

Data X

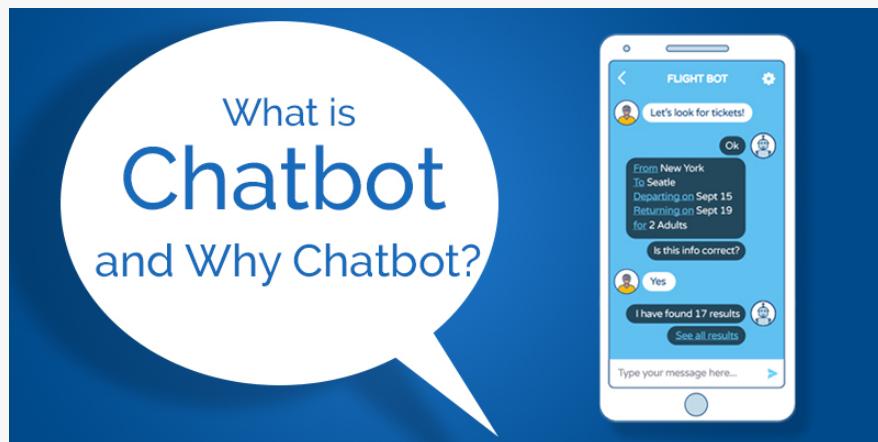
How to Design and build a Chatbot

Applied Data Science with Venture Applications
With examples from Google Cloud Services



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- Text or voice interface to any customer
- People like to chat: 18B text/day, 60B WhatsApp/Messenger
- Uses AI or ML to make communication natural

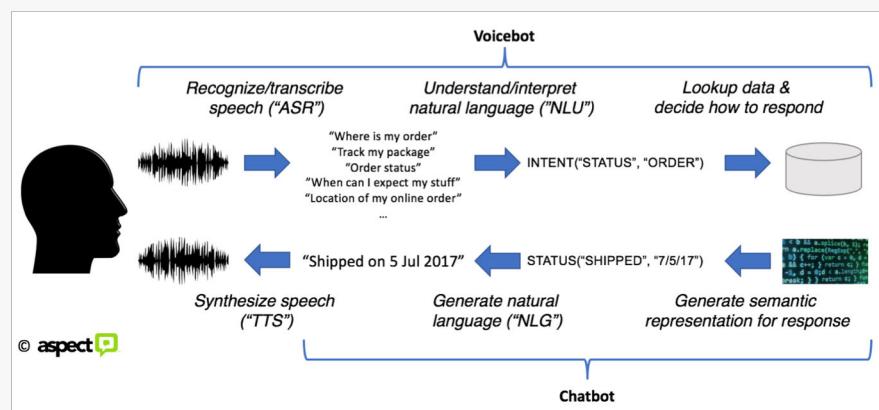
Data X

How Does a Basic Chatbot Work – Basic Architecture

For example: A customer agent that can check on the status of your order?



How Does a Basic Chatbot Work – Basic Architecture

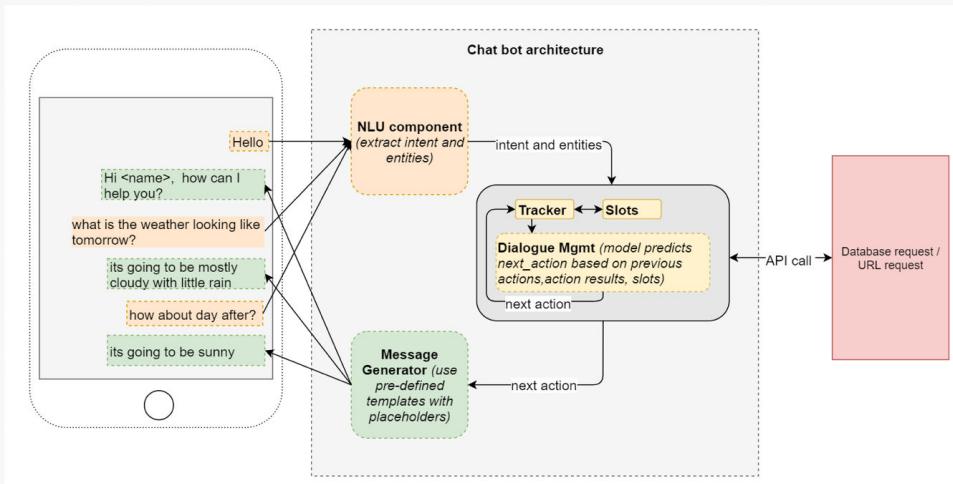


Notes:

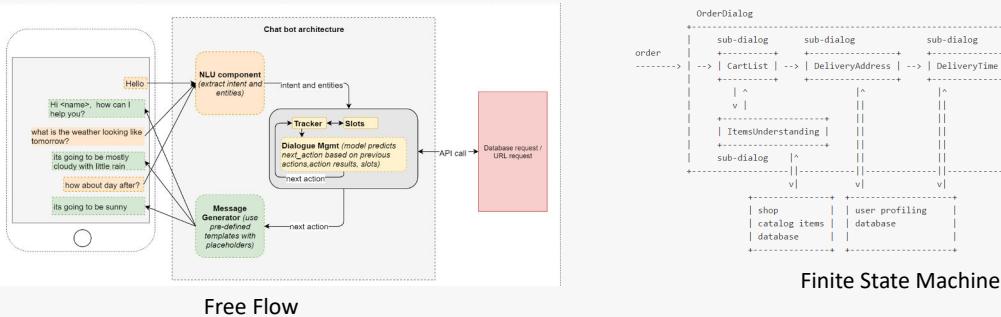
1. A useful chatbot application would **connect to a backend system** or database.
 2. They can **map “intent”** from many variations of natural text and phrases
 3. Chatbots typically have a **semi-scripted dialog**. (ie you can't ask it anything, won't pass Turing test)



Chatbot Design



Chatbot Design Issues and Terminology



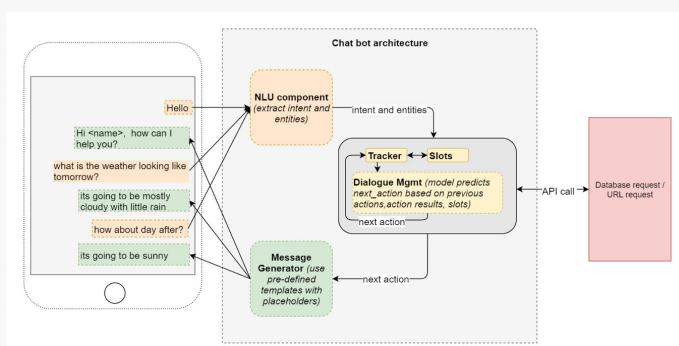
Finite State Machine

Free Flow

- **Grounding** is acknowledging to your user that you understood what was just said.
- **Slot Filling:** When a user asks for something, it's possible that the **bot doesn't have enough information** from the user to process the request -> conversational context
- **Initiative:** Generally if person A is asking person B a question then person A has the initiative.
- Changing of subject is called **context switching**: "You know what? I hate travelling. Can you suggest a restaurant?"
- **Finite State Machines** -> **inflexible** conversations
- **Goal based:** figuring out intent (**goal**) of a **sequence of user statements**
- **Beliefs:** not fully knowing what the user is saying



Your Chatbot Design



Options:

1. Write all the code yourself
 2. Write your code, but also use cloud service
 3. Outsource your chatbot to someone else
 4. Hire a third party to develop your chatbot using methods 1 or 2



Example of a Cloud based API Service

The Google Cloud Platform

- **Computing & Hosting**
 - **Storage & Networking**
 - **Big Data**
 - **Machine Learning**



Example of a Cloud based API Service

The Google Cloud Platform

- Computing & Hosting
- Storage & Networking
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- Machine Learning



Advantages of Cloud (eg GCP) for Machine Learning vs Do it Yourself



Build **Stronger Proofs of Concept**
 (eg high compute power)



Go **Faster** from Concept to M.V.P.
 (difficult code is already there)



Train your models faster and on
larger data sets. (this is big!)



Only pay for actual usage
 (scale)



Set up systems with no start-up costs
(freemium)



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May cost more when the system becomes large:

Speech Recognition API Monthly Pricing

Speech Source	0 – 60 min	60 – 1,000,000 min
Sound File	Free	\$ 0.006 / 15 sec
Video File	Free	\$ 0.012 / 15 sec



Example: Dialog Flow



DialogFlow

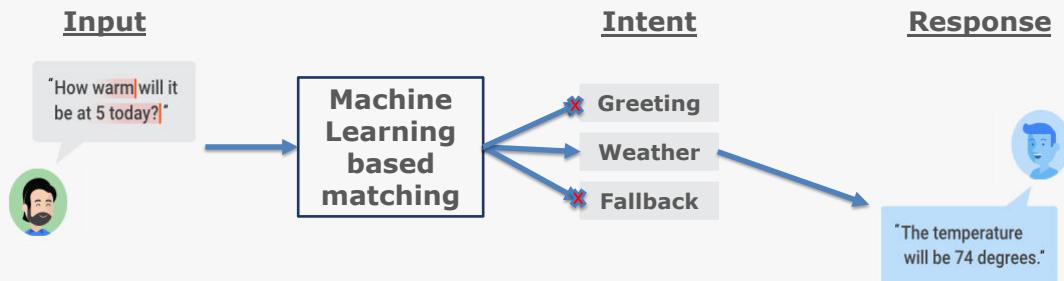
What it can do

**Dialogflow is an intuitive and streamlined way
of building smart chatbots to interact with
your clients.**



DialogFlow

How it works



DialogFlow Intents

The screenshot shows the DialogFlow Intent configuration interface. At the top, there's a section for 'Name' with a 'SAVE' button. Below it is a 'Training phrases' section with a search bar labeled 'Search in user says'. There are three examples listed: 'name', 'Do you have a name?', and 'What is your name?'. Underneath is a 'Action & parameters' section with a dropdown arrow. Below that is a 'Responses' section with a dropdown arrow. It shows two response variants under 'Text response': '1 My name is Dialogflow.' and '2 Enter a text response variant'. The interface has tabs for 'DEFAULT' and 'GOOGLE ASSISTANT'.



Integration Into Your Projects

- Exists in **7 different languages**
- Integrate an ML API in **5 steps:**
 1. Create a Google Cloud account
 2. Create a project
 3. pip-install the API
 4. Enable the API
 5. Set up the API Credentials



Google Cloud



DialogFlow

Features and Capabilities

- Integrates across **14 platforms**
- Works on **any device**
- Understands over **20 languages**
- Integrates with **Google Cloud**
- Improves with time and experience



An Example Project

A Data Driven Customer Service Chatbot – Part 1

	Step 1: Collect Data	Step 2: Set-up the Bot	Step 3: Performance Analytics
Action	<ul style="list-style-type: none"> • Transcribe Customer Service Calls • Extract your FAQ into a text file 	<ul style="list-style-type: none"> • Parse the data with <i>Knowledge Connectors</i> to automatically create intents and training phrases • Complete them manually 	<ul style="list-style-type: none"> • Analyze Chat Bot response performance • Measure Customer Happiness
Google Cloud	Natural Language API	Dialogflow	Natural Language API & Dialogflow



An Example Project

A Data Driven Customer Service Chatbot – Part 2

	Step 4: Guided Counceling	Step 5: Let'em Talk!	Step 6: Video Counceling
Action	<ul style="list-style-type: none"> Recognize customer's screenshots Use them to advise on next steps 	<ul style="list-style-type: none"> Recognize the customer's recorded voice messages Transcribe them to text 	<ul style="list-style-type: none"> Recognize your customer's video of the issue Use it to advise on next steps
 Google Cloud	Vision API & Dialogflow	Speech to Text API & Dialogflow	Video API & Dialogflow



The Machine Learning Services

1. [**Dialogflow**](#)
2. [**Vision API**](#)
3. [**Video API**](#)
4. [**Speech API**](#)
5. [**NLP API**](#)
6. [**Additional Services**](#)
7. [**Lab: Label Images**](#)



Slide Set Appendix With Examples of Each Machine Learning Service

The Vision API

Data X

The Vision API

What it can do

- Automatically generate meta-data
- Extract text
- Detect inappropriate content
- Train a customized and scalable model
- Search internet for similar images
- Recognize handwriting
- Detect facial expressions
- Recognize products from catalog



The Vision API

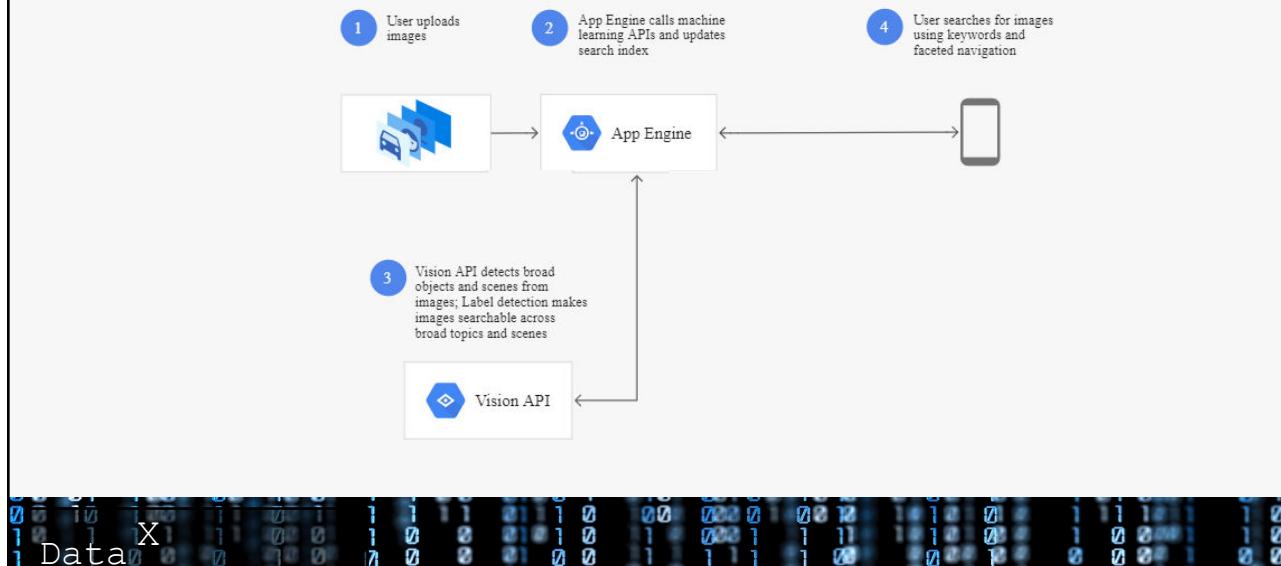
Pricing

FEATURE	PRICE PER 1,000 UNITS, BY MONTHLY USAGE		
	1–1,000 UNITS/MONTH	1,001–5,000,000 UNITS/MONTH	5,000,001–20,000,000 UNITS/MONTH
Label Detection	Free	\$1.50	\$1.00
Text Detection	Free	\$1.50	\$0.60
Safe Search (explicit content) Detection	Free	Free with Label Detection, or \$1.50	Free with Label Detection, or \$0.60
Facial Detection	Free	\$1.50	\$0.60
Landmark Detection	Free	\$1.50	\$0.60
Logo Detection	Free	\$1.50	\$0.60
Image Properties	Free	\$1.50	\$0.60
Crop Hints	Free	Free with Image Properties, or \$1.50	Free with Image Properties, or \$0.60
Web Detection	Free	\$3.50	Contact Google for more information
Document Text Detection	Free	\$1.50	\$0.60
Object Localizer	Free	\$2.25	\$1.50



The Vision AP

Use Case Example: Intelligent Image Search



The Vision API

Code Example: Label Detection

```
def detect_labels(path):
    """Detects labels in the file."""
    client = vision.ImageAnnotatorClient()

    with io.open(path, 'rb') as image_file:
        content = image_file.read()

    image = vision.types.Image(content=content)

    response = client.label_detection(image=image)
    labels = response.label_annotations
    print('Labels:')

    for label in labels:
        print(label.description)
```

Saving the annotation client in a variable

**Upload the image in binary mode
Save the image data in variable 'content'**

Where the magic happens

In 9 lines of code!



The Vision API



```
"rapid", "score": 0.88886356,  
"canoe slalom", "score": 0.88697785  
"kayak", "score": 0.86466473
```



```
"running", "score": 0.99803412,  
"marathon", "score": 0.99482006
```

The Video API

The Video API

What it can do

- Automatically generate labels
 - Detect entities present in video
 - Detect Scene changes
 - Detect explicit content
 - Transcribe videos in English

The Video API Pricing

FIRST 1000 MINUTES	MINUTES 1001-100,000
Label detection	
Free	\$0.10 / minute
Shot detection	
Free	\$0.05 / minute, or free with Label detection
SafeSearch detection	
Free	\$0.10 / minute

Data X

The Video API

Demo

<https://cloud.google.com/video-intelligence/#demo>



The Video API

Use Case Examples



Contextual Advertisements

You can identify appropriate locations in videos to insert ads that are contextually relevant to the video content. This can be done by matching the timeframe-specific labels of your video content with the content of your advertisements.



Recommended content

Build a content recommendation engine with labels generated by Cloud Video Intelligence and a user's viewing history and preferences. This will simplify content discovery for your users and guide them to the most relevant content that they want.



Media archives

Create an indexed archive of your entire video library by using the metadata from Cloud Video Intelligence. Ideal for mass media companies, Cloud Video Intelligence can automatically analyze content and make the results immediately accessible via the API.



The Speech to Text API

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The Speech-to-Text API

What it can do

- **Automatically recognize speech**
 - **Real time speech processing**
 - **Handle environment noise**
 - **Recognize 120 languages**
 - **Real time transcription**

Data X

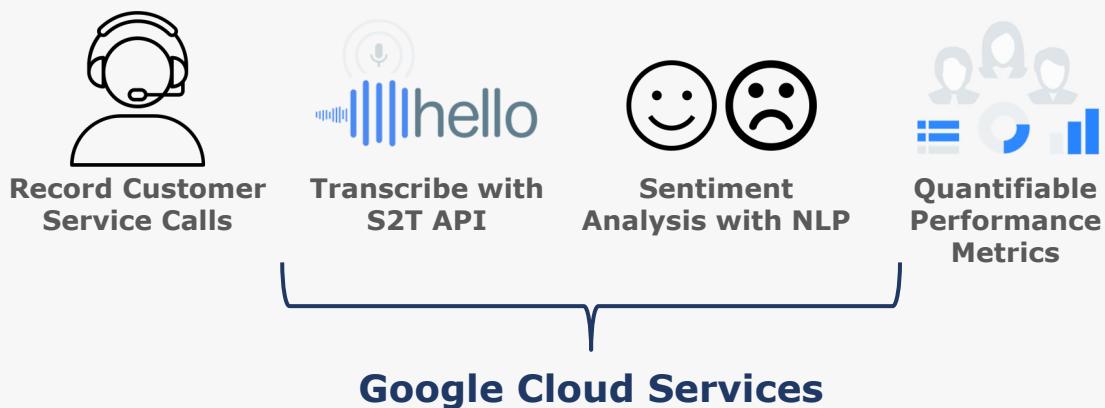
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The Speech to Text API Use Case Example: Measure the Quality of Customer Service



The NLP API

Data X

The NLP API

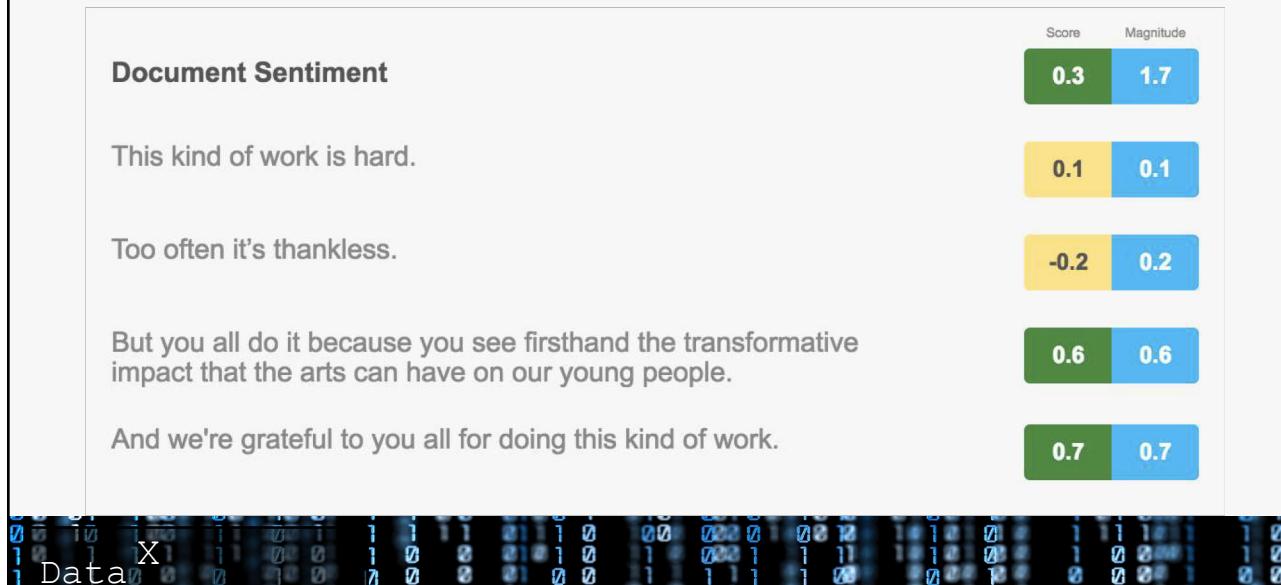
What it can do

- **Analyze syntax**
 - **Recognize entities (Person, organization, ...)**
 - **Sentiment Analysis**
 - **Classify documents according to content**
 - **Analyze multiple languages**

Data X

The NLP API

Sentiment Analysis



The NLP API

Pricing

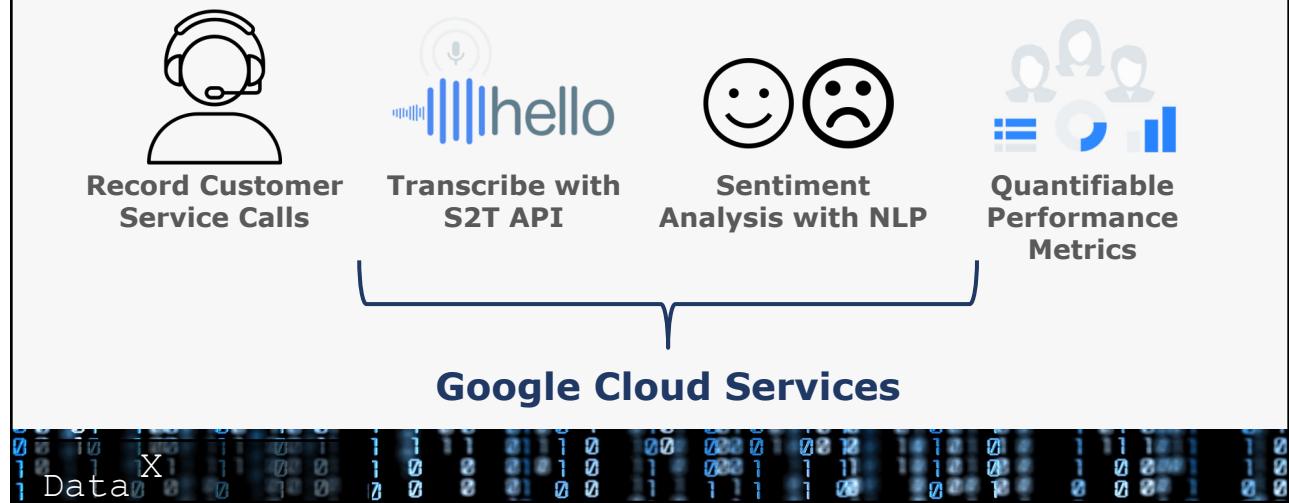
Feature	Price per 1,000 Units, by Monthly Usage			
	0 - 5K Units/Month	5K+ - 1M Units/Month	1M+ - 5M Units/Month	5M+ - 20M Units/Month
Entity Analysis	FREE	\$1.00	\$0.50	\$0.25
Sentiment Analysis	FREE	\$1.00	\$0.50	\$0.25
Syntax Analysis	FREE	\$0.50	\$0.25	\$0.125
Entity Sentiment Analysis	FREE	\$2.00	\$1.00	\$0.50

Feature	Price per 1,000 Units, by Monthly Usage			
	0 - 30K Units/Month	30K+ - 250K Units/Month	250K+ - 5M Units/Month	5M+ Units/Month
Content Classification	FREE	\$2.00	\$0.50	\$0.10



The NLP API

Use Case Example: Measure the Quality of Customer Service



NLP

```

"""Run a sentiment analysis request on text within a passed filename."""
client = language.LanguageServiceClient()

with open(movie_review_filename, 'r') as review_file:
    # Instantiates a plain text document.
    content = review_file.read()

document = types.Document(
    content=content,
    type=enums.Document.Type.PLAIN_TEXT)
annotations = client.analyze_sentiment(document=document)

# Print the results
score = annotations.document_sentiment.score
magnitude = annotations.document_sentiment.magnitude
print('Overall Sentiment: score of {} with magnitude of {}'.format(
    score, magnitude))
    
```



Other Services



Other Services

Google Cloud also offers:

- Automatic translation with [Cloud Translation](#)
- Smarter hiring with [Cloud Talent Solution](#)

And if you want to build your models yourself, Google Cloud also allows you to access its state of the art computing capabilities.



Summary

Why use Google Cloud?

- Predictive Power (amount of data + compute power)
 - Ease of use – little coding required

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Tutorials

- **Sentdex Video Tutorials on Google Cloud API:**
<https://www.youtube.com/playlist?list=PLQVvaa0QuDfGVb3yucqvKtUgwOJgZWCM>
 - **Yufeng G:** <https://towardsdatascience.com/getting-started-with-automl-vision-alpha-ba769121235c>

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