Deployment on Flask

Name: Asher Chok

Batch code: LISUM17

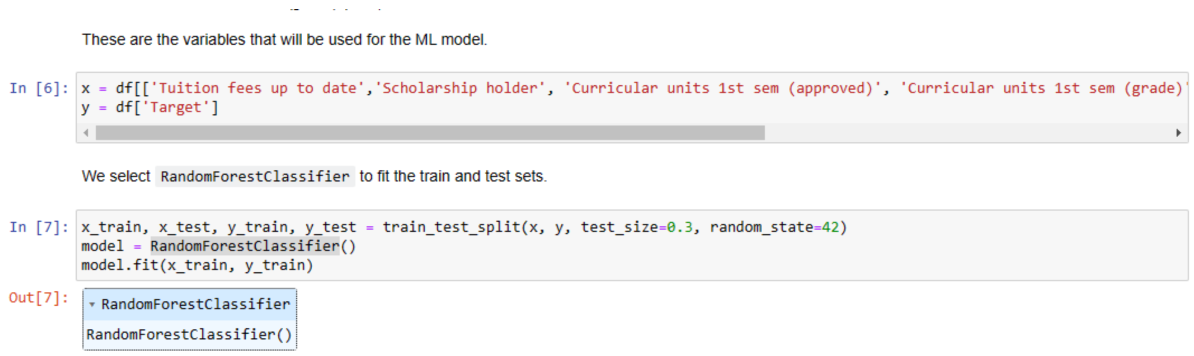
Submission date: 1/23/2023

Submitted to: Data Glacier

Dataset from: Predict students' dropout and academic success | Kaggle

Deployment steps

A notebook was created for making a simple ML model for the student dataset.



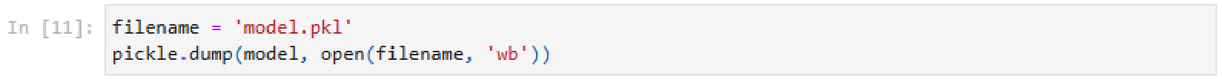
These are the variables that will be used for the ML model.

```
In [6]: x = df[['Tuition fees up to date','Scholarship holder', 'Curricular units 1st sem (approved)', 'Curricular units 1st sem (grade)'
        y = df['Target']
```

We select `RandomForestClassifier` to fit the train and test sets.

```
In [7]: x_train, x_test, y_train, y_test = train_test_split(x, y, test_size=0.3, random_state=42)
        model = RandomForestClassifier()
        model.fit(x_train, y_train)

Out[7]: ▾ RandomForestClassifier
        RandomForestClassifier()
```

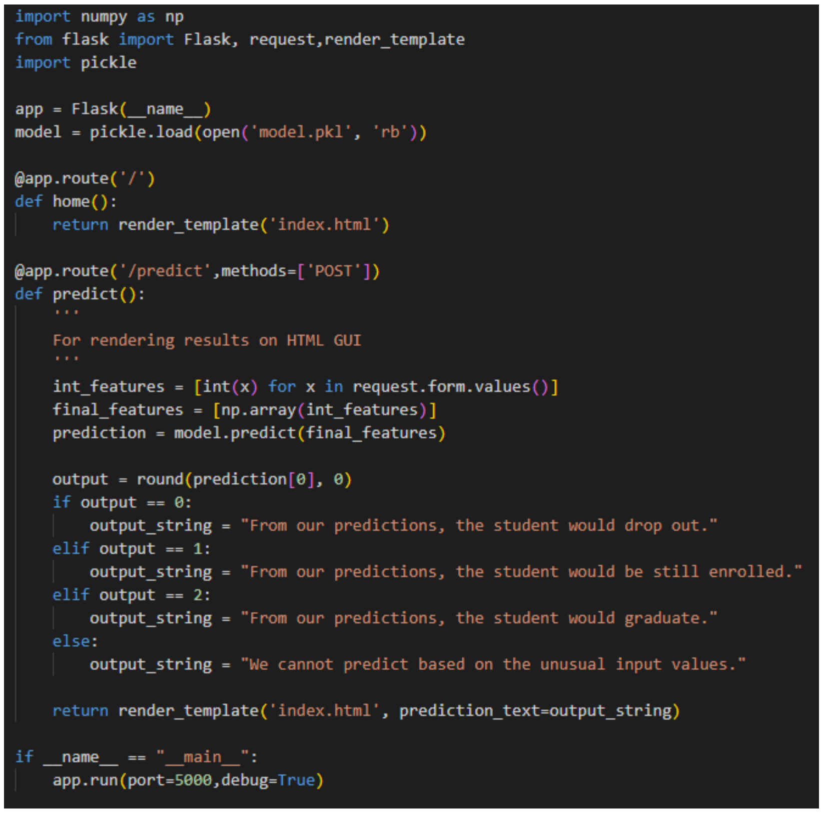
The model was then pickled (a process that saves model to a file on disk in binary format that can be used to make prediction) with the code block as shown below.



```
In [11]: filename = 'model.pkl'
         pickle.dump(model, open(filename, 'wb'))
```

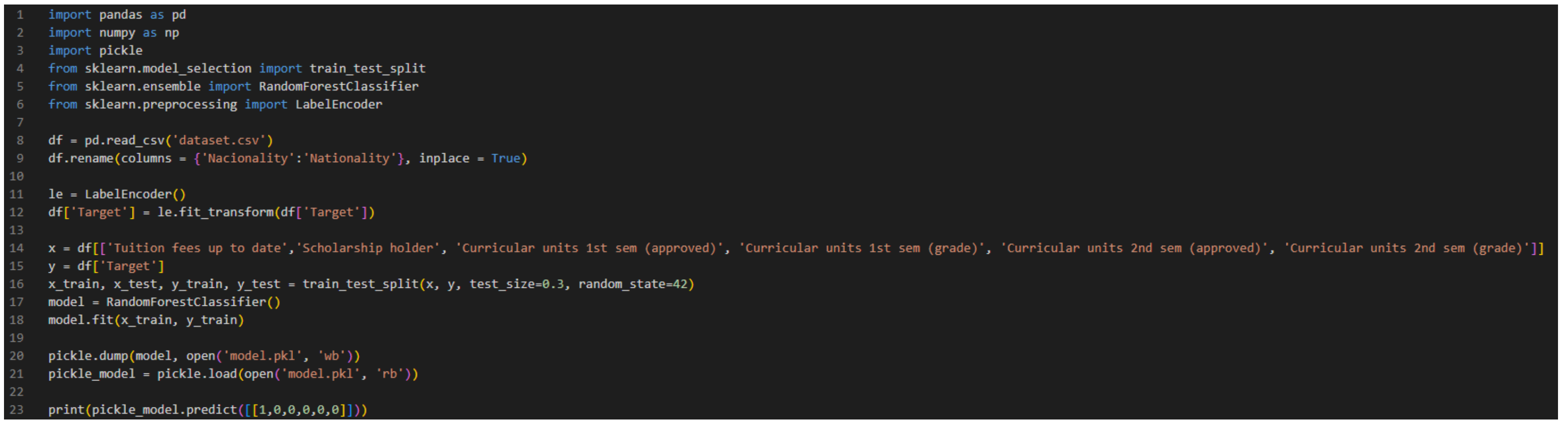
Two python files were written for Flask deployment:

1) *app.py*: A python file for creating and configuring the Flask application, handling requests and defining routes and views.



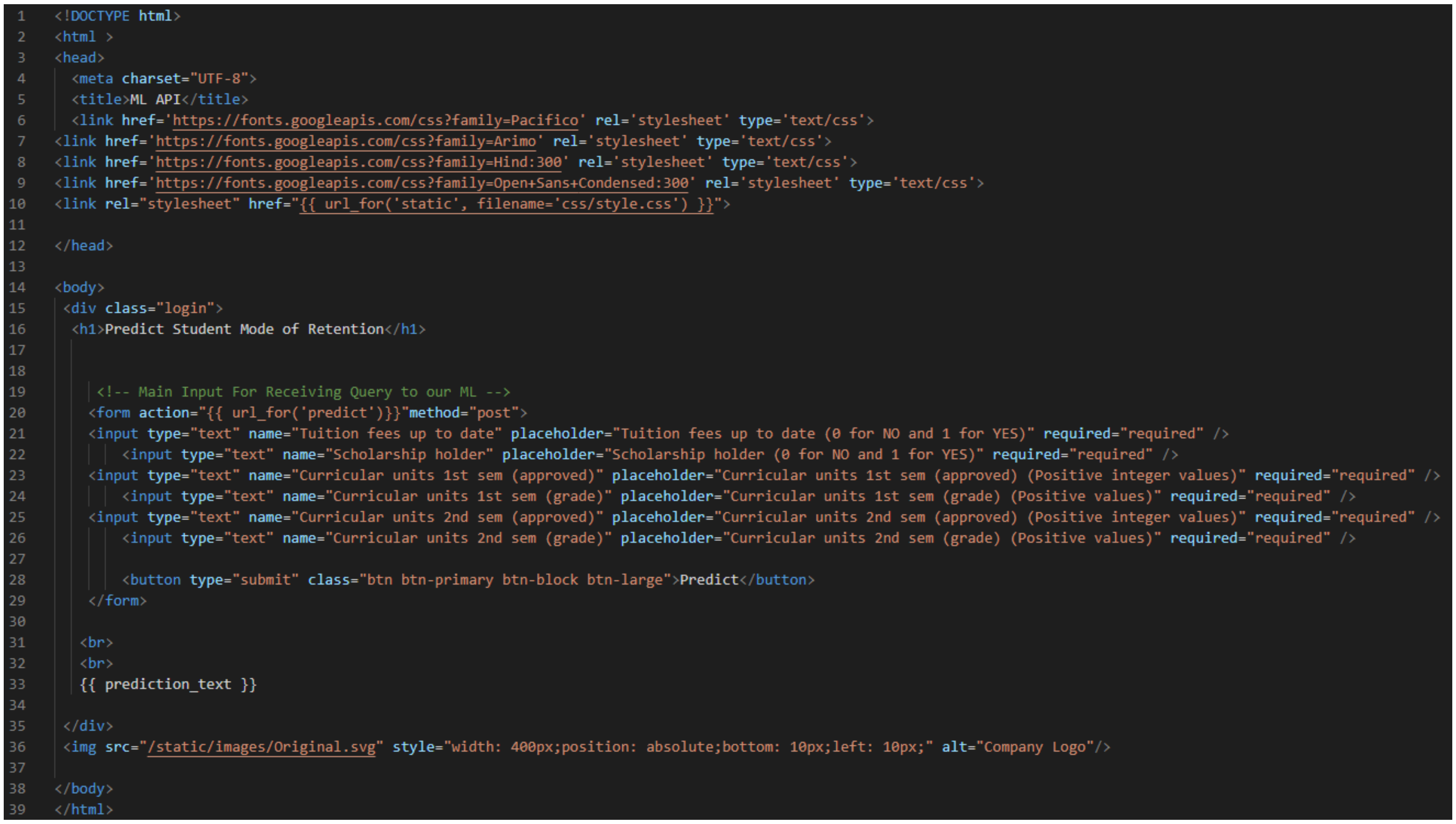
```python
import numpy as np
from flask import Flask, request,render_template
import pickle

app = Flask(__name__)
model = pickle.load(open('model.pkl', 'rb'))

@app.route('/')
def home():
    return render_template('index.html')

@app.route('/predict',methods=['POST'])
def predict():
    '''
    For rendering results on HTML GUI
    '''
    int_features = [int(x) for x in request.form.values()]
    final_features = [np.array(int_features)]
    prediction = model.predict(final_features)

    output = round(prediction[0], 0)
    if output == 0:
        output_string = "From our predictions, the student would drop out."
    elif output == 1:
        output_string = "From our predictions, the student would be still enrolled."
    elif output == 2:
        output_string = "From our predictions, the student would graduate."
    else:
        output_string = "We cannot predict based on the unusual input values."

    return render_template('index.html', prediction_text=output_string)

if __name__ == "__main__":
    app.run(port=5000,debug=True)
```

2) *model.py*: A python file that loads the trained ML model and provides an interface for making predictions.



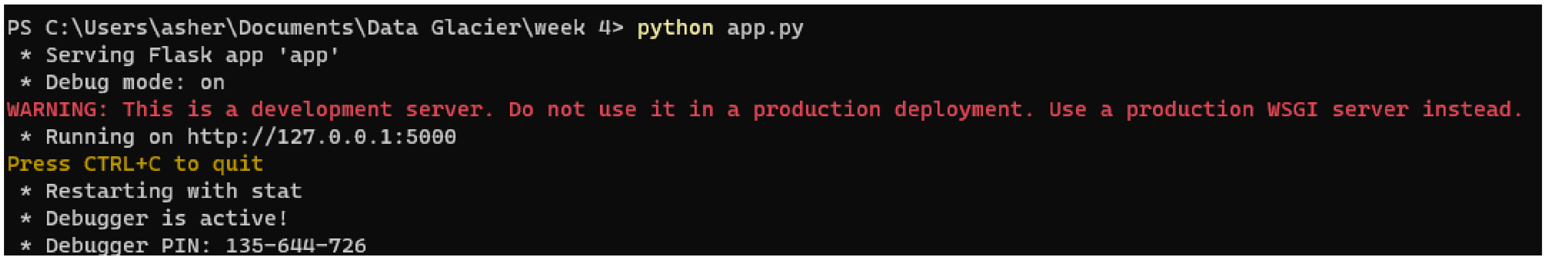
```python
import pandas as pd
import numpy as np
import pickle
from sklearn.model_selection import train_test_split
from sklearn.ensemble import RandomForestClassifier
from sklearn.preprocessing import LabelEncoder

df = pd.read_csv('dataset.csv')
df.rename(columns = {'Nacionality':'Nationality'}, inplace = True)

le = LabelEncoder()
df['Target'] = le.fit_transform(df['Target'])

x = df[['Tuition fees up to date','Scholarship holder', 'Curricular units 1st sem (approved)', 'Curricular units 1st sem (grade)', 'Curricular units 2nd sem (approved)', 'Curricular units 2nd sem (grade)']]
y = df['Target']
x_train, x_test, y_train, y_test = train_test_split(x, y, test_size=0.3, random_state=42)
model = RandomForestClassifier()
model.fit(x_train, y_train)

pickle.dump(model, open('model.pkl', 'wb'))
pickle_model = pickle.load(open('model.pkl', 'rb'))

print(pickle_model.predict([[1,0,0,0,0,0]]))
```

Then a HTML file *index.html* was created for the Flask web app.



```html
<!DOCTYPE html>
<html >
<head>
  <meta charset="UTF-8">
  <title>ML API</title>
  <link href='https://fonts.googleapis.com/css?family=Pacifico' rel='stylesheet' type='text/css'>
<link href='https://fonts.googleapis.com/css?family=Arimo' rel='stylesheet' type='text/css'>
<link href='https://fonts.googleapis.com/css?family=Hind:300' rel='stylesheet' type='text/css'>
<link href='https://fonts.googleapis.com/css?family=Open+Sans+Condensed:300' rel='stylesheet' type='text/css'>
<link rel="stylesheet" href="{{ url_for('static', filename='css/style.css') }}">

</head>

<body>
 <div class="login">
  <h1>Predict Student Mode of Retention</h1>


    <!-- Main Input For Receiving Query to our ML -->
    <form action="{{ url_for('predict')}}"method="post">
    <input type="text" name="Tuition fees up to date" placeholder="Tuition fees up to date (0 for NO and 1 for YES)" required="required" />
        <input type="text" name="Scholarship holder" placeholder="Scholarship holder (0 for NO and 1 for YES)" required="required" />
    <input type="text" name="Curricular units 1st sem (approved)" placeholder="Curricular units 1st sem (approved) (Positive integer values)" required="required" />
        <input type="text" name="Curricular units 1st sem (grade)" placeholder="Curricular units 1st sem (grade) (Positive values)" required="required" />
    <input type="text" name="Curricular units 2nd sem (approved)" placeholder="Curricular units 2nd sem (approved) (Positive integer values)" required="required" />
        <input type="text" name="Curricular units 2nd sem (grade)" placeholder="Curricular units 2nd sem (grade) (Positive values)" required="required" />

        <button type="submit" class="btn btn-primary btn-block btn-large">Predict</button>
    </form>

   <br>
   <br>
   {{ prediction_text }}

 </div>
 <img src="/static/images/Original.svg" style="width: 400px;position: absolute;bottom: 10px;left: 10px;" alt="Company Logo"/>

</body>
</html>
```

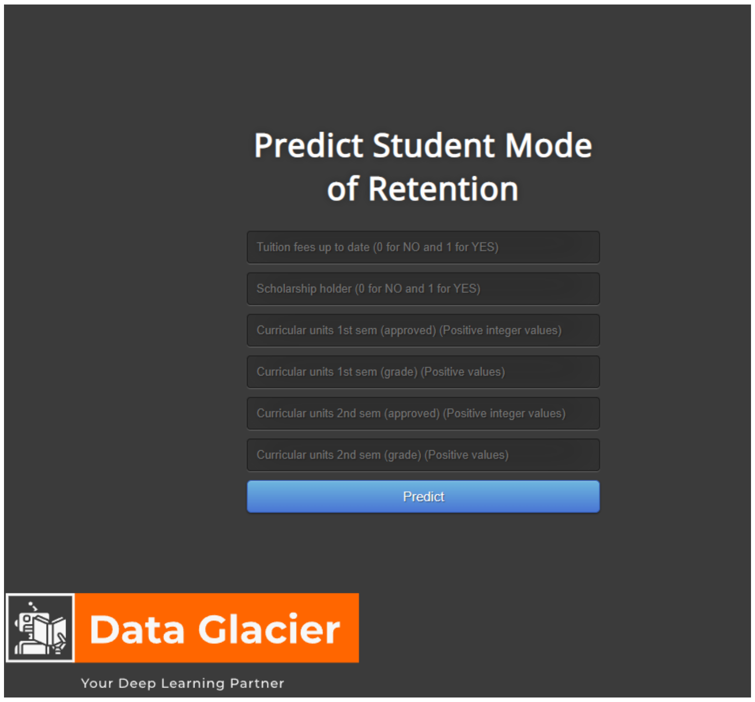
Pickle was then installed in Windows PowerShell terminal with *pip install pickle* command. Then, the following command *python app.py* was run to display the local web app:



```
PS C:\Users\asher\Documents\Data Glacier\week 4> python app.py
 * Serving Flask app 'app'
 * Debug mode: on
WARNING: This is a development server. Do not use it in a production deployment. Use a production WSGI server instead.
 * Running on http://127.0.0.1:5000
Press CTRL+C to quit
 * Restarting with stat
 * Debugger is active!
 * Debugger PIN: 135-644-726
```

CTRL+click on the link http://127.0.0.1:5000 redirects user to the development server.

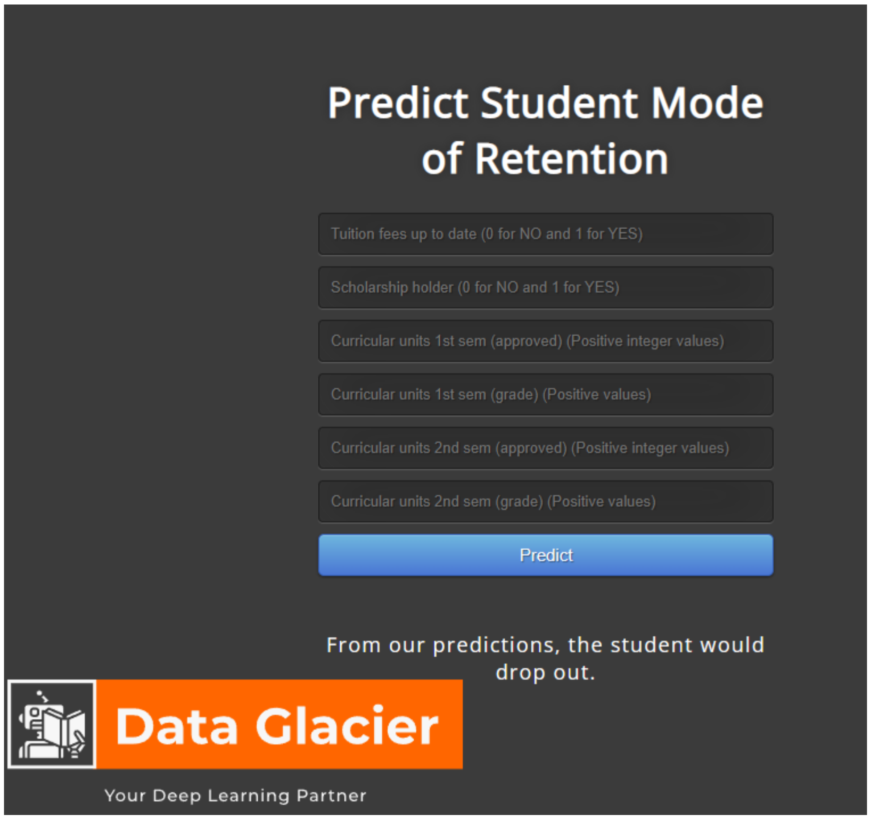
The displayed webpage on localhost shows:



Predict Student Mode of Retention

Tuition fees up to date (0 for NO and 1 for YES)
Scholarship holder (0 for NO and 1 for YES)
Curricular units 1st sem (approved) (Positive integer values)
Curricular units 1st sem (grade) (Positive values)
Curricular units 2nd sem (approved) (Positive integer values)
Curricular units 2nd sem (grade) (Positive values)
Predict
Data Glacier
Your Deep Learning Partner

When we try to enter sample row values into the fields, we get the expected target value from the original dataset which means that the model works as expected. For demonstrating purpose, below is what was shown when [1,0,0,0,0,0] was entered into the fields:



Predict Student Mode of Retention

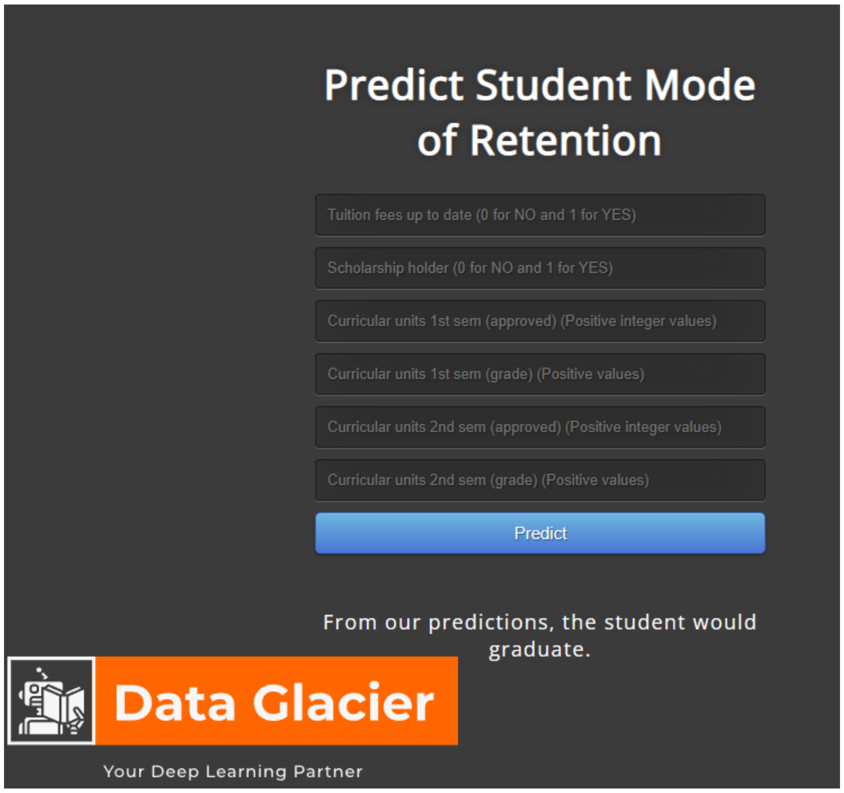
Tuition fees up to date (0 for NO and 1 for YES)
Scholarship holder (0 for NO and 1 for YES)
Curricular units 1st sem (approved) (Positive integer values)
Curricular units 1st sem (grade) (Positive values)
Curricular units 2nd sem (approved) (Positive integer values)
Curricular units 2nd sem (grade) (Positive values)
Predict
Data Glacier
Your Deep Learning Partner

From our predictions, the student would drop out.

Another example case can be tested where a student:

- has tuition fees up to date
- is a scholarship holder
- has 15 curricular units for the two semesters

gives output value of 2, which returns the desired string from *app.py*.


Predict Student Mode of Retention
Tuition fees up to date (0 for NO and 1 for YES)
Scholarship holder (0 for NO and 1 for YES)
Curricular units 1st sem (approved) (Positive integer values)
Curricular units 1st sem (grade) (Positive values)
Curricular units 2nd sem (approved) (Positive integer values)
Curricular units 2nd sem (grade) (Positive values)
Predict
Data Glacier
Your Deep Learning Partner

From our predictions, the student would graduate.