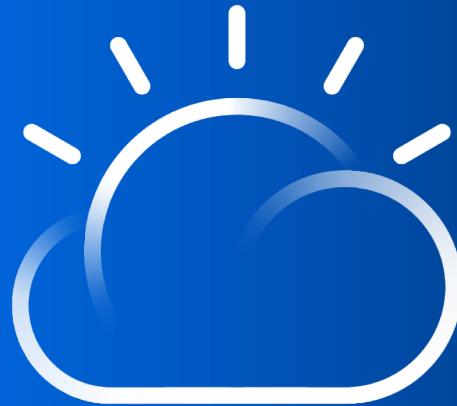


# LAB: Rede Neural com Watson Studio



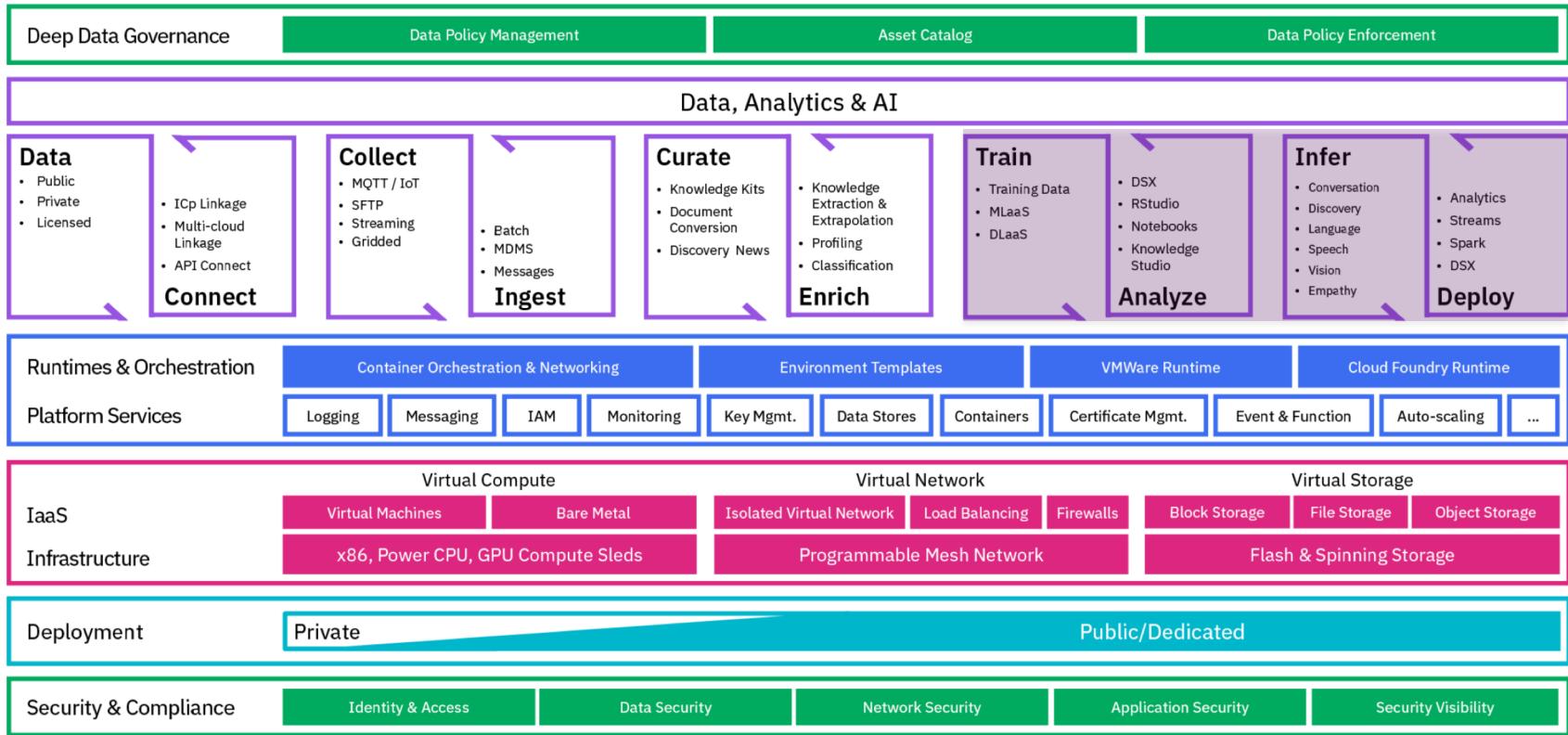
# Demo

Rede Neural para reconhecimento  
de objetos em Imagens

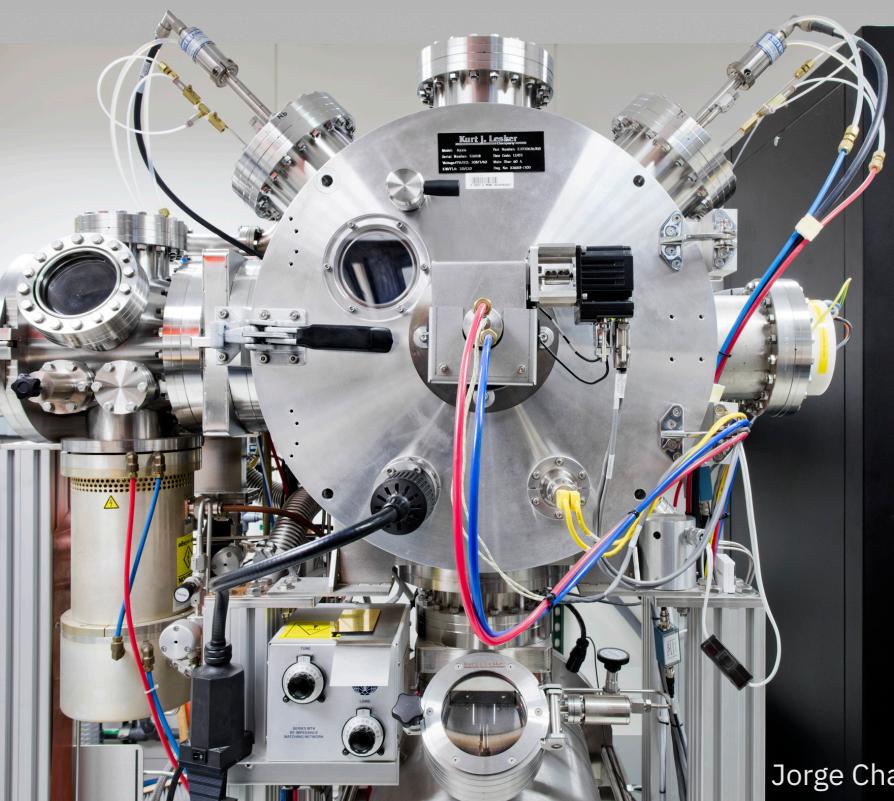
<http://ibmdiscolab.mybluemix.net/>



# IBM CLOUD: AI



# TUTORIAL



Jorge Chagas

# Serviços necessários para esse LAB



<https://console.bluemix.net/catalog/>



## Object Storage

Lite • IBM

Provides flexible, cost-effective, and scalable cloud storage for unstructured data.



## Apache Spark

Lite • IBM

IBM Analytics for Apache [Spark](#) for IBM Cloud.



## Python Web App with Flask

IBM

A starter that provides a basic web serving application using the Flask framework.



## Watson Studio

Lite • IBM

Embed AI and machine learning into your business. Create custom models using your own data.



## Python

Lite • Community

Develop, deploy, and scale [Python](#) web apps with ease.



## Machine Learning

Lite • IBM

IBM Watson Machine Learning - make smarter decisions, solve tough problems, and improve user outcomes.

# Configure e Crie os Serviços

[View all](#)

## Cloud Object Storage

[Lite • IBM](#)

IBM Cloud Object Storage is a highly scalable cloud storage service, designed for high durability, resiliency and security. Store, manage and access your data via our self-service portal and RESTful APIs. Connect applications directly to Cloud Object Storage use other IBM Cloud Services with your data.

[View Docs](#) [Terms](#)

AUTHOR IBM

PUBLISHED 10/01/2018

TYPE Service

**Service name:**

Cloud Object Storage-disco

**Select a resource group:** [i](#)

Default

Looking for our infrastructure offerings?

[Compare Versions](#)

## Features

- **Storage for the IBM Cloud**

IBM Cloud Object Storage provides unstructured data storage for cloud applications. Libraries and SDKs support a common set of S3 API functions for connecting new applications to scalable cloud storage and integrating your data into other services on the IBM Watson and Cloud Platform.

- **Encryption management**

- **IAM Policies - Bucket level access management**

IBM Identity and Access Management (IAM) integration allows for granular access control at the bucket level using role-based policies.

- **Regional and Cross Region resiliency options**

Need Help?

[Contact IBM Cloud Support](#)

Estimate Monthly Cost

[Cost Calculator](#)[Create](#)

# Configure e Crie os Serviços

[View all](#)

## Apache Spark

Lite • IBM

Apache Spark is an open source cluster computing framework optimized for extremely fast and large scale data processing, which you can access via the newly integrated notebook interface IBM Analytics for Apache Spark. You can connect to your existing data sources or take advantage of the on-demand big data optimization of Object Storage. Spark plans are based on the maximum number of executors available to process your analytic jobs. Executors exist only as long as they're needed for processing, so you're charged only for processing done.

[View Docs](#) [Terms](#)

AUTHOR IBM

PUBLISHED 09/18/2018

TYPE Service

LOCATION United Kingdom, US South

**Service name:**

Apache Spark-disco

**Choose a region/location to deploy in:**

US South

**Choose an organization:**

jdchagasbkp6@gmail.com

**Choose a space:**

dev

## Features

- **Incredibly Fast**

Apache Spark delivers 100x the performance of Apache Hadoop for certain workloads because of its advanced in-memory computing engine.

- **Easy to Use and Powerful**

Apache Spark's Streaming and SQL programming models backed by MLlib and GraphX make it incredibly easy for developers and data scientists to build apps that exploit machine learning and graph analytics. Because the service is 100% compatible with Apache Spark, developers can build their apps and run them against the IBM managed service to benefit from operational, maintenance, and hardware excellence.

Need Help?

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Estimate Monthly Cost

[Cost Calculator](#)[Create](#)

# Configure e Crie os Serviços

[View all](#)

## Machine Learning

Lite • IBM

IBM Watson Machine Learning is a full-service IBM Cloud offering that makes it easy for developers and data scientists to work together to integrate predictive capabilities with their applications. The Machine Learning service is a set of REST APIs that you can call from any programming language to develop applications that make smarter decisions, solve tough problems, and improve user outcomes.

[View Docs](#) [Terms](#)

AUTHOR	IBM
PUBLISHED	09/12/2018
TYPE	Service

**Service name:**

Machine Learning-d2

**Choose a region/location to deploy in:**

US South

**Select a resource group:** [i](#)

Default

## Features

- **Machine Learning features**

Take advantage of machine learning models management (continuous learning system) and deployment (online, batch, streaming). Select any of widely supported machine learning frameworks: Tensorflow, Keras, Caffe, Pytorch, Spark MLlib, scikit learn, xgboost and SPSS.

- **Integration with Watson Studio**

Create and train machine learning models with the best

- **Wide choice of interfaces**

Use the command line interface and Python client to manage your artifacts. Extend your application with artificial intelligence through the Watson Machine Learning REST API.

Need Help?

[Contact IBM Cloud Support](#)

Estimate Monthly Cost

[Cost Calculator](#)[Create](#)

# Configure e Crie os Serviços

[View all](#)

## .py Create a Cloud Foundry App

[Lite](#) • [Community](#)

### Python

Develop, deploy, and scale Python web apps with ease.

[View Docs](#) [Terms](#)

VERSION 1.5.15  
TYPE Application  
LOCATION Sydney, Germany, United Kingdom, US East, US South

**App name:**

disco

**Host name:**

disco

**Domain:**

mybluemix.net

**Choose a region/location to deploy in:**

US South

**Choose an organization:**

jdchagasbkp5@gmail.com

**Choose a space:**

dev

### Pricing Plans

Monthly prices shown are for country or region: [Brazil](#)

PLAN	FEATURES	PRICING
 Lite 	Lite apps are free You get up to 256 MB of memory while you work on your apps.	Free

[Need Help?](#)[Contact IBM Cloud Support](#)[Estimate Monthly Cost](#)[Cost Calculator](#)

Free

[Create](#)

FEEDBACK

# Configure e Crie os Serviços

[View all](#)

Watson Studio

Lite • IBM

Watson Studio democratizes machine learning and deep learning to accelerate infusion of AI in your business to drive innovation. Watson Studio provides a suite of tools and a collaborative environment for data scientists, developers and domain experts.

[View Docs](#) [Terms](#)

AUTHOR	IBM
PUBLISHED	09/18/2018
TYPE	Service

**Service name:**

Watson Studio-disco

**Choose a region/location to deploy in:**

US South

**Select a resource group:** [i](#)

Default

## Features

- **Use what you know, learn what you don't**

Start from a tutorial, start from a sample, or start from scratch. Tap into the power of the best of open source (RStudio, Jupyter Notebooks) and Watson services for flexible model creation. Use Python, R, or Scala. Stop downloading and configuring analysis environments and start getting insights.

- **Be a founding member**

- **Power on demand**

Enterprise-scale features on demand. From data exploration and preparation, to enterprise-scale performance. Manage your data, your analytical assets, and your projects in a secured cloud environment.

- **Collaborate for better outcomes**

Need Help?

[Contact IBM Cloud Support](#)

Estimate Monthly Cost

[Cost Calculator](#)[Create](#)

# Primeiros Passos: Watson Studio



Dashboard /



Watson Studio-disco



Resource Group: Default

Location: US South

[Add Tags](#)



## Watson Studio

Welcome to Watson Studio. Let's get started!



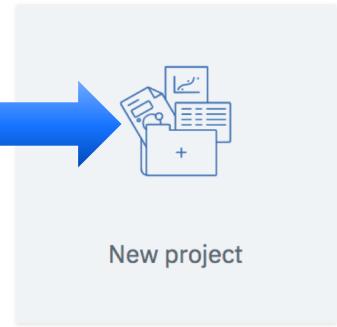
### Documentation

From getting started to how to's – see what's available.

### Community

Check out our tutorials, articles, along with sample notebooks and data sets you can use to get going.

# Criando um projeto



**New project**

Select a project tile to get the right tools and services for your work.  
You can add additional tools later as the needs of your project grow. All projects include data storage.

<b>Basic</b>  Want to start simple? Upload data in your project and add tools later.	<b>Data Science</b>  Analyze data to discover insights and share your findings with others.	<b>Watson Tools</b>  Tag and classify content using Watson services.
<b>Deep Learning</b>  Build neural networks and deploy deep learning models.	<b>Modeler</b>  Build modeler flows to train SPSS and Spark models or design deep neural networks.	<b>Business Analytics</b>  Create visual dashboards from your data to gain insights faster.
<b>Data Engineering</b>  Combine, cleanse, analyze, and shape data using Data Refinery.	<b>Complete</b> <input checked="" type="checkbox"/>  Want to explore every corner of Watson Studio? See every tool in one project.	

**OK**

# Criando um projeto

IBM Watson Studio

Projects

Tools

Community

Services

Manage

Support

Docs



Jorge Chagas's Account

## New project

### Define project details

#### Name

LAB\_DISCO

91

#### Description

Projeto destinado ao lab de AI

2969

### Choose project options

 Restrict who can be a collaborator (i)Project will include integration with [Cloud Object Storage](#) for storing project assets.

### Storage

Cloud Object Storage-23



# Em configurações, vamos integrar os serviços necessários



My Projects / LAB\_DISCO

Add to project

Storage

Type Cloud Object Storage Bucket Name labdisco-donotdelete-pr-rtks92b7ed7kay

0 Byte Used 0% of 25 GB used

Associated services

Add service

Amazon EMR Spark

IBM Analytics Engine

**Spark**

Streaming Analytics

Dashboard

Watson

You don't have a

ACTIONS

New token

ACTIONS

Access tokens

Name Role Created

You don't have

ACTIONS

Em configurações, vamos integrar os serviços necessários



## Apache Spark

Existing

New

RESOURCE GROUP

All Resources ▾

LOCATION

Locations 2 ▾

CLOUD FOUNDRY ORG

None ▾

### Existing Service Instance

Select service from the list

Apache Spark-nk

display job history information for all the projects.

story server will

Select

Cancel

# Em configurações, vamos integrar os serviços necessários



My Projects / LAB\_DISCO

Add to project

Storage

Type Cloud Object Storage Bucket Name labdisco-donotdelete-pr-rtks92b7ed7kay

0 Byte Used 0% of 25 GB used

Associated services

Add service

Amazon EMR Spark

IBM Analytics Engine

Spark

Streaming Analytics

Dashboard

Watson

New token

Access tokens

Name Role Created

You don't have any Access tokens

Add service

# Em configurações, vamos integrar os serviços necessários



IBM Watson Studio

Projects

Tools

Community

Services

Manage

Support

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Jorge Chagas's Account

JC



## Discovery

Add a cognitive search and content analytics engine to applications.

Add



## Knowledge Studio

Teach Watson the language of your domain.

Add



## Language Translator

Translate text, documents, and websites from one language to another. Create industry or region-specific t

Add



## Machine Learning

IBM Watson Machine Learning - make smarter decisions, solve tough problems, and improve user outcomes

Add



## Natural Language Classifier

Natural Language Classifier performs natural language classification on question texts. A user would be able

Add



## Natural Language Understanding

Analyze text to extract meta-data from content such as concepts, entities, emotion, relations, sentime

Add



## Personality Insights

The Watson Personality Insights derives insights from transactional and social media data to identify psych

Add



## Speech to Text

Low-latency, streaming transcription

Add



## Text to Speech

Synthesizes natural-sounding speech from text.

Add

Em configurações, vamos integrar os serviços necessários



## Machine Learning

Existing      New

RESOURCE GROUP      LOCATION      CLOUD FOUNDRY ORG

All Resources      Locations 2      None

**Existing Service Instance**

Select service from the list

Machine Learning-37

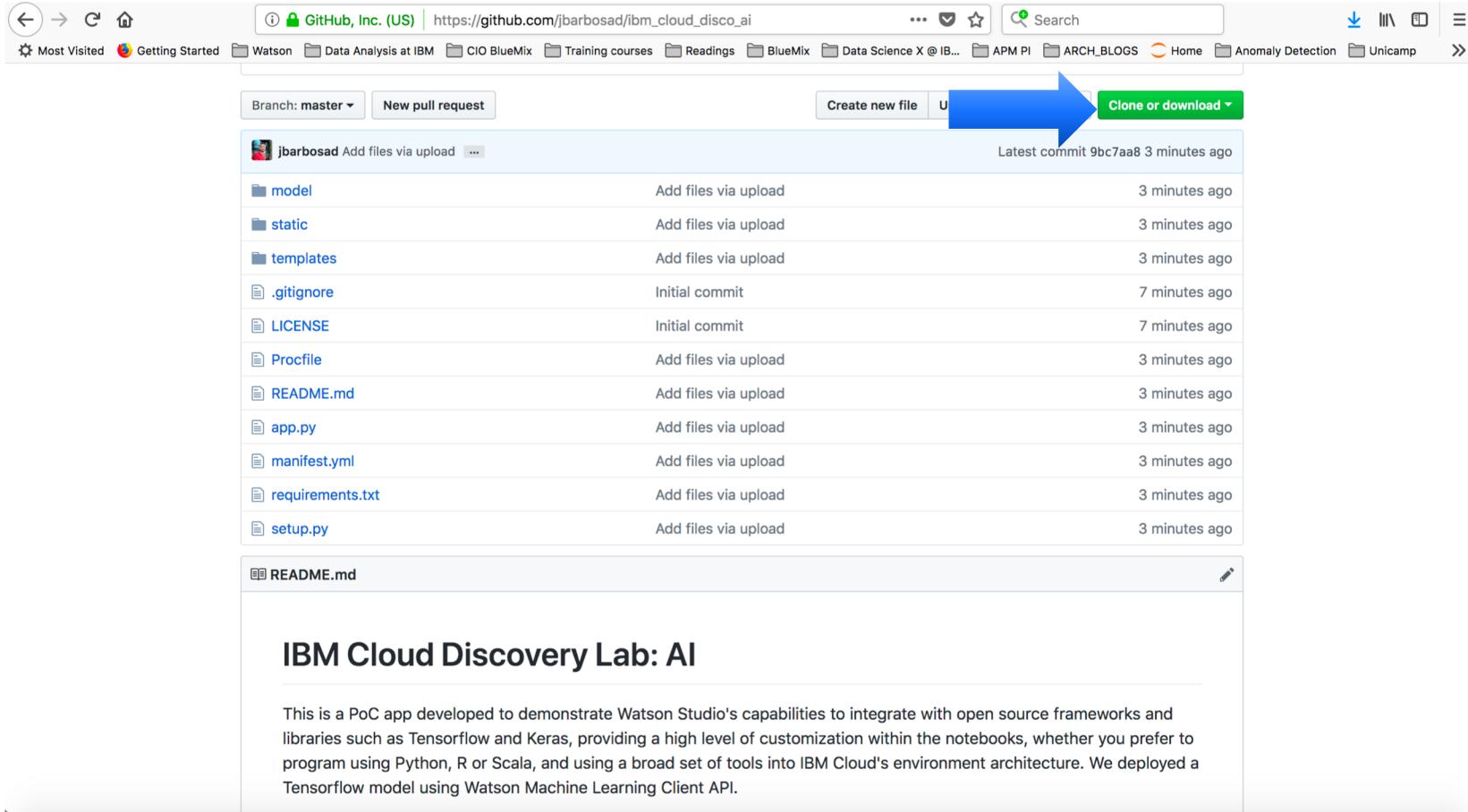
Select      Cancel



Let's do it!

# Faça o clone ou download do repositório no Github

[https://github.com/jbarbosad/ibm\\_cloud\\_disco\\_ai](https://github.com/jbarbosad/ibm_cloud_disco_ai)



The screenshot shows a GitHub repository page for the user jbarbosad. The repository name is ibm\_cloud\_disco\_ai. The page displays a list of files and their upload history. A large blue arrow points to the green 'Clone or download' button at the top right of the main content area.

Branch: master

New pull request

Create new file

Clone or download

jbarbosad Add files via upload ...

Latest commit 9bc7aa8 3 minutes ago

File	Action	Time Ago
model	Add files via upload	3 minutes ago
static	Add files via upload	3 minutes ago
templates	Add files via upload	3 minutes ago
.gitignore	Initial commit	7 minutes ago
LICENSE	Initial commit	7 minutes ago
Procfile	Add files via upload	3 minutes ago
README.md	Add files via upload	3 minutes ago
app.py	Add files via upload	3 minutes ago
manifest.yml	Add files via upload	3 minutes ago
requirements.txt	Add files via upload	3 minutes ago
setup.py	Add files via upload	3 minutes ago

README.md

## IBM Cloud Discovery Lab: AI

This is a PoC app developed to demonstrate Watson Studio's capabilities to integrate with open source frameworks and libraries such as Tensorflow and Keras, providing a high level of customization within the notebooks, whether you prefer to program using Python, R or Scala, and using a broad set of tools into IBM Cloud's environment architecture. We deployed a Tensorflow model using Watson Machine Learning Client API.

# Crie seu primeiro “notebook”



IBM Watson Studio

Projects

Tools

Community

Services

Manage

Support

Docs

My Projects / Neural\_model

+ Add to project ▾



Overview

Assets

Environments

Bookmarks

Deployments

Access Control

Settings

Q What assets are you looking for?

## Notebooks



+ New notebook

NAME	SHARED	SCHEDULED	STATUS	LANGUAGE	LAST EDITOR	LAST MODIFIED	ACTIONS
You don't have any Notebooks yet.							

## Models

### Natural Language Classifier models

+ New Natural Language Classifier model

NAME	MODEL ID	SERVICE INSTANCE	LAST MODIFIED	ACTIONS
You don't have any Natural Language Classifier models yet.				

# Importe o arquivo “IBM\_DISCO\_LAB.ipynb” e crie o notebook



My Projects / LAB\_DISCO / Add Notebook

## New notebook

Blank    From file    From URL

Name\*

LAB\_DISCO

41 Characters  
Remaining

Description

Notebook lab|

488 Characters Remaining

Notebook file\*

No file chosen

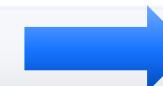
Import a Python, Scala, or R notebook file (.ipynb) from your local device.

Select runtime\* Includes notebook environments ⓘ

Apache Spark-disco

Associate this notebook with the runtime service of your choice.

O arquivo IBM\_DISCO\_LAB.ipynb está dentro do diretório ‘model’. Utilize-o para esse lab.



# Configure o Kernel para iniciar o ambiente



My Projects / Neural\_model / LAB

File Edit View Insert Cell Kernel Help

Not Trusted | Python 3.5 with Spark 2.1

IBM Cloud Discovery Lab: Neural M

**Lab Details:**

This lab was created to demonstrate Watson Studio's capabilities to integrate Notebooks with Watson Machine Learning. You can run the Notebooks whether you prefer to program using Python, R or Scala, and interact with Watson Machine Learning via the Watson Studio interface.

**Services and Tools:**

In addition to Watson Studio, We'll make use of the following IBM Cloud's services:

- Apache Spark;
- Cloud Object Storage;
- Python Web App with Flask;
- Watson Machine Learning;

**Datasets used:**

AIRCRAFT <http://image-net.org/synset?wnid=n02686568>

BIRDS <http://image-net.org/synset?wnid=n01503061>

HUMANS <http://image-net.org/synset?wnid=n02472987>

Kernel not found

Could not find a kernel matching Python 3. Please select a kernel: Python 3.5 with Spark 2.1

Contin Set Kernel

# Execução do modelo: SHIFT + Enter para cada célula



```
images.extend([os.path.join(path, f) for f in os.listdir(path)])  
  
# Plot some sample images in the dataset.  
plt.figure(figsize=(20,10))  
for i in range(15):  
    img = mpimg.imread(random.choice(images))  
    plt.subplot(3, 5, i+1)  
    plt.imshow(img)  
    frame = plt.gca()  
    frame.axes.get_xaxis().set_visible(False)  
    frame.axes.get_yaxis().set_visible(False)
```



# Célula de Treinamento da Rede Neural aplicando “*transfer learning*”



<http://cs231n.github.io/transfer-learning/>

My Projects / Neural\_model / LAB



Lastly, we use the *image\_dir* argument to pass in the directory containing the labeled class folders containing our images.



```
In [17]: !python retrain.py \
    --bottleneck_dir=./ml-model/bottlenecks \
    --how_many_training_steps 1000 \
    --learning_rate 0.01 \
    --train_batch_size 200 \
    --model_dir=./ml-model/pretrained_model \
    --summaries_dir=./retrain-logs \
    --output_graph=./ml-model/retrained_graph.pb \
    --output_labels=./ml-model/retrained_labels.txt \
    --image_dir=./training_images/ \
    --saved_model_dir =./saved-model/
```

```
INFO:tensorflow:2018-10-02 04:10:06.432100: Step 950: Train accuracy = 99.5%
INFO:tensorflow:2018-10-02 04:10:06.432430: Step 950: Cross entropy = 0.052394
INFO:tensorflow:2018-10-02 04:10:06.536270: Step 950: Validation accuracy = 99.0% (N=100)
INFO:tensorflow:2018-10-02 04:10:08.622708: Step 960: Train accuracy = 100.0%
INFO:tensorflow:2018-10-02 04:10:08.622921: Step 960: Cross entropy = 0.046097
INFO:tensorflow:2018-10-02 04:10:08.715050: Step 960: Validation accuracy = 97.0% (N=100)
INFO:tensorflow:2018-10-02 04:10:10.840282: Step 970: Train accuracy = 100.0%
INFO:tensorflow:2018-10-02 04:10:10.840540: Step 970: Cross entropy = 0.043023
INFO:tensorflow:2018-10-02 04:10:10.939237: Step 970: Validation accuracy = 99.0% (N=100)
INFO:tensorflow:2018-10-02 04:10:13.103423: Step 980: Train accuracy = 100.0%
INFO:tensorflow:2018-10-02 04:10:13.103697: Step 980: Cross entropy = 0.041070
INFO:tensorflow:2018-10-02 04:10:13.243076: Step 980: Validation accuracy = 100.0% (N=100)
INFO:tensorflow:2018-10-02 04:10:15.567676: Step 990: Train accuracy = 99.5%
INFO:tensorflow:2018-10-02 04:10:15.568236: Step 990: Cross entropy = 0.056701
INFO:tensorflow:2018-10-02 04:10:15.676230: Step 990: Validation accuracy = 99.0% (N=100)
INFO:tensorflow:2018-10-02 04:10:17.715947: Step 999: Train accuracy = 99.5%
INFO:tensorflow:2018-10-02 04:10:17.716152: Step 999: Cross entropy = 0.070229
INFO:tensorflow:2018-10-02 04:10:17.821286: Step 999: Validation accuracy = 99.0% (N=100)
```

Leva cerca de 15 min para executar  
com o dataset que vamos utilizar

# Célula de Teste da Rede Neural aplicando “transfer learning”



## Running the scripts and getting the results of the Image Recognition tests

```
img = mpimg.imread(test_image)
plt.figure(figsize=(8,8))
plt.imshow(img)
frame = plt.gca()
frame.axes.get_xaxis().set_visible(False)
frame.axes.get_yaxis().set_visible(False)

!python ./label_image.py \
    --graph=$MODEL_DIR/retrained_graph.pb --labels=$MODEL_DIR/retrained_labels.txt \
    --input_layer=$INPUT_LAYER \
    --output_layer=final_result \
    --input_height=$INPUT_HEIGHT --input_width=$INPUT_WIDTH \
    --image=$TEST_IMAGE
```

```
aircrafts 0.99746144
birds 0.0019319953
humans 0.0006065576
```



Caso tenha executado corretamente, nessa célula o resultado deve ser similar a esse!

File Edit View Insert Cell Kernel Help

Not Trusted | Python 3.5 with Spark 2.1

## Creating REST API

```
In [28]: cos_credentials = {  
    "suas credenciais"  
}
```

```
auth_endpoint = ''  
service_endpoint = ''
```

```
In [29]: cos = ibm_boto3.resource('s3',  
    ibm_api_key_id=cos_credentials['apikey'],  
    ibm_service_instance_id=cos_credentials['resource_instance_id'],  
    ibm_auth_endpoint=auth_endpoint,  
    config=Config(signature_version='oauth'),  
    endpoint_url=service_endpoint)
```

É necessário inserir suas credenciais de acesso do  
Cloud Object Storage

# No Dashboard da IBM Cloud

(<https://console.bluemix.net/dashboard/apps>)

## Dashboard

RESOURCE GROUP	CLOUD FOUNDRY ORG	CLOUD FOUNDRY SPACE	LOCATION	CATEGORY	Filter by resource name...	Create resource
All Resources	All Organizations	All Spaces	All Locations	All Categories		
<strong>Services</strong>						
Name	Location	Resource Group	Plan	Details	Service Offering	
Cloud Object Storage-3q	global	Default	Lite	Provisioned	Cloud Object Stor...	⋮
Cloud Object Storage-3q Continuous Delivery	US South	Default	Lite	Provisioned	Continuous Deliv...	⋮
Machine Learning-37	US South	Default		Provisioned	Machine Learning	⋮
Watson Studio	US South	Default	Lite	Provisioned	Watson Studio	⋮



# Cloud Object Storage Service Credentials



IBM Cloud

Catalog

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Jorge Chagas's Account



Getting started New

Buckets

Endpoint

Service credentials

Connections

Usage details

Plan

Dashboard /



Cloud Object Storage-3q

Resource Group: Default

[Add Tags](#)

[View docs](#)



## Service credentials

Credentials are provided in JSON format. The JSON snippet lists credentials, such as the API key and secret, as well as connection information for the service.

[Learn more](#)

## Service credentials



[New credential](#)



10

Items per page 1-4 of 4 items

1 of 1 pages

1



### KEY NAME

### DATE CREATED

### ACTIONS

WDP-Admin-09a658f5-f8b3-43c6-b6be-f2bb17be3de1

OCT 1, 2018 - 01:44:39 AM

[View credentials](#)



catalog-50d4d0b3-bc94-498a-9b07-78c78f0ae5a4-HMAC-manager

OCT 2, 2018 - 08:13:51 AM

[View credentials](#)



WDP-Editor-neuralmodel-donotdelete-pr-rfjqirlbwbx3ex

OCT 1, 2018 - 01:44:48 AM

[View credentials](#)



# Cloud Object Storage Service Credentials



IBM Cloud    Catalog    Docs    Support    Manage    Search for resource...    Jorge Chagas's Account

Getting started    New

Buckets

Endpoint

**Service credentials**

Connections

Usage details

Plan

Dashboard / Cloud Resource Groups

Service credentials

Credentials service.

Service credentials

10 ▾

KEY NAME

WDP-Admin

catalog-50

WDP-Editor

WDP-Viewer-neuralmodel-donotdelete-pr-rfjqirlbwbx3ex

Add new credential

Name: disco\_credentials

Role: Writer

Select Service ID (Optional)

Select Service ID...

Add Inline Configuration Parameters (Optional):

```
{"HMAC":true}
```

**Add**

View docs

tion information for the Learn more

New credential +

1 of 1 pages < 1 >

ACTIONS

View credentials

View credentials

View credentials

View credentials

# Cloud Object Storage Service Credentials



<input type="checkbox"/> catalog-50d4d0b3-bc94-498a-9b07-78c78f0ae5a4-HMAC-manager	OCT 2, 2018 - 08:13:51 AM	<a href="#">View credentials</a> ▾	
<input type="checkbox"/> WDP-Editor-neuralmodel-donotdelete-pr-rfqjirlbwbx3ex	OCT 1, 2018 - 01:44:48 AM	<a href="#">View credentials</a> ▾	
<input type="checkbox"/> WDP-Viewer-neuralmodel-donotdelete-pr-rfqjirlbwbx3ex	OCT 1, 2018 - 01:44:48 AM	<a href="#">View credentials</a> ▾	
<input type="checkbox"/> disco_credentials	OCT 2, 2018 - 09:03:31 AM	<a href="#">View credentials</a> ▾	

```
"iam_apikey_description": "Auto generated apikey during resource-key operation for InstanceId:v1:bluemix:public:cloud-object-storage:global:a/0a26841f6a904815ba5f06a963c1b7e6:09a658f5-f8b3-43c6-b6be-f2bb17be3de1::",
  "iam_apikey_name": "auto-generated-apikey-3d80d831-8237-4ea9-8b27-5ea3cc39eb1d",
  "iam_role_crn": "crn:v1:bluemix:public:iam::::serviceRole:Writer",
  "iam_serviceid_crn": "crn:v1:bluemix:public:iam-identity::a/0a26841f6a904815ba5f06a963c1b7e6::serviceid:ServiceId-ecb1eeda-cf6c-4b89-b14e-36eb239d569a",
  "resource_instance_id": "crn:v1:bluemix:public:cloud-object-storage:global:a/0a26841f6a904815ba5f06a963c1b7e6:09a658f5-f8b3-43c6-b6be-f2bb17be3de1::"
```



# Substitua com suas credenciais e execute as demais células



File Edit View Insert Cell Kernel Help Not Trusted | Python 3.5 with Spark 2.1 O



```
SECRET_ACCESS_KEY = "2005210914e0427510ca38e033470ee2a4012"

},
"endpoints": "https://cos-service.bluemix.net/endpoints",
"iam_apikey_description": "Auto generated apikey during resource-key operation for Instance - crn:v1:bluemix:public:cloud-object-storage:global:a/04543316c305b0e77c0d3d83f5e3584c::serviceid:ServiceId-30d5d11e-4de3-4d97-90df-6e6a3d63eb7",
"iam_apikey_name": "auto-generated-apikey-5fe034e2-621b-4d8f-87f3-4e727e52c261",
"iam_role_crn": "crn:v1:bluemix:public:iam::::serviceRole:Writer",
"iam_serviceid_crn": "crn:v1:bluemix:public:iam-identity:a/04543316c305b0e77c0d3d83f5e3584c::serviceid:ServiceId-30d5d11e-4de3-4d97-90df-6e6a3d63eb7",
"resource_instance_id": "crn:v1:bluemix:public:cloud-object-storage:global:a/04543316c305b0e77c0d3d83f5e3584c:c2c53560-a65c-4e18-af7a-279d1cc17547::"

auth_endpoint = 'https://iam.bluemix.net/oidc/token'
service_endpoint = 'https://s3-api.us-geo.objectstorage.softlayer.net'

In [29]: cos = ibm_boto3.resource('s3',
                                ibm_api_key_id=cos_credentials['apikey'],
                                ibm_service_instance_id=cos_credentials['resource_instance_id'],
                                ibm_auth_endpoint=auth_endpoint,
                                config=Config(signature_version='oauth'),
                                endpoint_url=service_endpoint)

In [31]: from uuid import uuid4

bucket_uid = str(uuid4())
buckets = ['training-data-' + bucket_uid, 'training-results-' + bucket_uid]

for bucket in buckets:
    if not cos.Bucket(bucket).in cos.buckets.all():
        print('Creating bucket "{}"...'.format(bucket))
        try:
            cos.create_bucket(Bucket=bucket)
        except ibm_boto3.exceptions.ibm_botocore.client.ClientError as e:
            print('Error: {}'.format(e.response['Error']['Message']))
```

# Watson Machine Learning Client API



File Edit View Insert Cell Kernel Help Not Trusted | Python 3.5 with Spark 2.1

```
In [34]: for bucket_name in buckets:  
    print(bucket_name)  
    bucket_obj = cos.Bucket(bucket_name)  
    for obj in bucket_obj.objects.all():  
        print("  File: {}, {:.2f}kB".format(obj.key, obj.size/1024))  
  
training-data-0a568ff1-f973-4ed3-896f-5d57328621d7  
  File: t10k-images-idx3-ubyte.gz, 1610.23kB  
  File: t10k-labels-idx1-ubyte.gz, 4.44kB  
  File: train-images-idx3-ubyte.gz, 9680.10kB  
  File: train-labels-idx1-ubyte.gz, 28.20kB  
training-results-0a568ff1-f973-4ed3-896f-5d57328621d7
```

```
In [35]: import urllib3, requests, json, base64, time, os, wget
```

## Integration with Watson Machine Learning client API services



```
In [36]: wml_credentials = {  
    "Suas Credenciais"  
}
```

```
In [37]: !rm -rf $PIP_BUILD/watson-machine-learning-client
```

É necessário inserir suas credenciais de acesso da instância do Watson Machine Learning

# No Dashboard da IBM Cloud

(<https://console.bluemix.net/dashboard/apps>)

## Dashboard

RESOURCE GROUP All Resources	CLOUD FOUNDRY ORG All Organizations	CLOUD FOUNDRY SPACE All Spaces	LOCATION All Locations	CATEGORY All Categories	Filter by resource name...	Create resource
---------------------------------	--	-----------------------------------	---------------------------	----------------------------	----------------------------	-----------------

### Services

Name	Location	Resource Group	Plan	Details	Service Offering	⋮
Cloud Object Storage-3q	global	Default	Lite	Provisioned	Cloud Object Stor...	⋮
Continuous Delivery	US South	Default	Lite	Provisioned	Continuous Deliv...	⋮
<u>Machine Learning-37</u>	US South	Default	Lite	Provisioned	Machine Learning	⋮
Machine Learning-37 Watson Studio	US South	Default	Lite	Provisioned	Watson Studio	⋮





# Watson Machine Learning Client API credentials



IBM Cloud Catalog Docs Support Manage Search for resource... Jorge Chagas's Account

Manage Service credentials Plan Connections

Dashboard / Machine Learning-37

Resource Group: Default Location: US South Add Tags

Items per page 10 ▾ | 1-2 of 2 items 1 of 1 pages < 1 ▾ >

<input type="checkbox"/> KEY NAME	DATE CREATED	ACTIONS
<input type="checkbox"/> wdp-writer	OCT 1, 2018 - 01:52:16 AM	<a href="#">View credentials</a> ▾
<input type="checkbox"/> service_disco	OCT 2, 2018 - 10:51:52 AM	<a href="#">View credentials</a> ▾

```
{  
  "apikey": "3nwxhrmA1ge2IzL97hTAuR937lZiu8E4YPpTcD_GHlnu",  
  "iam_apikey_description": "Auto generated apikey during resource-key operation for Instance - crn:v1:bluemix:public:pm-20:us-sout  
h:a/0a26841f6a904815ba5f06a963c1b7e6:28ad867c-7dff-4739-b22e-4ce8b4b49dab:::",  
  "iam_apikey_name": "auto-generated-apikey-780d4d0c-ec03-4cab-ac9f-e7c045e37b5d",  
  "iam_role_crn": "crn:v1:bluemix:public:iam::::serviceRole:Writer",
```



# Substitua com suas credenciais e execute as demais células



File Edit View Insert Cell Kernel Help      Not Trusted | Python 3.5 with Spark 2.1

Uploading data t10k-labels-idx1-ubyte.gz...  
t10k-labels-idx1-ubyte.gz is uploaded.

In [34]:

```
for bucket_name in buckets:  
    print(bucket_name)  
    bucket_obj = cos.Bucket(bucket_name)  
    for obj in bucket_obj.objects.all():  
        print("  File: {}, {:.2f}kB".format(obj.key, obj.size/1024))
```

training-data-0a568ff1-f973-4ed3-896f-5d57328621d7  
 File: t10k-images-idx3-ubyte.gz, 1610.23kB  
 File: t10k-labels-idx1-ubyte.gz, 4.44kB  
 File: train-images-idx3-ubyte.gz, 9680.10kB  
 File: train-labels-idx1-ubyte.gz, 28.20kB  
training-results-0a568ff1-f973-4ed3-896f-5d57328621d7

In [35]:

```
import urllib3, requests, json, base64, time, os, wget
```

## Integration with Watson Machine Learning client API services

→

```
wml_credentials = {  
    "Suas Credenciais"  
}
```

In [37]:

```
!rm -rf $PIP_BUILD/watson-machine-learning-client
```

# Gerando a URL Score para o deploy do modelo via API



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## Verification for the model deployment

In [54]: `deployment_details = client.deployments.create(model_uid, "IBM Disco")`

```
#####
# Synchronous deployment creation for uid: '37d3fe03-0bd9-4bca-bd9a-52bca34e99eb' started
#####

INITIALIZING
DEPLOY_IN_PROGRESS.
DEPLOY_SUCCESS
```

```
-----  
Successfully finished deployment creation, deployment_uid='f0509b9c-131d-4b12-b7d4-6a1736bcbda5'  
-----
```

In [55]: `scoring_url = client.deployments.get_scoring_url(deployment_details)`  
`print(scoring_url)`

 [https://us-south.ml.cloud.ibm.com/v3/wml\\_instances/49d7cc1f-0cd7-4886-905b-12d786c50aee/deployments/f0509b9c-131d-4b12-b7d4-6a1736bcbda5/online](https://us-south.ml.cloud.ibm.com/v3/wml_instances/49d7cc1f-0cd7-4886-905b-12d786c50aee/deployments/f0509b9c-131d-4b12-b7d4-6a1736bcbda5/online)

Se todas as execuções foram executadas corretamente, a URL de score será gerada. Copie-a!

# Validação final utilizando a URL Score do Watson Machine Learning Client API



My Projects / Deep Learning Project - TLE / TLE LAB



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Not Trusted | Python 3.5 with Spark 2.1



Parabéns! Seu modelo está pronto e integrado a API. Agora iremos realizar o deploy do modelo na aplicação web!

```
In [65]: input_image = image.img_to_array(img)
input_image = np.expand_dims(input_image, axis=0)
input_image = preprocess_input(input_image).tolist()

In [66]: scoring_data = {'values': input_image}

In [67]: predictions = client.deployments.score(scoring_url, scoring_data)
print("Scoring result: " + str(predictions))

Scoring result: {'values': [[0.9858685731887817, 0.006838159170001745, 0.0011627099011093378, 0.0015266451518982649, 0.0015551344258710742, 0.00304
87235635519028]]}

In [68]: predictions.get('values')

Out[68]: [[0.9858685731887817,
```

# Vamos trabalhar na web app agora!

A partir de agora, você pode utilizar a sua IDE de preferência



Abra o arquivo “app.py” e insira suas credenciais obtidas no WML e sua URL score



jupyter app.py Yesterday at 10:43 AM

Logout

File Edit View Language Python

```
9 #Importing Tensorflow
10 import tensorflow as tf
11
12 #Importing the Watson Machine Learning Client API and the libraries for preprocessing the uploaded images
13 from watson_machine_learning_client import WatsonMachineLearningAPIClient
14 from keras.preprocessing import image
15 from keras.applications.inception_v3 import decode_predictions, preprocess_input
16 from io import BytesIO
17
18 # Emit Bluemix deployment event
19 cf_deployment_tracker.track()
20
21 app = Flask(__name__)
22 BASE = './assets/'
23
24 ALLOWED_EXTENSIONS = set(['png', 'jpg', 'jpeg', 'gif'])
25
26 # Inception v3 initial parameters.
27
28 INPUT_LAYER = 'Mul'
29 INPUT_HEIGHT = 299
30 INPUT_WIDTH = 299
31
32
33 # Load your WML Credentials here.
34 wml_credentials={
35     "Insira suas suas credenciais"
36 }
37
38 #Creating an instance to run the WML API Client with the Tensorflow model
39 client = WatsonMachineLearningAPIClient(wml_credentials)
40 client._refresh_token()
41
42 #The REST API URL provided by your WML instance
scoring_url = "Insira sua URL score"
```

# No diretório “templates” abra o arquivo “index.html”



jupyter index.html a few seconds ago Logout

File Edit View Language HTML

```
16 <div class="container">
17   <h1>IBM Cloud Discovery: AI LAB</h1>
18   <p>Image Object Recognition: Airplanes, Birds and Humans!</p>
19   <div class="input-group-lg center-block tf-image-pane">
20     <ul class="nav nav-tabs">
21       <li><a data-toggle="tab" href="#upload">Upload an Image</a></li>
22     </ul>
23
24     <div class="tab-content">
25       <div id="upload" class="tab-pane fade">
26         <div class="input-group">
27           <span class="input-group-btn">
28             <span class="btn btn-default btn-upload">
29               <input type="file" accept="image/*" id="upload_input"
30                 onchange="onUpload(this.files[0])">
31             </span>
32           </span>
33         </div>

```

A large blue arrow points from the left towards the code editor.

Código HTML com a estrutura visual da página. Edite como quiser futuramente!

```
84   }
85   .done(function(data) {
86     $('#loading').hide();
87     confidences = data['values'][0]
88     classes = ['Airplanes', 'Birds' 'Humans']
89     for (var i = 0; i < confidences.length; i++) {
90       var label = classes[i];
91       var confidence = confidences[i].toFixed(2);
92       $('#results').append('<strong>' + label +
93                           '</strong> ' + Math.round(confidence*100) + '%'+<br>');
94     }
95   })
96   .fail(function(data) {
97     $('#error').html(data.responseText);

```

A large blue arrow points from the left towards the code editor.

Código JavaScript com a lógica para pré-processamento da página e de alguns efeitos visuais.

# Modifique em seu diretório o arquivo “manifest.yml”



The screenshot shows a Jupyter Notebook interface with a manifest.yml file open. The file contains the following YAML code:

```
1 ---  
2 applications:  
3 - name: IBM-DISCO  
4   host: ibmdiscolab  
5   memory: 1024M  
6
```

The notebook header includes the Jupyter logo, the file name "manifest.yml", a timestamp "a few seconds ago", and a "Logout" button. The menu bar has "File", "Edit", "View", "Language", and "YAML".

**Lembre-se:** o host será o endereço do seu app. Nesse caso da imagem, será publicado assim:

<http://ibmdiscolab.mybluemix.net/>

# No Dashboard da IBM Cloud

(<https://console.bluemix.net/dashboard/apps>)

## Dashboard

RESOURCE GROUP	CLOUD FOUNDRY ORG	CLOUD FOUNDRY SPACE	LOCATION	CATEGORY	Filter by resource name...	Create resource
All Resources	All Organizations	All Spaces	All Locations	All Categories		

### Cloud Foundry Applications

Name	Region	CF Org	CF Space	Memory (MB)	Status	⋮
<a href="#">disco</a>	US South	jdchagasb5p5@g...	dev	256	<span>● Running (0/1)</span>	⋮
<a href="#">dis...</a>						⋮

### Services

Name	Location	Resource Group	Plan	Details	Service Offering	⋮
<a href="#">Cloud Object Storage-3q</a>	global	Default	Lite	Provisioned	Cloud Object Stor...	⋮
<a href="#">Cloud Object Storage-3q</a>	US South	Default	Lite	Provisioned	Continuous Deliv...	⋮
Machine Learning-37	US South	Default		Provisioned	Machine Learning	⋮
Watson Studio	US South	Default	Lite	Provisioned	Watson Studio	⋮



# Faça o Download da IBM Cloud CLI e instale em sua máquina



## Getting started

Overview

Runtime

Connections

Logs

Monitoring

API Management

Cloud Foundry apps /



disco

Starting

[Visit App URL](#)

Routes ▾

Org: jdchagasbkp5@gmail.com

Location: US South

Space: dev

Download, modify, and redeploy your Cloud Foundry app with the command line interface

Last Updated: 2018-05-24 | [Edit in GitHub](#)

Use IBM Cloud command line interface to download, modify, and redeploy your Cloud Foundry applications and service instances.



Before you begin, download and install the IBM Cloud [CLI](#)

**Restriction:** The command line tool is not supported by Cygwin. Use the tool in a command line window other than the Cygwin command line window.

After you install the command line interface, you can get started:

- ① Change to the directory where your code is located.

```
$ cd your_new_directory
```



- ② Make changes to your app code as you see fit. For example, if you are using a IBM® Cloud sample application and your app contains the `src/main/webapp/index.html` file, you can modify it and edit "Thanks for creating ..." to say something new. Ensure the app runs locally before you deploy it back to IBM Cloud.

# Realize o deploy do seu app



```
Uploading droplet...
Exit status 0
Staging complete
Uploading droplet, build artifacts cache...
Uploaded build artifacts cache (2.7M)
Uploaded droplet (6.1M)
Uploading complete
Stopping instance 281f2e2e-1c7c-4eb6-b47a-47ffad276aa9
Destroying container
Successfully destroyed container

1 of 1 instances running
```

**App started**

**OK**

```
App TEST-APP was started using this command `$HOME/boot.sh`
```

```
Showing health and status for app TEST-APP in org jorge.barbosa@ibm.com / space dev as jorge.ba
OK
```

```
requested state: started
instances: 1/1
usage: 256M x 1 instances
urls: ibmdiscotest.mybluemix.net
last uploaded: Tue Oct 2 13:41:20 UTC 2018
stack: cflinuxfs2
buildpack: https://github.com/cloudfoundry/staticfile-buildpack.git
```

```
      state      since           cpu    memory      disk      details
#0  running   2018-10-02 10:41:58 AM  0.0%  4.1M of 256M  11.8M of 1G
Jorges-MacBook-Pro:ibmdisco_neural jdchagas$
```



**Acesse a raiz do projeto que você fez clone/download do Github**

**Execute os seguintes comandos:**

```
bx login -sso
```

**Insira suas credenciais de acesso a IBM Cloud e o código de acesso. Logo após, digite:**

```
cf push app_name
```

Acesse seu app via Browser e teste com imagens novas



Not Secure | ibmdiscolab.mybluemix.net



## IBM Cloud Discovery: AI LAB

Image Object Recognition: Airplanes, Birds and Humans!

Upload an Image

Choose File n04583620\_76.JPG



Classify

**Airplanes:** 99%

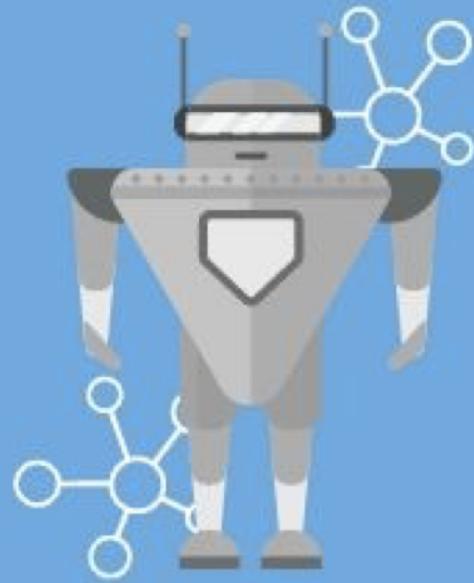
**Birds:** 0%



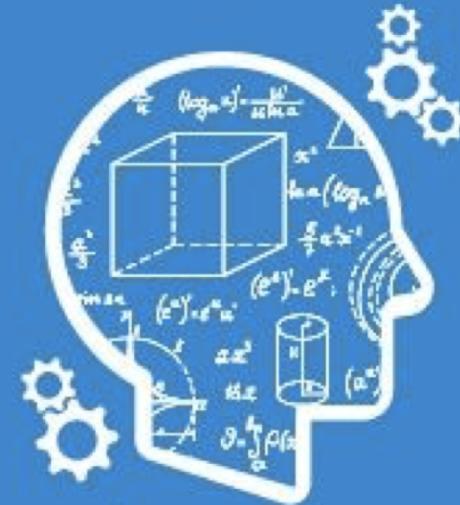
Um pouco de teoria...

IBM

# ARTIFICIAL INTELLIGENCE



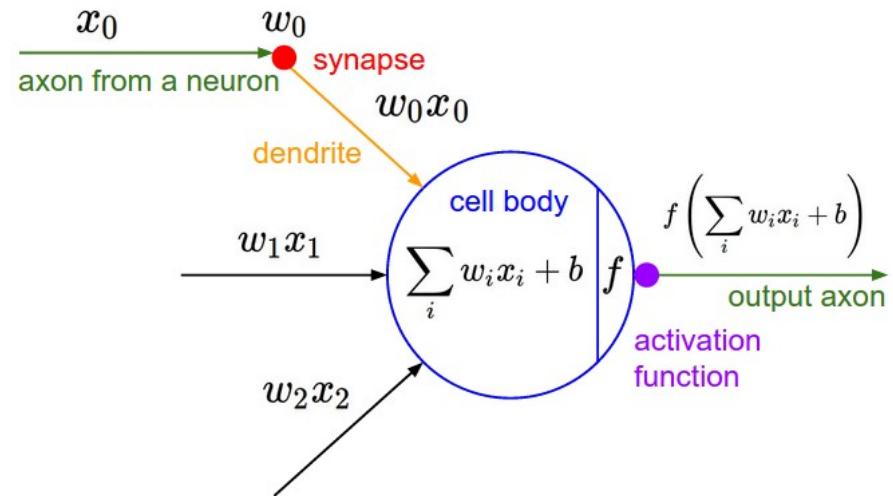
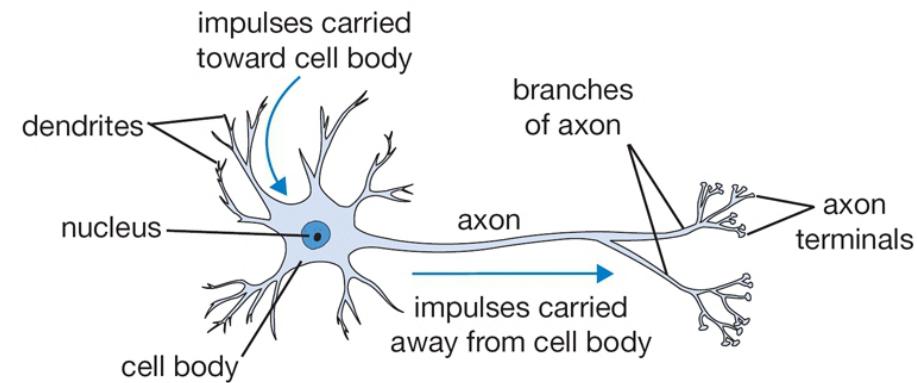
# MACHINE LEARNING



# DEEP LEARNING

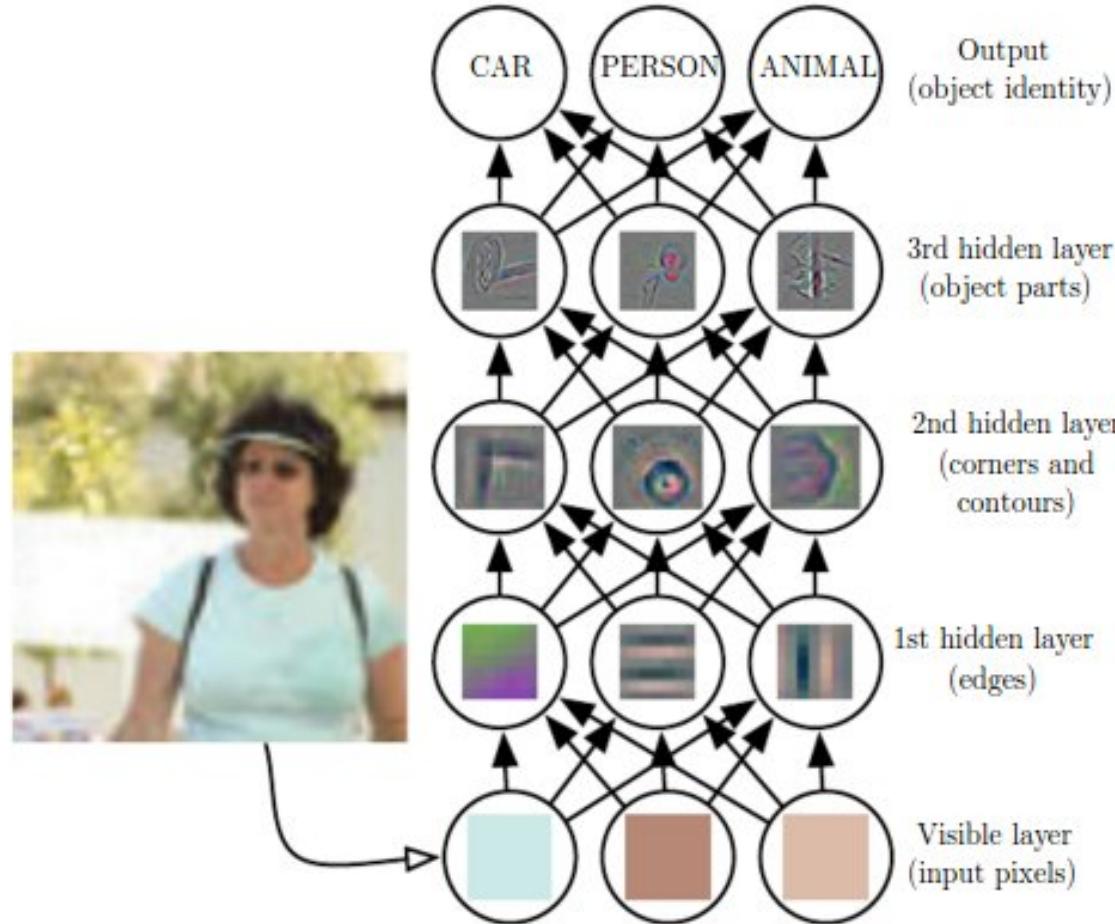


# Conceitos simples de uma rede neural artificial

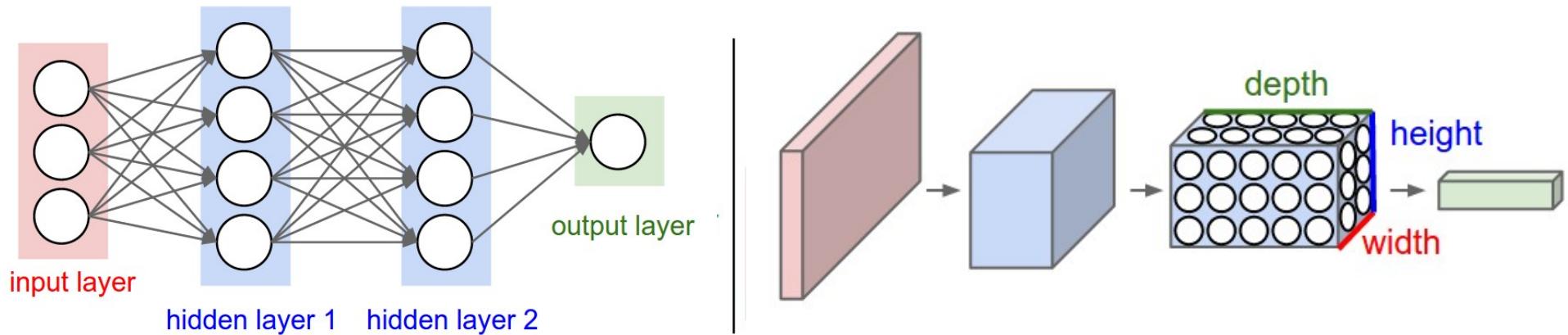


# Conceitos simples de uma rede neural artificial

IBM



# Redes Neurais Convolucionais



# Referência de estudo, projetos e code patterns



Screenshot of the IBM Developer website showing the Center for Open-Source Data & AI Technologies page.

The URL in the browser bar is <https://developer.ibm.com/code/open/centers/codait/>.

The page features a large title "Center for Open-Source Data & AI Technologies" and a subtitle "Improving the Enterprise AI Lifecycle in Open Source". To the right is a stylized graphic of a brain with blue and grey sections.

The navigation menu includes "IBM Code", "Code", "Content", "Community", "Open Source", and links for "About", "Advisory council", "Projects", and "Blogs".

<https://developer.ibm.com/code/open/centers/codait/>

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