1000 dataset. ImageAI also supports object detection, video detection and object tracking using RetinaNet, YOLOv3 and TinyYOLOv3 trained on COCO

dataset. Finally, ImageAI allows you to train custom models for performing detection and recognition of new objects.
https://github.com/OlafenwaMoses/ImageAI

2. Object Detection API – The **Object Detection API** provides fast and accurate image object recognition using advanced neural networks developed by machine learning experts. It also has a Live Demo or rules with Mime Post Multipart FormData_:
https://api-ninjas.com/api/objectdetection
https://github.com/maxkleiner/HttpComponent
3. Recognizes and reads the text embedded in images very accurare and usable.
Image to Text API uses a neural net (LSTM) based OCR engine which is focused on line recognition, but also supports recognizing the character patterns. It supports both handwriting and printed materials.
It will extract the text information easily, even though the text or number is positioned with angle, like Berthold.
https://apilayer.com/marketplace/image_to_text-api
4. The **Requests library** in Python is one of the integral parts of Python for making HTTP requests to a specified URL as post or get. Whether it be REST APIs or Web Scraping, requests are a must to be learned for proceeding further with these technologies.
5. Out of the examples above but also mention it: The **Face Detect API** uses state of the art computer vision algorithms to accurately and efficiently detect faces in images.
https://api-ninjas.com/api/facedetect



Face Detect API

The Face Detect API uses state of the art computer vision algorithms to accurately and efficiently detect faces in images.

/v1/facedetect POST

`https://api.api-ninjas.com/v1/facedetect`

Given an input image, returns a list containing all detected faces in the form of bounding boxes.

Files

`image` required
Image file containing faces. Must be either JPEG or PNG format.

Headers

`X-Api-Key` required
API Key associated with your account.

The Face Detect API

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TheiaEngine, the next-generation computer Vision AI API capable of all Generative and Understanding computer vision tasks in a single API call and available via REST API to all programming languages. Features include

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