Text Extraction with different libraries

Author: Sandipan Dey

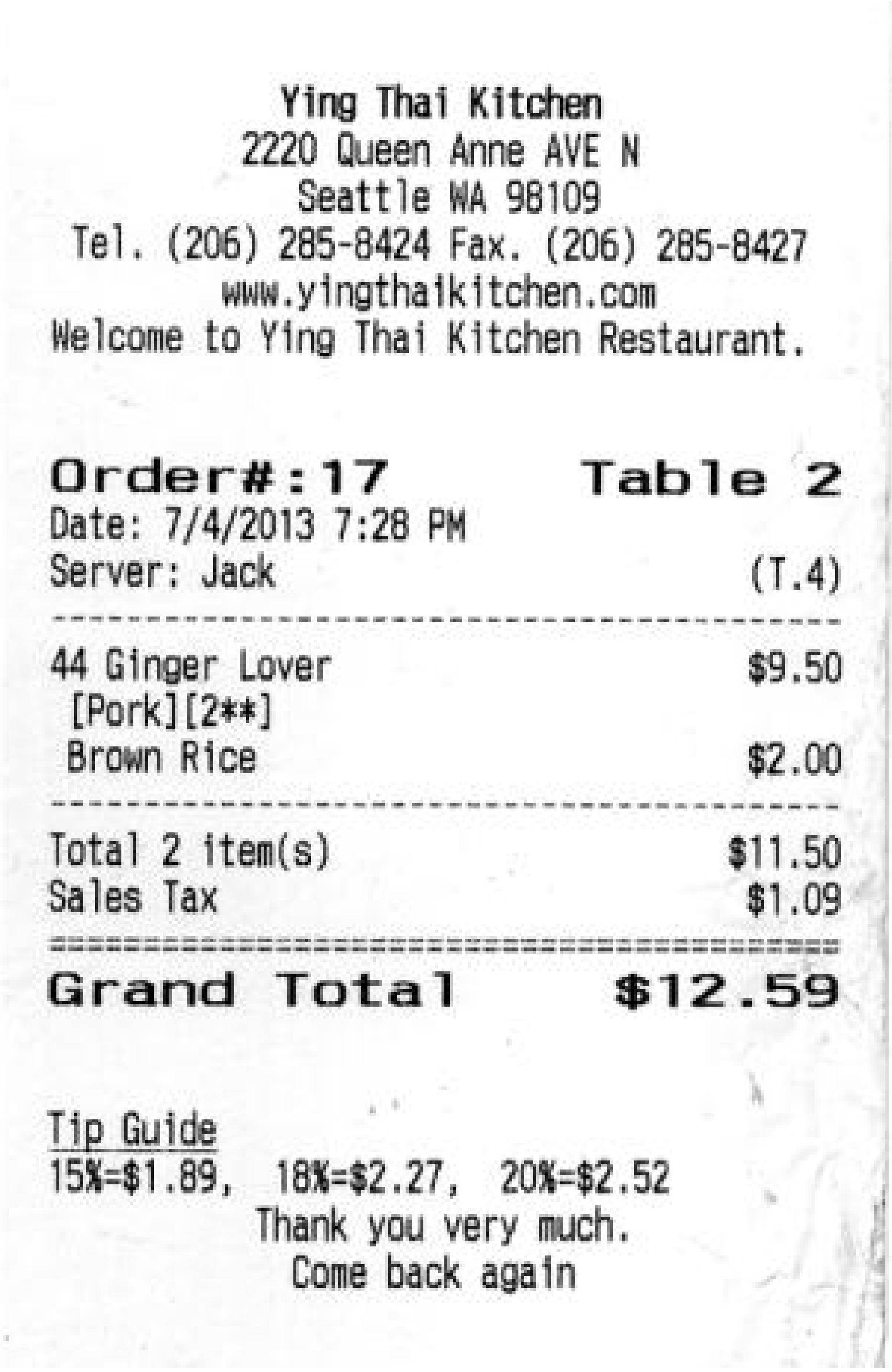
1. Text Extraction with Tesseract

In [7]:

```
import cv2
import numpy as np
import pandas as pd
import pytesseract
import re
from skimage.io import imread
import matplotlib.pylab as plt
```

In [199]:

```
pytesseract.pytesseract.tesseract_cmd = r'C:\Program Files\Tesseract-OCR\tesseract.ex
e'

def get_text_conf(path, thres=80, rsz_factor=1, annotate=False):

    image = cv2.imread(path)

    #sharpen_filter = np.array([[0, -1, 0], [-1, 5, -1], [0, -1, 0]])
    #image = cv2.filter2D(image, -1, sharpen_filter)

    if rsz_factor != 1:
        image = cv2.resize(image, None, fx=rsz_factor, fy=rsz_factor, interpolation =
cv2.INTER_AREA)

    gray = cv2.cvtColor(image, cv2.COLOR_BGR2GRAY)
    txt = pytesseract.image_to_string(gray)
    txt = re.sub(r'\r\n', '\n', txt).strip()
    txt = re.sub(r'\s+\n', '\n', txt).strip()
    txt = re.sub(r'\n+', '\n', txt).strip() #cv2.equalizeHist(gray)

    text = pytesseract.image_to_data(gray, output_type='data.frame')
    text = text[text.conf != -1]

    lines = text.groupby(['page_num', 'block_num', 'par_num', 'line_num'])['text'].ap
ply(lambda x: ' '.join(list(x))).tolist()
    confs = text.groupby(['page_num', 'block_num', 'par_num', 'line_num'])['conf'].me
an().tolist()

    line_conf = []

    for i in range(len(lines)):
        if lines[i].strip() and confs[i] >= thres:
            line_conf.append((lines[i], round(confs[i],3)))

    if annotate:
        image = cv2.cvtColor(image, cv2.COLOR_BGR2RGB)
        n_boxes, texts = len(text['level']), text['text'].tolist()
        left, top, width, height = text['left'].tolist(), text['top'].tolist(), text[
'width'].tolist(), text['height'].tolist()
        conf = text['conf'].tolist()
        for i in range(n_boxes):
            if conf[i] < thres:
                continue
            (x, y, w, h) = (left[i], top[i], width[i], height[i])
            cv2.rectangle(image, (x, y), (x + w, y + h), (0, 255, 0), 2)
            cv2.putText(image, texts[i], (x,y), cv2.FONT_HERSHEY_SIMPLEX, 0.5, 255, 2
)
        plt.figure(figsize=(20,40))
        plt.imshow(image)
        plt.show()

    return line_conf
```



Ying Thai Kitchen
2220 Queen Anne AVE N
Seattle WA 98109
Tel. (206) 285-8424 Fax. (206) 285-8427
www.yingthaikitchen.com
Welcome to Ying Thai Kitchen Restaurant.

Order#:17 Table 2

Date: 7/4/2013 7:28 PM

Server: Jack (T.4)

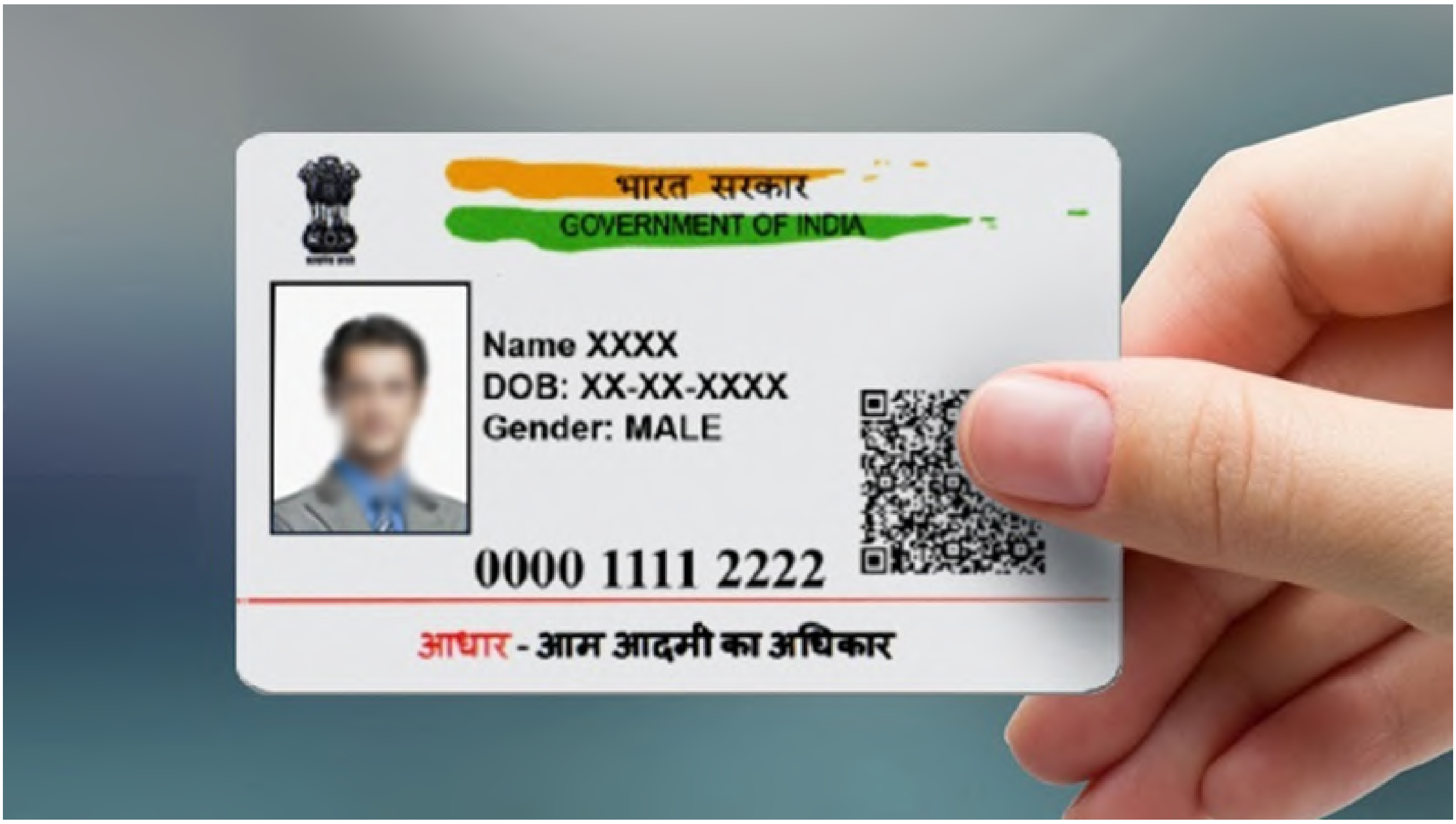
44 Ginger Lover [Pork][2**]	$9.50
Brown Rice	$2.00
Total 2 item(s)	$11.50
Sales Tax	$1.09
Grand Total	**$12.59**

Tip Guide
15%=$1.89, 18%=$2.27, 20%=$2.52

Thank you very much.
Come back again

```
In [200]: get_text_conf('bill.png')
```

```
Out[200]: [('Ying Thai Kitchen', 91.667),
           ('2220 Queen Anne AVE N', 88.2),
           ('Seattle WA 98109', 90.333),
           ('« (206) 285-8424 Fax. (206) 285-8427', 83.167),
           ('Welcome to Ying Thai Kitchen Restaurant,', 85.333),
           ('Order#:17 Table 2', 94.0),
           ('Date: 7/4/2013 7:28 PM', 86.25),
           ('Server: Jack (1.4)', 83.0),
           ('44 Ginger Lover $9.50', 89.0),
           ('Brown Rice $2.00', 95.333),
           ('Total 2 iten(s) $11.50', 89.5),
           ('Sales Tax $1.09', 95.667),
           ('Grand Total $12.59', 95.0),
           ('Tip Guide', 95.0),
           ('Thank you very much,', 90.75),
           ('Cone back again', 92.667)]
```



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GOVERNMENT OF INDIA

Name XXXX
DOB: XX-XX-XXXX
Gender: MALE

0000 1111 2222

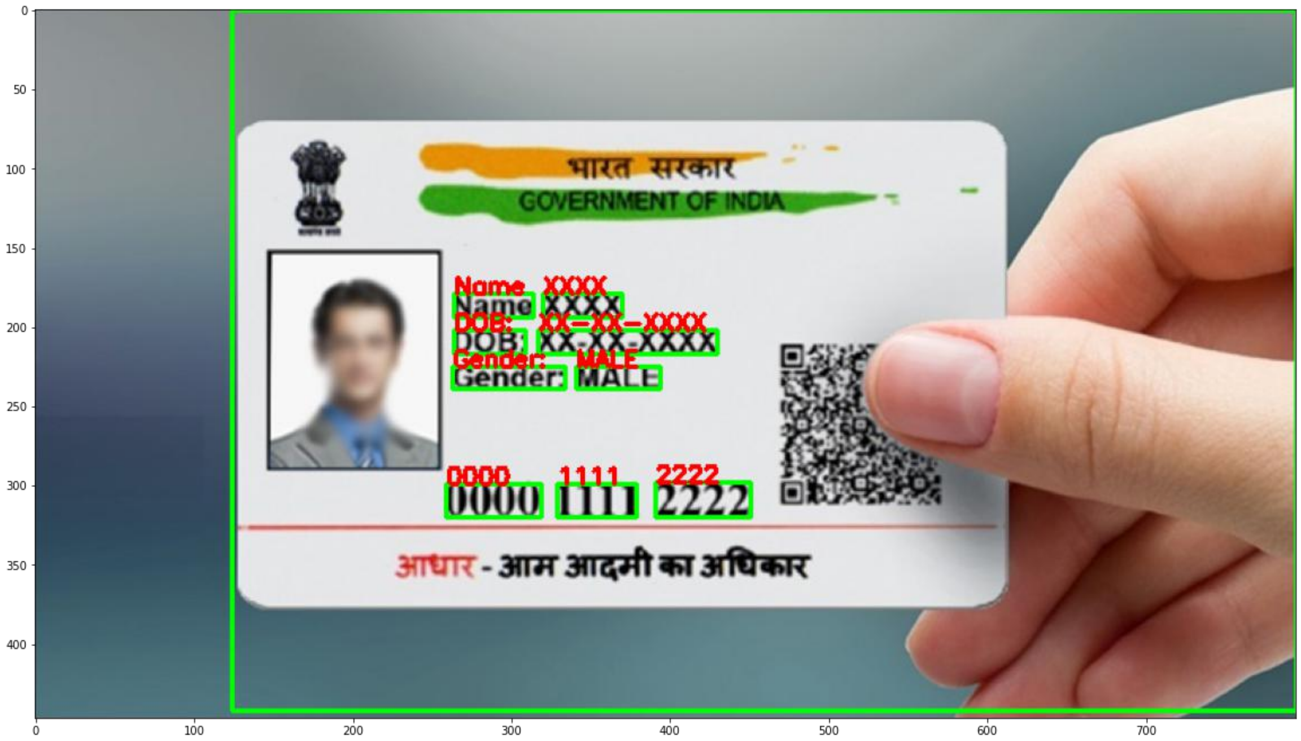
आधार - आम आदमी का अधिकार

```
In [201]: get_text_conf('aadhaar.jpg')
```

```
Out[201]: [('Name XXXX', 92.5),
           ('DOB: XX-XX-XXXX', 90.0),
           ('Gender: MALE', 96.0),
           ('0000 1111 2222', 94.667)]
```

In [202]:

```
get_text_conf('aadhaar.jpg', annotate=True)
```



Out[202]:

```
[('Name XXXX', 92.5),
 ('DOB: XX-XX-XXXX', 90.0),
 ('Gender: MALE', 96.0),
 ('0000 1111 2222', 94.667)]
```

1.1 Extract key-value pairs with regex templates

In [139]:

```
import re

def process_template(keys, regex_pattern_templates, txt_conf):
    vals = {}
    for txt, conf in txt_conf:
        for k, pat in zip(keys, regex_pattern_templates):
            m = re.search(pat, txt, re.IGNORECASE | re.DOTALL)
            if m:
                vals[k] = (m.group(1), conf)
                break
    return vals

keys = ['Name', 'DOB', 'Gender']
regex_pattern_templates = [r'name[\s:]?\s+(.*)',
                           r'dob[\s:]?\s+(.*)',
                          r'gender[\s:]?\s+(.*)']
tc = get_text_conf('aadhaar.jpg')
process_template(keys, regex_pattern_templates, tc)
```

Out[139]:

```
{'Name': ('XXXX', 92.5), 'DOB': ('XX-XX-XXXX', 90.0), 'Gender': ('MALE', 96.0)}
```

In [141]:

```
def get_text_conf_regex(path, thres=80, rsz_factor=1, process_template_func=process_template):

    image = cv2.imread(path)

    #sharpen_filter = np.array([[0, -1, 0], [-1, 5, -1], [0, -1, 0]])
    #image = cv2.filter2D(image, -1, sharpen_filter)

    if rsz_factor != 1:
        image = cv2.resize(image, None, fx=rsz_factor, fy=rsz_factor, interpolation = cv2.INTER_AREA)

    gray = cv2.cvtColor(image, cv2.COLOR_BGR2GRAY)
    txt = pytesseract.image_to_string(gray)
    txt = re.sub(r'\r\n', '\n', txt).strip()
    txt = re.sub(r'\s+\n', '\n', txt).strip()
    txt = re.sub(r'\n+', '\n', txt).strip() #cv2.equalizeHist(gray)

    text = pytesseract.image_to_data(gray, output_type='data.frame')
    text = text[text.conf != -1]

    lines = text.groupby(['page_num', 'block_num', 'par_num', 'line_num'])['text'].apply(lambda x: ' '.join(list(x))).tolist()
    confs = text.groupby(['page_num', 'block_num', 'par_num', 'line_num'])['conf'].mean().tolist()

    line_conf = []

    for i in range(len(lines)):
        if lines[i].strip() and confs[i] >= thres:
            line_conf.append((lines[i], round(confs[i],3)))

    line_conf = process_template_func(keys, regex_pattern_templates, line_conf)

    return line_conf
```

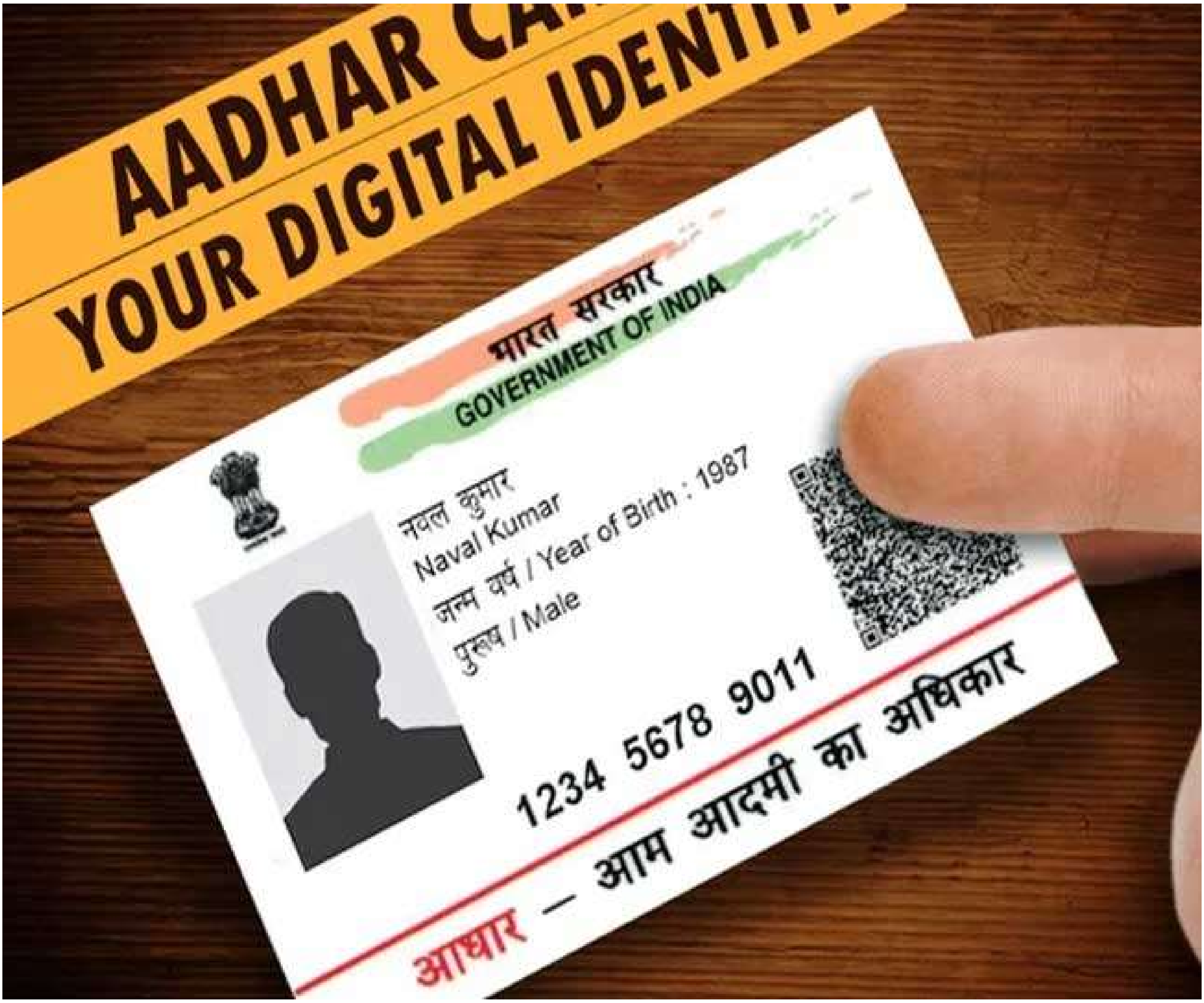
In [143]:

```
keys = ['Name', 'DOB', 'Gender']
regex_pattern_templates = [r'name[\s:]?\s+(.*)',
                            r'dob[\s:]?\s+(.*)',
                           r'gender[\s:]?\s+(.*)']
get_text_conf_regex('aadhaar.jpg')
```

Out[143]:

```
{'Name': ('XXXX', 92.5), 'DOB': ('XX-XX-XXXX', 90.0), 'Gender': ('MALE', 96.0)}
```

1.2 Challenging examples



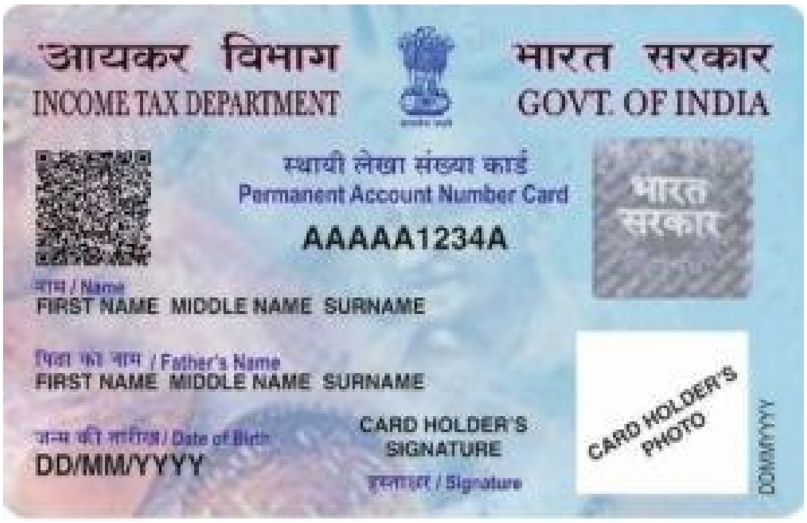
भारत सरकार
GOVERNMENT OF INDIA

नवल कुमार
Naval Kumar
जन्म वर्ष / Year of Birth : 1987
पुरुष / Male

1234 5678 9011

आधार — आम आदमी का अधिकार

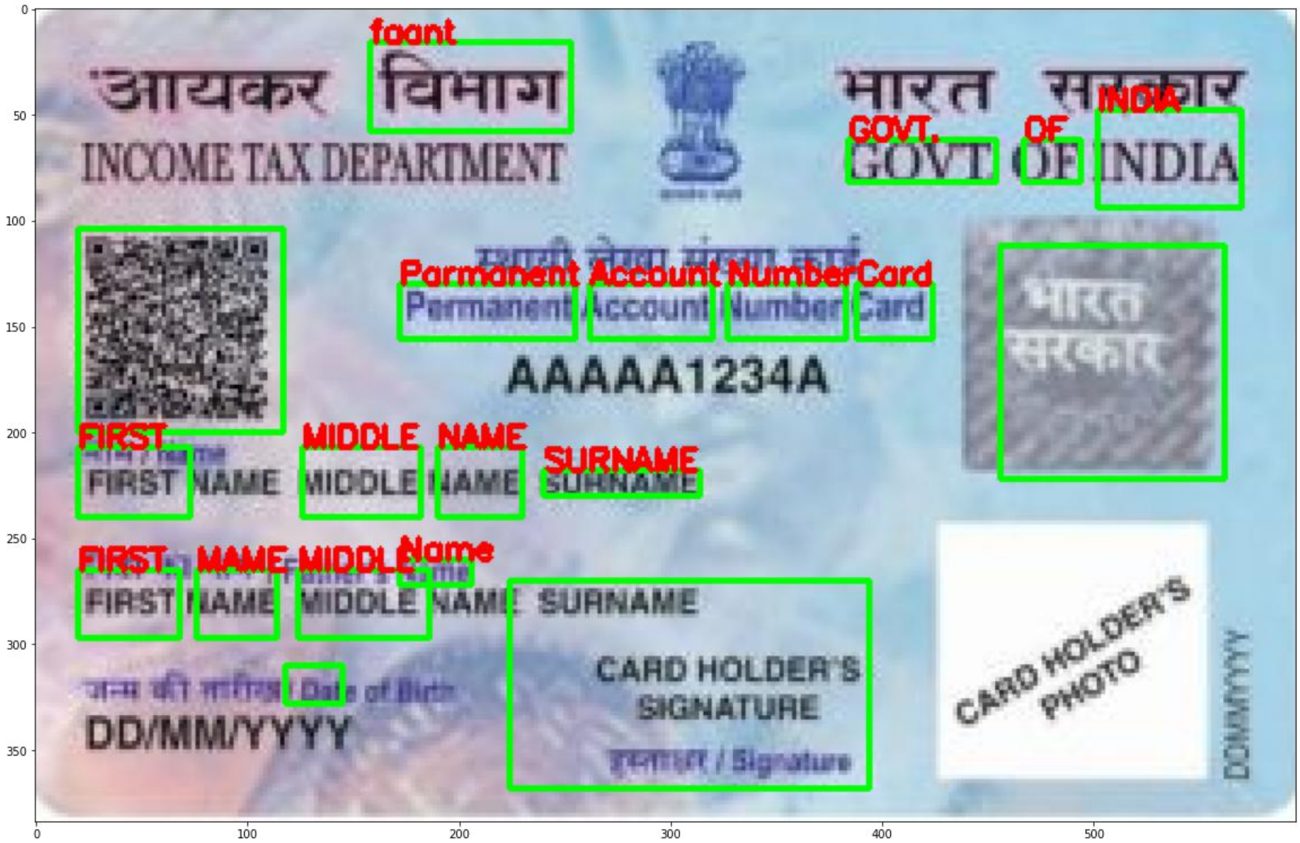
```
In [131]: get_text_conf('adhar2.jpg')

Out[131]: []
```



आयकर विभाग
INCOME TAX DEPARTMENT
भारत सरकार
GOVT. OF INDIA
स्थायी लेखा संख्या कार्ड
Permanent Account Number Card
AAAAA1234A
नाम / Name
FIRST NAME MIDDLE NAME SURNAME
पिता का नाम / Father's Name
FIRST NAME MIDDLE NAME SURNAME
जन्म की तारीख / Date of Birth
DD/MM/YYYY
CARD HOLDER'S SIGNATURE
हस्ताक्षर / Signature
भारत सरकार
CARD HOLDER'S PHOTO
DDMMYYYY

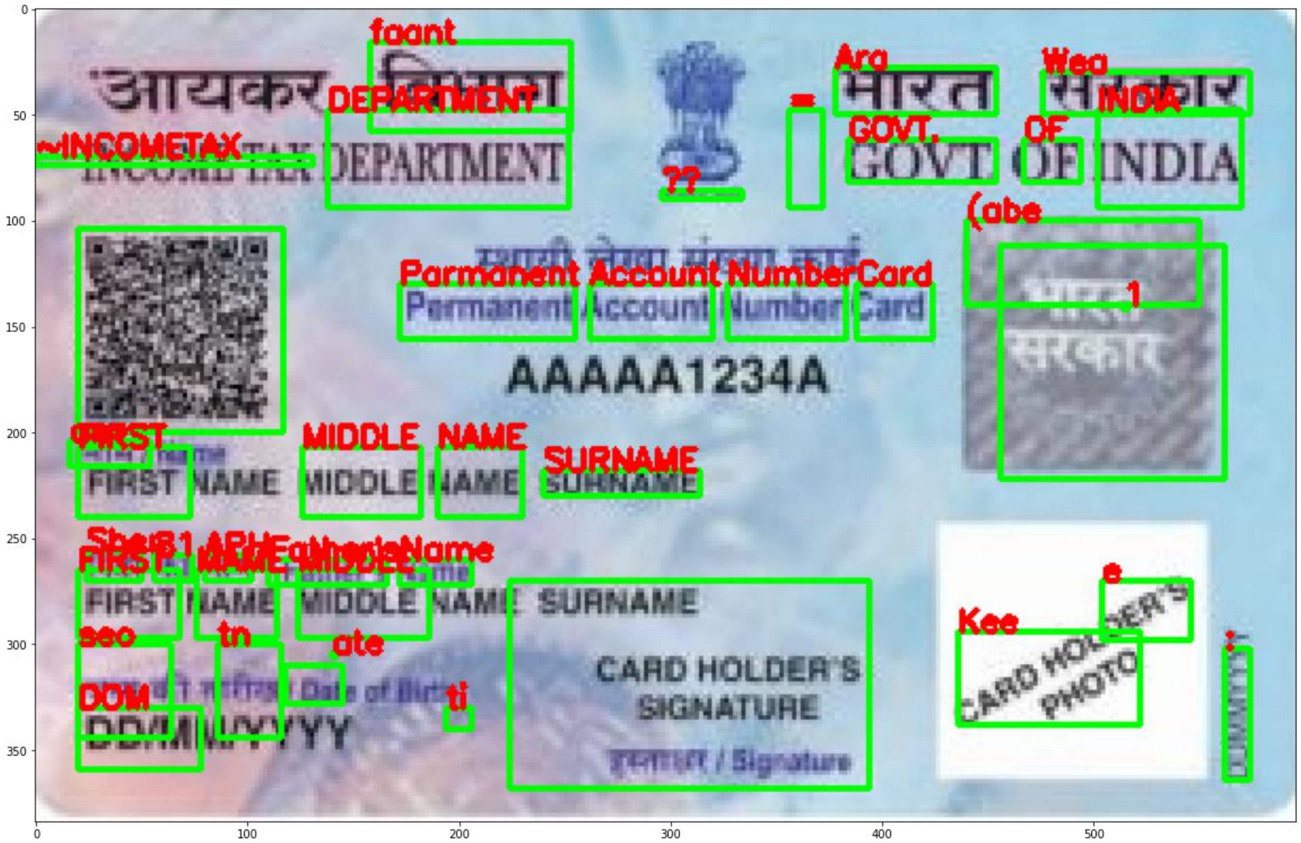
```
In [126]: get_text_conf('PANCard.png', rsz_factor=2.7)

Out[126]: [('“FIRST NAME. MIDDLE NAME SURNAME', 85.2)]
```

```
In [203]: get_text_conf('PANCard.png', rsz_factor=2, thres=60, annotate=True)
```



```
Out[203]: [('~INCOMETAX DEPARTMENT © = GOVT. OF INDIA', 62.0),
           ('Parmanent Account Number Card 1', 81.6),
           ('FIRST MIDDLE NAME SURNAME', 94.0),
           ('FIRST MAME MIDDLE e', 73.75)]
```

```
In [207]: get_text_conf('PANCard.png', rsz_factor=2, thres=10, annotate=True)
```



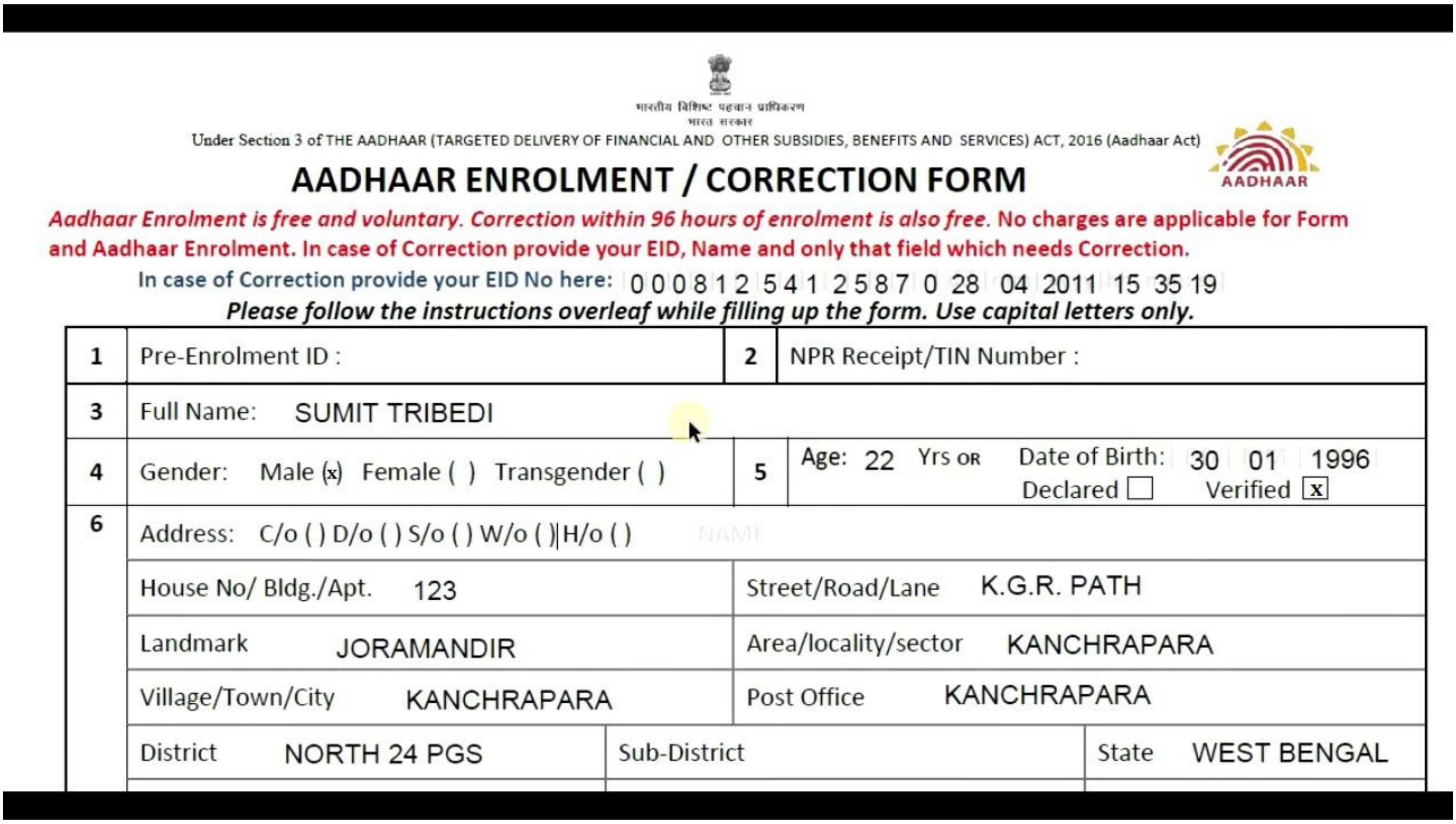
```
Out[207]: [(', Sreear faant Ara Wea', 25.8),
           ('~INCOMETAX DEPARTMENT © = GOVT. OF INDIA', 62.0),
           ('amiaendemert (abe', 12.5),
           ('Parmanent Account Number Card 1', 81.6),
           ('am', 45.0),
           ('FIRST MIDDLE NAME SURNAME', 94.0),
           ("Sher 81 APH Father's Name", 45.0),
           ('FIRST MAME MIDDLE e', 73.75),
           ('seo tn ate ti Kee :', 39.0)]
```

```
In [128]: get_text_conf('PANCard.png', rsz_factor=1.5)
```

```
Out[128]: [('Permanent Account Number Card', 93.5)]
```

```
In [129]: get_text_conf('PANCard.png')
```

```
Out[129]: []
```



भारतीय विशिष्ट पहचान प्राधिकरण
भारत सरकार

Under Section 3 of THE AADHAAR (TARGETED DELIVERY OF FINANCIAL AND OTHER SUBSIDIES, BENEFITS AND SERVICES) ACT, 2016 (Aadhaar Act)

AADHAAR

AADHAAR ENROLMENT / CORRECTION FORM

Aadhaar Enrolment is free and voluntary. Correction within 96 hours of enrolment is also free. No charges are applicable for Form and Aadhaar Enrolment. In case of Correction provide your EID, Name and only that field which needs Correction.

In case of Correction provide your EID No here: 0008125412587 0 28 04 2011 15 35 19

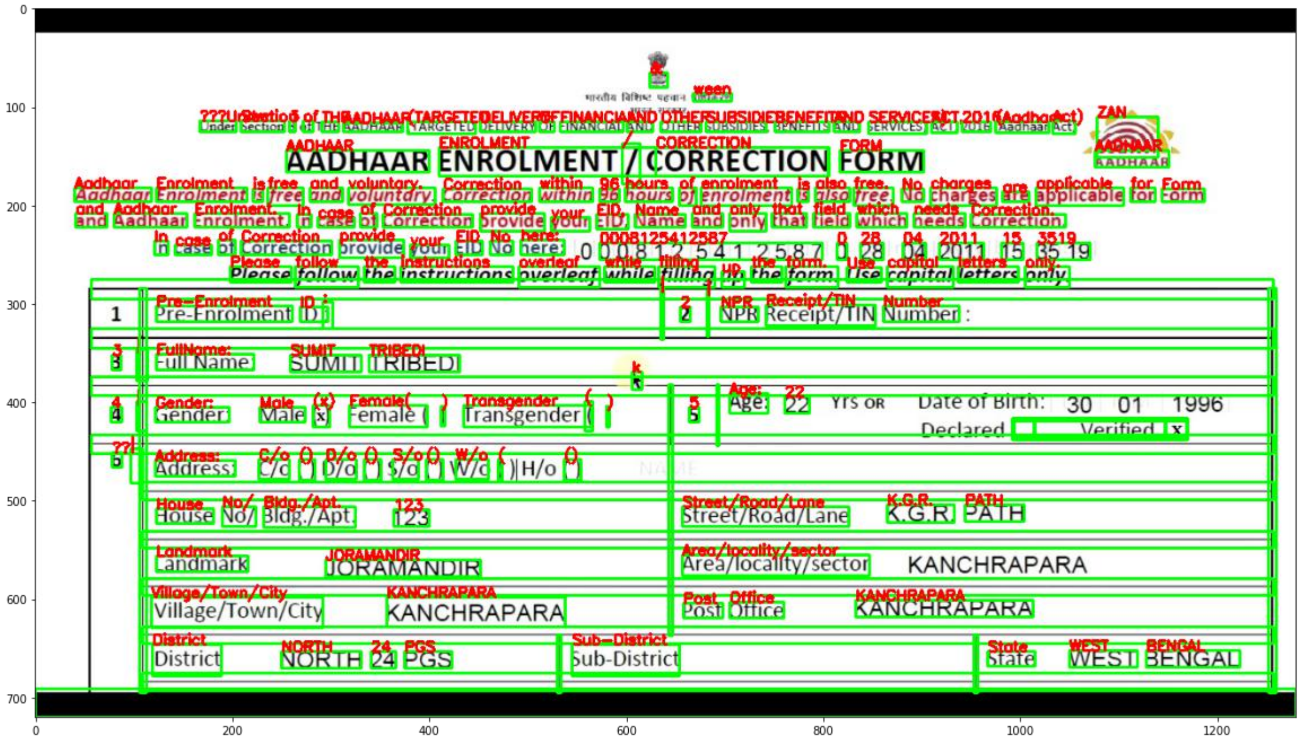
Please follow the instructions overleaf while filling up the form. Use capital letters only.

1	Pre-Enrolment ID :	2	NPR Receipt/TIN Number :
3	Full Name: SUMIT TRIBEDI		
4	Gender: Male (x) Female ( ) Transgender ( )	5	Age: 22 Yrs OR Date of Birth: 30 01 1996 Declared □ Verified ☒
6	Address: C/o ( ) D/o ( ) S/o ( ) W/o ( ) H/o ( ) NAME		
	House No/ Bldg./Apt. 123		Street/Road/Lane K.G.R. PATH
	Landmark JORAMANDIR		Area/locality/sector KANCHRAPARA
	Village/Town/City KANCHRAPARA		Post Office KANCHRAPARA
	District NORTH 24 PGS	Sub-District	State WEST BENGAL

```
In [209]: get_text_conf('adharapp.jpg')
```

```
Out[209]: [('‘Under Section 3 of THE AADHAAR (TARGETED DELIVERY OF FINANCIAL AND OTHER SUBSIDI
          ES, BENEFITS AND SERVICES) ACT, 2016 (Aadhaar Act) ZAN',
            93.762),
           ('AADHAAR ENROLMENT / CORRECTION FORM AADHAAR', 92.333),
           ('Aadhaar Enrolment is free and voluntary. Correction within 96 hours of enrolment
          is also free. No charges are applicable for Form',
            95.524),
           ('and Aadhaar Enrolment. In case of Correction provide your EID, Name and only that
          field which needs Correction.',
            95.389),
           ('In case of Correction provide your EID No here: 0008125412587 0 28 04 2011 15 351
          9',
            91.062),
           ('Please follow the instructions overleaf while filling up the form. Use capital le
          tters only.',
            96.071),
           ('3 | FullName: SUMIT TRIBEDI k', 80.833),
           ('House No/ Bldg./Apt. 123 Street/Road/Lane K.G.R. PATH', 83.143),
           ('Village/Town/City KANCHRAPARA Post Office KANCHRAPARA', 93.2),
           ('District NORTH 24 PGS Sub-District State WEST BENGAL', 94.375)]
```

```
In [212]: get_text_conf('adharapp.jpg', thres=50, annotate=True)
```



Under Section 3 of THE AADHAAR (TARGETED DELIVERY OF FINANCIAL AND OTHER SUBSIDIES, BENEFITS AND SERVICES) ACT, 2016 (Aadhaar Act)

AADHAAR ENROLMENT / CORRECTION FORM

Aadhaar Enrolment is free and voluntary. Correction within 96 hours of enrolment is also free. No charges are applicable for Form and Aadhaar Enrolment. In case of Correction provide your EID, Name and only that field which needs Correction.

In case of Correction provide your EID No here: 0 0 0 8 1 2 5 4 1 2 5 8 7 0 28 04 2011 15 35 19

Please follow the instructions overleaf while filling up the form. Use capital letters only.

1 Pre-Enrolment ID : | 2 NPR Receipt/TIN Number :

3 Full Name SUMIT TRIBEDI

4 Gender: Male (x) Female ( ) Transgender ( ) | 5 Age: 22 Yrs OR Date of Birth: 30 01 1996 Declared ☐ Verified ☒

6 Address: C/o ( ) D/o ( ) S/o ( ) W/o ( ) H/o ( )

House No/ Bldg./Apt. 123 | Street/Road/Lane K.G.R. PATH

Landmark JORAMANDIR | Area/locality/sector KANCHRAPARA

Village/Town/City KANCHRAPARA | Post Office KANCHRAPARA

District NORTH 24 PGS | Sub-District | State WEST BENGAL

```
Out[212]: [('&', 52.0),
           ('‘Under Section 3 of THE AADHAAR (TARGETED DELIVERY OF FINANCIAL AND OTHER SUBSIDI
          ES, BENEFITS AND SERVICES) ACT, 2016 (Aadhaar Act) ZAN',
            93.762),
           ('AADHAAR ENROLMENT / CORRECTION FORM AADHAAR', 92.333),
           ('Aadhaar Enrolment is free and voluntary. Correction within 96 hours of enrolment
          is also free. No charges are applicable for Form',
            95.524),
           ('and Aadhaar Enrolment. In case of Correction provide your EID, Name and only that
          field which needs Correction.',
            95.389),
           ('In case of Correction provide your EID No here: 0008125412587 0 28 04 2011 15 351
          9',
            91.062),
           ('Please follow the instructions overleaf while filling up the form. Use capital le
          tters only.',
            96.071),
           ('1. | Pre-Enrolment ID : | 2 | NPR Receipt/TIN Number', 78.727),
           ('3 | FullName: SUMIT TRIBEDI k', 80.833),
           ('4 | Gender: Male (x) Female( ) Transgender ( ) 5 Age: 22 Yrs on areal eae aes',
            63.389),
           ('© | Address: C/o () D/o () S/o () W/o ( )|H/o ()', 75.538),
           ('House No/ Bldg./Apt. 123 Street/Road/Lane K.G.R. PATH', 83.143),
           ('Landmark JORAMANDIR Area/locality/sector KANCHRAPARA', 71.0),
           ('Village/Town/City KANCHRAPARA Post Office KANCHRAPARA', 93.2),
           ('District NORTH 24 PGS Sub-District State WEST BENGAL', 94.375)]
```

2. Text Extraction with Azure Form Recognizer

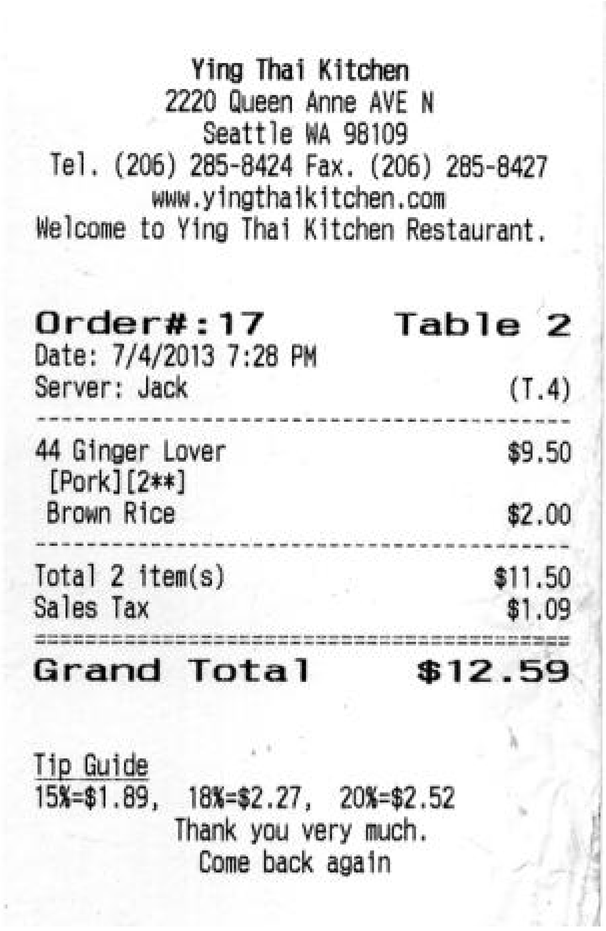
In [8]:

```
from azure.ai.formrecognizer import FormRecognizerClient
from azure.core.credentials import AzureKeyCredential

endpoint = "https://formrecognizertestpoc.cognitiveservices.azure.com/"
key = "120f1740967945909ec98a6cc2e3e357" # 'xxxxxxx'
credential = AzureKeyCredential(key)

form_recognizer_client = FormRecognizerClient(endpoint, credential)
model_id = "test"
```

2.1 Processing Receipts with Recognize Receipts API

In [39]:

```python
def process_receipt(recceipts):
    for idx, receipt in enumerate(receipts):
        print("--------Recognizing receipt #{}--------".format(idx+1))
        receipt_type = receipt.fields.get("ReceiptType")
        if receipt_type:
            print("Receipt Type: {} has confidence: {}".format(receipt_type.value, receipt_type.confidence))
        merchant_name = receipt.fields.get("MerchantName")
        if merchant_name:
            print("Merchant Name: {} has confidence: {}".format(merchant_name.value, merchant_name.confidence))
        transaction_date = receipt.fields.get("TransactionDate")
        if transaction_date:
            print("Transaction Date: {} has confidence: {}".format(transaction_date.value, transaction_date.confidence))
        print("Receipt items:")
        if receipt.fields.get("Items") is not None:
            for idx, item in enumerate(receipt.fields.get("Items").value):
                print("...Item #{}".format(idx+1))
                item_name = item.value.get("Name")
                if item_name:
                    print("......Item Name: {} has confidence: {}".format(item_name.value, item_name.confidence))
                item_quantity = item.value.get("Quantity")
                if item_quantity:
                    print("......Item Quantity: {} has confidence: {}".format(item_quantity.value, item_quantity.confidence))
                item_price = item.value.get("Price")
                if item_price:
                    print("......Individual Item Price: {} has confidence: {}".format(item_price.value, item_price.confidence))
                item_total_price = item.value.get("TotalPrice")
                if item_total_price:
                    print("......Total Item Price: {} has confidence: {}".format(item_total_price.value, item_total_price.confidence))
        subtotal = receipt.fields.get("Subtotal")
        if subtotal:
            print("Subtotal: {} has confidence: {}".format(subtotal.value, subtotal.confidence))
        tax = receipt.fields.get("Tax")
        if tax:
            print("Tax: {} has confidence: {}".format(tax.value, tax.confidence))
        tip = receipt.fields.get("Tip")
        if tip:
            print("Tip: {} has confidence: {}".format(tip.value, tip.confidence))
        total = receipt.fields.get("Total")
        if total:
            print("Total: {} has confidence: {}".format(total.value, total.confidence))
        print("--------------------------------------")
```



Ying Thai Kitchen
2220 Queen Anne AVE N
Seattle WA 98109
Tel. (206) 285-8424 Fax. (206) 285-8427
www.yingthaikitchen.com
Welcome to Ying Thai Kitchen Restaurant.

Order#:17 **Table 2**
Date: 7/4/2013 7:28 PM
Server: Jack (T.4)

44 Ginger Lover [Pork][2**]	$9.50
Brown Rice	$2.00
Total 2 item(s)	$11.50
Sales Tax	$1.09
Grand Total	**$12.59**

Tip Guide
15%=$1.89, 18%=$2.27, 20%=$2.52
Thank you very much.
Come back again

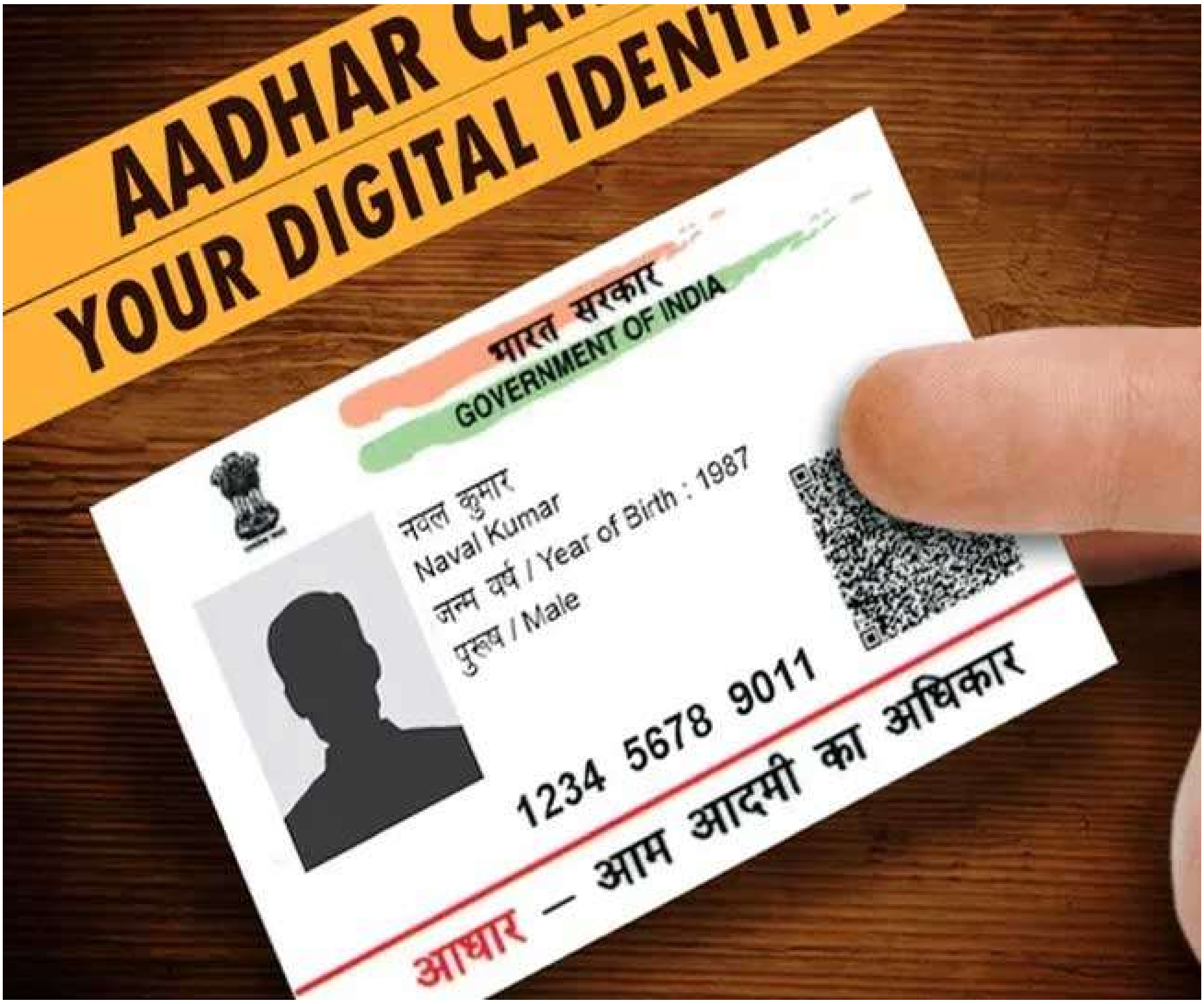
In [30]:
```
with open("bill.png", "rb") as fd:
    form = fd.read()
```

In [31]:
```
poller = form_recognizer_client.begin_recognize_receipts(receipt=form)
receipts = poller.result()
```

```
In [35]: process_receipt(receipts)
```

```
--------Recognizing receipt #1--------
Receipt Type: Itemized has confidence: 0.983
Merchant Name: Ying Thai Kitchen has confidence: 0.896
Transaction Date: 2013-07-04 has confidence: 0.99
Receipt items:
...Item #1
......Item Name: Ginger Lover has confidence: 0.839
......Item Quantity: 44.0 has confidence: 0.825
......Total Item Price: 9.5 has confidence: 0.916
...Item #2
......Item Name: Brown Rice has confidence: 0.858
......Total Item Price: 2.0 has confidence: 0.854
Subtotal: 11.5 has confidence: 0.948
Tax: 1.09 has confidence: 0.99
Total: 12.59 has confidence: 0.685
--------------------------------------
```

2.2 Processing Text with Recognize Content API



In [11]:

```
def process_content(form_pages, image=None, annotate=False):

    for page in range(len(form_pages)):
        print('Page #{}'.format(page+1))
        for line in form_pages[page].lines:
            #txt = ''
            conf = []
            for word in line.words:
                #txt += word.text + ' '
                conf.append(word.confidence)
            if annotate:
                bb = line.bounding_box
                lt, rt = [bb[0].x, bb[0].y], [bb[1].x, bb[1].y]
                rb, lb = [bb[2].x, bb[2].y], [bb[3].x, bb[3].y]
                pts = np.array([lt, rt, rb, lb], np.int32).reshape((-1, 1, 2))
                image = cv2.polylines(image, [pts], True, (0, 255, 0), 2)
                cv2.putText(image, line.text, (pts[0][0][0],pts[0][0][1]), cv2.FONT_H
ERSHEY_SIMPLEX, 0.5, 255, 2)
            print(line.text, np.mean(conf))
    if annotate:
        plt.figure(figsize=(20,40))
        plt.imshow(image)
        plt.axis('off')
        plt.show()
```

In [74]:

```
with open("adhar2.jpg", "rb") as fd:
    form = fd.read()
```

In [57]:

```
#poller = form_recognizer_client.begin_recognize_custom_forms(form=form, model_id=mod
el_id)
poller = form_recognizer_client.begin_recognize_content(form=form)
form_pages = poller.result()
```

In [75]:

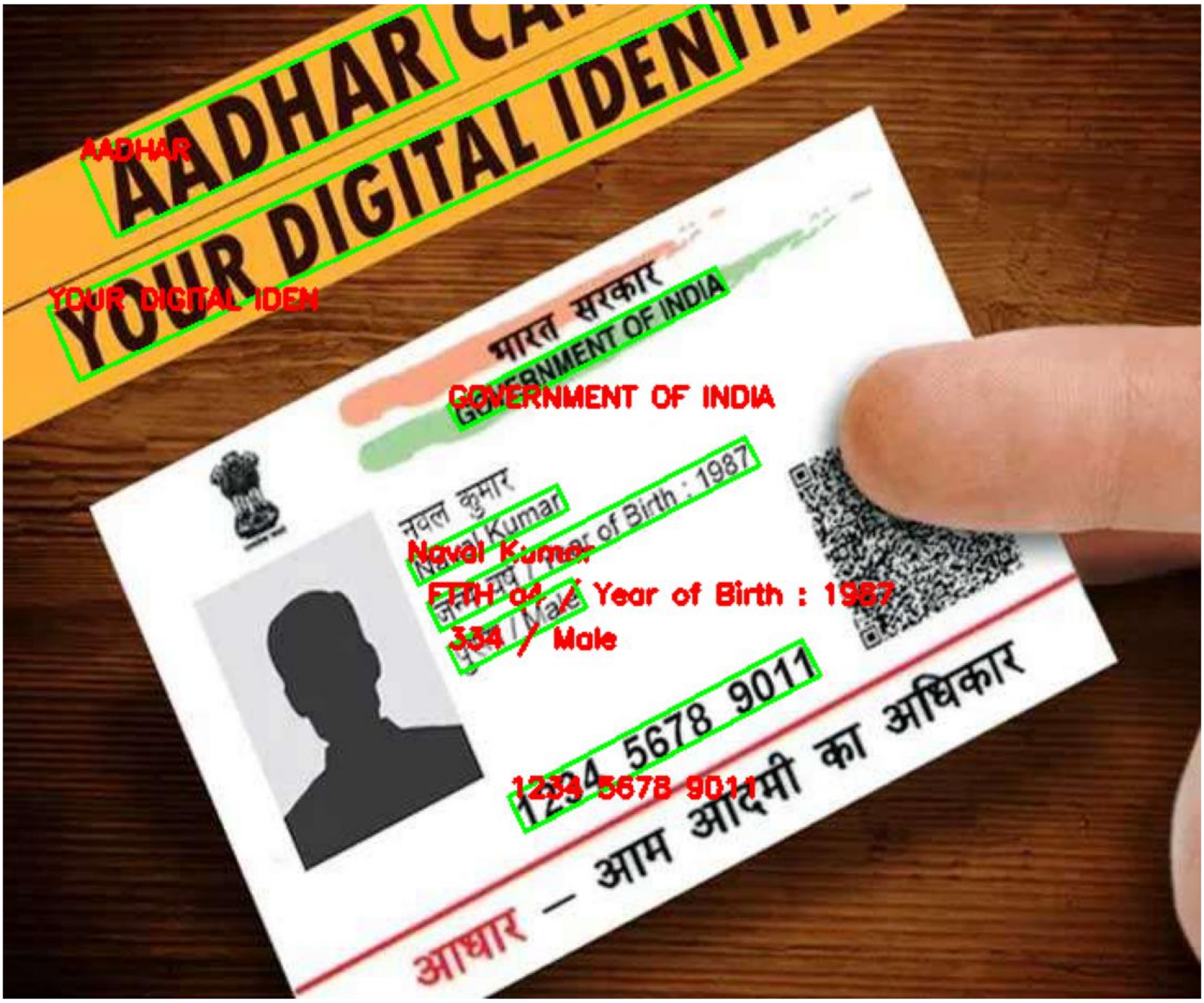
```
form_pages
```

Out[75]:

```
[FormPage(page_number=1, text_angle=-27.3499, width=650.0, height=540.0, unit=pixel,
tables=[], lines=[FormLine(text=AADHAR, bounding_box=[Point(x=42.0, y=84.0), Point(x
=227.0, y=0.0), Point(x=246.0, y=41.0), Point(x=61.0, y=126.0)], words=[FormWord(tex
t=AADHAR, bounding_box=[Point(x=42.0, y=86.0), Point(x=215.0, y=6.0), Point(x=236.0,
y=46.0), Point(x=65.0, y=126.0)], confidence=0.996, page_number=1, kind=word)], page
_number=1, kind=line, appearance=TextAppearance(style=TextStyle(name=other, confiden
ce=0.878))), FormLine(text=YOUR DIGITAL IDEN, bounding_box=[Point(x=24.0, y=165.0),
Point(x=381.0, y=0.0), Point(x=400.0, y=35.0), Point(x=41.0, y=204.0)], words=[FormW
ord(text=YOUR, bounding_box=[Point(x=24.0, y=167.0), Point(x=119.0, y=121.0), Point
(x=137.0, y=159.0), Point(x=43.0, y=204.0)], confidence=0.994, page_number=1, kind=w
ord), FormWord(text=DIGITAL, bounding_box=[Point(x=130.0, y=116.0), Point(x=275.0, y
=47.0), Point(x=292.0, y=85.0), Point(x=147.0, y=154.0)], confidence=0.995, page_num
ber=1, kind=word]
```

```
In [113]: image = imread('adhar2.jpg')
          process_content(form_pages, image, True)
```

```
Page #1
AADHAR 0.996
YOUR DIGITAL IDEN 0.9923333333333333
GOVERNMENT OF INDIA 0.9946666666666667
Naval Kumar 0.996
FTTH q4 / Year of Birth : 1987 0.764625
334 / Male 0.676
1234 5678 9011 0.9913333333333334
```

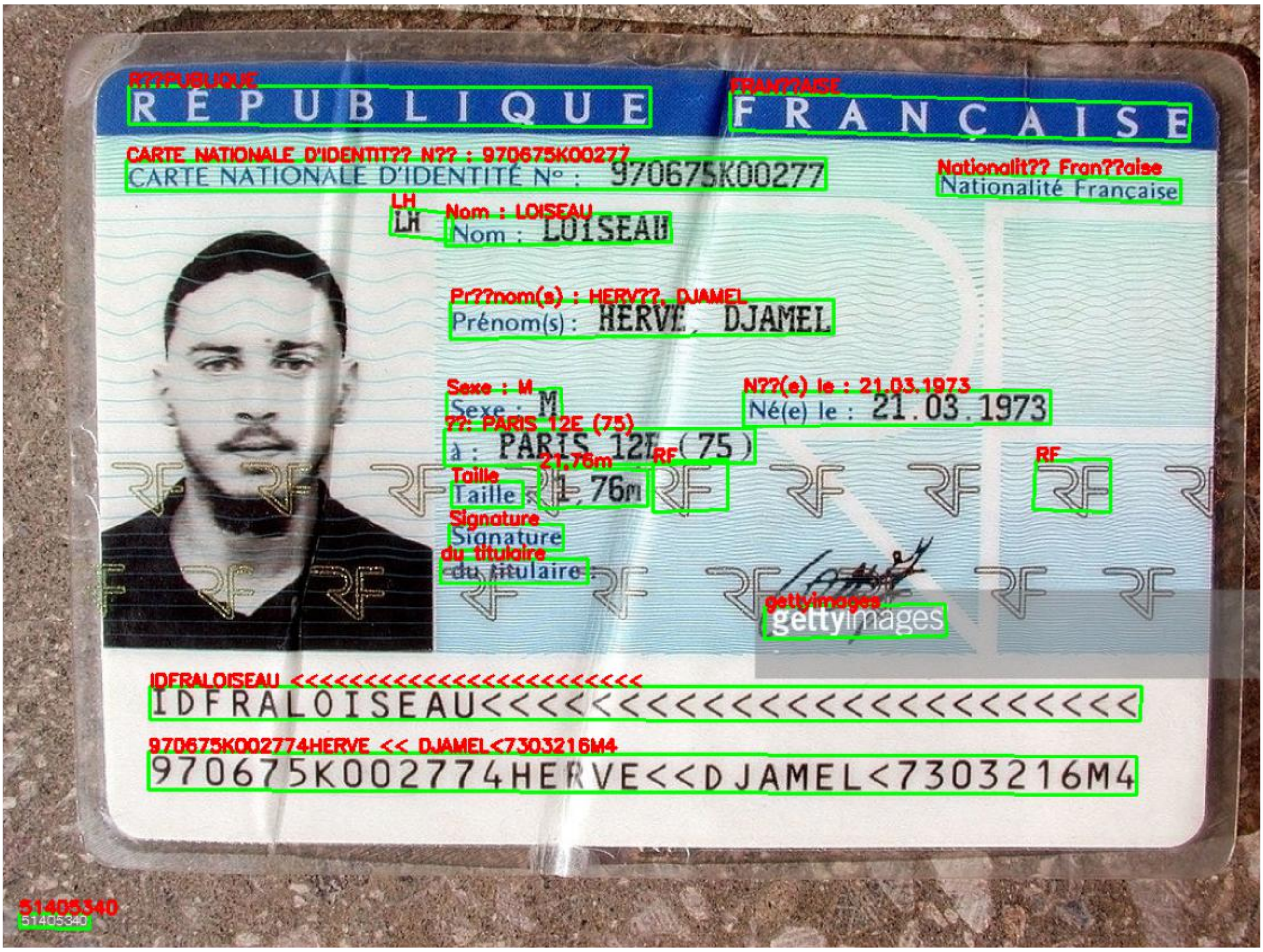


2.3 Processing Other Language (French) Texts with Recognize Content API

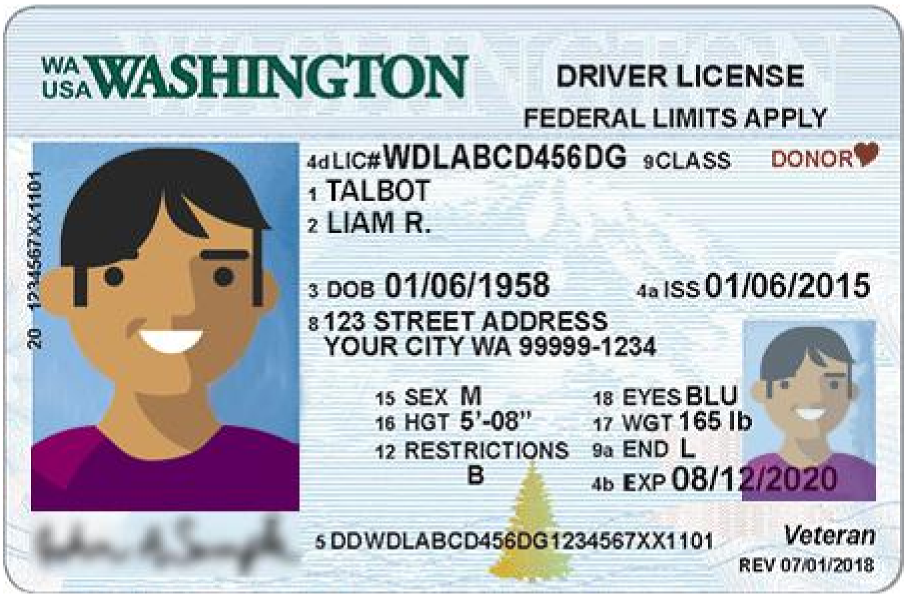
```
In [9]: with open("id_fr.jpg", "rb") as fd:
            form = fd.read()
        poller = form_recognizer_client.begin_recognize_content(form=form, language='fr')
        form_pages = poller.result()
```

```
In [13]: process_content(form_pages, imread('id_fr.jpg'), True)
```

```
Page #1
RÉPUBLIQUE 0.742
FRANÇAISE 0.215
CARTE NATIONALE D'IDENTITÉ Nº : 970675K00277 0.7896666666666666
Nationalité Française 0.994
LH 0.919
Nom : LOISEAU 0.9303333333333333
Prénom(s) : HERVÉ, DJAMEL 0.9199999999999999
Sexe : M 0.9376666666666665
Né(e) le : 21.03.1973 0.885
à: PARIS 12E (75) 0.6805000000000001
Taille 0.994
21,76m 0.257
RF 0.698
RF 0.678
Signature 0.994
du titulaire 0.44
gettyimages 0.795
IDFRALOISEAU <<<<<<<<<<<<<<<<<<<<<<<<< 0.581
970675K002774HERVE << DJAMEL<7303216M4 0.866
51405340 0.995
```



2.4 Processing ID with Recognize ID Document API



WA
USA WASHINGTON

DRIVER LICENSE

FEDERAL LIMITS APPLY

4d LIC# WDLABCD456DG 9 CLASS DONOR

1 TALBOT

2 LIAM R.

3 DOB 01/06/1958 4a ISS 01/06/2015

8 123 STREET ADDRESS
YOUR CITY WA 99999-1234

15 SEX M 18 EYES BLU

16 HGT 5'-08" 17 WGT 165 lb

12 RESTRICTIONS 9a END L
B

4b EXP 08/12/2020

5 DD WDLABCD456DG1234567XX1101

Veteran

REV 07/01/2018

20 1234567XX1101

In [3]:

```
def process_id(id_documents):
    for idx, id_document in enumerate(id_documents):
        print("--------Recognizing ID document #{}--------".format(idx+1))
        print(id_document.fields.keys())
        first_name = id_document.fields.get("FirstName")
        if first_name:
            print("First Name: {} has confidence: {}".format(first_name.value, first_name.confidence))
        last_name = id_document.fields.get("LastName")
        if last_name:
            print("Last Name: {} has confidence: {}".format(last_name.value, last_name.confidence))
        document_number = id_document.fields.get("DocumentNumber")
        if document_number:
            print("Document Number: {} has confidence: {}".format(document_number.value, document_number.confidence))
        dob = id_document.fields.get("DateOfBirth")
        if dob:
            print("Date of Birth: {} has confidence: {}".format(dob.value, dob.confidence))
        doe = id_document.fields.get("DateOfExpiration")
        if doe:
            print("Date of Expiration: {} has confidence: {}".format(doe.value, doe.confidence))
        sex = id_document.fields.get("Sex")
        if sex:
            print("Sex: {} has confidence: {}".format(sex.value, sex.confidence))
        address = id_document.fields.get("Address")
        if address:
            print("Address: {} has confidence: {}".format(address.value, address.confidence))
        country = id_document.fields.get("Country")
        if country:
            print("Country: {} has confidence: {}".format(country.value, country.confidence))
        region = id_document.fields.get("Region")
        if region:
            print("Region: {} has confidence: {}".format(region.value, region.confidence))
```

In [29]:

```
#idURL = "https://api.github.com/repos/rndpoc/ocrplusplus/contents/id-license.jpg"
with open('id-license.jpg', 'rb') as fd:
    form = fd.read()
```

In [30]:

```
poller = form_recognizer_client.begin_recognize_id_documents(form)
id_documents = poller.result()
process_id(id_documents)
```

```
--------Recognizing ID document #1--------
dict_keys(['Address', 'Country', 'DateOfBirth', 'DateOfExpiration', 'DocumentNumber', 'FirstName', 'LastName', 'Region', 'Sex'])
First Name: LIAM R. has confidence: 0.985
Last Name: TALBOT has confidence: 0.987
Document Number: LICWDLACD5DG has confidence: 0.99
Date of Birth: 1958-01-06 has confidence: 0.99
Date of Expiration: 2020-08-12 has confidence: 0.99
Sex: M has confidence: 0.99
Address: 123 STREET ADDRESS YOUR CITY WA 99999-1234 has confidence: 0.965
Country: USA has confidence: 0.99
Region: Washington has confidence: 0.99
```

In [36]:

```
with open('aadhaar.jpg', 'rb') as fd:
    form = fd.read()
poller = form_recognizer_client.begin_recognize_id_documents(form)
id_documents = poller.result()
process_id(id_documents)
```

भारत गणराज्य REPUBLIC OF INDIA

सत्यमेव जयते

इसके द्वारा, भारत गणराज्य के राष्ट्रपति के नाम पर, उन सभी से जिनका इससे संबंध हो, अनुरोध एवं अपेक्षा की जाती है कि वे धारक को बिना किसी रोक-टोक के स्वतंत्र रूप से आने-जाने दें, और उसे हर तरह की ऐसी सहायता और सुरक्षा प्रदान करें जिसकी उसे आवश्यकता हो।

THESE ARE TO REQUEST AND REQUIRE IN THE NAME OF THE PRESIDENT OF THE REPUBLIC OF INDIA ALL THOSE WHOM IT MAY CONCERN TO ALLOW THE BEARER TO PASS FREELY WITHOUT LET OR HINDRANCE AND TO AFFORD HIM OR HER, EVERY ASSISTANCE AND PROTECTION OF WHICH HE OR SHE MAY STAND IN NEED.

भारत गणराज्य के राष्ट्रपति के आदेश से

BY ORDER OF THE PRESIDENT OF THE REPUBLIC OF INDIA

MINISTRY OF EXTERNAL AFFAIRS
विदेश मंत्रालय
PASSPORT OFFICE
पासपोर्ट कार्यालय
Hyderabad/हैदराबाद

एम डी. महबूब अली
Md. MAHABOOB ALI
सहायक /Assistant
कृते पासपोर्ट अधिकारी
For Passport Officer
हैदराबाद / Hyderabad.

1

भारत गणराज्य REPUBLIC OF INDIA

टाईप / Type
P

राष्ट्र कोड / Country Code
IND

पासपोर्ट नं. / Passport No.
J8369854

उपनाम / Surname
RAMADUGULA

दिया गया नाम / Given Name(s)
SITA MAHA LAKSHMI

राष्ट्रीयता / Nationality
INDIAN

लिंग / Sex
F

जन्मतिथि / Date of Birth
23/09/1959

जन्म स्थान / Place of Birth
GUNDUGOLANU

R.S. Lakshmi

जारी करने का स्थान / Place of Issue
HYDERABAD

जारी करने की तिथि / Date of Issue
11/10/2011

समाप्ति की तिथि / Date of Expiry
10/10/2021

```
P<INDRAMADUGULA<<SITA<MAHA<LAKSHMI<<<<<<<<<<<
J8369854<4IND5909234F2110101<<<<<<<<<<<<<<<<8
```

In [52]:

```
def process_id2(id_documents):
    for idx, id_document in enumerate(id_documents):
        print("--------Recognizing ID document #{}--------".format(idx+1))
        #print(id_document.fields.keys())
        for v in id_document.fields.values():
            print('{}, conf={}'.format(v.value_data.text, v.confidence))
            for vv in v.value:
                print('{}: {}, conf={}'.format(vv, v.value[vv].value_data.text, v.value[vv].confidence))
```

In [53]:

```
with open('passport2.jpg', 'rb') as fd:
    form = fd.read()
poller = form_recognizer_client.begin_recognize_id_documents(form)
id_documents = poller.result()
```

In [54]:

```
str(id_documents[0].fields['MachineReadableZone'])
```

Out[54]:

```
"FormField(value_type=dictionary, label_data=None, value_data=FieldData(page_number=
1, text=P<INDRAMADUGULA<<SITA<MAHA<LAKSHMI<<<<<<<<<< J8369854<4IND5909234F2110101<<<
<<<<<<<<<<<<8, bounding_box=[Point(x=54.4, y=935.9), Point(x=711.4, y=947.0), Point
(x=710.4, y=1006.3), Point(x=53.4, y=995.2)], field_elements=None), name=MachineRead
ableZone, value={'Country': FormField(value_type=country, label_data=None, value_dat
a=FieldData(page_number=None, text=IND, bounding_box=None, field_elements=None), nam
e=Country, value='IND', confidence=1.0), 'DateOfBirth': FormField(value_type=date, l
abel_data=None, value_data=FieldData(page_number=None, text=590923, bounding_box=Non
e, field_elements=None), name=DateOfBirth, value=datetime.date(1959, 9, 23), confide
nce=1.0), 'DateOfExpiration': FormField(value_type=date, label_data=None, value_data
=FieldData(page_number=None, text=211010, bounding_box=None, field_elements=None), n
ame=DateOfExpiration, value=datetime.date(2021, 10, 10), confidence=1.0), 'DocumentN
umber': FormField("
```

In [55]:

```
process_id2(id_documents)
```

```
--------Recognizing ID document #1--------
P<INDRAMADUGULA<<SITA<MAHA<LAKSHMI<<<<<<<<<< J8369854<4IND5909234F2110101<<<<<<<<<<<
<<<<8, conf=0.809
Country: IND, conf=1.0
DateOfBirth: 590923, conf=1.0
DateOfExpiration: 211010, conf=1.0
DocumentNumber: J8369854, conf=1.0
FirstName: SITA<MAHA<LAKSHMI, conf=1.0
LastName: RAMADUGULA, conf=1.0
Nationality: IND, conf=1.0
Sex: F, conf=1.0
```

2.5 Training Custom Models for Form Recognition

In [213]:

```
## ToDo
```

In [ ]:

In [ ]:

2.6 With Form Analyze Layout Async REST API

In [16]:

```
import json
import time
import requests
from requests import get, post
import pandas as pd
```

In [17]:

```
# Endpoint URL
apim_key = key
```

In [18]:

```
post_url = endpoint + "/formrecognizer/v2.0/Layout/analyze"
```

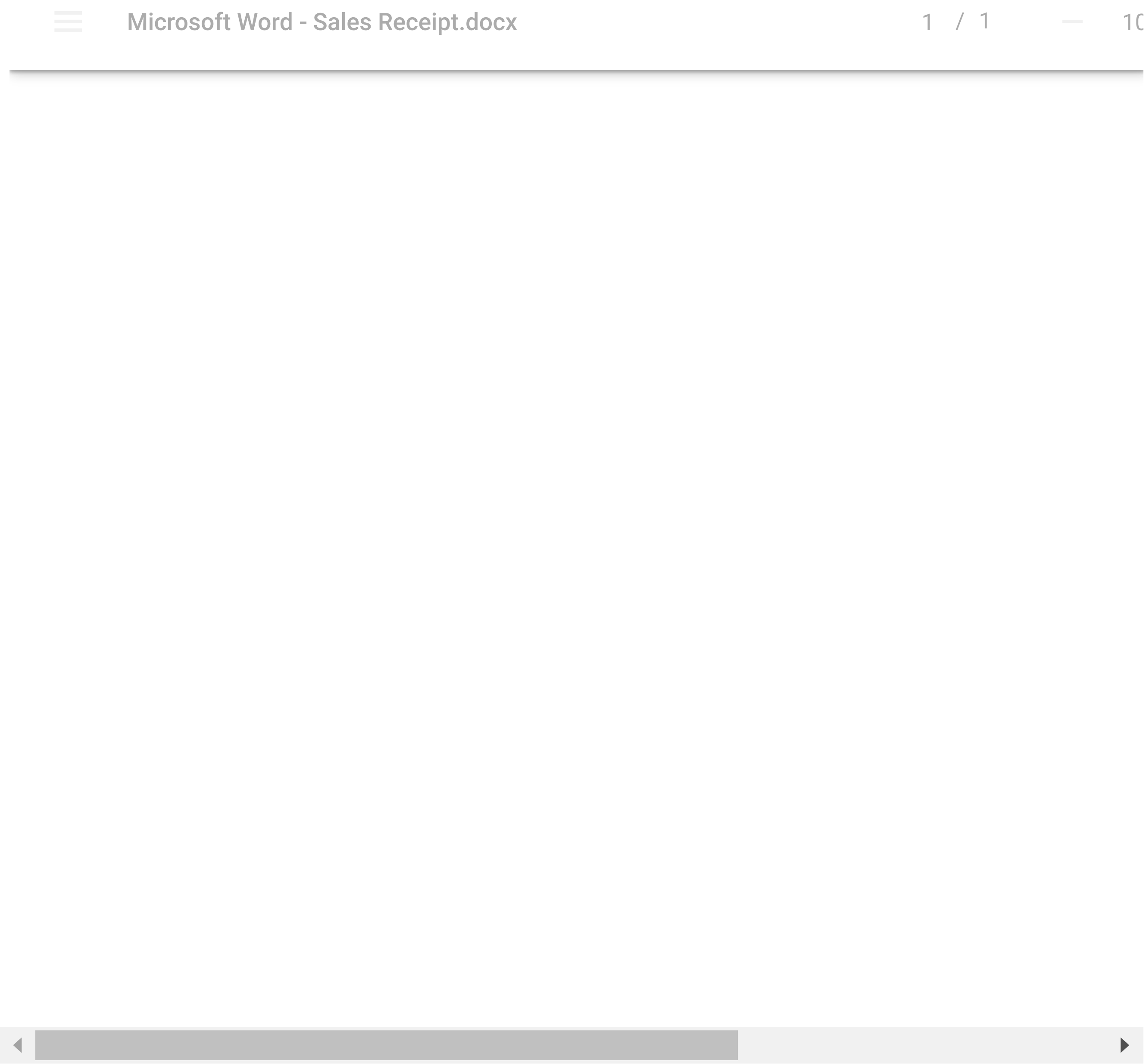
In [14]:

```
def get_analyze_response(input_path, content_type='application/pdf'):

    headers = {
        # Request headers

        # Change Content-Type as appropriate
        'Content-Type': '{}'.format(content_type),
        'Ocp-Apim-Subscription-Key': apim_key,
    }

    #req = requests.get(input_path)
    #if req.status_code == requests.codes.ok:
    #    data_bytes = req.json()  # the response is a JSON

    try:
        if content_type == 'application/json':
            resp = post(url = post_url, data = {'source': input_path}, headers = head
ers)
            print(resp.status_code)
        else:
            with open(input_path, "rb") as f:
                data_bytes = f.read()
            resp = post(url = post_url, data = data_bytes, headers = headers)

        if resp.status_code != 202:
            print("POST analyze failed:\n%s" % resp.text)
            return None
        print("POST analyze succeeded:\n%s" % resp.headers)
        get_url = resp.headers["operation-location"]
    except Exception as e:
        print("POST analyze failed:\n%s" % str(e))
        return None

    n_tries = 2 #10
    n_try = 0
    wait_sec = 25
    resp_json = None
    while n_try < n_tries:
        try:
            resp = get(url = get_url, headers = {"Ocp-Apim-Subscription-Key": apim_ke
y})
            resp_json = json.loads(resp.text)
            if resp.status_code != 200:
                print("GET Layout results failed:\n%s" % resp_json)
                quit()
            status = resp_json["status"]
            if status == "succeeded":
                print("Layout Analysis succeeded\n") #%s" % resp_json)
                #Result = resp_json["analyzeResult"]["pageResults"][0]["keyValuePair
s"]
                #ResultCount = len(resp_json["analyzeResult"]["pageResults"][0]["keyV
aluePairs"])
                #for i in range(ResultCount):
                #    print(Result[i]["key"]["text"], Result[i]["value"]["text"], " ||
Confidence: ", Result[i]["confidence"])
                break
            if status == "failed":
                print("Layout Analysis failed:\n%s" % resp_json)
                return None
            # Analysis still running. Wait and retry.
            time.sleep(wait_sec)
            n_try += 1
        except Exception as e:
            msg = "GET analyze results failed:\n%s" % str(e)
            print(msg)
            return None

    return resp_json

def extract_tables(resp_json):
    for page in range(len(resp_json['analyzeResult']['pageResults'])):
        for table in resp_json['analyzeResult']['pageResults'][page]['tables']:
            table_list = [[None for x in range(table['columns'])] for x in range(table['rows'])]
            for cell in table['cells']:
                table_list[cell['rowIndex']][cell['columnIndex']] = cell['text']
            df = pd.DataFrame.from_records(table_list)
            display(df)
```

In [11]:

```
from IPython.display import IFrame
IFrame("pdfs/Invoice-6.pdf", width=1000, height=600)
#from wand.image import Image as WImage
#img = WImage(filename='Invoice-6.pdf')
#img
```

Out[11]:



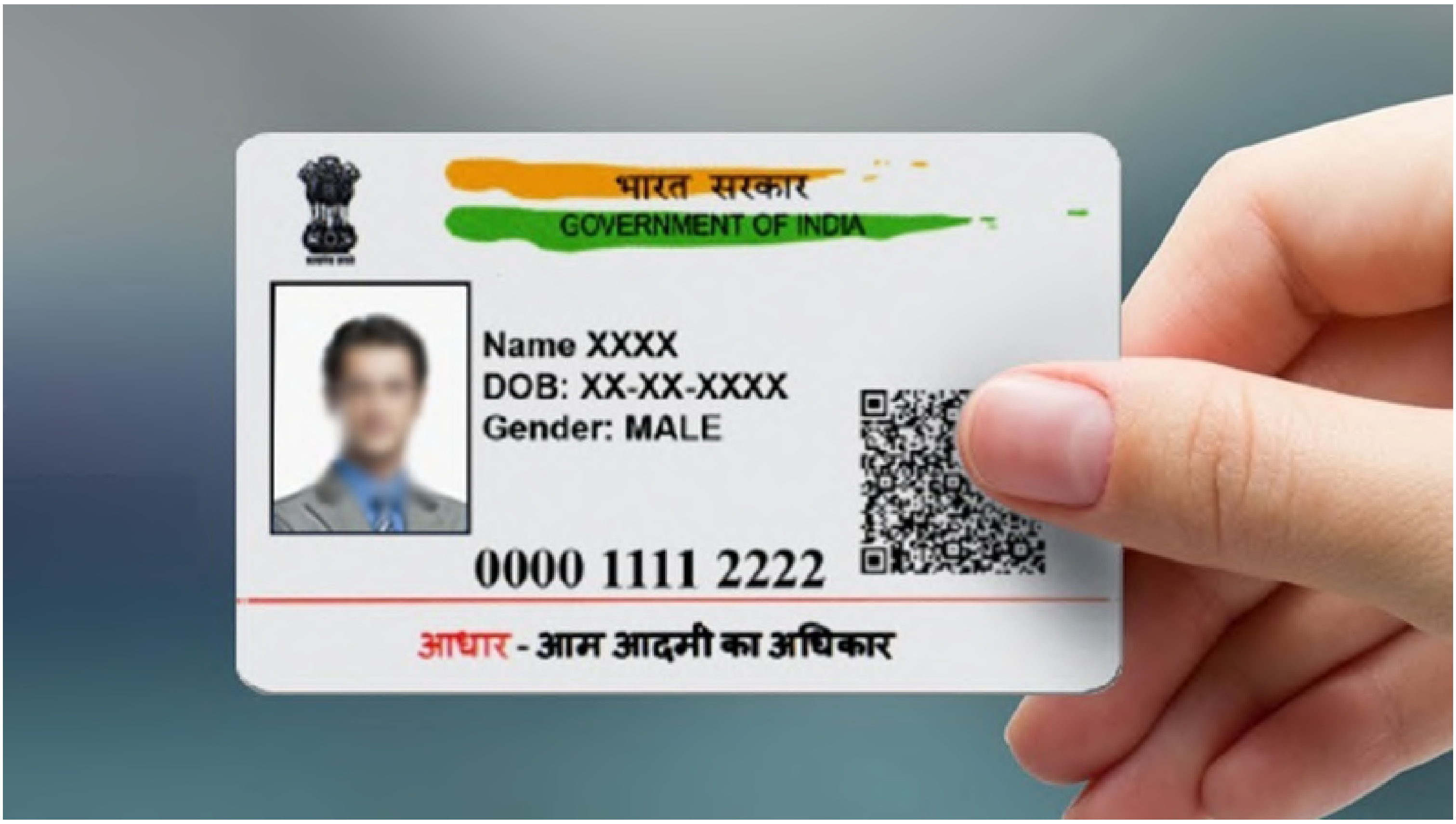
```
In [19]: resp_json = get_analyze_response(r"pdfs/Invoice-6.pdf")
```

```
POST analyze succeeded:
{'Content-Length': '0', 'Operation-Location': 'https://formrecognizertestpoc.cogniti
veservices.azure.com/formrecognizer/v2.0/layout/analyzeResults/dc4195bc-e8dc-4b6f-be
af-161acc81c662', 'x-envoy-upstream-service-time': '62', 'apim-request-id': 'dc4195b
c-e8dc-4b6f-beaf-161acc81c662', 'Strict-Transport-Security': 'max-age=31536000; incl
udeSubDomains; preload', 'x-content-type-options': 'nosniff', 'Date': 'Tue, 27 Apr 2
021 09:51:55 GMT'}
Layout Analysis succeeded
```

```
In [20]: extract_tables(resp_json)
```

	0	1	2	3	4
0	Training Date	Description	Price	Discount	Line Total
1	12/5/2020	Manager Training	$3,500	-	$3,500
2	12/10/2020	Manager Training	$3,500	-	$3,500
3	12/11/2020	Leadership Training	$4,500	25%	$3,375
4	None	None	None	None	None

	0	1
0	Subtotal	$10,375
1	Sales Tax	3%
2	Total	$10,686.25



भारत सरकार

GOVERNMENT OF INDIA

Name XXXX
DOB: XX-XX-XXXX
Gender: MALE

0000 1111 2222

आधार - आम आदमी का अधिकार

In [19]:
```
resp_json = get_analyze_response(r"aadhaar.jpg", 'image/jpeg')
```

```
POST analyze succeeded:
{'Content-Length': '0', 'Operation-Location': 'https://formrecognizertestpoc.cogniti
veservices.azure.com/formrecognizer/v2.0/layout/analyzeResults/45e7ddd8-70a6-48d2-85
81-c5ee703a70a1', 'x-envoy-upstream-service-time': '58', 'apim-request-id': '45e7ddd
8-70a6-48d2-8581-c5ee703a70a1', 'Strict-Transport-Security': 'max-age=31536000; incl
udeSubDomains; preload', 'x-content-type-options': 'nosniff', 'Date': 'Wed, 28 Apr 2
021 12:51:53 GMT'}
Layout Analysis succeeded
```

In [24]:
```
def extract_text(resp_json):
    for line in resp_json['analyzeResult']['readResults'][0]['lines']:
        print(line['text'], np.mean([word['confidence'] for word in line['words']]))
```

In [63]:
```
extract_text(resp_json)
```

```
- 0.817
GOVERNMENT OF INDIA 0.9346666666666668
Name XXXX 0.953
DOB: XX-XX-xxxx 0.9484999999999999
Gender: MALE 0.9584999999999999
0000 1111 2222 0.9356666666666666
```

In [21]:
```
resp_json = get_analyze_response(r"adharapp.jpg", 'image/jpeg')
```

```
POST analyze succeeded:
{'Content-Length': '0', 'Operation-Location': 'https://formrecognizertestpoc.cogniti
veservices.azure.com/formrecognizer/v2.0/layout/analyzeResults/f363078d-3634-4fc1-81
99-027ad0d1f7f0', 'x-envoy-upstream-service-time': '67', 'apim-request-id': 'f363078
d-3634-4fc1-8199-027ad0d1f7f0', 'Strict-Transport-Security': 'max-age=31536000; incl
udeSubDomains; preload', 'x-content-type-options': 'nosniff', 'Date': 'Wed, 28 Apr 2
021 12:57:34 GMT'}
Layout Analysis succeeded
```

2.6.1 Detecting Selection boxes

```
In [25]: extract_text(resp_json)
```

```
Under Section 3 of THE AADHAAR (TARGETED DELIVERY OF FINANCIAL AND OTHER SUBSIDIES,
BENEFITS AND SERVICES) ACT, 2016 (Aadhaar Act) 0.9360999999999999
AADHAAR ENROLMENT / CORRECTION FORM 0.9438000000000001
AADHAAR 0.958
Aadhaar Enrolment is free and voluntary. Correction within 96 hours of enrolment is
also free. No charges are applicable for Form 0.9443809523809521
and Aadhaar Enrolment. In case of Correction provide your EID, Name and only that fi
eld which needs Correction. 0.953
In case of Correction provide your EID No here: |0 0 0 8 1 2 5 4 1 2 5 8 7 0 28 04 2
011 15 35 19 0.8886896551724136
Please follow the instructions overleaf while filling up the form. Use capital lette
rs only. 0.9477142857142857
1 0.799
Pre-Enrolment ID : 0.9183333333333333
2 0.893
NPR Receipt/TIN Number : 0.851
3 0.626
Full Name: 0.958
SUMIT TRIBEDI 0.959
4 Gender: Male (x) Female ( ) Transgender ( ) 0.8918999999999999
5 0.892
Age: 22 Yrs OR 0.9137500000000001
Date of Birth: 30 01 1996 0.9253333333333332
Declared 0.727
Verified x 0.917
6 0.889
Address: C/o ( ) D/o ( ) s/o ( ) W/o ()H/o () 0.7808461538461539
NAME 0.959
House No/ Bidg./Apt. 0.715
123 0.958
Street/Road/Lane K.G.R. PATH 0.9166666666666666
Landmark 0.959
JORAMANDIR 0.959
Area/locality/sector KANCHRAPARA 0.9335
Village/Town/City 0.903
KANCHRAPARA 0.958
Post Office 0.959
KANCHRAPARA 0.958
District 0.959
NORTH 24 PGS 0.9583333333333334
Sub-District 0.955
State WEST BENGAL 0.959
```

2.7 Extracting key-value pairs with Form Analyze Invoice Async REST API

CONTOSO LTD.

INVOICE

Contoso Headquarters
123 456th St
New York, NY, 10001

INVOICE: INV-100
INVOICE DATE: 11/15/2019
DUE DATE: 12/15/2019
CUSTOMER NAME: MICROSOFT CORPORATION
SERVICE PERIOD: 10/14/2019 – 11/14/2019
CUSTOMER ID: CID-12345

Microsoft Corp
123 Other St,
Redmond WA, 98052

BILL TO:
Microsoft Finance
123 Bill St,
Redmond WA, 98052

SHIP TO:
Microsoft Delivery
123 Ship St,
Redmond WA, 98052

SERVICE ADDRESS:
Microsoft Services
123 Service St,
Redmond WA, 98052

SALESPERSON	P.O. NUMBER	REQUISITIONER	SHIPPED VIA	F.O.B. POINT	TERMS
	PO-3333				

DATE	ITEM CODE	DESCRIPTION	QTY	UM	PRICE	TAX	AMOUNT
3/4/2021	A123	Consulting Services	2	hours	$30.00	10%	$60.00
3/5/2021	B456	Document Fee	3		$10.00	5%	$30.00
3/6/2021	C789	Printing Fee	10	pages	$1.00	20%	$10.00

SUBTOTAL	$100.00
SALES TAX	$10.00
TOTAL	$110.00
PREVIOUS UNPAID BALANCE	$500.00
AMOUNT DUE	$610.00

THANK YOU FOR YOUR BUSINESS!

REMIT TO:
Contoso Billing
123 Remit St
New York, NY, 10001

In [74]:

```
post_url = endpoint + "/formrecognizer/v2.1-preview.3/prebuilt/invoice/analyze"
```

In [75]:

```
resp_json = get_analyze_response(r"sample-invoice.jpg", 'image/jpeg')
```

```
POST analyze succeeded:
{'Content-Length': '0', 'Operation-Location': 'https://formrecognizertestpoc.cogniti
veservices.azure.com/formrecognizer/v2.1-preview.3/prebuilt/invoice/analyzeResults/a
ecab5ff-af0b-475d-81cd-dc71ff4cbae0', 'x-envoy-upstream-service-time': '127', 'apim-
request-id': 'aecab5ff-af0b-475d-81cd-dc71ff4cbae0', 'Strict-Transport-Security': 'm
ax-age=31536000; includeSubDomains; preload', 'x-content-type-options': 'nosniff',
'Date': 'Tue, 27 Apr 2021 19:28:05 GMT'}
Layout Analysis succeeded
```

In [98]:

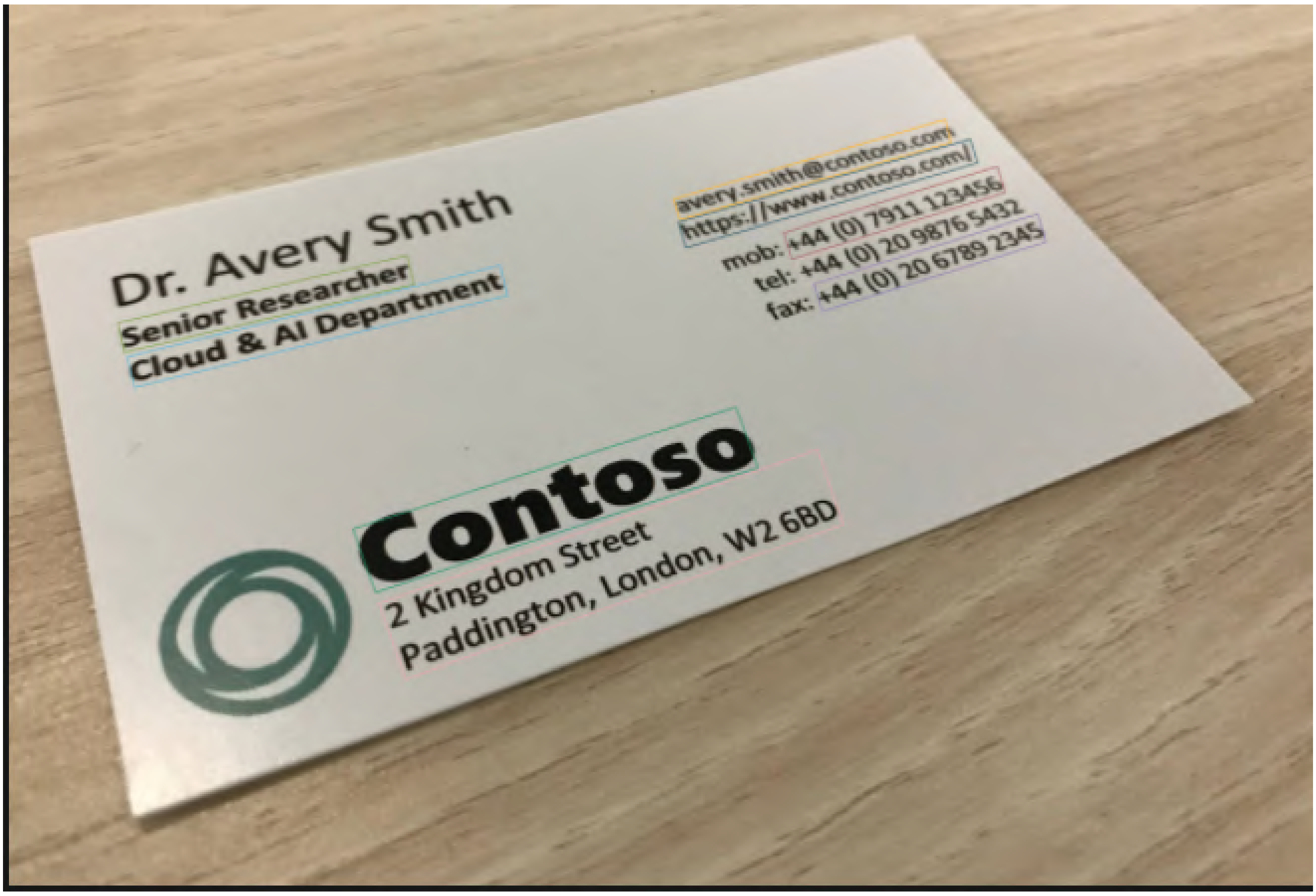
```
def extract_key_value_pairs(resp_json):
    res = resp_json['analyzeResult']['documentResults']
    for k in range(len(res)):
        print('Doc #{}'.format(k+1))
        fields = res[k]['fields']
        for field in fields:
            if field == 'Items':
                items = fields[field]['valueArray']
                for i in range(len(items)):
                    print('Item #{}'.format(i+1))
                    for key, value in items[i]['valueObject'].items():
                        print(key, value['text'], value['confidence'])
            else:
                print(field, fields[field]['text'])
```

In [99]:

```
extract_key_value_pairs(resp_json)
```

```
Doc #1
AmountDue $610.00
BillingAddress 123 Bill St, Redmond WA, 98052
BillingAddressRecipient Microsoft Finance
CustomerAddress 123 Other St, Redmond WA, 98052
CustomerAddressRecipient Microsoft Corp
CustomerId CID-12345
CustomerName MICROSOFT CORPORATION
DueDate 12/15/2019
InvoiceDate 11/15/2019
InvoiceId INV-100
InvoiceTotal $110.00
Item #1
Amount $60.00 0.916
Date 3/4/2021 0.934
Description Consulting Services 0.9
ProductCode A123 0.876
Quantity 2 0.9
Tax 10% 0.8
Unit hours 0.895
UnitPrice $30.00 0.831
Item #2
Amount $30.00 0.959
Date 3/5/2021 0.902
Description Document Fee 0.901
ProductCode B456 0.898
Quantity 3 0.9
Tax 5% 0.787
UnitPrice $10.00 0.832
Item #3
Amount $10.00 0.962
Date 3/6/2021 0.903
Description Printing Fee 0.899
ProductCode C789 0.899
Quantity 10 0.911
Tax 20% 0.802
Unit pages 0.893
UnitPrice $1.00 0.829
PreviousUnpaidBalance $500.00
PurchaseOrder PO-3333
RemittanceAddress 123 Remit St New York, NY, 10001
RemittanceAddressRecipient Contoso Billing
ServiceAddress 123 Service St, Redmond WA, 98052
ServiceAddressRecipient Microsoft Services
ServiceEndDate 11/14/2019
ServiceStartDate 10/14/2019
ShippingAddress 123 Ship St, Redmond WA, 98052
ShippingAddressRecipient Microsoft Delivery
SubTotal $100.00
TotalTax $10.00
VendorAddress 123 456th St New York, NY, 10001
VendorAddressRecipient Contoso Headquarters
VendorName CONTOSO LTD.
```

2.8 Extracting key-value pairs with Form Analyze BusinesCard Async REST API



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Contoso
2 Kingdom Street
Paddington, London, W2 6BD

In [103]:
```
post_url = endpoint + "/formrecognizer/v2.1-preview.3/prebuilt/businessCard/analyze"
```

In [104]:
```
resp_json = get_analyze_response(r"businessCard.png", 'image/png')
```

```
POST analyze succeeded:
{'Content-Length': '0', 'Operation-Location': 'https://formrecognizertestpoc.cogniti
veservices.azure.com/formrecognizer/v2.1-preview.3/prebuilt/businessCard/analyzeResu
lts/2176175b-1e10-44e7-a0f8-48a18cb79090', 'x-envoy-upstream-service-time': '164',
'apim-request-id': '2176175b-1e10-44e7-a0f8-48a18cb79090', 'Strict-Transport-Securit
y': 'max-age=31536000; includeSubDomains; preload', 'x-content-type-options': 'nosni
ff', 'Date': 'Tue, 27 Apr 2021 19:57:25 GMT'}
Layout Analysis succeeded
```

In [120]:
```
def extract_key_value_pairs2(resp_json):
    res = resp_json['analyzeResult']['documentResults']
    for k in range(len(res)):
        print('Doc #{}'.format(k+1))
        fields = res[k]['fields']
        for field in fields:
            items = fields[field]['valueArray']
            for i in range(len(items)):
                if items[i]['type'] == 'object':
                    print(field, items[i]['confidence'])
                    for key, value in items[i]['valueObject'].items():
                        print(key, value['text'])
                else:
                    print(field, items[i]['text'], items[i]['confidence'])
```

In [121]:

```
extract_key_value_pairs2(resp_json)
```

```
Doc #1
Addresses 2 Kingdom Street Paddington, London, W2 6BD 0.979
CompanyNames Contoso 0.166
ContactNames 0.979
FirstName Avery
LastName Smith
Departments Cloud & Al Department 0.989
Emails avery.smith@contoso.com 0.99
Faxes +44 (0) 20 6789 2345 0.99
JobTitles Senior Researcher 0.99
MobilePhones +44 (0) 7911 123456 0.99
Websites https://www.contoso.com/ 0.99
WorkPhones +44 (0) 20 9876 5432 0.989
```

In [ ]:

```

```

3. Text Recognition with Keras-OCR

In [50]:

```
import matplotlib.pyplot as plt
import keras_ocr
# keras-ocr will automatically download pretrained (CRAFT / CRNN)
# weights for the detector and recognizer.
pipeline = keras_ocr.pipeline.Pipeline()

images = [keras_ocr.tools.read('PANCard.png'), keras_ocr.tools.read('AADHAAR.jpg'),
          keras_ocr.tools.read('univ.png'), keras_ocr.tools.read('adhar2.jpg'),
          keras_ocr.tools.read('ballys.png'), keras_ocr.tools.read('adharapp.jpg')]

# needs to be run on GPU, otherwise will be slow
prediction_groups = pipeline.recognize(images)
```

```
Looking for C:\Users\Sandipan.Dey\.keras-ocr\craft_mlt_25k.h5
WARNING:tensorflow:Entity <bound method UpsampleLike.call of <keras_ocr.detection.Up
sampleLike object at 0x000002199940FE48>> could not be transformed and will be execu
ted as-is. Please report this to the AutgoGraph team. When filing the bug, set the v
erbosity to 10 (on Linux, `export AUTOGRAPH_VERBOSITY=10`) and attach the full outpu
t. Cause: converting <bound method UpsampleLike.call of <keras_ocr.detection.Upsampl
eLike object at 0x000002199940FE48>>: AttributeError: module 'gast' has no attribute
'Num'
WARNING: Entity <bound method UpsampleLike.call of <keras_ocr.detection.UpsampleLike
object at 0x000002199940FE48>> could not be transformed and will be executed as-is.
Please report this to the AutgoGraph team. When filing the bug, set the verbosity to
10 (on Linux, `export AUTOGRAPH_VERBOSITY=10`) and attach the full output. Cause: co
nverting <bound method UpsampleLike.call of <keras_ocr.detection.UpsampleLike object
at 0x000002199940FE48>>: AttributeError: module 'gast' has no attribute 'Num'
WARNING:tensorflow:Entity <bound method UpsampleLike.call of <keras_ocr.detection.Up
sampleLike object at 0x0000021999600F48>> could not be transformed and will be execu
ted as-is. Please report this to the AutgoGraph team. When filing the bug, set the v
erbosity to 10 (on Linux, `export AUTOGRAPH_VERBOSITY=10`) and attach the full outpu
t. Cause: converting <bound method UpsampleLike.call of <keras_ocr.detection.Upsampl
eLike object at 0x0000021999600F48>>: AttributeError: module 'gast' has no attribute
'Num'
WARNING: Entity <bound method UpsampleLike.call of <keras_ocr.detection.UpsampleLike
object at 0x0000021999600F48>> could not be transformed and will be executed as-is.
Please report this to the AutgoGraph team. When filing the bug, set the verbosity to
10 (on Linux, `export AUTOGRAPH_VERBOSITY=10`) and attach the full output. Cause: co
nverting <bound method UpsampleLike.call of <keras_ocr.detection.UpsampleLike object
at 0x0000021999600F48>>: AttributeError: module 'gast' has no attribute 'Num'
WARNING:tensorflow:Entity <bound method UpsampleLike.call of <keras_ocr.detection.Up
sampleLike object at 0x000002198C15F2C8>> could not be transformed and will be execu
ted as-is. Please report this to the AutgoGraph team. When filing the bug, set the v
erbosity to 10 (on Linux, `export AUTOGRAPH_VERBOSITY=10`) and attach the full outpu
t. Cause: converting <bound method UpsampleLike.call of <keras_ocr.detection.Upsampl
eLike object at 0x000002198C15F2C8>>: AttributeError: module 'gast' has no attribute
'Num'
WARNING: Entity <bound method UpsampleLike.call of <keras_ocr.detection.UpsampleLike
object at 0x000002198C15F2C8>> could not be transformed and will be executed as-is.
Please report this to the AutgoGraph team. When filing the bug, set the verbosity to
10 (on Linux, `export AUTOGRAPH_VERBOSITY=10`) and attach the full output. Cause: co
nverting <bound method UpsampleLike.call of <keras_ocr.detection.UpsampleLike object
at 0x000002198C15F2C8>>: AttributeError: module 'gast' has no attribute 'Num'
Looking for C:\Users\Sandipan.Dey\.keras-ocr\crnn_kurapan.h5
```

In [51]:

```
# Plot the predictions
fig, axs = plt.subplots(nrows=len(images), figsize=(20, 30))
for ax, image, predictions in zip(axs, images, prediction_groups):
    keras_ocr.tools.drawAnnotations(image=image, predictions=predictions, ax=ax)
```

```
C:\Users\Sandipan.Dey\anaconda3\lib\site-packages\keras_ocr\tools.py:166: Matplotlib
DeprecationWarning: The 's' parameter of annotate() has been renamed 'text' since Ma
tplotlib 3.3; support for the old name will be dropped two minor releases later.
  horizontalalignment='right' if side == 'left' else 'left')
```

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fanero
nume
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suaname
naae
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traar
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name
xxxxxxxx
dobi
male
gender
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2222
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shretatzear
srer
3trt
s
india
Name XXXX
DOB XX-XX-XXXX
Gender MALE
0000 1111 2222

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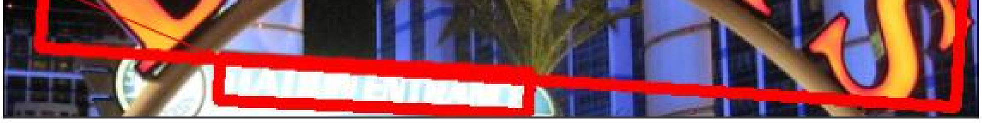

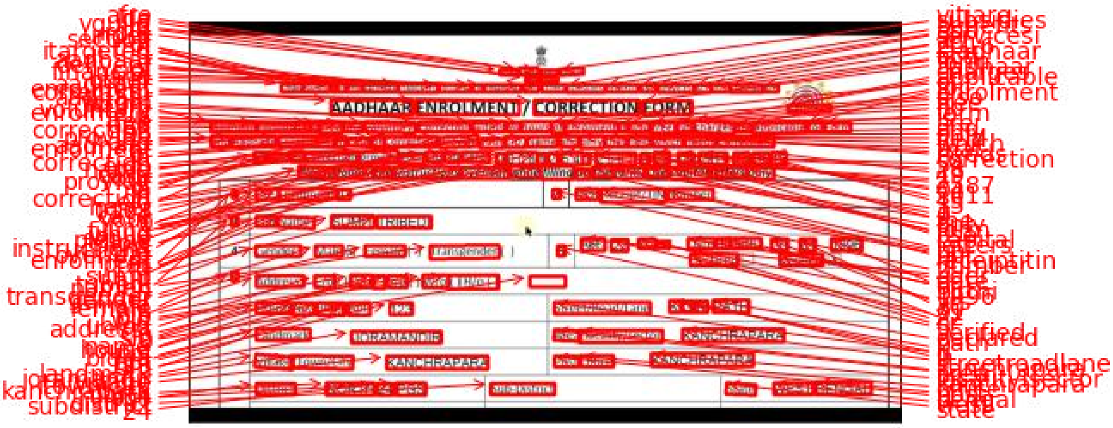

```
In [220]: [x[0] for x in prediction_groups[1]]
```

```
Out[220]: ['rd',
 'traar',
 'gonernmentos',
 'india',
 'name',
 'xxxx',
 'xxxxxxxx',
 'dobi',
 'male',
 'gender',
 'o000',
 '2222',
 '1111',
 'shretatzear',
 'srer',
 '3trt',
 's']
```

```
In [ ]:
```

4. Text extraction with NanoNet OCR

```
In [ ]:
```

```
In [ ]:
```

A few non-working examples

Camelot

```
In [16]: import camelot
         tables = camelot.read_pdf('adharapp.pdf') #, pages='all')
         tables[0].df
         #tables
         tables[0].parsing_report
         #tables.export('out.csv', f='csv', compress=True)
```

```
Out[16]: {'accuracy': 0, 'whitespace': 100.0, 'order': 1, 'page': 1}
```

In [28]:

```
import pytesseract
from PIL import Image
from itertools import groupby
from functools import reduce
import numpy as np
from spacy.lang.en import English
pytesseract.pytesseract.tesseract_cmd = r'C:\Program Files\Tesseract-OCR\tesseract.exe'

nlp = English()

# schema = [u'level', u'page_num', u'block_num', u'par_num', u'line_num', u'word_num', u'left', u'top', u'width', u'height', u'conf', u'text']

LINE_INDEX = 4
CONF_INDEX = -2
WORD_INDEX = -1
LEFT_INDEX = -6
WIDTH_INDEX = -4

def processingOneLineOfWords(words, joinThreshold = 10):
    words = list(words)
    wordDistanceArr = list(map(lambda p: p[1][LEFT_INDEX] - (p[0][LEFT_INDEX] + p[0][WIDTH_INDEX]), zip(words, words[1:])))
    shouldSplitBecauseOfText = np.array(list(map(lambda w: w[WORD_INDEX][0] == '|', words[1:])))
    shouldSplitBecauseOfDistance = np.array(wordDistanceArr) > joinThreshold
    shouldSplit = list((shouldSplitBecauseOfText + shouldSplitBecauseOfDistance)>0 +0)
    phraseIds = reduce(lambda s,x: s + [x+s[-1]] , shouldSplit, [0])
    # print(phraseIds)
    wordGroups = [map(lambda p: p[0], it) for k, it in groupby(zip(words, phraseIds), lambda p: p[1])]

    return map(lambda arr: arr[0][0:WORD_INDEX] + [' '.join(map(lambda w: w[WORD_INDEX], arr))], wordGroups)

def extract_data(img_file_path):
    data = pytesseract.image_to_data(Image.open(img_file_path))
    # print(data)
    arrays = list(map(lambda s: s.split('\t'), data.split('\n')))[1:]
    words = list(map(lambda arr: arr[0:6]  + list(map(lambda i: int(i), arr[6:-1])) + [arr[-1]], arrays))
    #print(words)
    words = list(filter(lambda arr: isinstance(arr[CONF_INDEX], float) and float(arr[CONF_INDEX]) >0 and arr[WORD_INDEX], words))
    lines = [processingOneLineOfWords(map(lambda x: x, it)) for k, it in groupby(words, lambda arr: ','.join(arr[0:5]))]
    return [lines]

def extract_key_values_from_line(line):
    hasNumbers = map(lambda phrase: reduce(lambda s,t: s+t.like_num, nlp(phrase[WORD_INDEX]), 0), line)
    return filter(lambda v: v, [[line[i-1][WORD_INDEX], line[i][WORD_INDEX]] if v > 0 and not hasNumbers[i-1] else None for i, v in enumerate(hasNumbers)])

[lines] = extract_data('claim_form2.png')

pairs = filter(lambda l: len(l)>0, map(extract_key_values_from_line, lines))
for p in pairs:
    print(p)
```

Deep Text Recognition

In [85]:

```
import os
os.chdir('deep-text-recognition/')
%pwd

#output = !CUDA_VISIBLE_DEVICES=0 python3 demo.py \
output = !python demo.py \
--Transformation TPS --FeatureExtraction ResNet --SequenceModeling BiLSTM --Predictio
n Attn \
--image_folder demo_image/ \
--saved_model TPS-ResNet-BiLSTM-Attn.pth
```

Out[85]:

```
'C:\\Work\\TCS\\aws\\ocrplusplus\\deep-text-recognition'
```

In [96]:

```
output
```

Out[96]:

```
['Traceback (most recent call last):',
 '  File "demo.py", line 10, in <module>',
 '    from dataset import RawDataset, AlignCollate',
 '  File "C:\\Work\\TCS\\aws\\ocrplusplus\\deep-text-recognition\\dataset.py", line
9, in <module>',
 '    from natsort import natsorted',
 "ModuleNotFoundError: No module named 'natsort'"]
```

In [93]:

```python
from IPython.core.display import display, HTML
from PIL import Image
import base64
import io
import pandas as pd

data = pd.DataFrame()
for ind, row in enumerate(output[output.index('image_path               \tpredicted_labels         \tconfidence score')+2:]):
  row = row.split('\t')
  filename = row[0].strip()
  label = row[1].strip()
  conf = row[2].strip()
  img = Image.open(filename)
  img_buffer = io.BytesIO()
  img.save(img_buffer, format="PNG")
  imgStr = base64.b64encode(img_buffer.getvalue()).decode("utf-8")

  data.loc[ind, 'img'] = '<img src="data:image/png;base64,{0:s}">'.format(imgStr)
  data.loc[ind, 'id'] = filename
  data.loc[ind, 'label'] = label
  data.loc[ind, 'conf'] = conf

html_all = data.to_html(escape=False)
display(HTML(html_all))
```

```
---------------------------------------------------------------------------
ValueError                                Traceback (most recent call last)
<ipython-input-93-edc761d0c3a4> in <module>
      6 
      7 data = pd.DataFrame()
----> 8 for ind, row in enumerate(output[output.index('image_path               \tpredicted_labels         \tconfidence score')+2:]):
      9   row = row.split('\t')
     10   filename = row[0].strip()

ValueError: 'image_path               \tpredicted_labels         \tconfidence score' is not in list
```

In [ ]: