# MACHINE LEARNING DESDE CERO CON PYTHON HASTA EL DESPLIEGUE EN GOOGLE CLOUD

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# Juan Guillermo Gómez

<vanity>

- Co-Leader y Co-Founder del GDG Cali.
- CEO DevHack.
- Consultant and advisor on software architecture, cloud computing and software development.
- Experience in several languages and platforms. (C, C#, Java, NodeJS, android, GCP, Firebase).
- Google Developer Expert (GDE)  in Firebase
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# Aprendizaje Continuo

- Autodidacta.
- Asiste a eventos
- Investiga.
- Práctica.
- Coding.
- Comparte
- Pierde el miedo.


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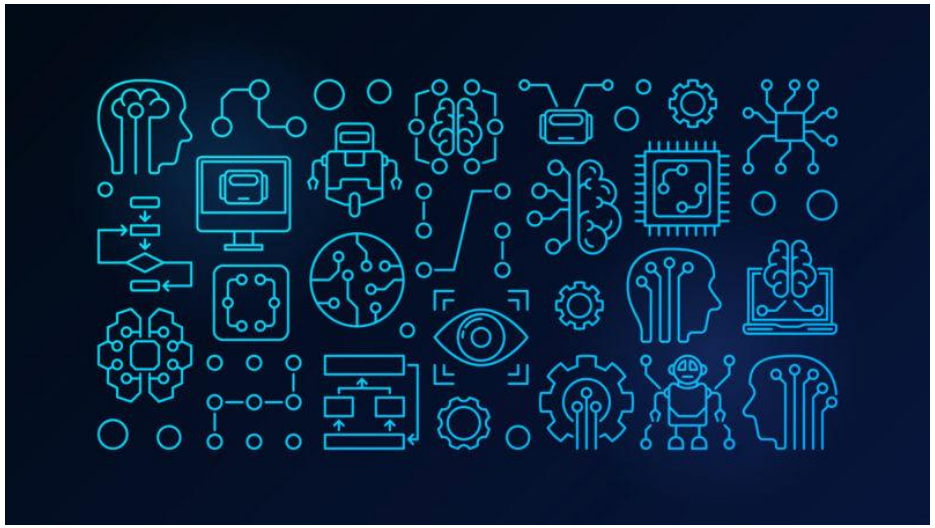
# Machine Learning

- Learning is any process by which a system improves performance from experience (data).
- Machine Learning is concerned with computer programs that automatically improve their performance (predictions) through experience.

**Hebert Alexander Simon**



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# Why now?

- Flood of available data.
- Increasing computational power.
- Growing progress in avalaible algorithms and theory developed by researchers.
- Increasing support from industries.
- Machine Learning is concerned with computer programs that automatically improve their performance through experience.


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# ML Applications


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# Where I Start?

## APIs

### Cloud Vision API

#### Powerful image analysis

Cloud Vision API enables you to derive insight from your images with our powerful pretrained API models or easily train custom vision models with AutoML Vision Beta. The API quickly classifies images into thousands of categories (such as “sailboat” or “Eiffel Tower”), detects individual objects and faces within images, and finds and reads printed words contained within images. AutoML Vision lets you build and train custom ML models with minimal ML expertise to meet domain-specific business needs.

### Cloud Speech-to-Text

#### Speech recognition across 120 languages

Cloud Speech-to-Text enables developers to convert audio to text by applying neural network models in an easy-to-use API. The API recognizes 120 languages and variants, to support your global user base. You can enable voice command-and-control, transcribe audio from call centers, and more. It can process real-time streaming or prerecorded audio, using Google’s machine learning technology.

LEARN MORE ABOUT CLOUD SPEECH-TO-TEXT

# Where I Start?

## APIs

### Cloud Natural Language API

#### Multimedia and multi-language processing

Cloud Natural Language API reveals the structure and meaning of text by offering powerful machine learning models in an easy-to-use REST API. And with AutoML Natural Language Beta you can build and train ML models easily, without extensive ML expertise. You can use Natural Language to extract information about people, places, events, and much more mentioned in text documents, news articles, or blog posts. You can also use it to understand sentiment about your product on social media or parse intent from customer conversations happening in a call center or a messaging app.

LEARN MORE ABOUT CLOUD NATURAL LANGUAGE

### Cloud Video Intelligence API

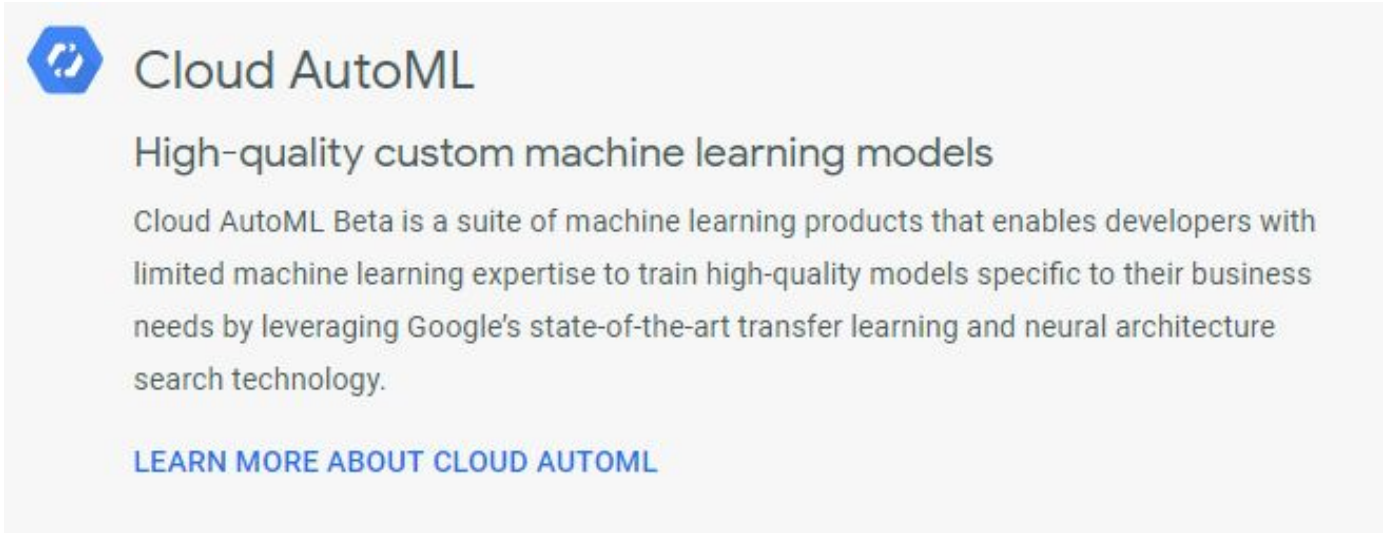
#### Precise video analysis — down to the frame

Cloud Video Intelligence API makes videos searchable and discoverable by extracting metadata, identifying key nouns, and annotating the content of the video. By calling an easy-to-use REST API, you can now search every moment of every video file in your catalog and find each occurrence of key nouns as well as its significance. Separate signal from noise by retrieving relevant information by video, shot, or frame.

LEARN MORE ABOUT CLOUD VIDEO INTELLIGENCE API

# Where I Start?

## APIs

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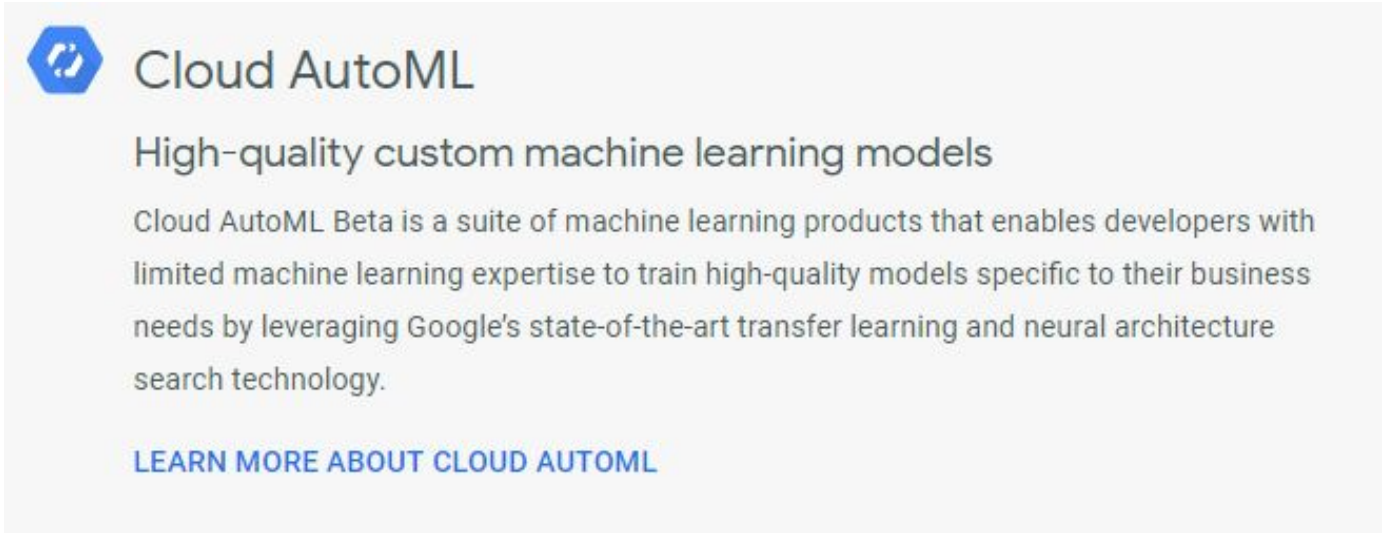
# Where I Start?

## APIs

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# Where I Start?

## Improve your contact center with AI

Designed to work with existing contact center technology, Contact Center AI makes it easy to train an AI model to interact with customers and provide insightful direction for agents. The result? A more personalized, intuitive customer care experience from the first "Hello."

### Smarter agent tools and at-the-ready resources

When calls are forwarded to a live agent, Agent Assist presents machine-learning-driven insights, helping the agent provide personalized and relevant upsells.

### Faster insights into your customer data

Bring the best of Google AI to every call. Improve customer service experience in your contact center through call automation, AI-powered assistance to human agents, and powerful analytics for business analysts and managers.

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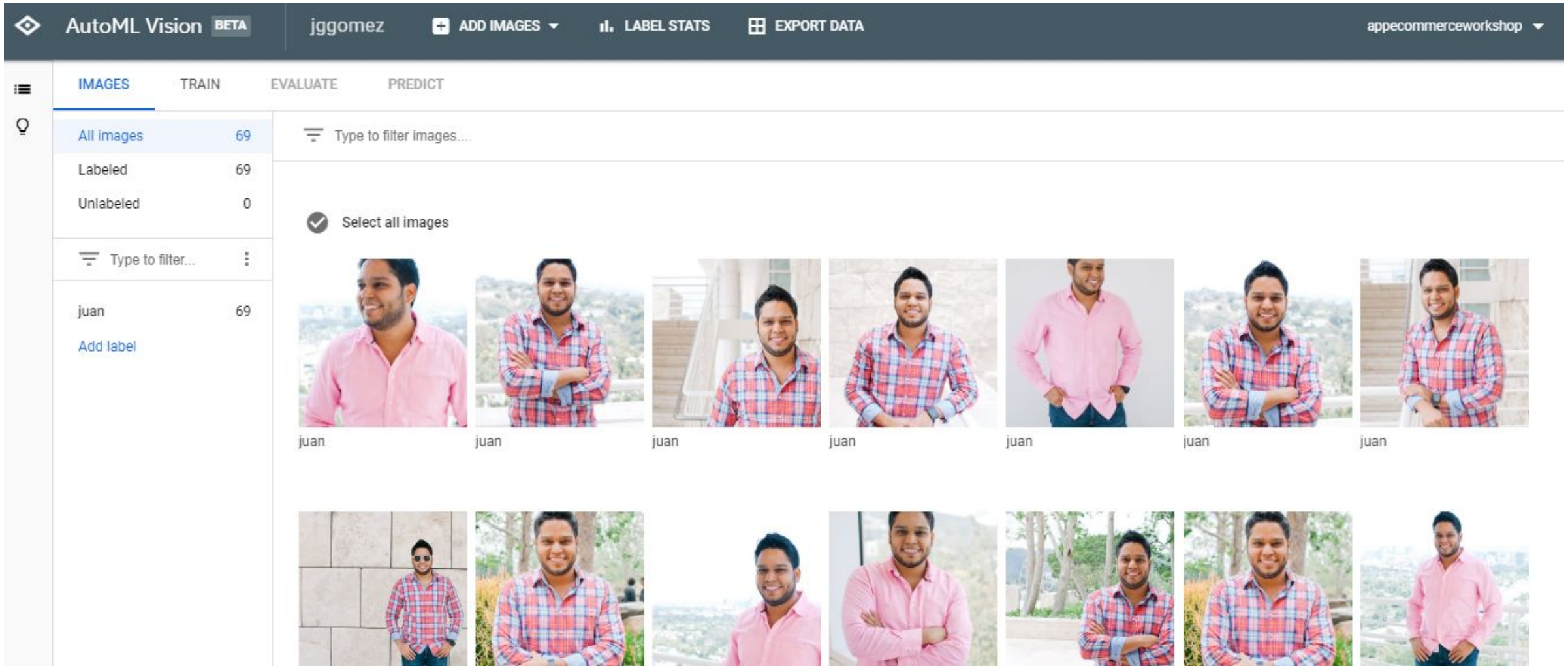
# Where I Start?

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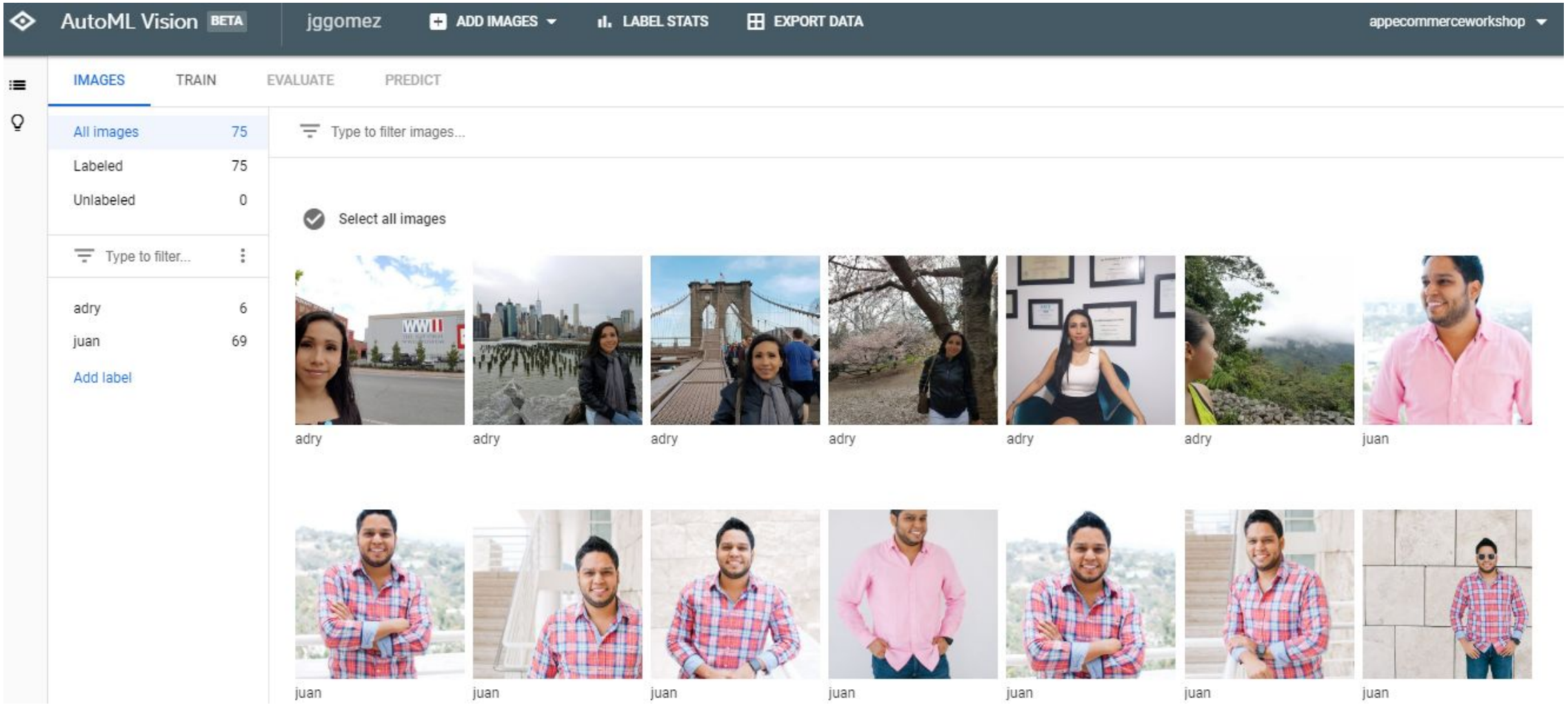


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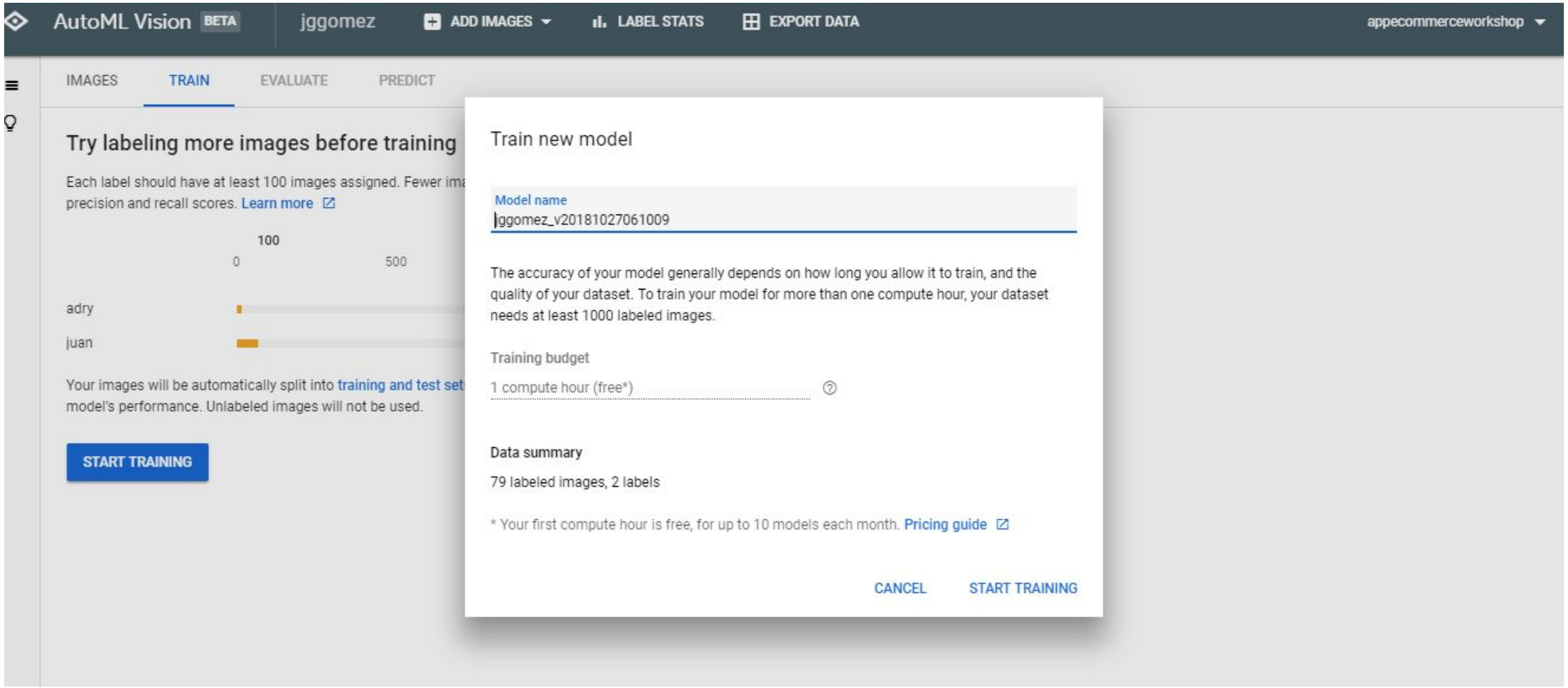


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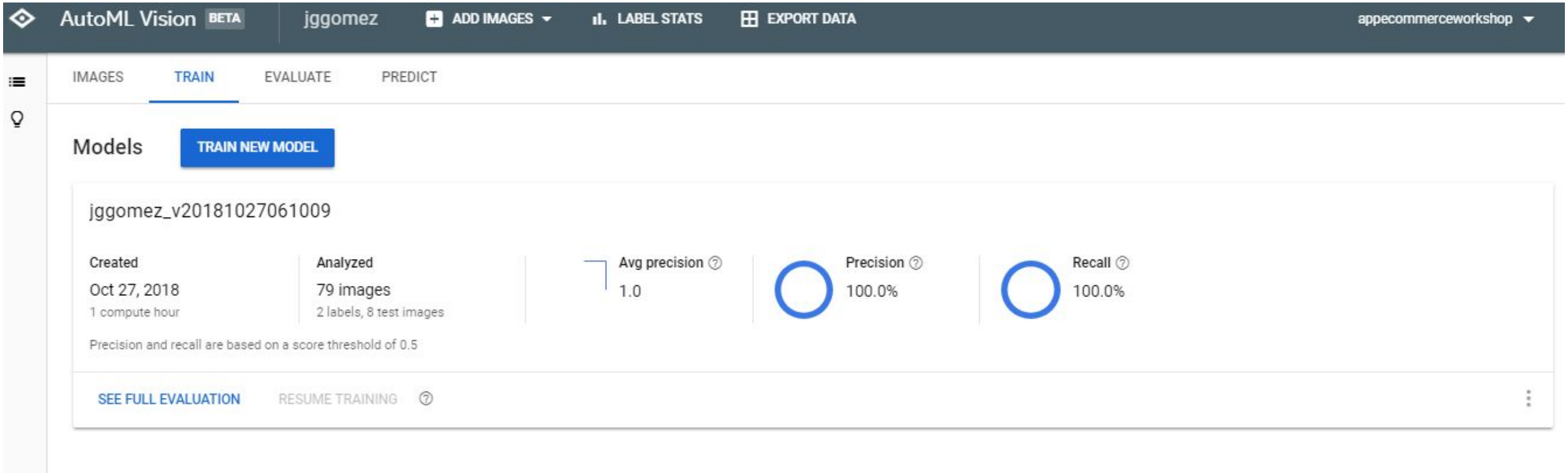


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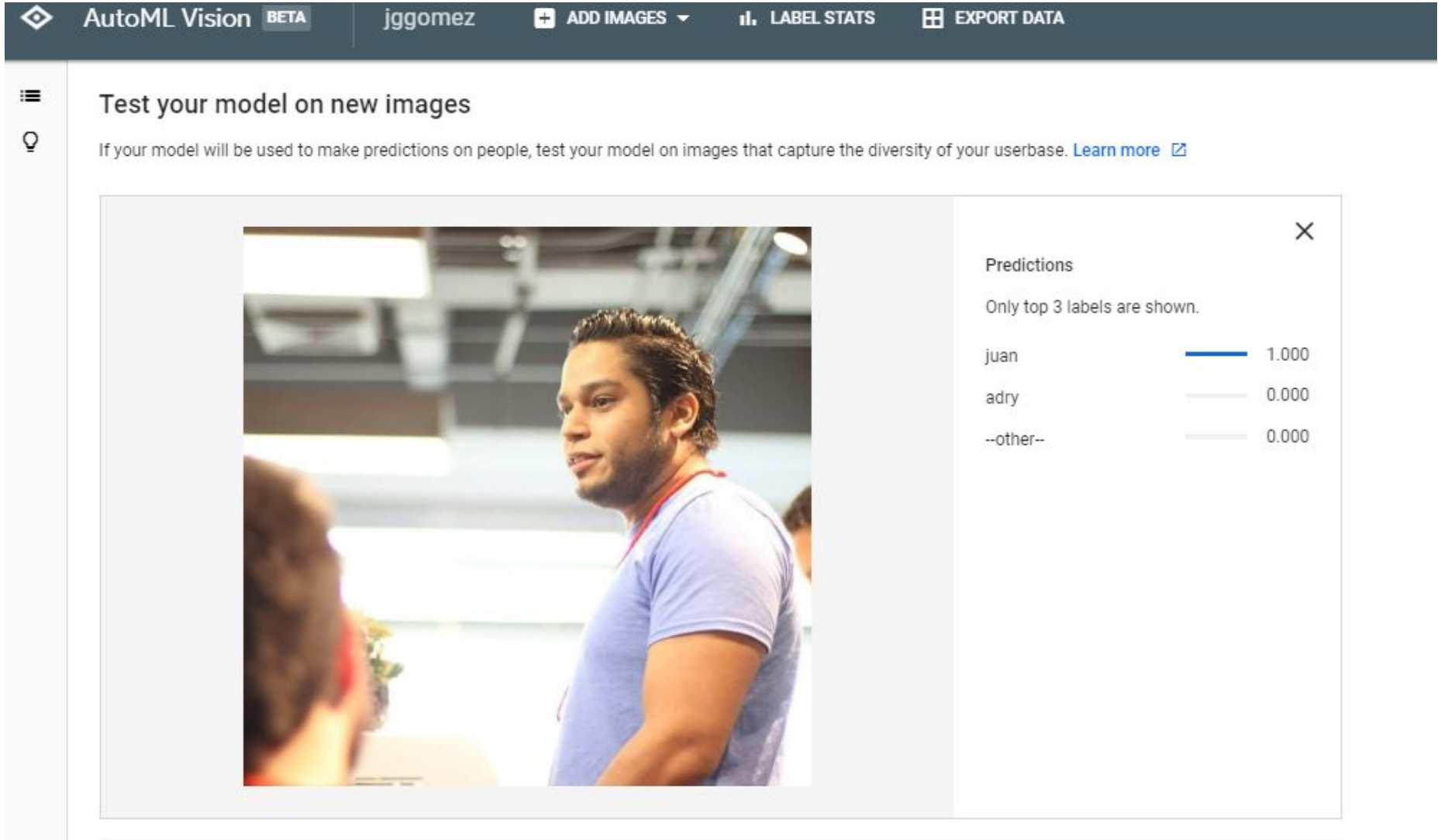


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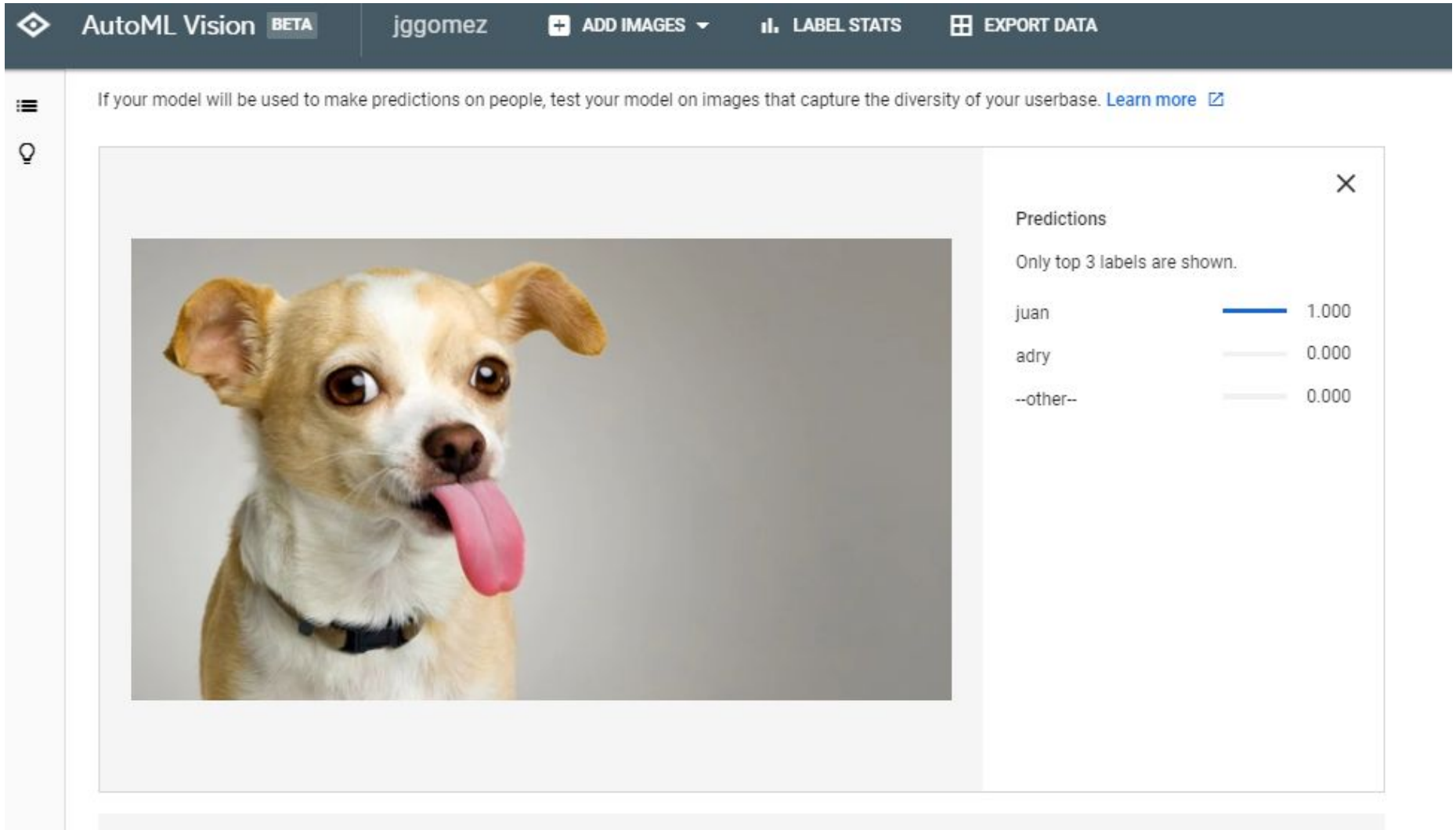


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# Where I Start?

REST API | PYTHON

predict.py

```
import sys

from google.cloud import automl_v1beta1
from google.cloud.automl_v1beta1.proto import service_pb2


def get_prediction(content, project_id, model_id):
  prediction_client = automl_v1beta1.PredictionServiceClient()

  name = 'projects/{}/locations/us-central1/models/{}'.format(project_id, model_id)
  payload = {'image': {'image_bytes': content }}
  params = {}
  request = prediction_client.predict(name, payload, params)
  return request  # waits till request is returned

if __name__ == '__main__':
  file_path = sys.argv[1]
  project_id = sys.argv[2]
  model_id = sys.argv[3]

  with open(file_path, 'rb') as ff:
    content = ff.read()

  print get_prediction(content, project_id,  model_id)
```

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# Where I Start?

## ML Kit for Firebase

What features are available on device or in the cloud?

| Feature | On-device | Cloud |
| --- | --- | --- |
| Text recognition | ✓ | ✓ |
| Face detection | ✓ | |
| Barcode scanning | ✓ | |
| Image labeling | ✓ | ✓ |
| Landmark recognition | | ✓ |
| Custom model inference | ✓ | |

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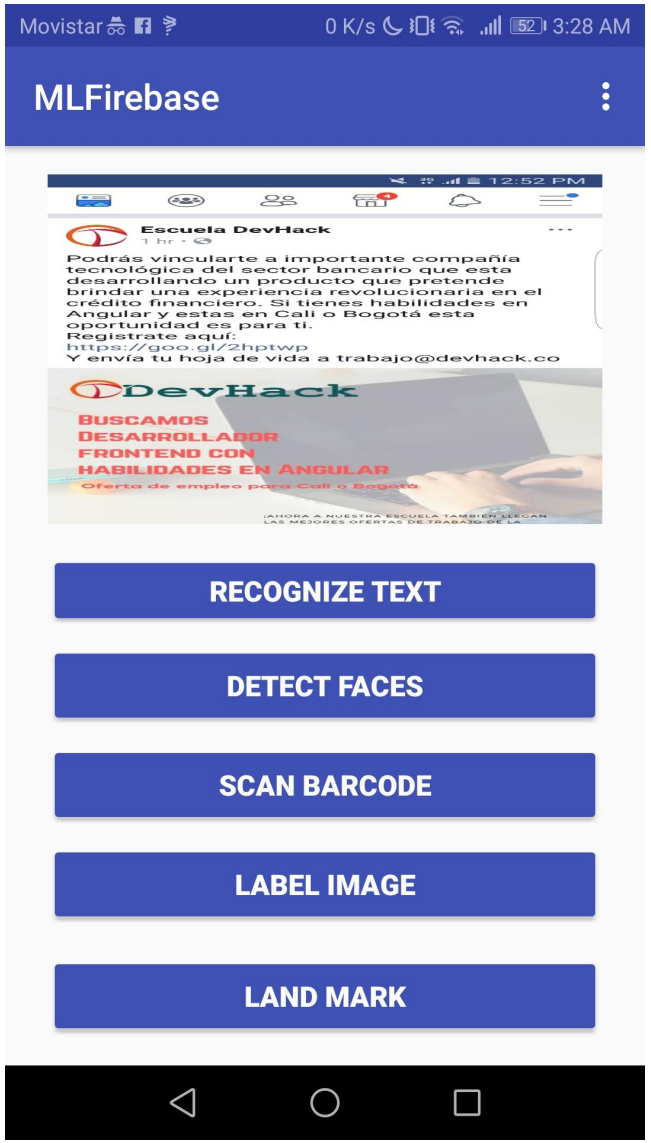
# Where I Start?




## ML Kit for Firebase

## https://github.com/jggomez/ml_kit_firebase

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# Model


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# Kind of Problems


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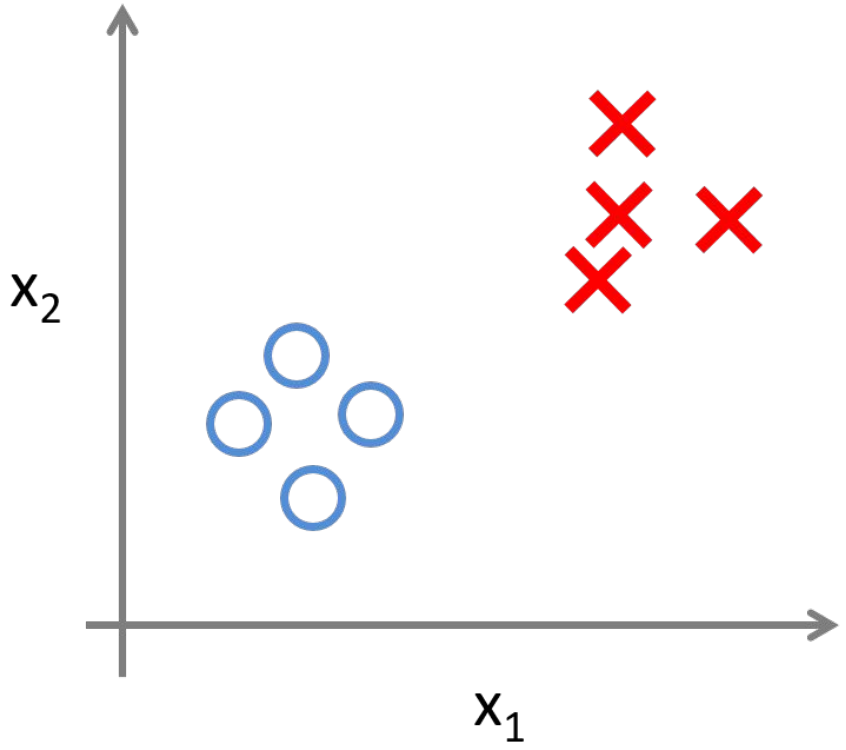
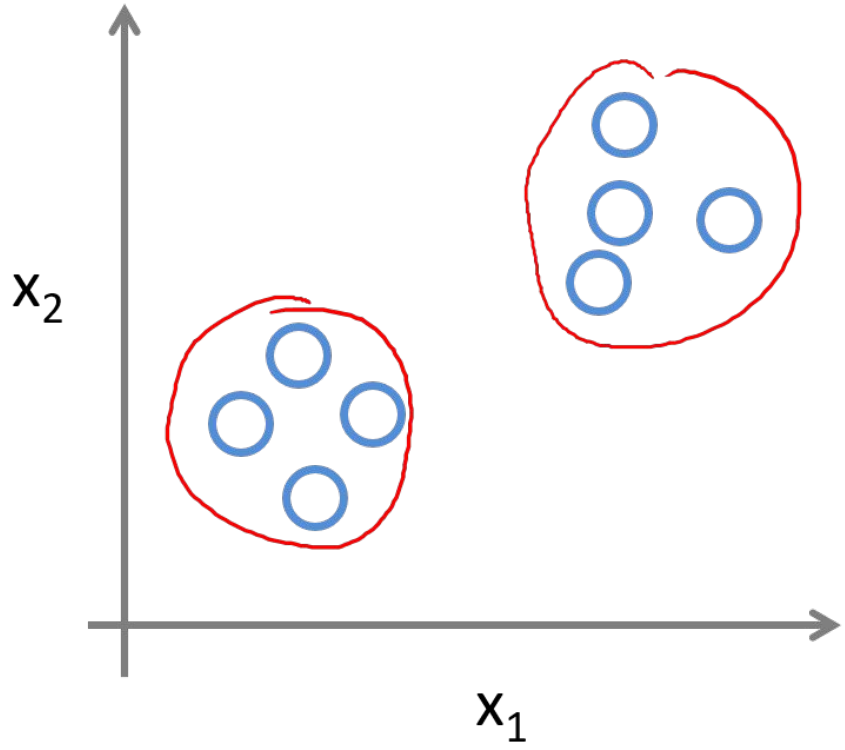
# Kind of Problems

## Supervised Learning




## Unsupervised Learning

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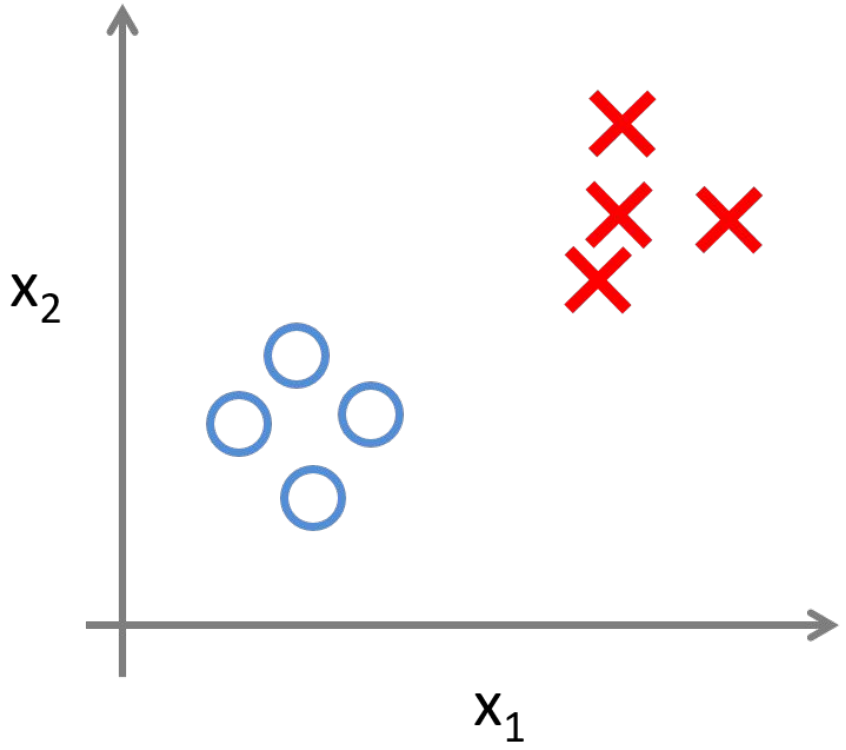
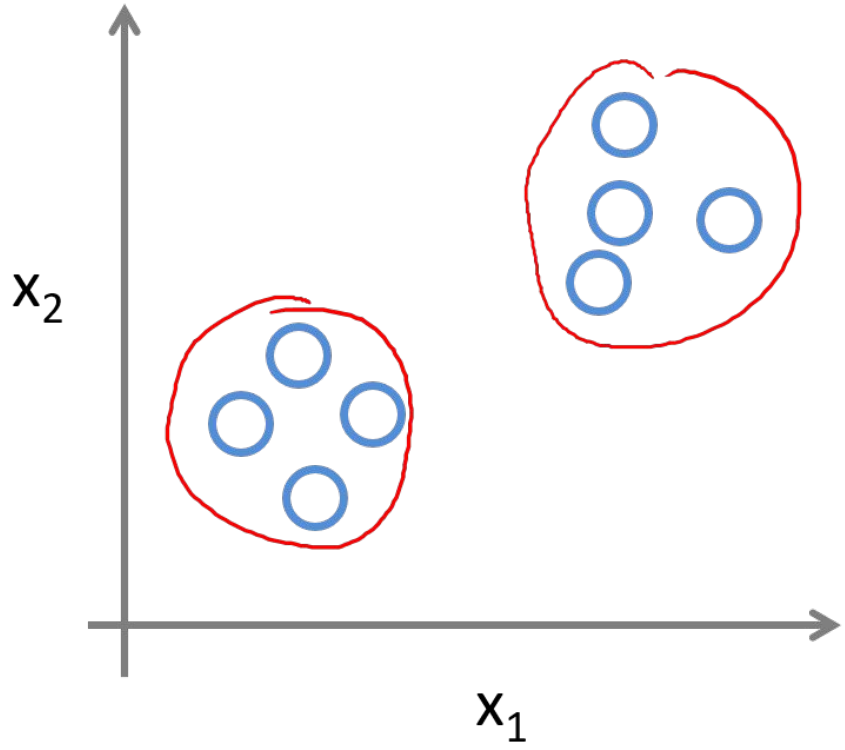
# Kind of Problems

## Supervised Learning




## Unsupervised Learning

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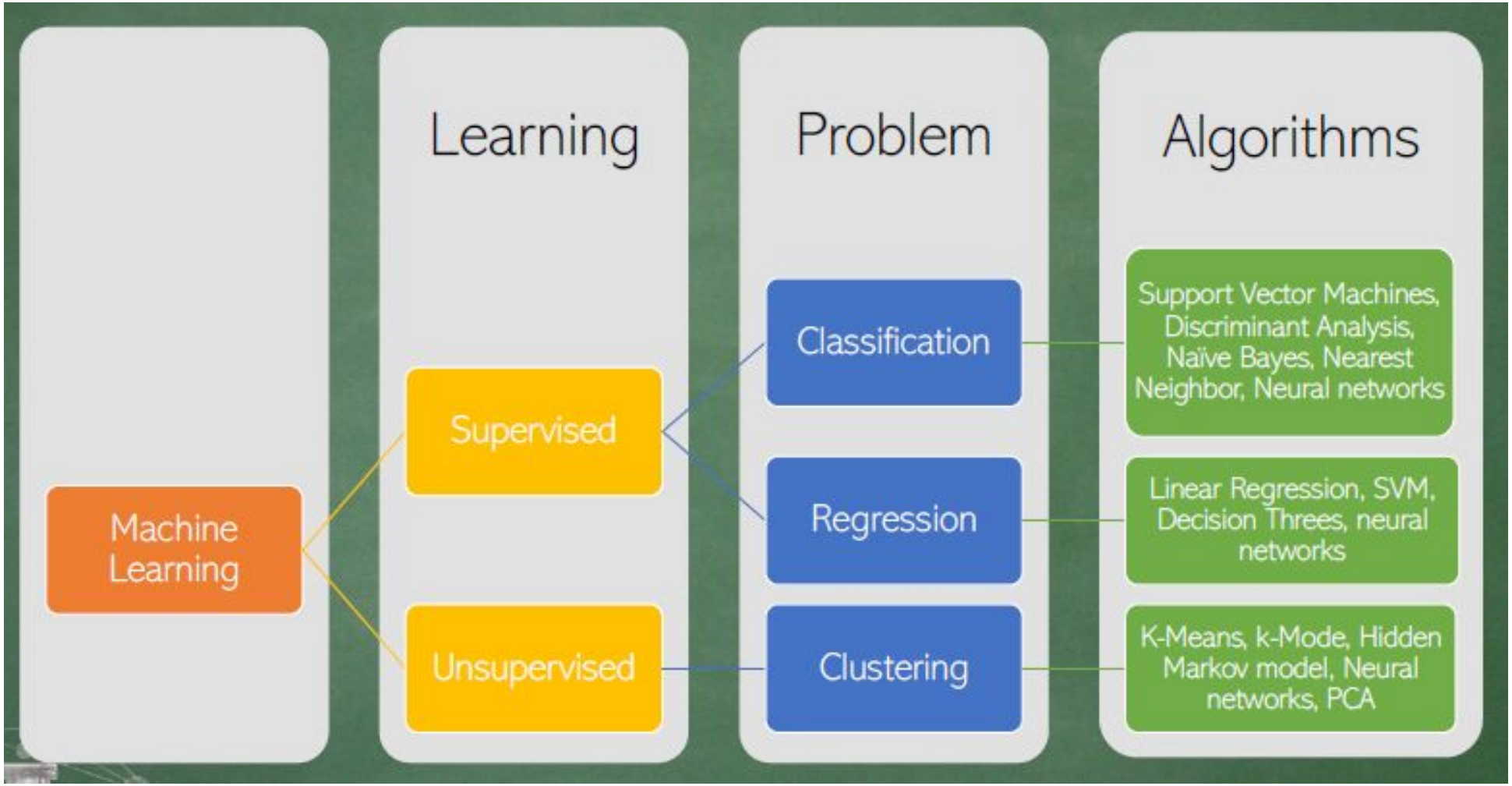
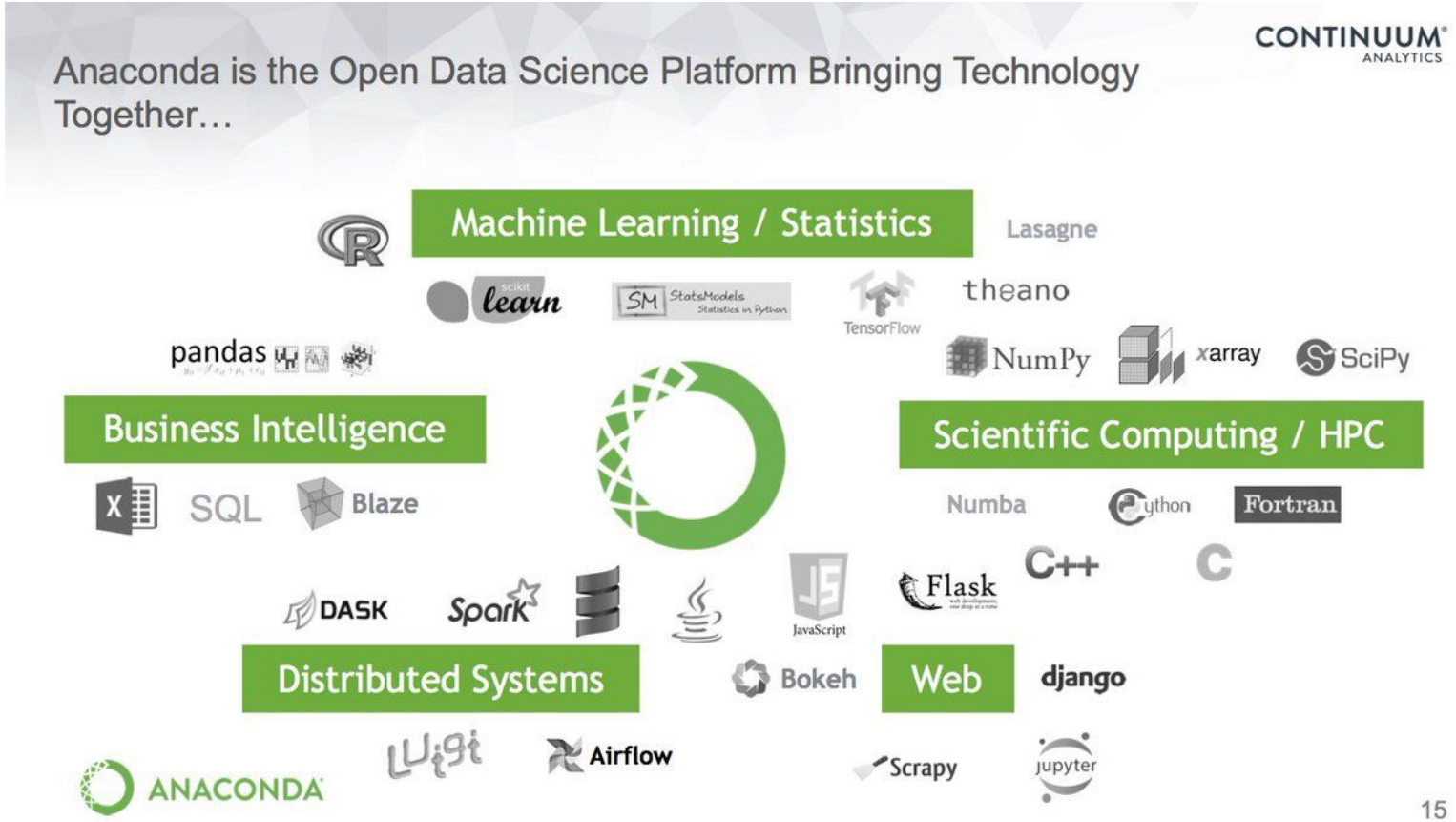
# Kind of Algorithms



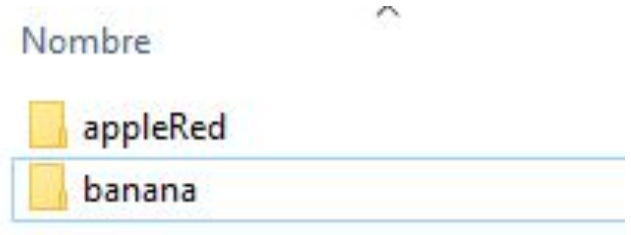
# Tools

ANACONDA®



# Tools - IDE - DATA - Libs

ANACONDA®


jupyter ClassifyFruits Last Checkpoint: 08/11/2018 (autosaved)

Logout

File Edit View Insert Cell Kernel Help Trusted Python 3

Run Code

In [31]:
```
import cv2
import urllib.request as req
from matplotlib import pyplot as plt
import numpy as np
import glob
import os
import pandas # visualization & transformation
from pandas.tools.plotting import scatter_matrix
import matplotlib.pyplot as plt
from sklearn import model_selection
from sklearn.metrics import classification_report
from sklearn.metrics import confusion_matrix
from sklearn.metrics import accuracy_score
from sklearn.linear_model import LogisticRegression
from sklearn.tree import DecisionTreeClassifier
from sklearn.neighbors import KNeighborsClassifier
from sklearn.discriminant_analysis import LinearDiscriminantAnalysis
from sklearn.naive_bayes import GaussianNB
from sklearn.svm import SVC
import pickle
import sklearn
print('The scikit-learn version is {}.'.format(sklearn.__version__))
```

```
The scikit-learn version is 0.19.2.
```

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# Tools - IDE - DATA - Libs

In [ ]:

In [8]:
```
DIR_DATA = "C:/Users/jggomez/Documents/MachineLearning/training_fruits"

data = []

def getFeaturesExtractionByClass(name, classId):
    classDir = os.path.join(DIR_DATA, name)
    for imageName in glob.glob("{}/*.jpg".format(classDir)):
        image = cv2.imread(imageName)
        image = cv2.cvtColor(image, cv2.COLOR_BGR2HSV)
        image = cv2.resize(image, (100, 100))
        (means, stds) = cv2.meanStdDev(image)
        stats = np.concatenate([means, stds])
        stats = np.append(stats, classId)
        data.append(stats.flatten())

getFeaturesExtractionByClass("Banana", 1)
getFeaturesExtractionByClass("AppleRed", 2)
#print(data)
```

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# Tools - IDE - DATA - Libs

In [10]:
```
## Standardize the Data
from sklearn.preprocessing import StandardScaler
features = ['c1', 'c2', 'c3', 'c4', 'c5', 'c6']
# Separating out the features
x = dataset.loc[:, features].values
# Separating out the target
y = dataset.loc[:,['class']].values
# Standardizing the features
x = StandardScaler().fit_transform(x)
```

In [ ]:
```
#PCA
from sklearn.decomposition import PCA
pca = PCA(n_components=2)
principalComponents = pca.fit_transform(x)
principalDf = pandas.DataFrame(data = principalComponents, columns = ['mc1', 'mc2'])
finalDf = pandas.concat([principalDf, dataset[['class']]], axis = 1)
```

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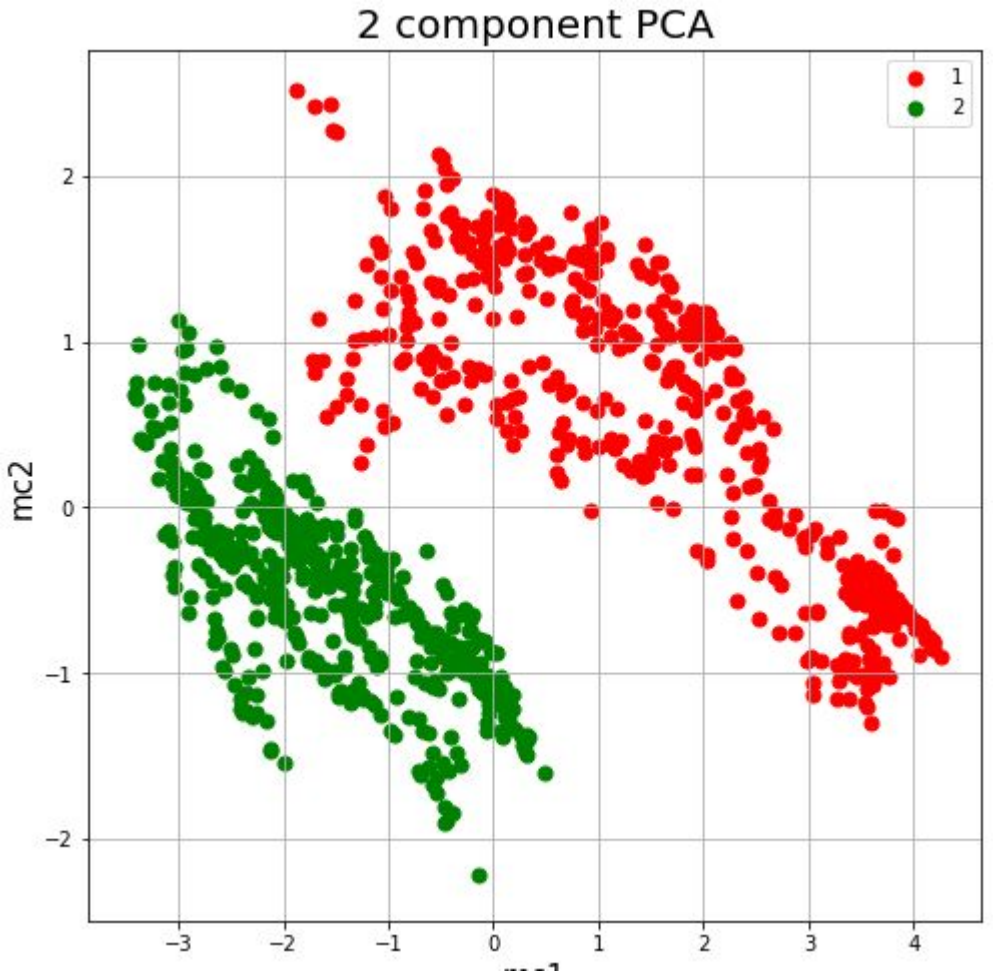
# Tools - IDE - DATA - Libs

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# Tools - IDE - DATA - Libs

In [14]:
```
# Spot Check Algorithms
models = []
models.append(('LR', LogisticRegression()))
models.append(('LDA', LinearDiscriminantAnalysis()))
models.append(('KNN', KNeighborsClassifier()))
models.append(('CART', DecisionTreeClassifier()))
models.append(('NB', GaussianNB()))
models.append(('SVM', SVC()))
# evaluate each model in turn
results = []
names = []
for name, model in models:
    kfold = model_selection.KFold(n_splits=10, random_state=seed)
    cv_results = model_selection.cross_val_score(model, X_train, Y_train, cv=kfold, scoring=scoring)
    results.append(cv_results)
    names.append(name)
    msg = "%s: %f (%f)" % (name, cv_results.mean(), cv_results.std())
    print(msg)
```

```
LR: 1.000000 (0.000000)
LDA: 1.000000 (0.000000)
KNN: 1.000000 (0.000000)
CART: 1.000000 (0.000000)
NB: 0.998734 (0.003797)
SVM: 0.989825 (0.015844)
```

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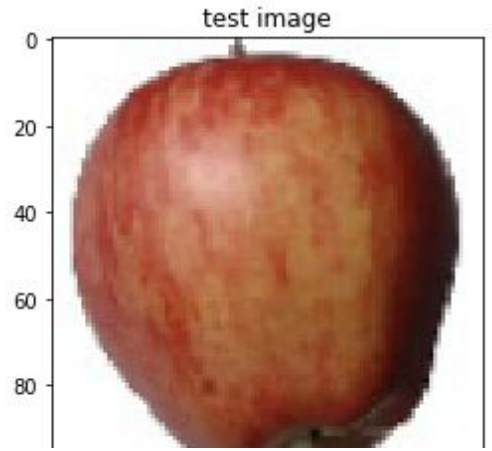
# Tools - IDE - DATA - Libs

In [20]:
```
import cv2
from matplotlib import pyplot as plt
path= "test_fruits/appletest.jpg"
image = cv2.imread(path)
image = cv2.cvtColor(image, cv2.COLOR_BGR2RGB)
#cv2.imwrite(path,image)
plt.figure()
plt.title("test image")
plt.imshow(image)
print(image.shape)
newImage = processImage(path)
print(newImage)
```

```
(100, 100, 3)
[ 20.3894     108.7278     180.1649      39.09395052  78.31752107
  60.75763086]
```

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# Tools - IDE - DATA - Libs

In [23]:
```
knn = KNeighborsClassifier()
knn.fit(X_train, Y_train.ravel())
filename = 'finalized_fruits_model.sav'
# save the model to disk
pickle.dump(knn, open(filename, 'wb'))


# load the model from disk
loaded_model = pickle.load(open(filename, 'rb'))
p = loaded_model.predict([newImage])
print(p)
```

```
[2.]
```

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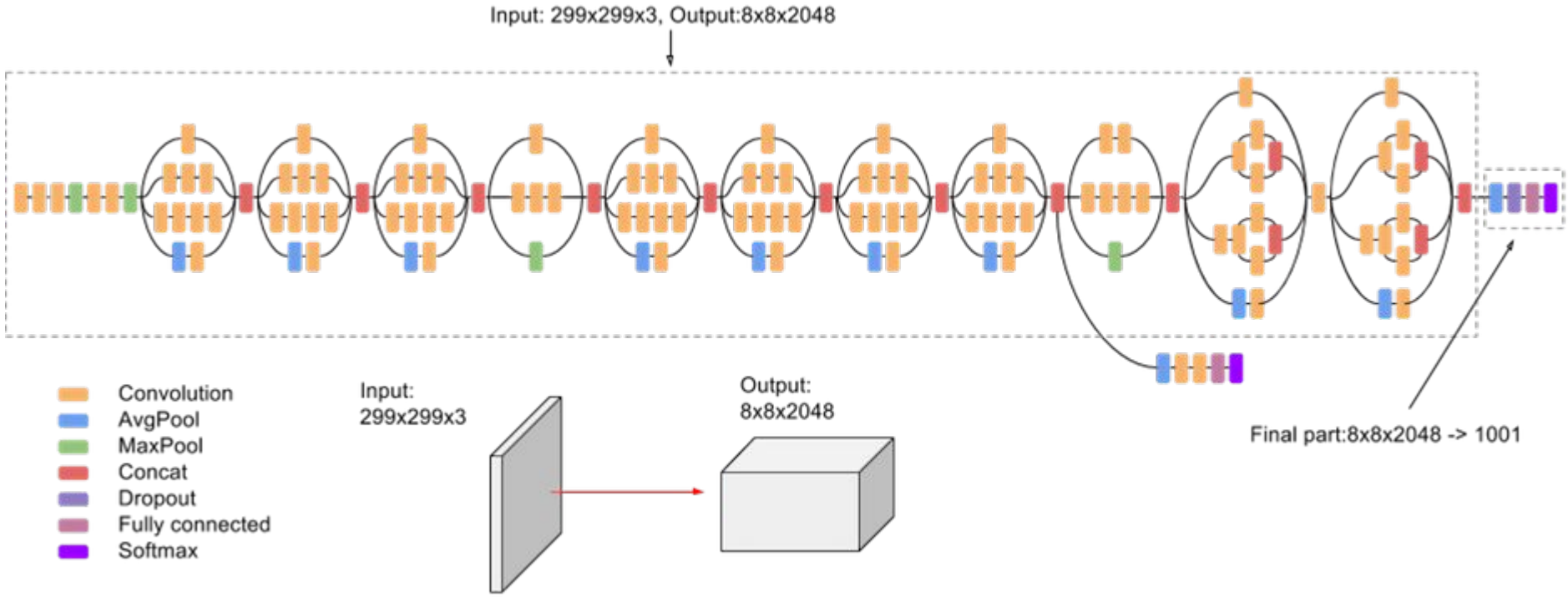
# Neural Network

## Inception V3 Architecture




```
python retrain.py --image_dir ~/flower_photos
```

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# Neural Network

## Inception V3 Architecture

In [2]:
```
!python label_image.py \
--graph="C:/tmp/output_graph.pb" \
--labels="C:/tmp/output_labels.txt" \
--input_layer=Placeholder \
--input_height=224 --input_width=224 \
--output_layer=final_result \
--image="dataset/appleRed/0_100.jpg"
```

```
applered 0.9995553
banana 0.000444695
```

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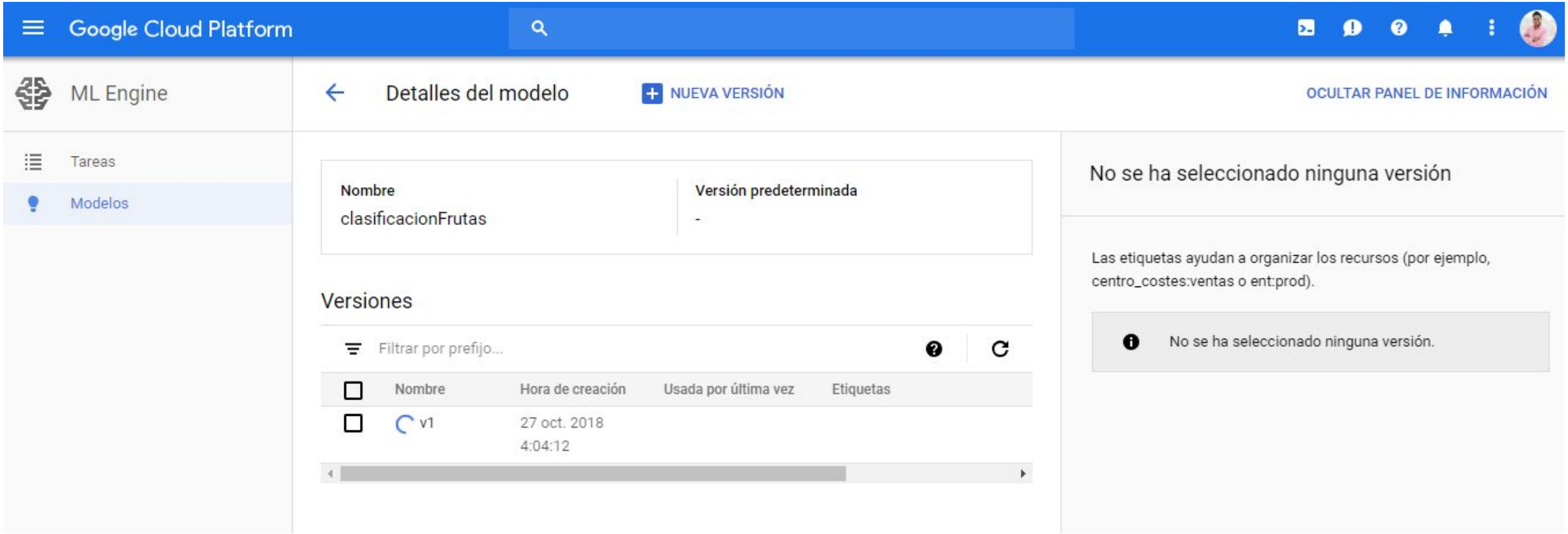
# Deploy GCP

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