Form Parsing with Document AI (Python) | Google Cloud Skills Boost

Qwiklabs ⁝ 19-24 minutes

GSP1139

Overview

Document AI is a document understanding solution that takes unstructured data (e.g. documents, emails, invoices, forms, etc.) and makes the data easier to understand, analyze, and consume. The API provides structure through content classification, entity extraction, advanced searching, and more.

In this lab, you will learn how to use the Document AI Form Parser to parse a handwritten form with Python. You will use a simple medical intake form as an example, but this procedure will work with any generalized form supported by DocAI.

Objectives

In this lab, you will learn how to perform the following tasks:

- Extract data from a scanned form using the Document AI Form Parser
- Extract key/value pairs from a form using the Document AI Form Parser
- Extract and export csv data from a form using the Document AI Form Parser

Setup and requirements

Before you click the Start Lab button

Read these instructions. Labs are timed and you cannot pause them. The timer, which starts when you click **Start Lab**, shows how long Google Cloud resources will be made available to you.

This hands-on lab lets you do the lab activities yourself in a real cloud environment, not in a simulation or demo environment. It does so by giving you new, temporary credentials that you use to sign in and access Google Cloud for the duration of the lab.

To complete this lab, you need:

- Access to a standard internet browser (Chrome browser recommended).

Note: Use an Incognito or private browser window to run this lab. This prevents any conflicts between your personal account and the Student account, which may cause extra charges incurred to your personal account.

- Time to complete the lab---remember, once you start, you cannot pause a lab.

Note: If you already have your own personal Google Cloud account or project, do not use it for this lab to avoid extra charges to your account.

How to start your lab and sign in to the Google Cloud Console

1. Click the **Start Lab** button. If you need to pay for the lab, a pop-up opens for you to select your payment method. On the left is the **Lab Details** panel with the following:
    - The **Open Google Console** button
    - Time remaining
    - The temporary credentials that you must use for this lab
    - Other information, if needed, to step through this lab
2. Click **Open Google Console**. The lab spins up resources, and then opens another tab that shows the **Sign in** page.

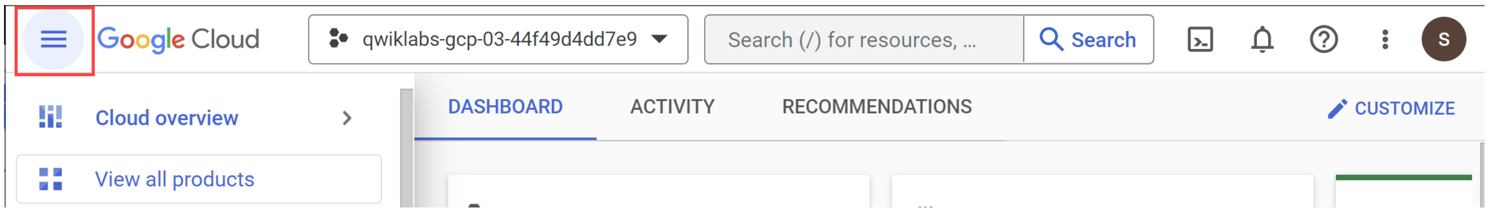
   Tip: Arrange the tabs in separate windows, side-by-side.

   Note: If you see the **Choose an account** dialog, click **Use Another Account**.
3. If necessary, copy the **Username** from the **Lab Details** panel and paste it into the **Sign in** dialog. Click **Next**.
4. Copy the **Password** from the **Lab Details** panel and paste it into the **Welcome** dialog. Click **Next**.

   Important: You must use the credentials from the left panel. Do not use your Google Cloud Skills Boost credentials. **Note:** Using your own Google Cloud account for this lab may incur extra charges.
5. Click through the subsequent pages:
    - Accept the terms and conditions.
    - Do not add recovery options or two-factor authentication (because this is a temporary account).
    - Do not sign up for free trials.

After a few moments, the Cloud Console opens in this tab.

Note: You can view the menu with a list of Google Cloud Products and Services by clicking the **Navigation menu** at the top-left.



Activate Cloud Shell

Cloud Shell is a virtual machine that is loaded with development tools. It offers a persistent 5GB home directory and runs on the Google Cloud. Cloud Shell provides command-line access to your Google Cloud resources.

1. Click **Activate Cloud Shell** at the top of the Google Cloud console.

When you are connected, you are already authenticated, and the project is set to your **PROJECT_ID**. The output contains a line that declares the **PROJECT_ID** for this session:

```
Your Cloud Platform project in this session is set to YOUR_PROJECT_ID
```

`gcloud` is the command-line tool for Google Cloud. It comes pre-installed on Cloud Shell and supports tab-completion.

2. (Optional) You can list the active account name with this command:

```
gcloud auth list
```

3. Click **Authorize**.

4. Your output should now look like this:

Output:

```
ACTIVE: * ACCOUNT: student-01-xxxxxxxxxxxx@qwiklabs.net To set the active account, run: $ gcloud config set account `ACCOUNT`
```

5. (Optional) You can list the project ID with this command:

```
gcloud config list project
```

Output:

```
[core] project = <project_ID>
```

Example output:

[core] project = qwiklabs-gcp-44776a13dea667a6 **Note:** For full documentation of `gcloud`, in Google Cloud, refer to the gcloud CLI overview guide.

Task 1. Enable the Document AI API

Before you can begin using Document AI, you must enable the API.

1. In Cloud Shell, run the following commands to enable the API for Document AI.

```
gcloud services enable documentai.googleapis.com
```

You should see something like this:

```
Operation "operations/..." finished successfully.
```

You will also need to install Pandas, an Open Source Data Analysis library for Python.

2. Run the following command to install Pandas.

```
pip3 install --upgrade pandas
```

3. Run the following command to install the Python client libraries for Document AI.

```
pip3 install --upgrade google-cloud-documentai
```

You should see something like this:

```
... Installing collected packages: google-cloud-documentai Successfully installed google-cloud-documentai-2.15.0
```

Now, you're ready to use the Document AI API!

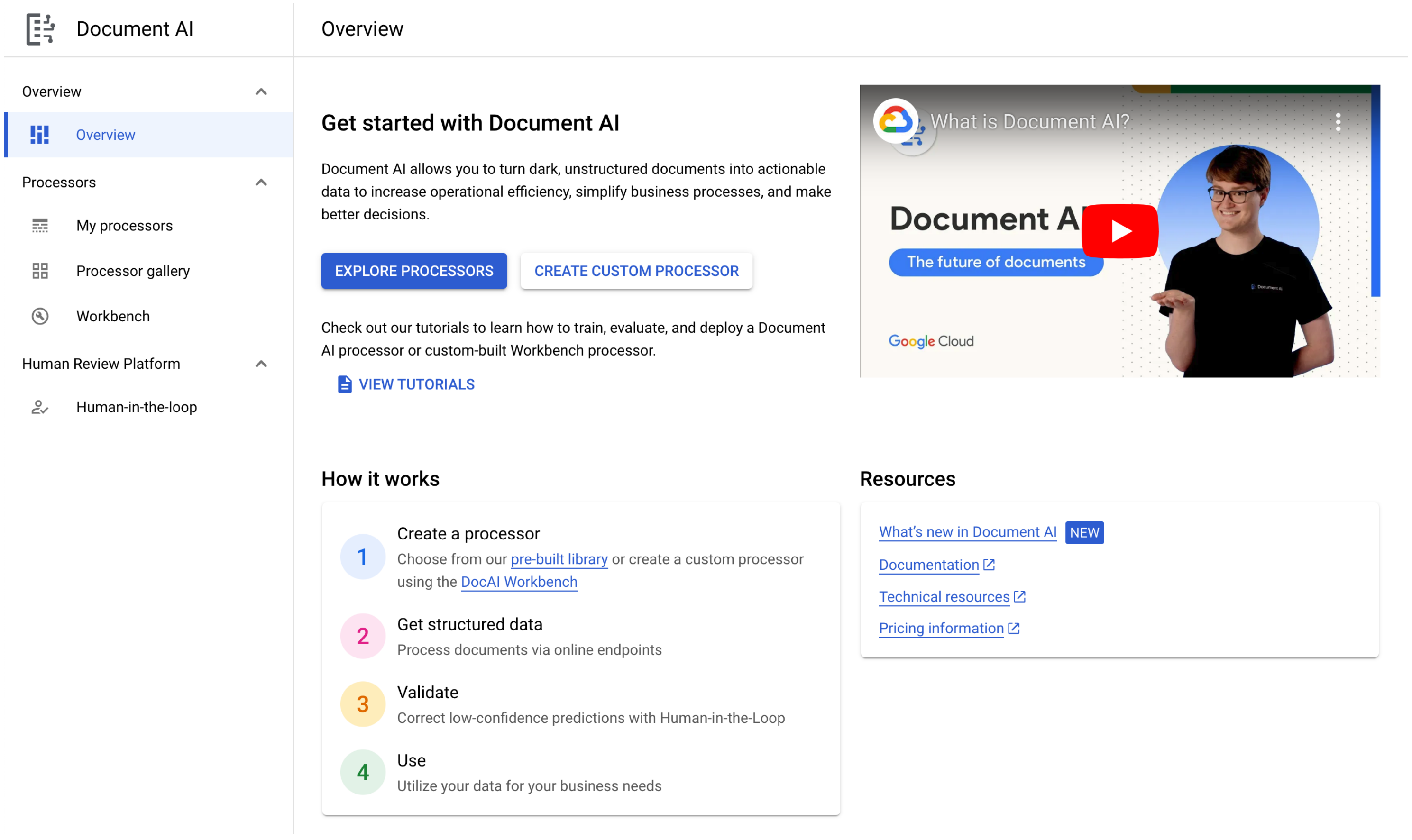
Click **Check my progress** to verify the objective.

Enable the Document AI API.

Task 2. Create a Form Parser processor

You must first create a Form Parser processor instance to use in the Document AI Platform for this tutorial.

1. From the Navigation Menu, under **Artificial Intelligence**, select **Document AI**.



Get started with Document AI

Document AI allows you to turn dark, unstructured documents into actionable data to increase operational efficiency, simplify business processes, and make better decisions.

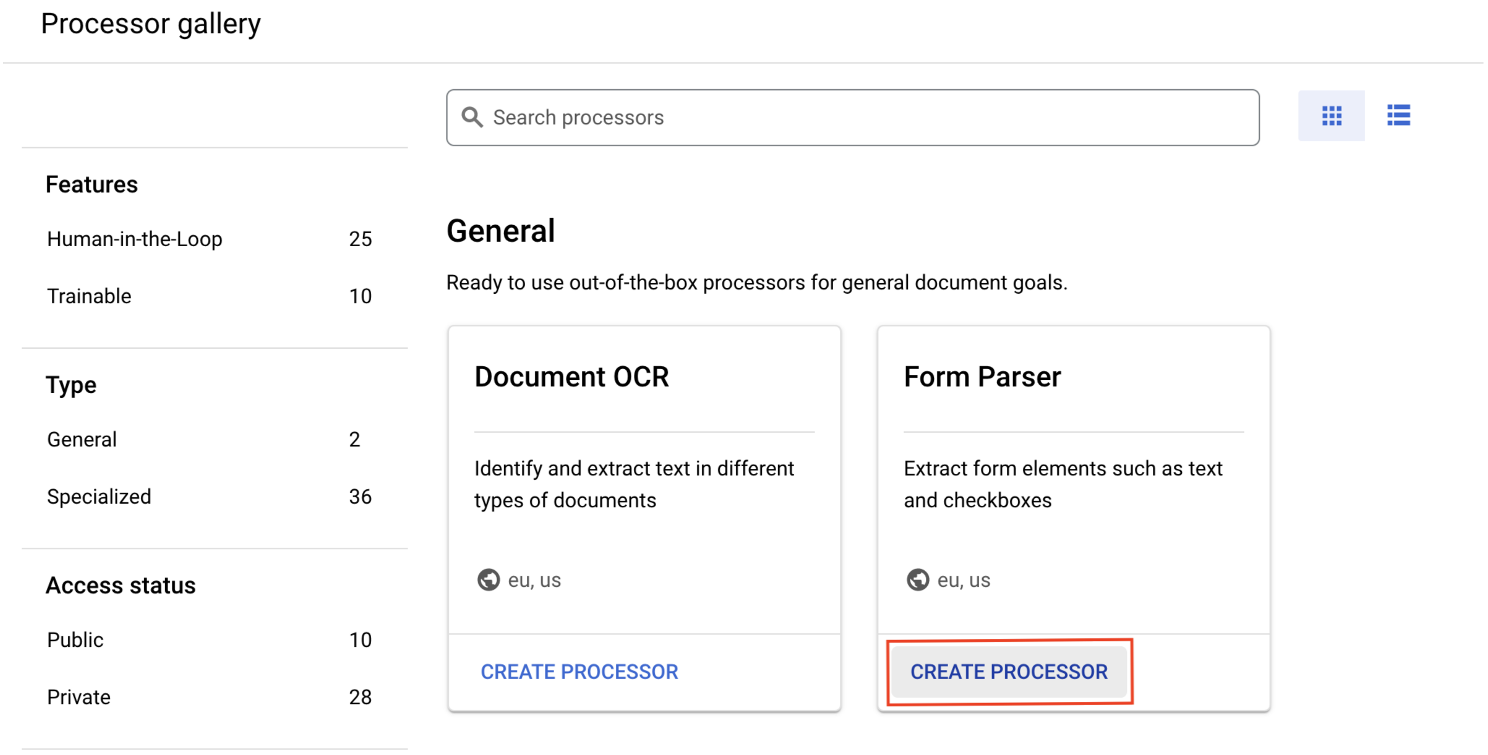
Check out our tutorials to learn how to train, evaluate, and deploy a Document AI processor or custom-built Workbench processor.

How it works

1. Create a processor
   Choose from our pre-built library or create a custom processor using the DocAI Workbench
2. Get structured data
   Process documents via online endpoints
3. Validate
   Correct low-confidence predictions with Human-in-the-Loop
4. Use
   Utilize your data for your business needs

Resources

2. Click **Explore Processors**, and inside **Form Parser**, click **Create Processor**.



Features	
Human-in-the-Loop	25
Trainable	10

Type	
General	2
Specialized	36

Access status	
Public	10
Private	28

General

Ready to use out-of-the-box processors for general document goals.

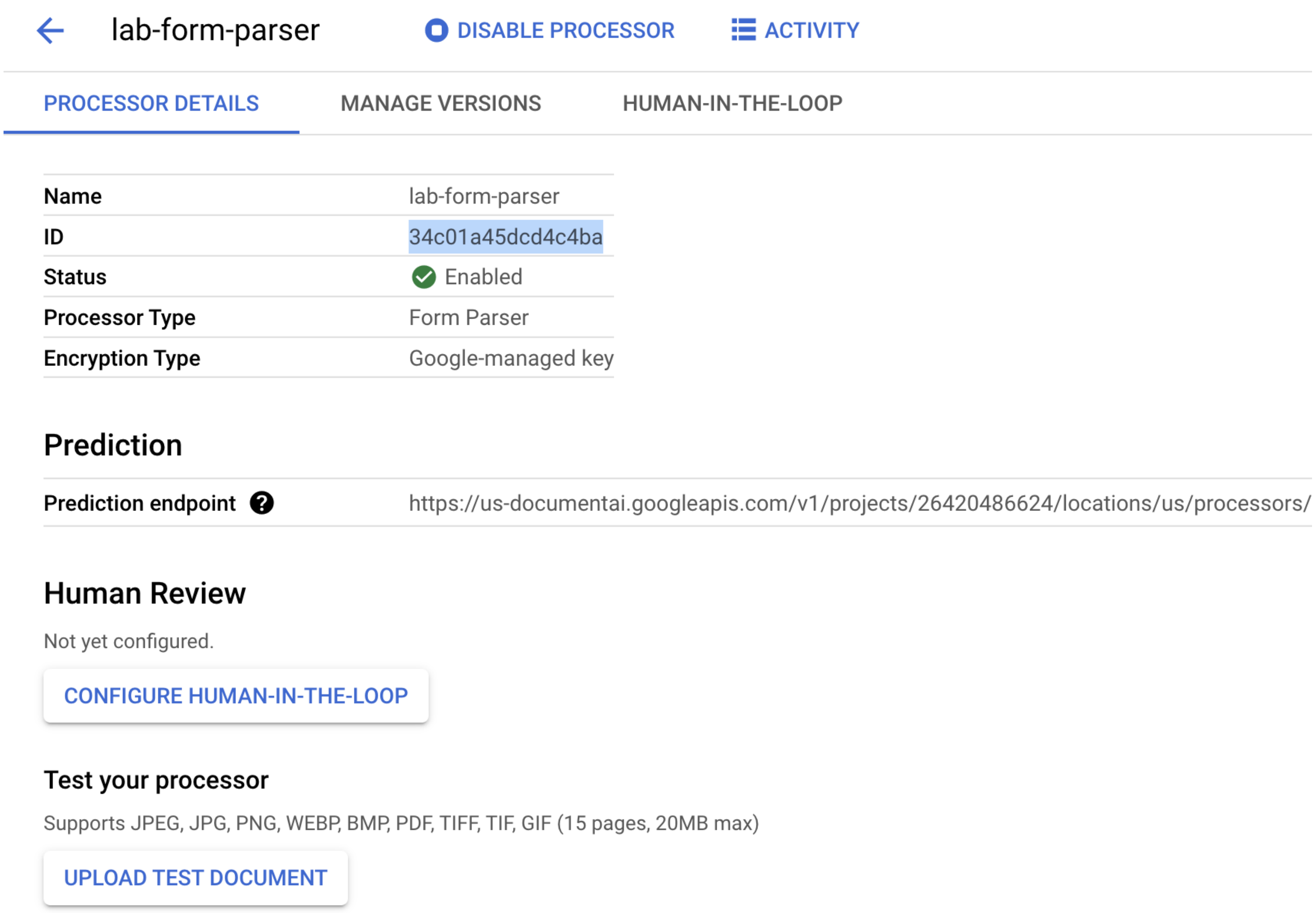
Document OCR
Identify and extract text in different types of documents
eu, us

Form Parser
Extract form elements such as text and checkboxes
eu, us

3. Give it the name `lab-form-parser` and select the closest region on the list.

4. Click **Create** to create your processor

5. **Copy** your Processor ID. You must use this in your code later.



Name	lab-form-parser
ID	34c01a45dcd4c4ba
Status	✓ Enabled
Processor Type	Form Parser
Encryption Type	Google-managed key

Prediction

Prediction endpoint	https://us-documentai.googleapis.com/v1/projects/26420486624/locations/us/processors/

Human Review

Not yet configured.

Test your processor

Supports JPEG, JPG, PNG, WEBP, BMP, PDF, TIFF, TIF, GIF (15 pages, 20MB max)

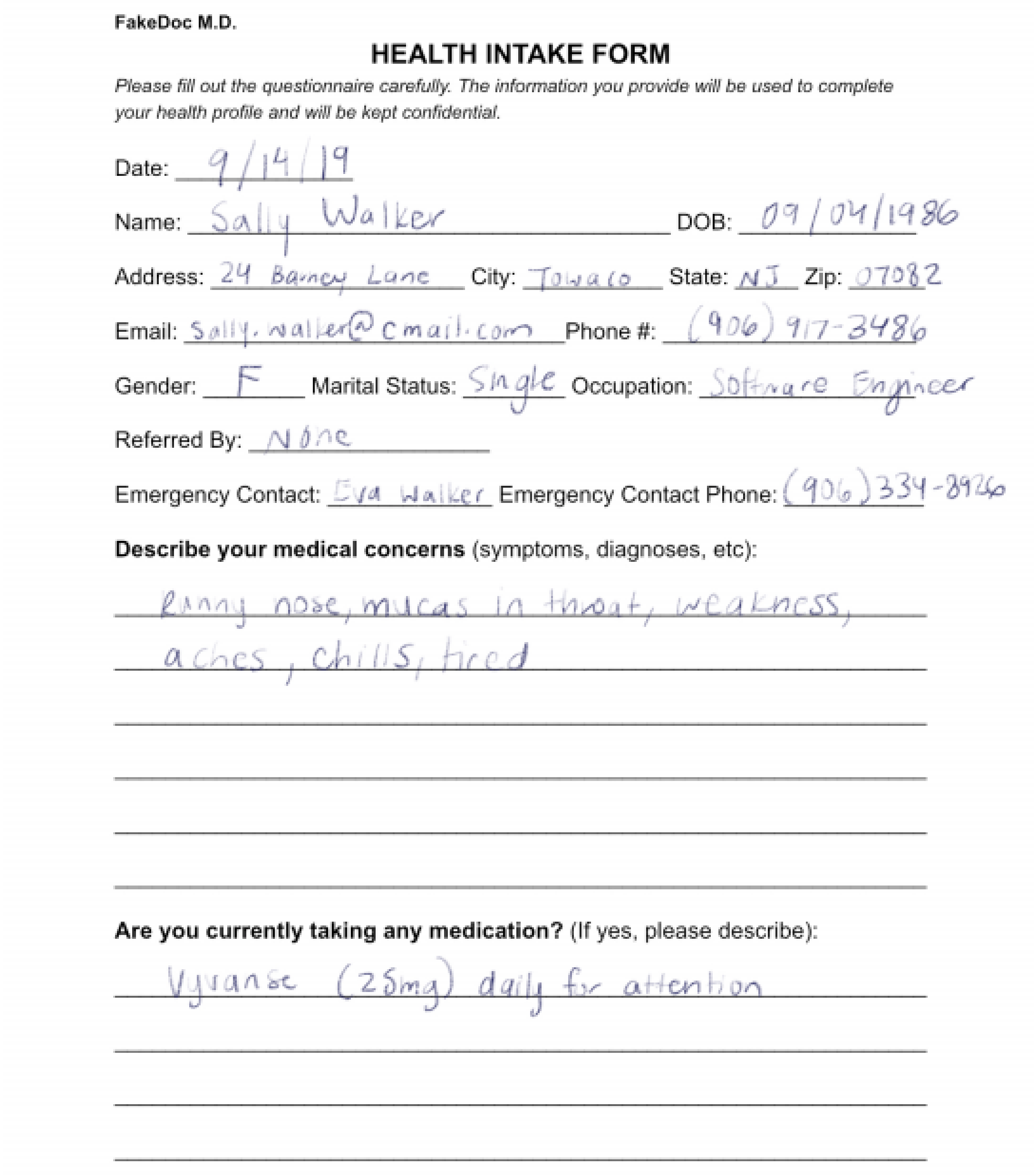
Click **Check my progress** to verify the objective.

Create a processor

Test the processor in the Cloud Console

You can test out your processor in the console by uploading a document.

1. Right click the image below, and select **Save Image As** to download the sample form.


FakeDoc M.D.

HEALTH INTAKE FORM

Please fill out the questionnaire carefully. The information you provide will be used to complete your health profile and will be kept confidential.

Date: 9/14/19

Name: Sally Walker DOB: 09/04/1986

Address: 24 Barney Lane City: Towaco State: NJ Zip: 07082

Email: sally.walker@cmail.com Phone #: (906) 917-3486

Gender: F Marital Status: Single Occupation: Software Engineer

Referred By: None

Emergency Contact: Eva Walker Emergency Contact Phone: (906) 334-8926

Describe your medical concerns (symptoms, diagnoses, etc):

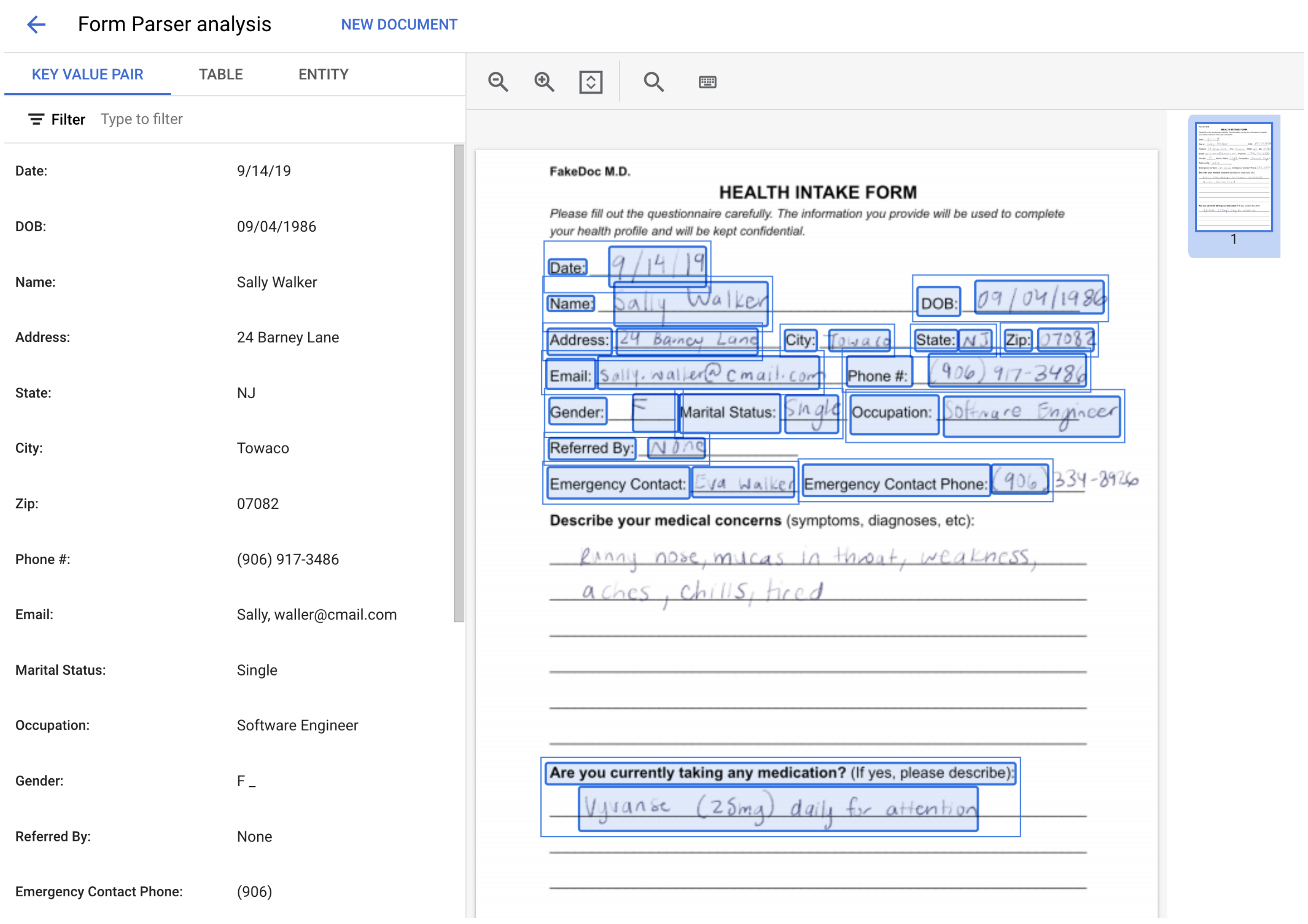
Runny nose, mucas in throat, weakness, aches, chills, tired

Are you currently taking any medication? (If yes, please describe):

Vyvanse (25mg) daily for attention

2. On the **Processor Details** page, click **Upload Test Document**. Select the form you just downloaded.

Your Form Parser processor will process the document and return the parsed form data. It should look something like this:



Date:	9/14/19
DOB:	09/04/1986
Name:	Sally Walker
Address:	24 Barney Lane
State:	NJ
City:	Towaco
Zip:	07082
Phone #:	(906) 917-3486
Email:	Sally, waller@cmail.com
Marital Status:	Single
Occupation:	Software Engineer
Gender:	F _
Referred By:	None
Emergency Contact Phone:	(906)

FakeDoc M.D.

HEALTH INTAKE FORM

Please fill out the questionnaire carefully. The information you provide will be used to complete your health profile and will be kept confidential.

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Emergency Contact: Eva Walker Emergency Contact Phone: (906) 334-8926

Describe your medical concerns (symptoms, diagnoses, etc):

Runny nose, mucas in throat, weakness, aches, chills, tired

Are you currently taking any medication? (If yes, please describe):

Vyvanse (25mg) daily for attention

Task 3. Download the sample form

We have a sample document which contains a simple medical intake form.

1. Run the following command to download the sample form to your Cloud Shell.

```
gcloud storage cp gs://cloud-samples-data/documentai/codelabs/form-parser/intake-form.pdf .
```

2. Confirm the file is downloaded to your Cloud Shell using the below command:

```
ls -ltr intake-form.pdf
```

Task 4. Extract form key/value pairs

In this step you will use the online processing API to call the Form Parser processor you created previously. Then, you will extract the key value pairs found in the document.

Online processing is for sending a single document and waiting for the response. You can also use batch processing if you want to send multiple files or if the file size exceeds the online processing maximum pages.

The code for making a process request is identical for every processor type aside from the Processor ID. The Document response object contains a list of pages from the input document. Each `page` object contains a list of form fields and their locations in the text.

The following code iterates through each page and extracts each key, value and confidence score. This is structured data that can more easily stored in databases or used in other applications.

1. In Cloud Shell, create a file called `form_parser.py` and paste the following code into it:

```
import pandas as pd from google.cloud import documentai_v1 as documentai def online_process( project_id:
str, location: str, processor_id: str, file_path: str, mime_type: str, ) -> documentai.Document: """ Processes a
document using the Document AI Online Processing API. """ opts = {"api_endpoint": f"{location}-
documentai.googleapis.com"} # Instantiates a client documentai_client =
documentai.DocumentProcessorServiceClient(client_options=opts) # The full resource name of the processor,
e.g.: # projects/project-id/locations/location/processor/processor-id # You must create new processors in the
Cloud Console first resource_name = documentai_client.processor_path(project_id, location, processor_id) #
Read the file into memory with open(file_path, "rb") as image: image_content = image.read() # Load Binary
Data into Document AI RawDocument Object raw_document = documentai.RawDocument(
content=image_content, mime_type=mime_type ) # Configure the process request request =
documentai.ProcessRequest( name=resource_name, raw_document=raw_document ) # Use the Document AI
client to process the sample form result = documentai_client.process_document(request=request) return
result.document def trim_text(text: str): """ Remove extra space characters from text (blank, newline, tab, etc.)
""" return text.strip().replace("\n", " ") PROJECT_ID = "YOUR_PROJECT_ID" LOCATION =
"YOUR_PROJECT_LOCATION" # Format is 'us' or 'eu' PROCESSOR_ID = "FORM_PARSER_ID" # Create
processor in Cloud Console # The local file in your current working directory FILE_PATH = "form.pdf" # Refer to
https://cloud.google.com/document-ai/docs/processors-list # for supported file types MIME_TYPE =
"application/pdf" document = online_process( project_id=PROJECT_ID, location=LOCATION,
processor_id=PROCESSOR_ID, file_path=FILE_PATH, mime_type=MIME_TYPE, ) names = []
name_confidence = [] values = [] value_confidence = [] for page in document.pages: for field in
page.form_fields: # Get the extracted field names
names.append(trim_text(field.field_name.text_anchor.content)) # Confidence - How "sure" the Model is that the
text is correct name_confidence.append(field.field_name.confidence)
values.append(trim_text(field.field_value.text_anchor.content))
value_confidence.append(field.field_value.confidence) # Create a Pandas Dataframe to print the values in
tabular format. df = pd.DataFrame( { "Field Name": names, "Field Name Confidence": name_confidence, "Field
Value": values, "Field Value Confidence": value_confidence, } ) print(df)
```

2. Replace `YOUR_PROJECT_ID`, `YOUR_PROJECT_LOCATION`, `YOUR_PROCESSOR_ID`, and the `FILE_PATH` with appropriate values for your environment.

Note that the `FILE_PATH` is the name of the file you downloaded to Cloud Shell in the previous step. If you didn't rename the file, it should be `intake-form.pdf`, which you will need to update in the code.

3. Run the following command to execute the script:

```
python3 form_parser.py
```

You should see the following output:

```
Field Name Field Name Confidence Field Value Field Value Confidence 0 Phone #: 0.999982 (906) 917-3486
0.999982 1 Emergency Contact: 0.999972 Eva Walker 0.999972 2 Marital Status: 0.999951 Single 0.999951 3
Gender: 0.999933 F 0.999933 4 Occupation: 0.999914 Software Engineer 0.999914 5 Referred By: 0.999862
None 0.999862 6 Date: 0.999858 9/14/19 0.999858 7 DOB: 0.999716 09/04/1986 0.999716 8 Address:
0.999147 24 Barney Lane 0.999147 9 City: 0.997718 Towaco 0.997718 10 Name: 0.997345 Sally Walker
0.997345 11 State: 0.996944 NJ 0.996944 ...
```

Task 5. Parse tables

The Form Parser is also able to extract data from tables within documents. In this section, you will download a new sample document and extract data from the table. Since you are loading the data into Pandas, this data can be output to a CSV file and many other formats with a single method call.

Download the Sample Form with Tables

We have a sample document which contains a sample form and a table.

1. Run the following command to download the sample form to your Cloud Shell.

```
gcloud storage cp gs://cloud-samples-data/documentai/codelabs/form-parser/form_with_tables.pdf .
```

2. Confirm the file is downloaded to your Cloud Shell using the below command:

```
ls -ltr form_with_tables.pdf
```

Extract Table Data

The processing request for table data is exactly the same as for extracting key-value pairs. The difference is which fields you extract the data from in the response. Table data is stored in the `pages[].tables[]` field.

This example extracts information about from the table header rows and body rows for each table and page, then prints out the table and saves the table as a CSV file.

1. Create a file called `table_parsing.py` and paste the following code into it:

```
# type: ignore[1] """ Uses Document AI online processing to call a form parser processor Extracts the tables
and data in the document. """ from os.path import splitext from typing import List, Sequence import pandas as
pd from google.cloud import documentai def online_process( project_id: str, location: str, processor_id: str,
file_path: str, mime_type: str, ) -> documentai.Document: """ Processes a document using the Document AI
Online Processing API. """ opts = {"api_endpoint": f"{location}-documentai.googleapis.com"} # Instantiates a
client documentai_client = documentai.DocumentProcessorServiceClient(client_options=opts) # The full
resource name of the processor, e.g.: # projects/project-id/locations/location/processor/processor-id # You must
create new processors in the Cloud Console first resource_name =
documentai_client.processor_path(project_id, location, processor_id) # Read the file into memory with
open(file_path, "rb") as image: image_content = image.read() # Load Binary Data into Document AI
RawDocument Object raw_document = documentai.RawDocument( content=image_content,
mime_type=mime_type ) # Configure the process request request = documentai.ProcessRequest(
name=resource_name, raw_document=raw_document ) # Use the Document AI client to process the sample
form result = documentai_client.process_document(request=request) return result.document def
get_table_data( rows: Sequence[documentai.Document.Page.Table.TableRow], text: str ) -> List[List[str]]: """
Get Text data from table rows """ all_values: List[List[str]] = [] for row in rows: current_row_values: List[str] = []
for cell in row.cells: current_row_values.append( text_anchor_to_text(cell.layout.text_anchor, text) )
all_values.append(current_row_values) return all_values def text_anchor_to_text(text_anchor:
documentai.Document.TextAnchor, text: str) -> str: """ Document AI identifies table data by their offsets in the
entirety of the document's text. This function converts offsets to a string. """ response = "" # If a text segment
spans several lines, it will # be stored in different text segments. for segment in text_anchor.text_segments:
start_index = int(segment.start_index) end_index = int(segment.end_index) response +=
text[start_index:end_index] return response.strip().replace("\n", " ") PROJECT_ID = "YOUR_PROJECT_ID"
LOCATION = "YOUR_PROJECT_LOCATION" # Format is 'us' or 'eu' PROCESSOR_ID =
"FORM_PARSER_ID" # Create processor before running sample # The local file in your current working
directory FILE_PATH = "form_with_tables.pdf" # Refer to https://cloud.google.com/document-ai/docs/file-types
# for supported file types MIME_TYPE = "application/pdf" document = online_process(
project_id=PROJECT_ID, location=LOCATION, processor_id=PROCESSOR_ID, file_path=FILE_PATH,
mime_type=MIME_TYPE, ) header_row_values: List[List[str]] = [] body_row_values: List[List[str]] = [] # Input
Filename without extension output_file_prefix = splitext(FILE_PATH)[0] for page in document.pages: for index,
table in enumerate(page.tables): header_row_values = get_table_data(table.header_rows, document.text)
body_row_values = get_table_data(table.body_rows, document.text) # Create a Pandas Dataframe to print the
values in tabular format. df = pd.DataFrame( data=body_row_values,
columns=pd.MultiIndex.from_arrays(header_row_values), ) print(f"Page {page.page_number} - Table {index}")
print(df) # Save each table as a CSV file output_filename = f"
{output_file_prefix}_pg{page.page_number}_tb{index}.csv" df.to_csv(output_filename, index=False)
```

2. Replace `YOUR_PROJECT_ID`, `YOUR_PROJECT_LOCATION`, `YOUR_PROCESSOR_ID`, and the `FILE_PATH` with appropriate values for your environment.

Note that the `FILE_PATH` is the name of the file you downloaded to Cloud Shell in the previous step. If you didn't rename the file, it should be `form_with_tables.pdf`, which is the default value and doesn't need to be changed.

3. Run the following command to execute the script:

```
python3 table_parsing.py
```

You should see the following output:

```
Page 1 - Table 0 Item Description 0 Item 1 Description 1 1 Item 2 Description 2 2 Item 3 Description 3 Page 1 -
Table 1 Form Number: 12345678 0 Form Date: 2020/10/01 1 Name: First Last 2 Address: 123 Fake St
```

You should also have two new CSV files in the directory you are running the code from.

4. Run the following command to list the files in your current working directory:

```
ls
```

You should see the following output:

```
form_with_tables_pg1_tb0.csv form_with_tables_pg1_tb1.csv
```

Congratulations!

Congratulations, in this lab you've successfully used the Document AI API to extract data from a handwritten form. You also learned how to use the Document AI Python client library to extract key-value pairs from a form and how to extract tabular data from a form with tables.

Next steps/Learn more

Check out the following resources to learn more about Document AI and the Python Client Library:

- Document AI Documentation
- Document AI Python Client Library
- Document AI Samples

Google Cloud training and certification

...helps you make the most of Google Cloud technologies. Our classes include technical skills and best practices to help you get up to speed quickly and continue your learning journey. We offer fundamental to advanced level training, with on-demand, live, and virtual options to suit your busy schedule. Certifications help you validate and prove your skill and expertise in Google Cloud technologies.

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Lab Last Tested: May 4, 2023