Entity and Sentiment Analysis with the Natural Language API

GSP038

Google Cloud Self-Paced Labs

Overview

The Cloud Natural Language API lets you extract entities from text, perform sentiment and syntactic analysis, and classify text into categories.

In this lab, you learn how to use the Natural Language API to analyze entities, sentiment, and syntax.

What you'll learn

- Creating a Natural Language API request and calling the API with curl
- Extracting entities and running sentiment analysis on text with the Natural Language API
- Performing linguistic analysis on text with the Natural Language API
- Creating a Natural Language API request in a different language

What you'll need

- A Google Cloud Project
- A Browser, such Chrome or Firefox

Setup and Requirements

Qwiklabs setup

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 Qwiklabs 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.

What you need

To complete this lab, you need:

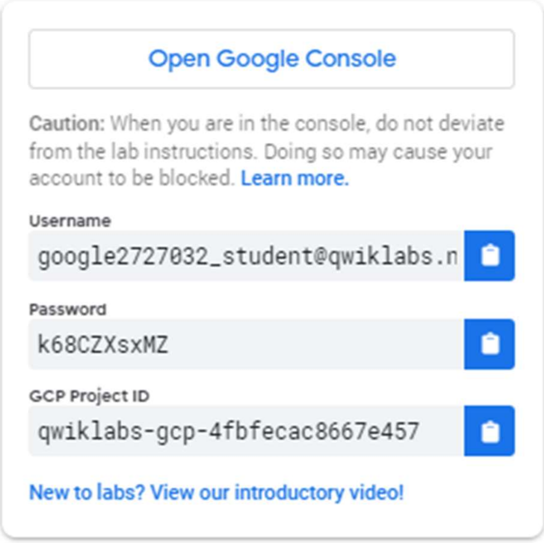
- Access to a standard internet browser (Chrome browser recommended).
- Time to complete the lab.
  Note: If you already have your own personal Google Cloud account or project, do not use it for this lab.

  Note: If you are using a Pixelbook, open an Incognito window to run this lab.

Cloud Console

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 a panel populated with the temporary credentials that you must use for this lab.



Caution: When you are in the console, do not deviate from the lab instructions. Doing so may cause your account to be blocked. Learn more.

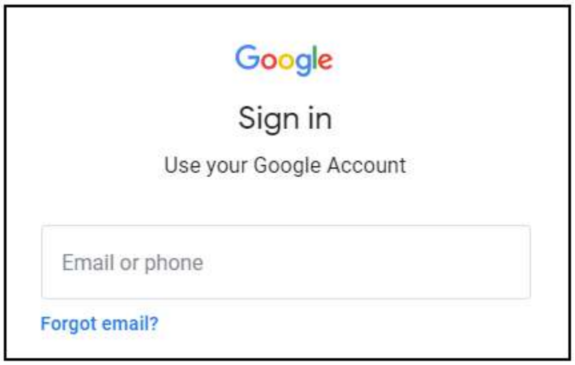
Username
`google2727032_student@qwiklabs.n`

Password
`k68CZXsxMZ`

GCP Project ID
`qwiklabs-gcp-4fbfecac8667e457`

New to labs? View our introductory video!

2. Copy the username, and then click **Open Google Console**. The lab spins up resources, and then opens another tab that shows the **Sign in** page.

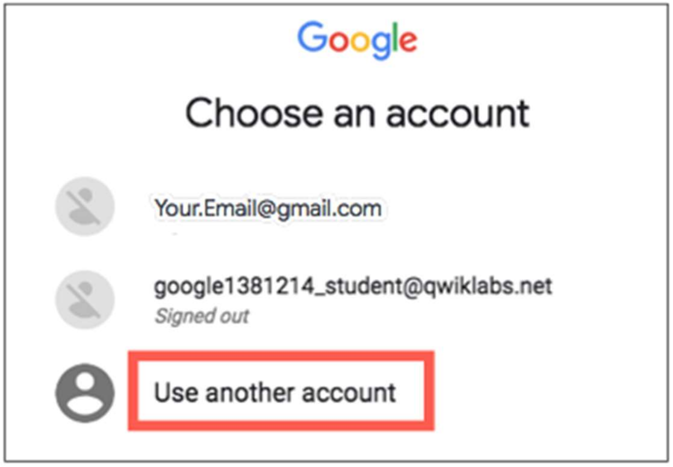


Sign in

Use your Google Account

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

If you see the **Choose an account** page, click **Use Another Account**.



Google

Choose an account

Your.Email@gmail.com

google1381214_student@qwiklabs.net
Signed out

Use another account

3. In the **Sign in** page, paste the username that you copied from the Connection Details panel. Then copy and paste the password.

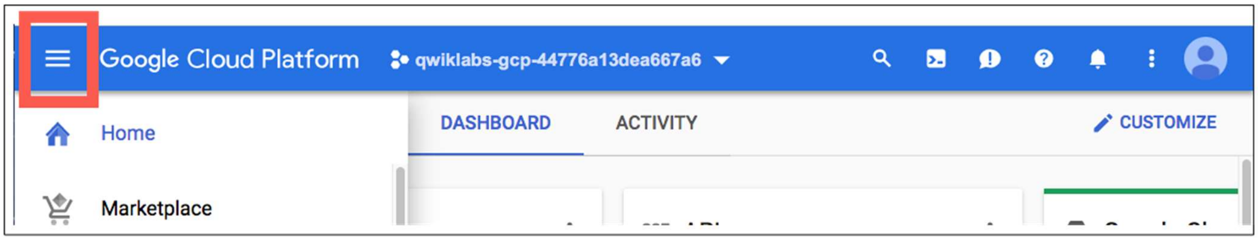
   Important: You must use the credentials from the Connection Details panel. Do not use your Qwiklabs credentials. If you have your own Google Cloud account, do not use it for this lab (avoids incurring charges).

4. 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.

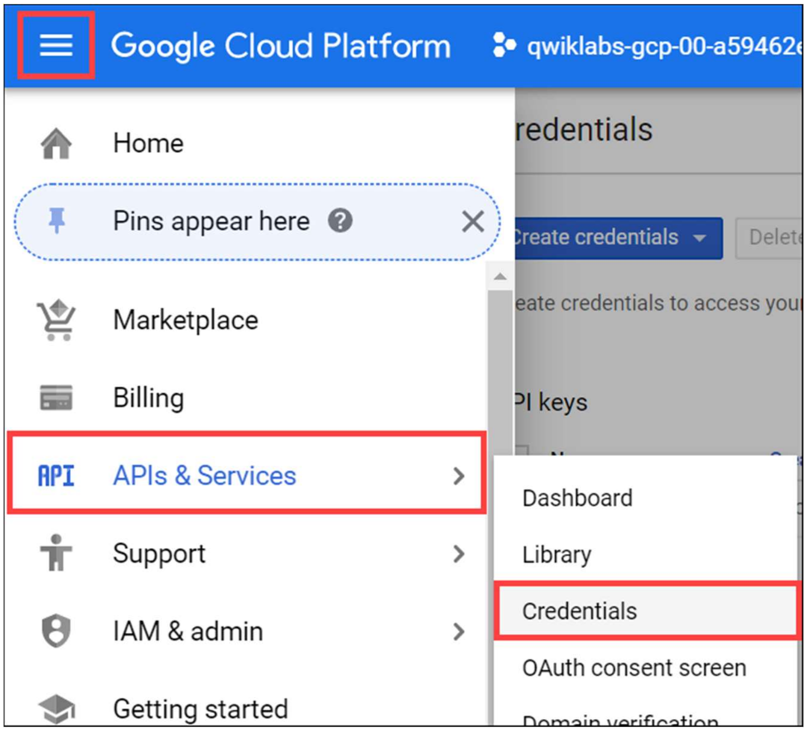
Note: You can view the menu with a list of Google Cloud Products and Services by clicking the **Navigation menu** at the top-left.



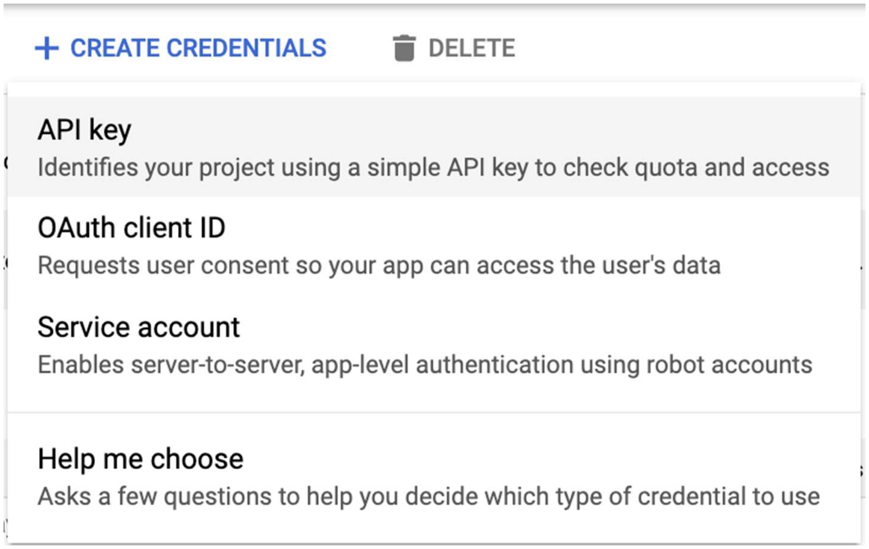
Create an API Key

Since you use `curl` to send a request to the Natural Language API, you must generate an API key to pass in your request URL.

To create an API key, in the Cloud Console, select **Navigation menu** > **APIs & Services** > **Credentials**.



Click **Create credentials** and select **API key**:



API key
Identifies your project using a simple API key to check quota and access

OAuth client ID
Requests user consent so your app can access the user's data

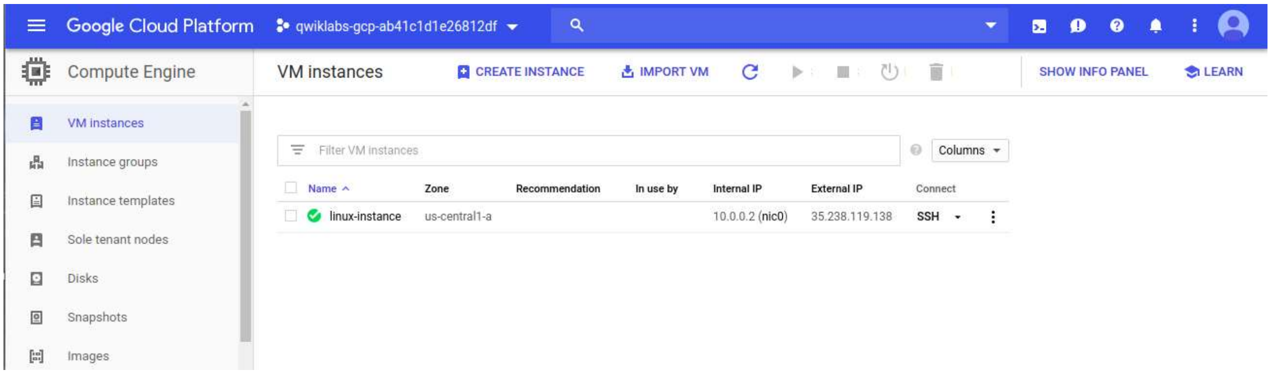
Service account
Enables server-to-server, app-level authentication using robot accounts

Help me choose
Asks a few questions to help you decide which type of credential to use

Copy the generated API key and click **Close**.

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

In order to perform next steps please connect to the instance provisioned for you via **SSH**. Open the navigation menu and select **Compute Engine**. You should see the following provisioned linux instance:



Name	Zone	Recommendation	In use by	Internal IP	External IP	Connect
linux-instance	us-central1-a			10.0.0.2 (nic0)	35.238.119.138	SSH

Click on the **SSH** button. You will be brought to an interactive shell. In the command line, enter in the following, replacing `<YOUR_API_KEY>` with the key you just copied:

```
export API_KEY=<YOUR_API_KEY>
```

Make an Entity Analysis Request

The first Natural Language API method you use is `analyzeEntities`. With this method, the API can extract entities (like people, places, and events) from text. To try it out the API's entity analysis, use the following sentence:

Joanne Rowling, who writes under the pen names J. K. Rowling and Robert Galbraith, is a British novelist and screenwriter who wrote the Harry Potter fantasy series.

You build your request to the Natural Language API in the file, `request.json`.

Use nano (code editor) to create the file `request.json`:

```
nano request.json
```

Type or paste the following code into `request.json`:

```
{
  "document":{
    "type":"PLAIN_TEXT",
    "content":"Joanne Rowling, who writes under the pen names J. K. Rowling and Robert
Galbraith, is a British novelist and screenwriter who wrote the Harry Potter fantasy
series."
  },
  "encodingType":"UTF8"
}
```

Press **Ctrl+x** to exit nano, then **Y** to save the file, then **Enter** to confirm.

In the request, you're telling the Natural Language API about the text being sent. Supported type values are `PLAIN_TEXT` or `HTML`. In content, you pass the text to send to the Natural Language API for analysis. The Natural Language API also supports sending files stored in Cloud Storage for text processing. If you wanted to send a file from Cloud Storage, you would replace `content` with `gcsContentUri` and give it a value of the text file's uri in Cloud Storage. `encodingType` tells the API which type of text encoding to use when processing our text. The API will use this to calculate where specific entities appear in our text.

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

Call the Natural Language API

You can now pass your request body, along with the API key environment variable you saved earlier, to the Natural Language API with the following `curl` command (all in one single command line):

```
curl "https://language.googleapis.com/v1/documents:analyzeEntities?key=${API_KEY}" \
  -s -X POST -H "Content-Type: application/json" --data-binary @request.json >
result.json
```

In order to check the response run:

```
cat result.json
```

The beginning of your response should look like this:

```
            "content": "Joanne Rowling",
            "beginOffset": 0
          },
          "type": "PROPER"
        },
        {
          "text": {
            "content": "Rowling",
            "beginOffset": 53
          },
          "type": "PROPER"
        },
        {
          "text": {
            "content": "novelist",
            "beginOffset": 96
          },
          "type": "COMMON"
        },
        {
          "text": {
            "content": "Robert Galbraith",
            "beginOffset": 65
          },
          "type": "PROPER"
        }
      ]
    },

    ...
  ]
}
```

For each entity in the response, you get the entity `type`, the associated Wikipedia URL if there is one, the `salience`, and the indices of where this entity appeared in the text. Salience is a number in the [0,1] range that refers to the centrality of the entity to the text as a whole. The Natural Language API can also recognize the same entity mentioned in different ways. Take a look at the `mentions` list in the response: the API is able to tell that "Joanne Rowling", "Rowling", "novelist" and "Robert Galbriath" all point to the same thing.

Sentiment analysis with the Natural Language API

In addition to extracting entities, the Natural Language API also lets you perform sentiment analysis on a block of text. This JSON request will include the same parameters as the request above, but this time change the text to include something with a stronger sentiment.

Use nano to replace the code in `request.json` with the following, and feel free to replace the `content` below with your own text:

```
 {
  "document":{
    "type":"PLAIN_TEXT",
    "content":"Harry Potter is the best book. I think everyone should read it."
  },
  "encodingType": "UTF8"
}
```

Next you send the request to the API's `analyzeSentiment` endpoint:

```
curl "https://language.googleapis.com/v1/documents:analyzeSentiment?key=${API_KEY}" \
  -s -X POST -H "Content-Type: application/json" --data-binary @request.json
```

Your response should look like this:

```
{
  "documentSentiment": {
    "magnitude": 0.8,
    "score": 0.4
  },
  "language": "en",
  "sentences": [
    {
      "text": {
        "content": "Harry Potter is the best book.",
        "beginOffset": 0
      },
      "sentiment": {
        "magnitude": 0.7,
        "score": 0.7
      }
    },
    {
      "text": {
        "content": "I think everyone should read it.",
        "beginOffset": 31
      },
      "sentiment": {
        "magnitude": 0.1,
        "score": 0.1
      }
    }
  ]
}
```

Notice that you get two types of sentiment values: sentiment for the document as a whole, and sentiment broken down by sentence. The sentiment method returns two values:

- `score` - is a number from -1.0 to 1.0 indicating how positive or negative the statement is.
- `magnitude` - is a number ranging from 0 to infinity that represents the weight of sentiment expressed in the statement, regardless of being positive or negative.
  Longer blocks of text with heavily weighted statements have higher magnitude values. The score for the first sentence is positive (0.7), whereas the score for the second sentence is neutral (0.1).

Analyzing entity sentiment

In addition to providing sentiment details on the entire text document, the Natural Language API can also break down sentiment by the entities in the text. Use this sentence as an example:

I liked the sushi but the service was terrible.

In this case, getting a sentiment score for the entire sentence as you did above might not be so useful. If this was a restaurant review and there were hundreds of reviews for the same restaurant, you'd want to know exactly which things people liked and didn't like in their reviews. Fortunately, the Natural Language API has a method that lets you get the sentiment for each entity in the text, called `analyzeEntitySentiment`. Let's see how it works!

Use nano to update `request.json` with the sentence above:

```
 {
  "document":{
    "type":"PLAIN_TEXT",
    "content":"I liked the sushi but the service was terrible."
  },
  "encodingType": "UTF8"
}
```

Then call the `analyzeEntitySentiment` endpoint with the following curl command:

```
curl
"https://language.googleapis.com/v1/documents:analyzeEntitySentiment?key=${API_KEY}" \
  -s -X POST -H "Content-Type: application/json" --data-binary @request.json
```

In the response you get back two entity objects: one for "sushi" and one for "service". Here's the full JSON response:

```
{
  "entities": [
    {
      "name": "sushi",
      "type": "CONSUMER_GOOD",
      "metadata": {},
      "salience": 0.52716845,
      "mentions": [
        {
          "text": {
            "content": "sushi",
            "beginOffset": 12
          },
          "type": "COMMON",
          "sentiment": {
            "magnitude": 0.9,
            "score": 0.9
          }
        }
      ],
      "sentiment": {
        "magnitude": 0.9,
        "score": 0.9
      }
    },
    {
      "name": "service",
      "type": "OTHER",
      "metadata": {},
      "salience": 0.47283158,
      "mentions": [
        {
          "text": {
            "content": "service",
            "beginOffset": 26
          },
          "type": "COMMON",
          "sentiment": {
            "magnitude": 0.9,
            "score": -0.9
          }
        }
      ],
      "sentiment": {
        "magnitude": 0.9,
        "score": -0.9
      }
    }
  ],
  "language": "en"
}
```

You can see that the score returned for "sushi" was 0.9, whereas "service" got a score of -0.9. Cool! You also may notice that there are two sentiment objects returned for each entity. If either of these terms were mentioned more than once, the API would return a different sentiment score and magnitude for each mention, along with an aggregate sentiment for the entity.

Analyzing syntax and parts of speech

Use **syntactic analysis**, another of the Natural Language API's method, to dive deeper into the the linguistic details of the text. `analyzeSyntax` extracts linguistic information, breaking up the given text into a series of sentences and tokens (generally, word boundaries), to provide further analysis on those tokens. For each word in the text, the API tells you the word's part of speech (noun, verb, adjective, etc.) and how it relates to other words in the sentence (Is it the root verb? A modifier?).

Try it out with a simple sentence. This JSON request will be similar to the ones above, with the addition of a features key. This tells the API to perform syntax annotation.

Use nano to replace the code in `request.json` with the following:

```
{
  "document":{
    "type":"PLAIN_TEXT",
    "content": "Joanne Rowling is a British novelist, screenwriter and film producer."
  },
  "encodingType": "UTF8"
}
```

Then call the API's `analyzeSyntax` method:

```
curl "https://language.googleapis.com/v1/documents:analyzeSyntax?key=${API_KEY}" \
  -s -X POST -H "Content-Type: application/json" --data-binary @request.json
```

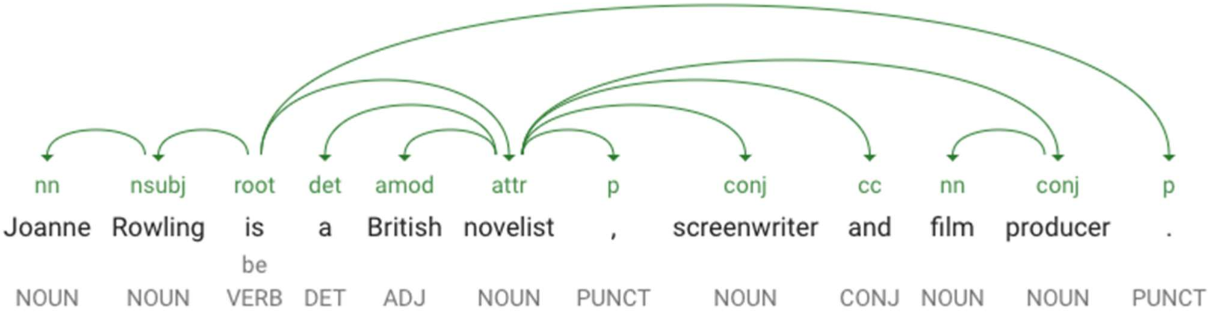
The response should return an object like the one below for each token in the sentence:

```
{
      "text": {
        "content": "is",
        "beginOffset": 15
      },
      "partOfSpeech": {
        "tag": "VERB",
        "aspect": "ASPECT_UNKNOWN",
        "case": "CASE_UNKNOWN",
        "form": "FORM_UNKNOWN",
        "gender": "GENDER_UNKNOWN",
        "mood": "INDICATIVE",
        "number": "SINGULAR",
        "person": "THIRD",
        "proper": "PROPER_UNKNOWN",
        "reciprocity": "RECIPROCITY_UNKNOWN",
        "tense": "PRESENT",
        "voice": "VOICE_UNKNOWN"
      },
      "dependencyEdge": {
        "headTokenIndex": 2,
        "label": "ROOT"
      },
      "lemma": "be"
    },
```

Let's break down the response:

- `partOfSpeech` tells you that "Joanne" is a noun.

- `dependencyEdge` includes data that you can use to create a dependency parse tree of the text. Essentially, this is a diagram showing how words in a sentence relate to each other. A dependency parse tree for the sentence above would look like this:



Note: You can create your own dependency parse trees in the browser with the Natural Language demo available here: https://cloud.google.com/natural-language

- `headTokenIndex` is the index of the token that has an arc pointing at "Joanne". Think of each token in the sentence as a word in an array.

- `headTokenIndex` of 1 for "Joanne" refers to the word "Rowling", which it is connected to in the tree. The label `NN` (short for noun compound modifier) describes the word's role in the sentence. "Joanne" modifies "Rowling", the subject of the sentence.

- `lemma` is the canonical form of the word. For example, the words *run*, *runs*, *ran*, and *running* all have a lemma of *run*. The lemma value is useful for tracking occurrences of a word in a large piece of text over time.

Multilingual natural language processing

The Natural Language API also supports languages other than English (full list here). Modify the code in `request.json` with a sentence in Japanese:

```
{
  "document":{
    "type":"PLAIN_TEXT",
    "content":"日本のグーグルのオフィスは、東京の六本木ヒルズにあります"
  }
}
```

Notice that you didn't tell the API which language the text is, it can automatically detect it!

Next, you send it to the `analyzeEntities` endpoint:

```
curl "https://language.googleapis.com/v1/documents:analyzeEntities?key=${API_KEY}" \
  -s -X POST -H "Content-Type: application/json" --data-binary @request.json
```

And you get the following response:

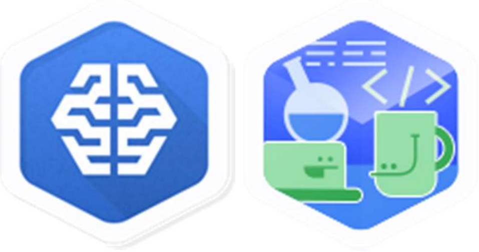
```
{
  "entities": [
    {
      "name": "日本",
      "type": "LOCATION",
      "metadata": {
        "mid": "/m/03_3d",
        "wikipedia_url": "https://en.wikipedia.org/wiki/Japan"
      },
      "salience": 0.23854347,
      "mentions": [
        {
          "text": {
            "content": "日本",
            "beginOffset": 0
          },
          "type": "PROPER"
        }
      ]
    },
    {
      "name": "グーグル",
      "type": "ORGANIZATION",
      "metadata": {
        "mid": "/m/045c7b",
        "wikipedia_url": "https://en.wikipedia.org/wiki/Google"
      },
      "salience": 0.21155767,
      "mentions": [
        {
          "text": {
            "content": "グーグル",
            "beginOffset": 9
          },
          "type": "PROPER"
        }
      ]
    },
    ...
  ]
  "language": "ja"
}
```

The wikipedia URLs even point to the Japanese Wikipedia pages - so cool!

Congratulations!

You've learned how to perform text analysis with the Cloud Natural Language API by extracting entities, analyzing sentiment, and doing syntax annotation. You have:

- Creating a Natural Language API request and calling the API with curl
- Extracting entities and running sentiment analysis on text with the Natural Language API
- Performing linguistic analysis on text to create dependency parse trees
- Creating a Natural Language API request in Japanese



Finish your quest

This self-paced lab is part of the Qwiklabs Machine Learning APIs and Intro to ML: Language Processing Quests. A Quest is a series of related labs that form a learning path. Completing either Quest earns you the badge above, to recognize your achievement. You can make your badge (or badges) public and link to them in your online resume or social media account. Enroll in the above Quests and get immediate completion credit if you've taken this lab. See other available Qwiklabs Quests.

Take your next lab

Try out another lab on Machine Learning APIs, like AI Platform: Qwik Start or Classify Images of Clouds in the Cloud with AutoML Vision.

Next steps

- Check out the Natural Language API tutorials in the documentation.

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