

Creating a Credit Card Approval Model in a Jupyter Notebook & Deploying it

In this exercise, you will use a coding approach to machine learning using Jupyter Notebook. We already prepared the Notebook for you, you will basically have to call the data and deploy it in Watson Studio.

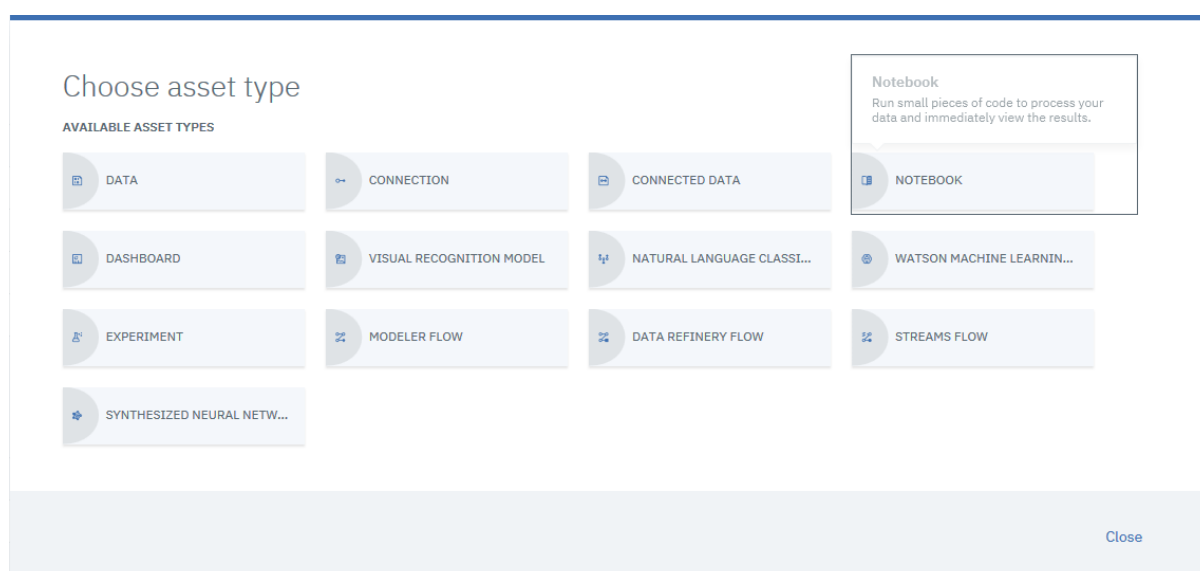
1. From your Watson Studio project's main dashboard, click on Add to project then Data. Browse “cc_applications.csv” from the workshop’s folder and upload it. It should appear now under the Data assets tab.

▼ Data assets

0 asset selected.

<input type="checkbox"/>	NAME	TYPE	CREATED BY	LAST MODIFIED	ACTIONS
	cc_applications.csv	Data Asset	Watson Studio	4 Feb 2019, 12:53:01 pm	⋮
	Bank_Customers_Data.csv	Data Asset	Watson Studio	1 Feb 2019, 3:40:43 pm	⋮
	adult_person_info.csv_shaped.csv	Data Asset	Watson Studio	1 Feb 2019, 3:11:08 pm	⋮
	adult_person_info.csv	Data Asset	Watson Studio	31 Jan 2019, 4:17:15 pm	⋮
	adult_org_info.csv	Data Asset	Watson Studio	31 Jan 2019, 4:17:07 pm	⋮

2. From your Watson Studio project's main dashboard, click on **Add to project** then Notebook.



3. Select the option “from file”, upload “Credit Card Approval Model .ipynb” from the workshop’s folder. Click on **Create Notebook**.

New notebook

Blank From file From URL

Name*

Credit Card Approval Model

Description

Type your Description here

Notebook file*

Parcourir... Credit Card Approval Model .ipynb

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

Select runtime* Includes notebook environments ⓘ

Default Python 3.5 XS (2 vCPU and 8 GB RAM)

The selected runtime has 2 vCPU and 8 GB RAM and consumes 1 capacity unit per hour.
[Learn more about capacity unit hours and Watson Studio pricing plans.](#)

4. You can now access the notebook and start the exercise. Note that we will not cover all the capabilities that come with Jupyter Notebook in Watson Studio but you can share, publish, comment or schedule a Notebook. You also have access to several kernels, here we will use Python 3.5.

IBM Watson Studio

My Projects / Workshop Watson Studio / Credit Card Approval Model

File Edit View Insert Cell Kernel Help

Run Format Code

In []:

```
# Export as slides command
# JupyterLab convert JupyterLab Slides.ipynb --to slides --post serve
```

Slide Type | Strip

Credit Card Approval

Heba El-Shimy
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 Twitter: @heba_elshimy

Slide Type | Slide

Pipeline


Slide Type | Slide

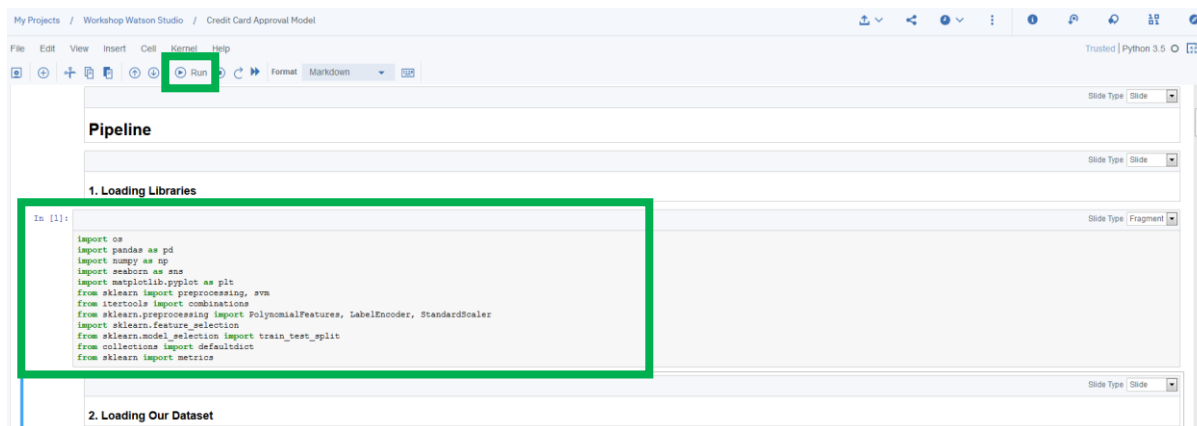
1. Loading Libraries


In []:

```
import os
import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
from sklearn import preprocessing, svm
from itertools import combinations
from sklearn.preprocessing import PolynomialFeatures, LabelEncoder, StandardScaler
import sklearn.feature_selection
from sklearn.model_selection import train_test_split
from collections import defaultdict
from sklearn import metrics
```

Slide Type | Fragment

5. The Notebook has all the details for developing the model and deployment steps already coded and embedded. One of the only input we need from you here is to load your dataset in the Notebook. In order to start, select the first cell under the Loading Libraries section, and click on Run . Every time you do so, this will run the selected cell's code. Here this will load the libraries needed for this exercise.



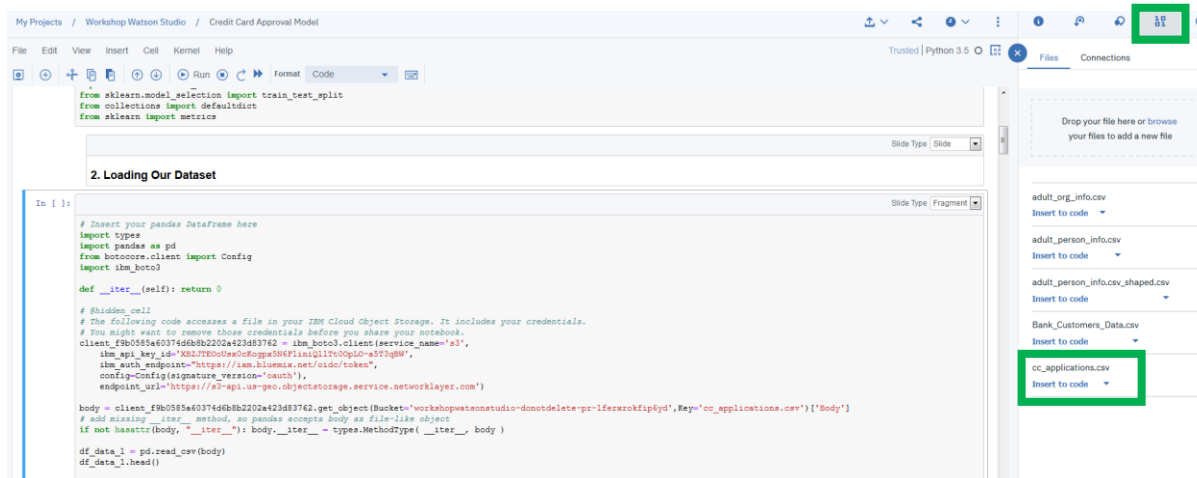
Then go to **2. Loading Our Dataset** and click in the cell that says # Insert your pandas DataFrame here. Click on  on the right hand side and go to **cc_applications.csv**, click on **Insert pandas DataFrame**:

cc_applications.csv

Insert to code

Insert pandas DataFrame

Insert Credentials



The next step is to replace at the end of the code just added

```
df_data_1 = pd.read_csv(body)
```

```
df_data_1.head()
```

By

```
applicants = pd.read_csv(body, header=None, na_values=['NaN'])
```

6. This is what you should see:

```

In [ ]:
# Insert your pandas DataFrame here
import types
import pandas as pd
from botocore.client import Config
import boto3

def __iter__(self): return 0


# @hidden_cell
# The following code accesses a file in your IBM Cloud Object Storage. It includes your credentials.
# You might want to remove those credentials before you share your notebook.
client_f9b0585a60374d68b2202a423d83762 = boto3.client(service_name='s3',
    iam_api_key_id='XB5Jr800Uaw0cK0qap5W6P1inQ117c0p10-a5Tr3qBW',
    iam_auth_endpoint='https://iam.bluemix.net/oidc/token',
    config=Config(signature_version='cauth'),
    endpoint_url='https://s3-api.us-gio.objectstorage.service.networklayer.com')

body = client_f9b0585a60374d68b2202a423d83762.get_object(Bucket='workshopwatsonstudio-donotdelete-pr-1ferxrokfp6yd', Key='cc_applications.csv')['Body']
# add missing __iter__ method, so pandas accepts body as file-like object
if not hasattr(body, "__iter__"): body.__iter__ = types.MethodType(__iter__, body)

applicants = pd.read_csv(body, header=None, na_values=['NaN'])

In [ ]:
# Checking that everything is correct
pd.set_option('display.max_columns', 30)
applicants.head(10)

```

7. Click on the cell we were working on and click Run . The next cell's goal is to give you an sample of the data imported. Select it and click Run. You should see:

```

In [3]:
# Checking that everything is correct
pd.set_option('display.max_columns', 30)
applicants.head(10)

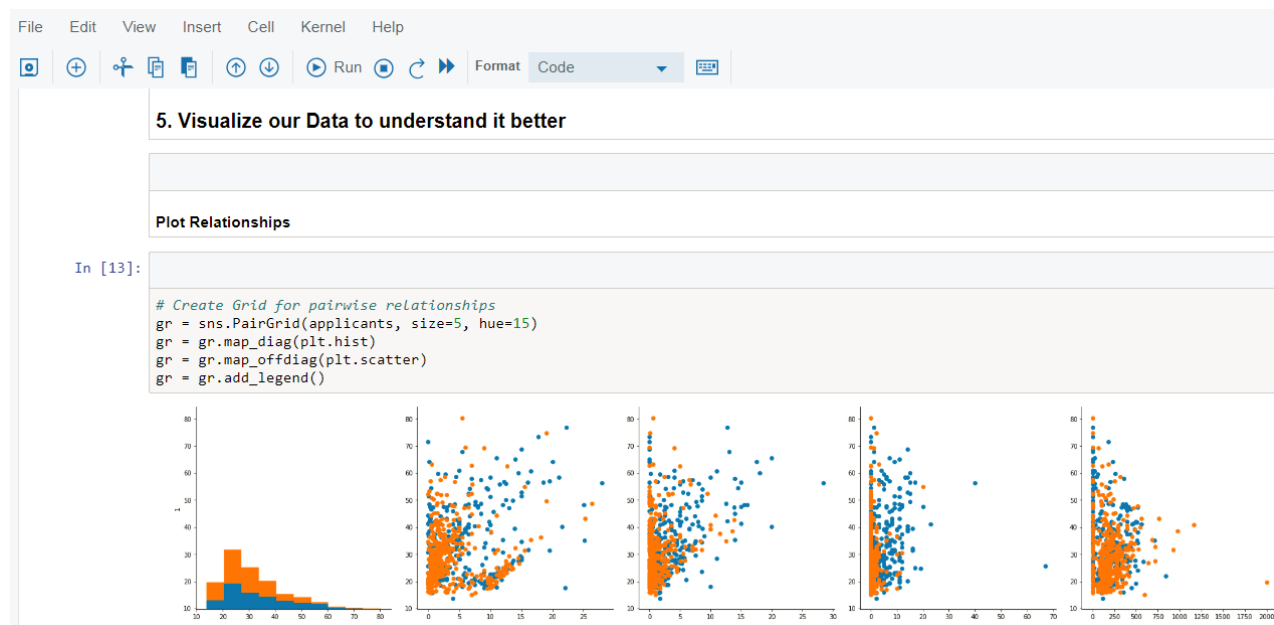
```

Out[3]:

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	b	30.83	0.000	u	g	w	v	1.250	t	t	1	f	g	00202	0	+
1	a	58.67	4.460	u	g	q	h	3.040	t	t	6	f	g	00043	560	+
2	a	24.50	0.500	u	g	q	h	1.500	t	f	0	f	g	00280	824	+
3	b	27.83	1.540	u	g	w	v	3.750	t	t	5	t	g	00100	3	+
4	b	20.17	5.625	u	g	w	v	1.710	t	f	0	f	s	00120	0	+
5	b	32.08	4.000	u	g	m	v	2.500	t	f	0	t	g	00360	0	+
6	b	33.17	1.040	u	g	r	h	6.500	t	f	0	t	g	00164	31285	+
7	a	22.92	11.585	u	g	cc	v	0.040	t	f	0	f	g	00080	1349	+
8	b	54.42	0.500	y	p	k	h	3.960	t	f	0	f	g	00180	314	+
9	b	42.50	4.915	y	p	w	v	3.165	t	f	0	t	g	00052	1442	+

8. Now you can go through all different sections and see how in this Notebook we call data, do data preparation and build a model for credit application. In order to do so, you have 2 options: go cell by cell and click on Run; or click on Cell > Run all below.

This is an example of the outputs created:



9. Now that we have this analysis, let's publish and deploy this model via a web service (REST API). In order to do so, go at the end of this Notebook to the section named **Bonus: Deploy model on the cloud using IBM Watson Machine Learning**. The code is already there, only your deployment server credentials are missing in this cell, let's retrieve yours and run this cell.

Bonus: Deploy model on the cloud using IBM Watson Machine Learning

We have our model, but we want to use it through multiple apps. A solution is to deploy it on the cloud as an endpoint (url) and send data collected from a web/mobile app as a REST API call with data sent in the form of a JSON request.

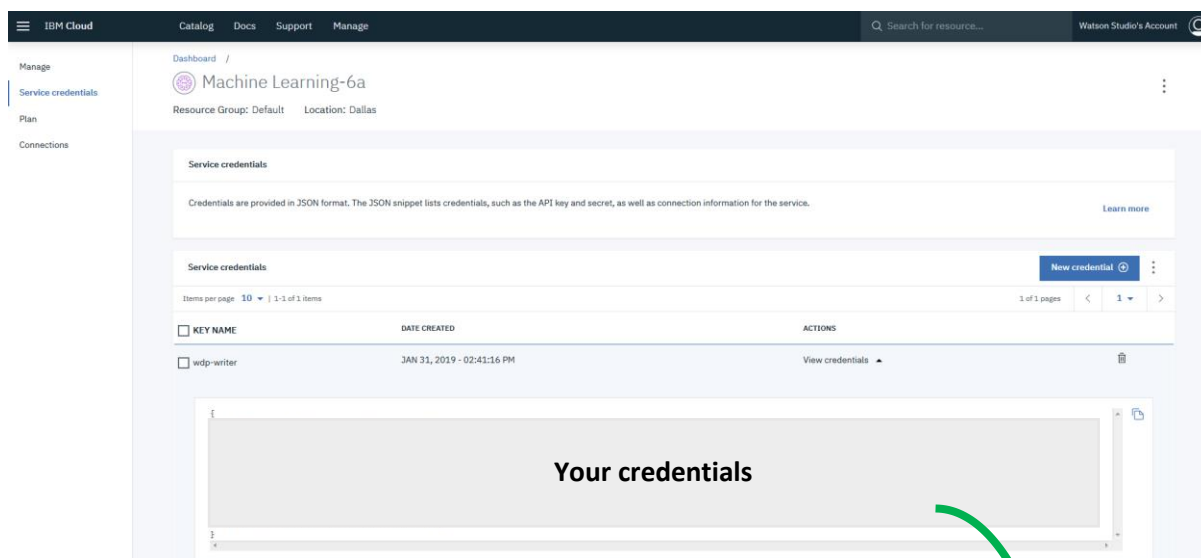
In [88]:

```
# The code was removed by DSX for sharing.
import urllib3, requests, json

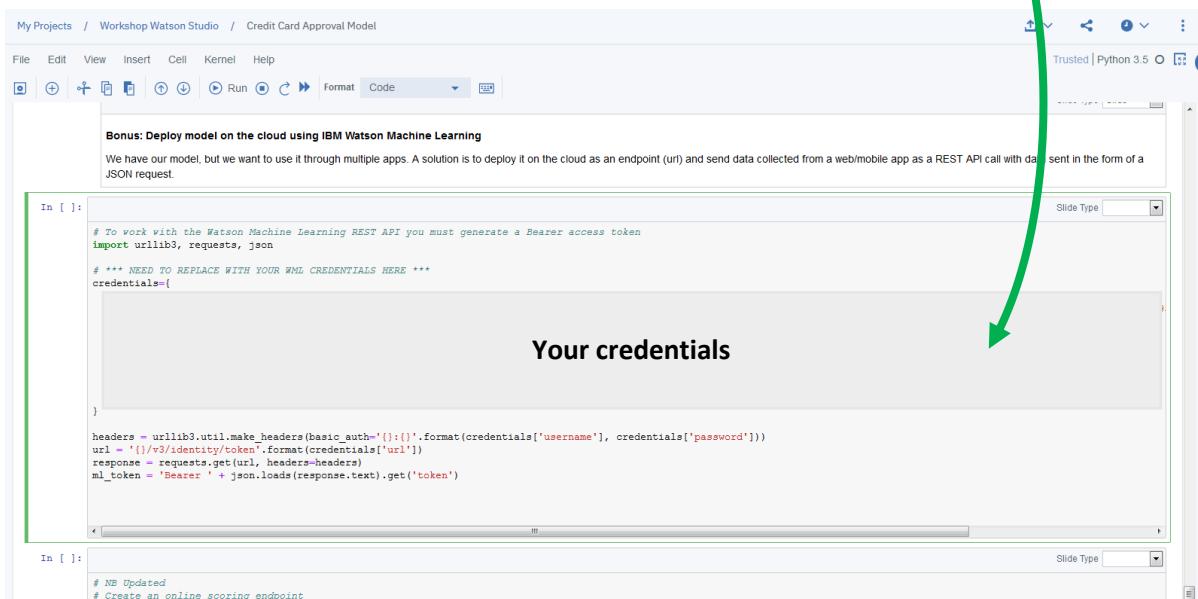
wml_credentials={
}

headers = urllib3.util.make_headers(basic_auth='{username}:{password}'.format(username=wml_credentials['username'], password=wml_credentials['password']))
url = '{}/v3/identity/token'.format(wml_credentials['url'])
response = requests.get(url, headers=headers)
mltoken = json.loads(response.text).get('token')
```

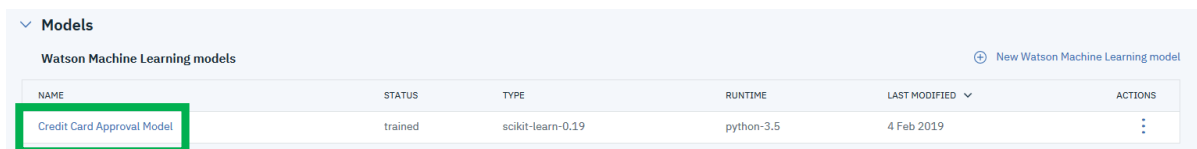
10. In order to find your credentials, go back to IBM Cloud, where you have created your services in order to do the workshop and find your Machine Learning service. You can use: <https://console.bluemix.net/dashboard/apps>
Copy your credentials.



11. Paste this information in your Notebook's cell in between the { }.

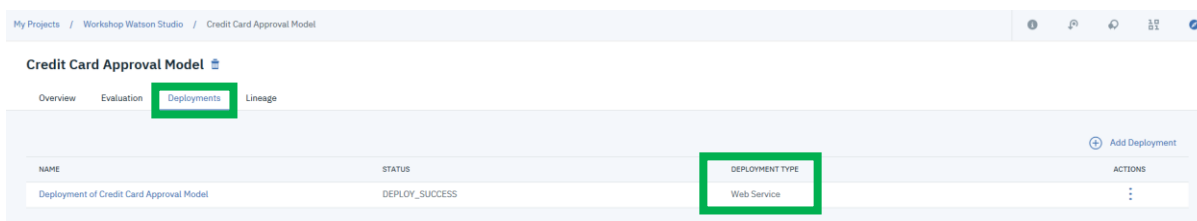


12. Run this cell and the following ones. These steps create a Model out of the notebook and deploy it. It will now appear in the Models section of your project.



NAME	STATUS	TYPE	RUNTIME	LAST MODIFIED	ACTIONS
Credit Card Approval Model	trained	scikit-learn-0.19	python-3.5	4 Feb 2019	

13. Click on the Credit Card Approval Model, then on the Deployments tab. You will see that the model has been successfully deployed as a web Service.



NAME	STATUS	DEPLOYMENT TYPE	ACTIONS
Deployment of Credit Card Approval Model	DEPLOY_SUCCESS	Web Service	

14. Click on Deployment of Credit Card Approval Model. This is where you can find all the information related to your deployment (ID, Name, Status, Model used, etc.). On the Implementation tab you will access its main access point (Scoring End-Point, Token, different code).



Implementation

Scoring End-point: https://us-south.ml.cloud.ibm.com/v3/wml_instances/256a5ae5-95e4-4daa-a702-01e513a6e3c5/deployments/e77793c1-75b9-4053-9146-08524c9fb688/online

Authorization: Bearer <token> See code snippets below for information on how to retrieve the WML Authorization Token to be passed with scoring requests.

Content-type: application/json Required if the request body is sent in JSON format.

Code Snippets

cURL Java JavaScript Python Scala

```
# retrieve your $WML_SERVICE_CREDENTIALS_USERNAME, $WML_SERVICE_CREDENTIALS_PASSWORD, and $WML_SERVICE_CREDENTIALS_URL from the
# Service credentials associated with your IBM Cloud Watson Machine Learning Service instance.

curl --basic --user $WML_SERVICE_CREDENTIALS_USERNAME:$WML_SERVICE_CREDENTIALS_PASSWORD $WML_SERVICE_CREDENTIALS_URL/v3/identity/token

# the above CURL request will return an auth token that you will use as $WML_AUTH_TOKEN in the scoring request below
# TODO: manually define and pass values to be scored below
curl -X POST --header 'Content-Type: application/json' --header 'Accept: application/json' --header 'Authorization: Bearer $WML_AUTH_TOKEN' -d '{"fields": ["F0", "F1", "F2", "F3", "F4", "F5", "F6", "F7", "F8", "F9", "F10"]}'
```

In this exercise, you have uploaded a Notebook in order to analyze credit card application data. You then published and deployed it as a web service.