CIO Connect Data Science Master Class
From Data Strategy to Implementation
Hong Kong, September 2018

Ikhlaq Sidhu
Chief Scientist & Founding Director, Sutardja Center
IEOR Emerging Area Professor Award
UC Berkeley

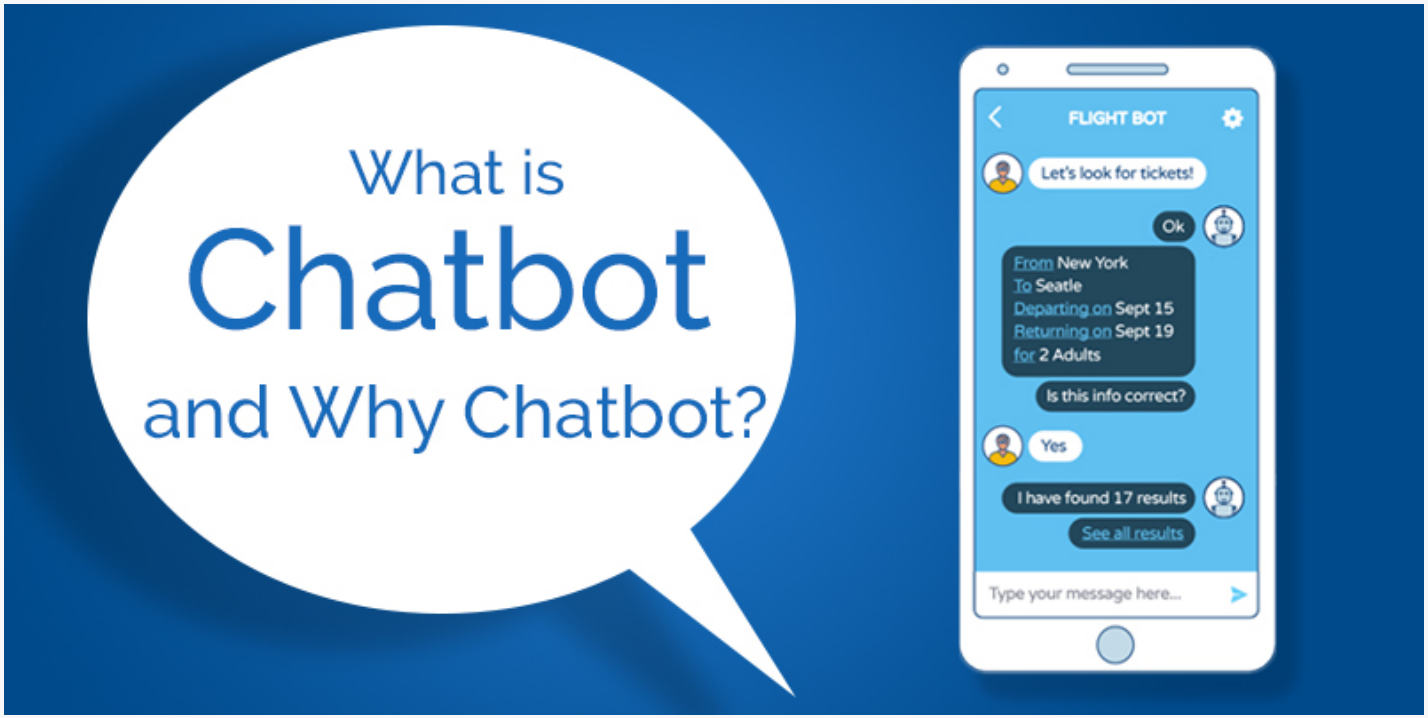
Data X

How to Design and build a Chatbot

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

Ikhlaq Sidhu
Founding Faculty Director, Sutardja Center for Entrepreneurship & Technology
IEOR Emerging Area Professor Award, UC Berkeley

Thomas Ferry
Data X Lab
Sutardja Center for Entrepreneurship & Technology
UC Berkeley

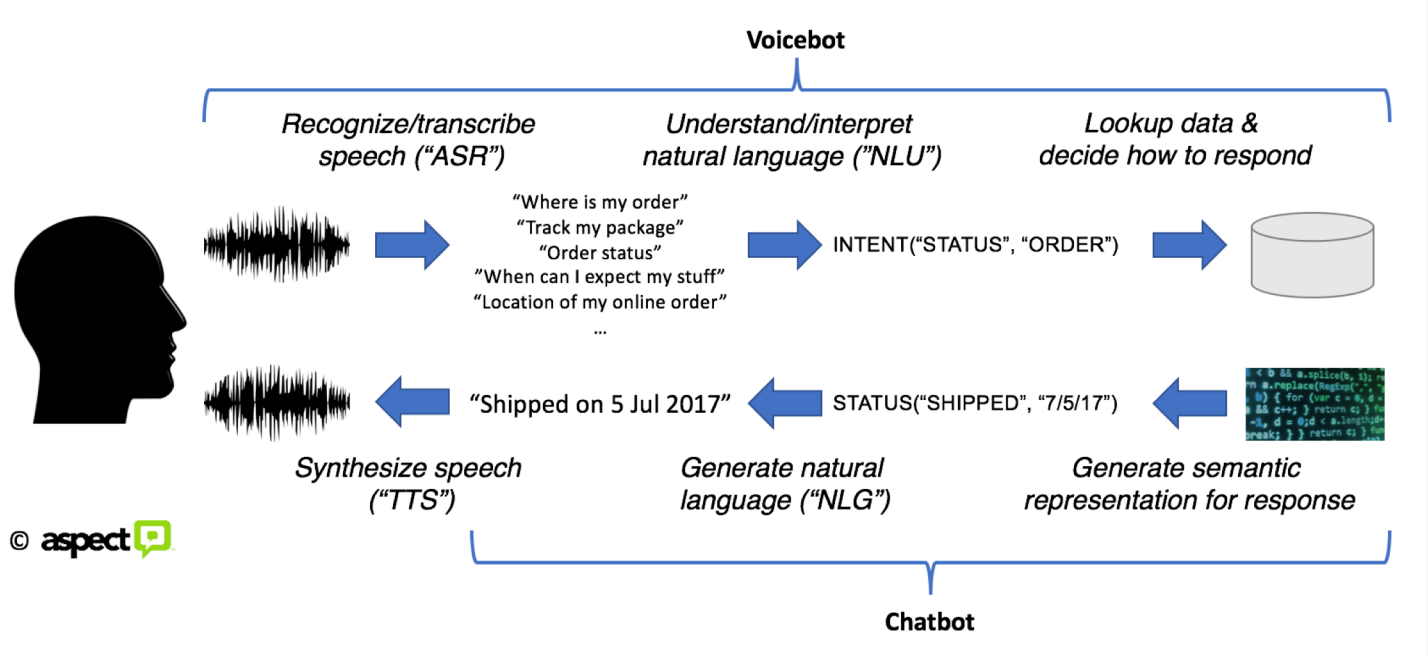


- Text or voice interface to any customer
- People like to chat: 18B text/day, 60B WhatsApp/Messenger
- Uses AI or ML to make communication natural

How Does a Basic Chatbot Work – Basic Architecture

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

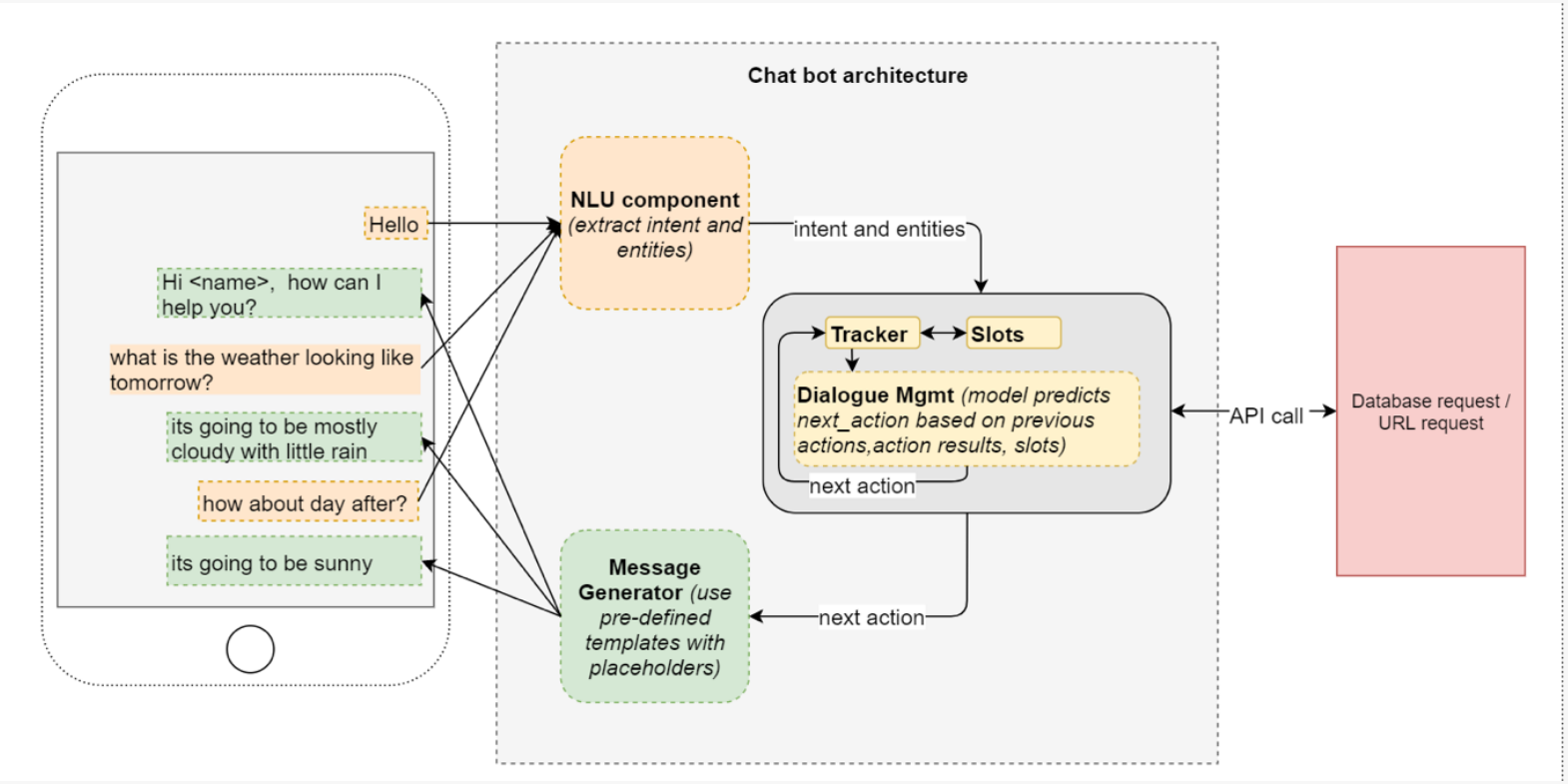
How Does a Basic Chatbot Work – Basic Architecture



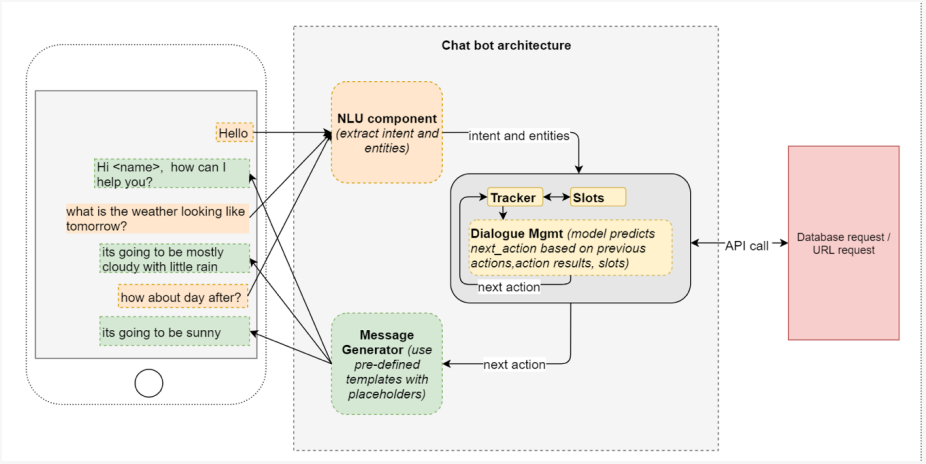
Notes:

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

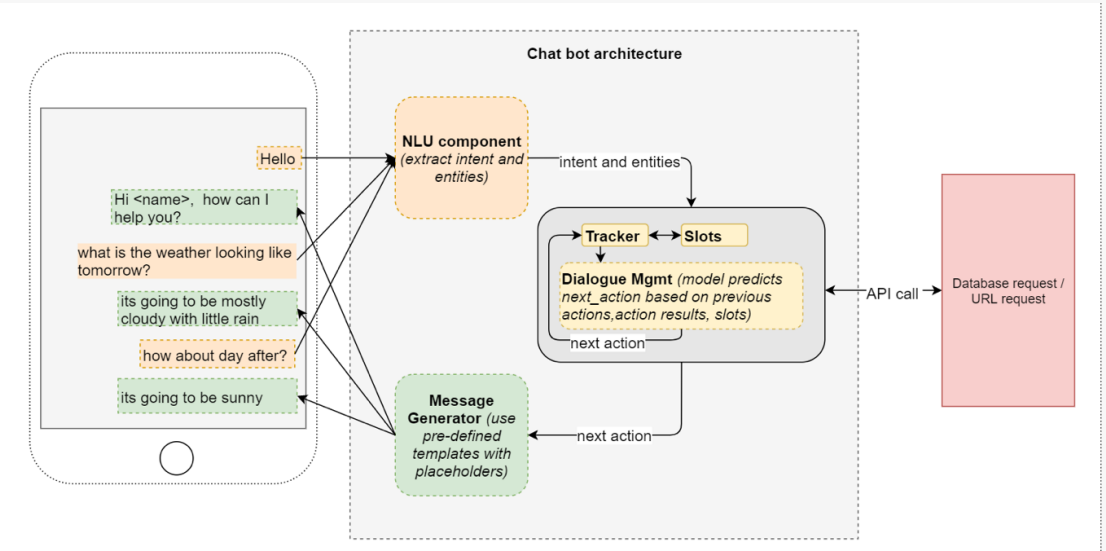


Free Flow

Finite State Machine

- **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) if 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

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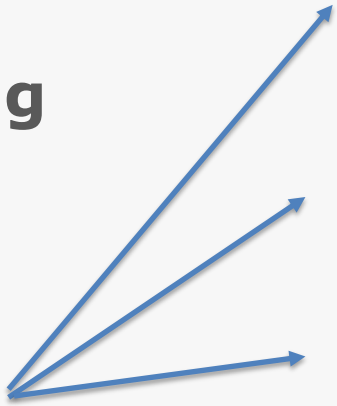

1. Dialogflow
2. Vision API
3. Video API
4. Speech API
5. NLP API
6. Additional Services
7. Lab: Label Images

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

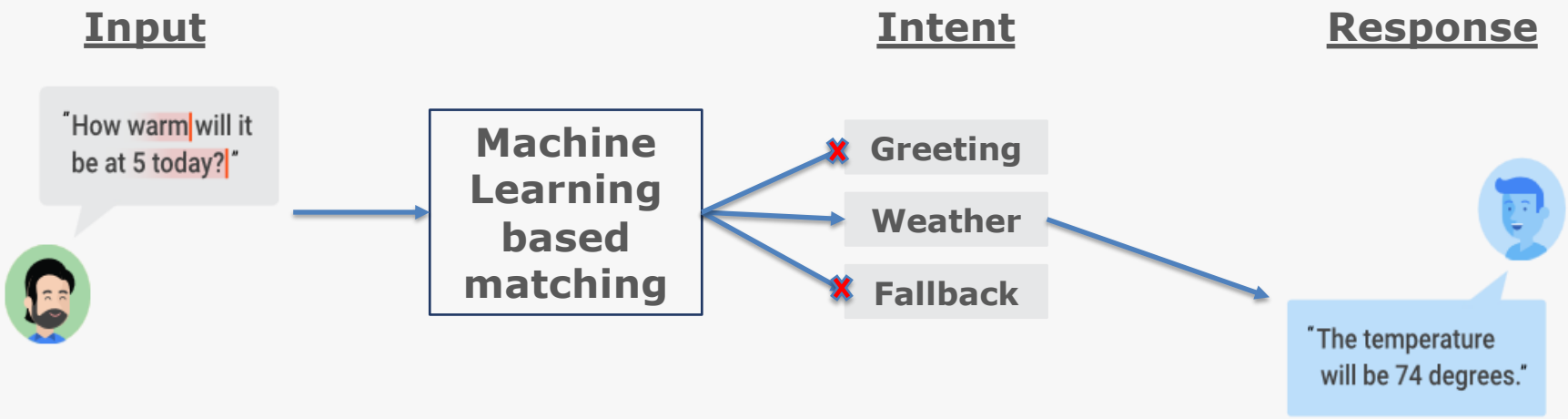
Speech Source	0 – 60 min	60 – 1,000,000 min
Sound File	Free	$ 0.006 / 15 sec
Video File	Free	$ 0.012 / 15 sec

Example: Dialog Flow

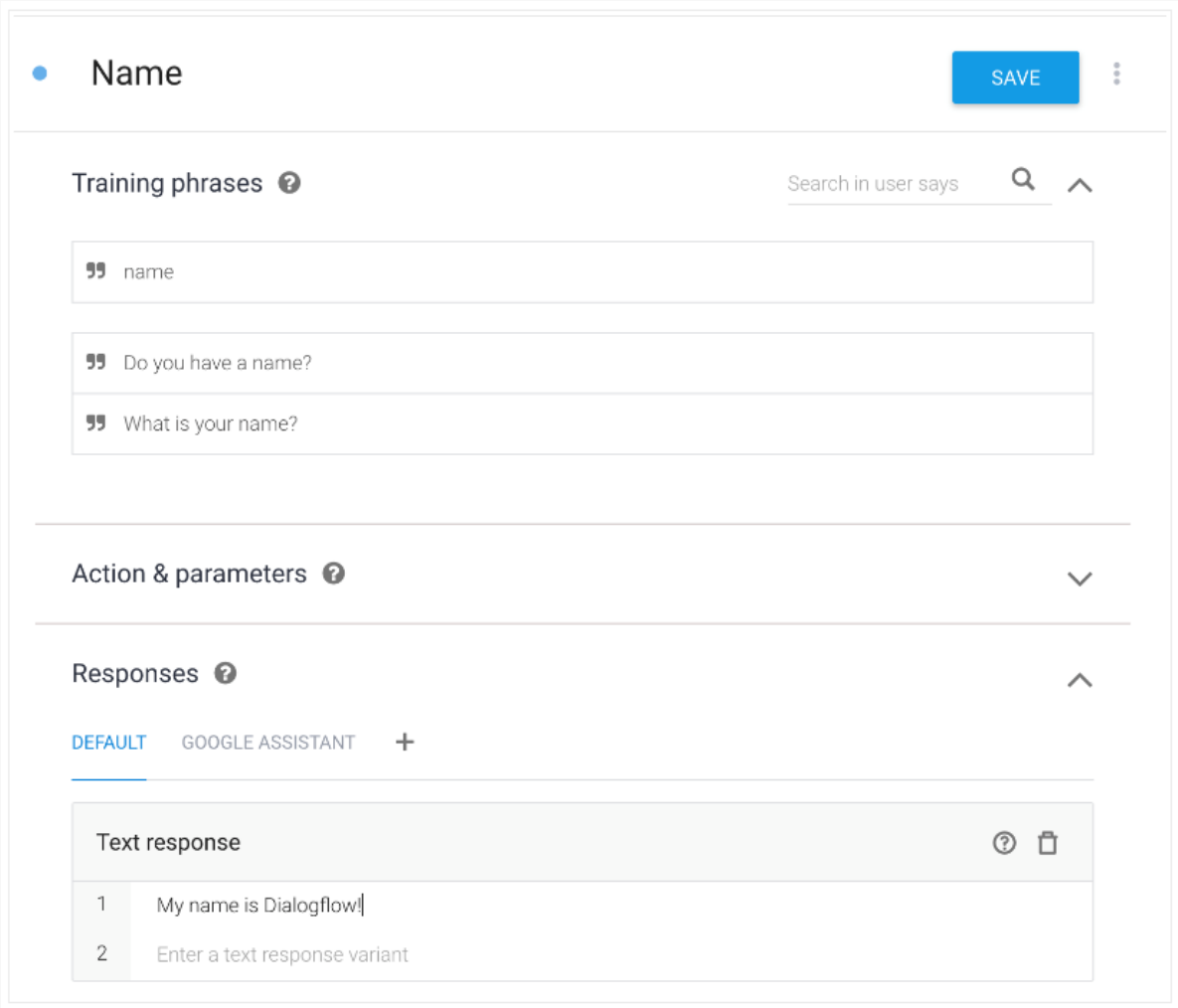
DialogFlow
What it can do

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

DialogFlow
How it works



DialogFlow Intents



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

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	• Transcribe Customer Service Calls • Extract your FAQ into a text file	• Parse the data with *Knowledge Connectors* to automatically create intents and training phrases • Complete them manually	• 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	• Recognize customer's screenshots • Use them to advise on next steps	• Recognize the customer's recorded voice messages • Transcribe them to text	• 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

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

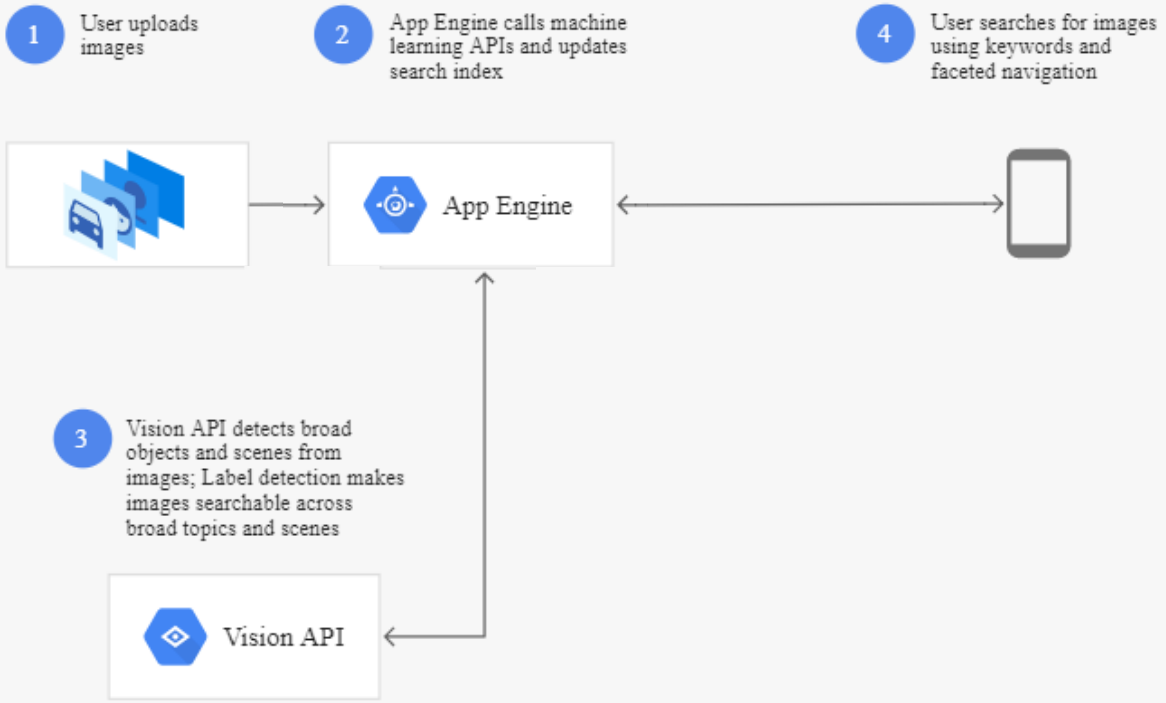
The Vision API

Pricing

	PRICE PER 1,000 UNITS, BY MONTHLY USAGE		
FEATURE	1–1,000 UNITS/MONTH	1001–5,000,000 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 API

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 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

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

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

The Speech to Text API
Pricing

Speech Recognition API Monthly Pricing

Speech Source	0 – 60 min	60 – 1,000,000 min
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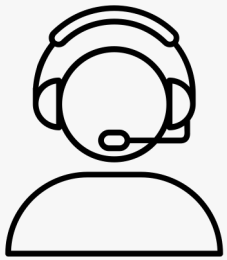
The Speech to Text API

Use Case Example: Measure the Quality of Customer Service



Record Customer Service Calls

Transcribe with S2T API

Sentiment Analysis with NLP

Quantifiable Performance Metrics

Google Cloud Services

The NLP API

The NLP API
What it can do

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

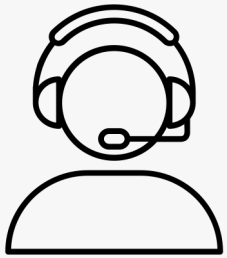
The NLP API
Pricing

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



Record Customer Service Calls

Transcribe with S2T API

Sentiment Analysis with NLP

Quantifiable Performance Metrics

Google Cloud Services

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 Could 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.

Lab: Label Images

How to Integrate Google Cloud to Your Project

Video

https://cloud.google.com/video-intelligence/docs/tutorials