

Week4: Deployment on Flask

Name: Madoka Fujii

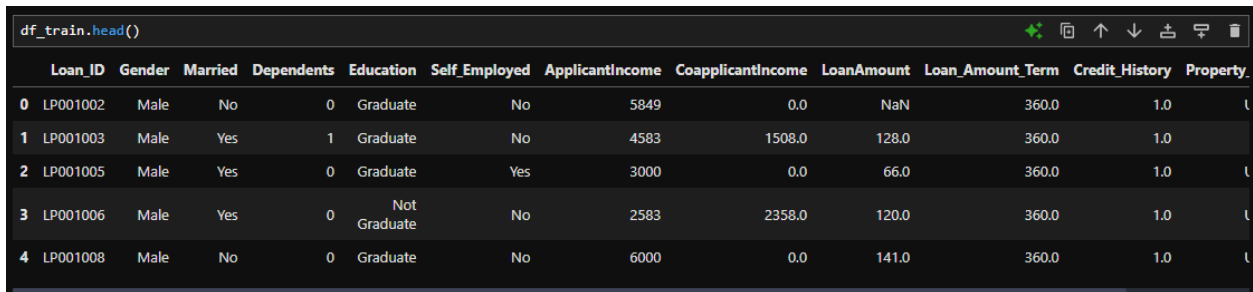
Batch Code: LISUM39

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Submission to: Data Glacier

Step1: Select any toy data

I found Loan Prediction dataset



```
df_train.head()
```

	Loan_ID	Gender	Married	Dependents	Education	Self_Employed	ApplicantIncome	CoapplicantIncome	LoanAmount	Loan_Amount_Term	Credit_History	Property
0	LP001002	Male	No	0	Graduate	No	5849	0.0	NaN	360.0	1.0	l
1	LP001003	Male	Yes	1	Graduate	No	4583	1508.0	128.0	360.0	1.0	l
2	LP001005	Male	Yes	0	Graduate	Yes	3000	0.0	66.0	360.0	1.0	l
3	LP001006	Male	Yes	0	Not Graduate	No	2583	2358.0	120.0	360.0	1.0	l
4	LP001008	Male	No	0	Graduate	No	6000	0.0	141.0	360.0	1.0	l

There are originally 13 variables.

Then, I have adjusted the dataset for building a logistic regression model.

-Omitted Loan_Status variable

-Created One-Hot encoding

-Mapped boolean answer to 1/0.

-Imputed missing value with mean

-Adjusted some row (eg. converted from 3+ to 3 in Dependents variable)

After the adjustments, the variable became 13. (it was the same as before but the contents were changed.)

```

29]: train.info()

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 614 entries, 0 to 613
Data columns (total 15 columns):
 #   Column                Non-Null Count  Dtype  
---  --
 0   Married                614 non-null   int64  
 1   Dependents              614 non-null   int32  
 2   Education               614 non-null   int64  
 3   Self_Employed           614 non-null   int64  
 4   ApplicantIncome         614 non-null   int64  
 5   CoapplicantIncome       614 non-null   float64 
 6   LoanAmount              614 non-null   float64 
 7   Loan_Amount_Term        614 non-null   float64 
 8   Credit_History           614 non-null   float64 
 9   Loan_Status             614 non-null   int64  
10   Gender_Female           614 non-null   bool    
11   Gender_Male             614 non-null   bool    
12   Property_Area_Rural     614 non-null   bool    
13   Property_Area_Semiurban 614 non-null   bool    
14   Property_Area_Urban     614 non-null   bool    
dtypes: bool(5), float64(4), int32(1), int64(5)
memory usage: 48.7 KB

Model Building

31]: #Splitting the dataset into features and target
x=train.drop('Loan_Status',axis=1)
y=train['Loan_Status']

```

Step2: Save the model

```

import pickle

# Saving model to disk
pickle.dump(lr, open('model.pkl','wb'))

# Loading model to compare the results
model = pickle.load(open('model.pkl','rb'))
print(model.predict([[1, 2, 1, 0, 6000, 500, 100.01, 360, 1.0, 0, 1, 0, 0, 1]]))

[1]

```

Using pickle, saved the model to deploy on Flask.

Step3: Deploy the model on Flask

In PyCharm, I created app.py file.

Data Mapping between app.py and index.html.

```
app.py 2 X <> index.html
C: > Users > la-ni > PycharmProjects > pythonProject > dataglacier2024 > week4 > app.py > ...
1  import numpy as np
2  from flask import Flask, request, render_template
3  import pickle
4
5  app = Flask(__name__)
6  model = pickle.load(open('model.pkl', 'rb'))
7
8  @app.route('/')
9  def home():
10     return render_template('index.html')
11
12  @app.route('/predict', methods=['POST'])
13  def predict():
14     '''
15     For rendering results on HTML GUI
16     '''
17     form_data = request.form
18
19     # conver strings to int or float as need
20     applicant_income = float(form_data['applicantIncome'])
21     coapplicant_income = float(form_data['coapplicantIncome'])
22     loan_amount = float(form_data['loanamount'])
23     loan_amount_term = float(form_data['loanamountterm'])
24     credit_history = 1 if form_data['credit_history'] == 'Yes' else 0
25
26
27     #One-Hot encoding
28     married = 1 if form_data['married'] == 'Yes' else 0 # married_yes -> 1
29     dependents = form_data['dependents']
30     dependents_value = 3 if dependents == '3+' else int(dependents)
31     education = 1 if form_data['education'] == 'Yes' else 0 # education_yes -> 1
32     self_employed = 1 if form_data['self_employed'] == 'Yes' else 0 # self_employed_yes -> 1
33
34     gender_male = 1 if form_data['gender_male'] == 'Yes' else 0 # Gender Male -> 1
35     gender_female = 1 if form_data['gender_male'] == 'No' else 0 # Gender Female -> 1
36
37     # encoding for Property Area
38     property_area = form_data['property_area']
```

app.py 2 x index.html

C: > Users > la-ni > PycharmProjects > pythonProject > dataglacier2024 > week4 > app.py > predict

```
13 def predict():
14     # encoding for Property Area
15
16     property_area = form_data['property_area']
17     rural = 1 if property_area == 'Rural' else 0
18     semiurban = 1 if property_area == 'Semiurban' else 0
19     urban = 1 if property_area == 'Urban' else 0
20
21
22     # put array the future characteristics
23     final_features = np.array([
24         applicant_income,
25         coapplicant_income,
26         loan_amount,
27         loan_amount_term,
28         credit_history,
29         married,
30         dependents_value,
31         education,
32         self_employed,
33         gender_male,
34         gender_female,
35         rural,
36         semiurban,
37         urban
38     ]).reshape(1, -1)
39
40
41     #predict implimentaion
42     prediction = model.predict(final_features)
43
44     output = "Yes" if prediction[0] == 1 else "No"
45
46     return render_template('index.html', prediction_text='Loan Acceptance {}'.format(output))
47
48
49 if __name__ == "__main__":
50     app.run(port=5000, debug=True)
```

Created index.html file.

Data Mapping between app.py and index.html.

```
app.py 2 index.html X
C: > Users > la-ni > PycharmProjects > pythonProject > dataglacier2024 > week4 > templates > index.html > ...
1 <!DOCTYPE html>
2 <html>
3 <head>
4 <meta charset="UTF-8">
5 <title>ML Logistics Reg API</title>
6 <link href='https://fonts.googleapis.com/css?family=Pacifico' rel='stylesheet' type='text/css'>
7 <link href='https://fonts.googleapis.com/css?family=Arimo' rel='stylesheet' type='text/css'>
8 <link href='https://fonts.googleapis.com/css?family=Hind:300' rel='stylesheet' type='text/css'>
9 <link href='https://fonts.googleapis.com/css?family=Open+Sans+Condensed:300' rel='stylesheet' type='text/css'>
10 <link rel="stylesheet" href="{{ url_for('static', filename='css/style.css') }}">
11
12 </head>
13
14 <body>
15 <div class="login">
16 <h1>Loan Prediction</h1>
17
18 <!-- Main Input For Receiving Query to our ML -->
19 <form action="{{ url_for('predict')}}" method="post">
20
21
22 <label for="gender_male">Are you Male?:</label>
23 <select name="gender_male" id="gender_male">
24 <option value="Yes">Yes</option>
25 <option value="No">No</option>
26 </select>
27 <br>
28 <br>
29 <label for="married">Married?:</label>
30 <select name="married" id="married">
31 <option value="Yes">Yes</option>
32 <option value="No">No</option>
33 </select>
34 <br>
35
36 <label for="dependents">How many Dependents?:</label>
37 <select name="dependents" id="dependents">
38 <option value="0">0</option>
```

app.py 2

index.html X

C:\Users\la-ni\PycharmProjects\pythonProject\dataglacier2024\week4\templates> index.html > ...

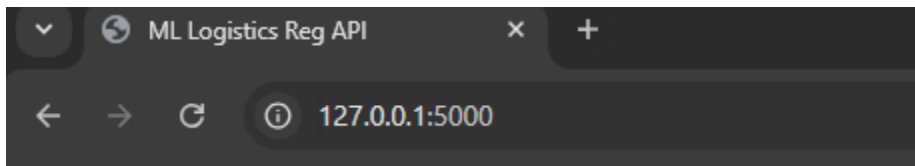
```
2  <html >
14 <body>
15   <div class="login">
19     <form action="{{ url_for('predict')}}"method="post">
36     <label for="dependents">How many Dependents?:</label>
37     <select name="dependents" id="dependents">
38       <option value="0">0</option>
39       <option value="1">1</option>
40       <option value="2">2</option>
41       <option value="3">3+</option>
42     </select>
43   <br>
44   <label for="education">Education is graduate?:</label>
46   <select name="education" id="education">
47     <option value="Yes">Yes</option>
48     <option value="No">No</option>
49   </select>
50   <br>
51   <label for="self_employed">Self Employed?:</label>
53   <select name="self_employed" id="self_employed">
54     <option value="Yes">Yes</option>
55     <option value="No">No</option>
56   </select>
57   <br>
58   <label for="applicantIncome">Applicant Income:</label>
61   <input type="text" name="applicantIncome" placeholder="eg: 2500" required="required" />
62   <br>
63   <label for="coapplicantIncome">Coapplicant Income:</label>
64   <input type="text" name="coapplicantIncome" placeholder="eg: 1500.54" required="required" />
65   <br>
66   <label for="bloanamount">Loan Amount:</label>
67   <input type="text" name="loanamount" placeholder="eg: 120.06" required="required" />
68   <br>
69   <label for="loanamountterm">Loan Amount Term:</label>
```

```
app.py 2 index.html X
C: > Users > la-ni > PycharmProjects > pythonProject > dataglacier2024 > week4 > templates > index.html > html > body > div.login > form > label
2 <html>
14 <body>
15 <div class="login">
19 <form action="{{ url_for('predict')}}" method="post">
65
66 <label for="loanamount">Loan Amount:</label>
67 <input type="text" name="loanamount" placeholder="eg: 120.06" required="required" />
68
69 <label for="loanamountterm">Loan Amount Term:</label>
70 <input type="text" name="loanamountterm" placeholder="eg: 360, 240, 180" required="required" />
71
72 <label for="credit_history">Do you have Credit History?:</label>
73 <select name="credit_history" id="credit_history">
74 <option value="Yes">Yes</option>
75 <option value="No">No</option>
76 </select>
77 <br>
78
79 <label for="property_area">Property Area:</label>
80 <select name="property_area" id="property_area">
81 <option value="Rural">Rural</option>
82 <option value="Semiurban">Semiurban</option>
83 <option value="Urban">Urban</option>
84 </select>
85 <br>
86
87 <button type="submit" class="btn btn-primary btn-block btn-large">Predict</button>
88 </form>
89
90 <br>
91
92 {{ prediction_text }}
93
94 </div>
95 <!--img src="/static/images/Original.svg" style="width: 400px;position: absolute;bottom: 10px;left: 10px;" alt="Company Logo"/-->
96
97 </body>
98 </html>
```

Run app.py in Command prompt.

```
PS C:\Users\la-ni\PycharmProjects\pythonProject\dataglacier2024\week4> python app.py
C:\Users\la-ni\AppData\Local\Programs\Python\Python312\Lib\site-packages\sklearn\base.py:376: Inco
: Trying to unpickle estimator LogisticRegression from version 1.3.0 when using version 1.5.2. Thi
ng code or invalid results. Use at your own risk. For more info please refer to:
https://scikit-learn.org/stable/model_persistence.html#security-maintainability-limitations
  warnings.warn(
* Serving Flask app "app" (lazy loading)
* Environment: production
  WARNING: This is a development server. Do not use it in a production deployment.
  Use a production WSGI server instead.
* Debug mode: on
* Restarting with stat
C:\Users\la-ni\AppData\Local\Programs\Python\Python312\Lib\site-packages\sklearn\base.py:376: Inco
: Trying to unpickle estimator LogisticRegression from version 1.3.0 when using version 1.5.2. Thi
ng code or invalid results. Use at your own risk. For more info please refer to:
https://scikit-learn.org/stable/model_persistence.html#security-maintainability-limitations
  warnings.warn(
* Debugger is active!
* Debugger PIN: 124-969-024
* Running on http://127.0.0.1:5000/ (Press CTRL+C to quit)
```


Open the link in the new browser.



Loan Prediction

Are you Male?: Yes ▾

Married?: Yes ▾

How many Dependents?: 0 ▾

Education is graduate?: Yes ▾

Self Employed?: Yes ▾

Applicant Income:

eg: 2500

Coapplicant Income:

eg: 1500.54

Loan Amount:

eg: 120.06

Loan Amount Term:

eg: 360, 240, 180

Do you have Credit History?: Yes ▾

Property Area: Rural ▾

Predict

Fill in the format and then press the button.
The result appears.

Loan Prediction

Are you Male?: Yes ▾

Married?: Yes ▾

How many Dependents?: 0 ▾

Education is graduate?: Yes ▾

Self Employed?: Yes ▾

Applicant Income:

eg: 2500

Coapplicant Income:

eg: 1500.54

Loan Amount:

eg: 120.06

Loan Amount Term:

eg: 360, 240, 180

Do you have Credit History?: Yes ▾

Property Area: Rural ▾

Predict

Loan Acceptance Yes