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Batch code: LISUM33

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For simplicity, the same virtual environment is used for model.py and app.py and the corresponding requirements saved in requirements.txt are used for the cloud deployed app.

These are the package installations (full range of dependencies is in requirements.txt below):

```
(.venv) D:\repos\Week_5>pip install flask numpy pandas scikit-learn gunicorn
```

This is part of the dataset I used to train the model.

The model predicts gender based on height, hand length, and foot length in millimeters.

Gender column: 1 represents male and 2 represents female.

```
GENDER,HEIGHT,HAND_LENGTH,FOOT_LENGTH
1,1760.2,208.6,269.6
1,1730.1,207.6,251.3
1,1659.6,173.2,193.6
1,1751.3,258,223.8
1,1780.6,212.3,282.1
1,1818.3,213.4,268
1,1798.7,213.2,272.4
1,1664,200,252.1
1,1808.7,214.5,274.7
1,1782.9,210.4,266.6
```

This is the model.py code that trains and saves the gender predicting model.

There is also an output for the data cleaning.

```python
# Importing the libraries
import numpy as np
import pandas as pd
import pickle
from sklearn.linear_model import LogisticRegression


def find_outliers(data):
    Q1 = np.percentile(data, 25)
    Q3 = np.percentile(data, 75)
    IQR = Q3 - Q1
    return np.where((data < Q1 - 1.5 * IQR) | (data > Q3 + 1.5 * IQR))[0]



gender_df = pd.read_csv('mw.csv')


#Data Cleaning:
print("\nColumn data Types:")
print(gender_df.dtypes)
print("\nNumber of NA's:\n"+str(gender_df.isna().sum()))
print("\nNumber of NUll's:\n"+str(gender_df.isnull().sum()))

print("\nBefore outlier removal:")
print("Height outliers:",len(find_outliers(gender_df["HEIGHT"])))
print("Hand length outliers:",len(find_outliers(gender_df["HAND_LENGTH"])))
print("Foot length outliers:",len(find_outliers(gender_df["FOOT_LENGTH"])))

gender_df = gender_df.drop(find_outliers(gender_df["HAND_LENGTH"])).reset_index(drop=True)

print("\nAfter outlier removal:")
print("Height outliers:",len(find_outliers(gender_df["HEIGHT"])))
print("Hand length outliers:",len(find_outliers(gender_df["HAND_LENGTH"])))
print("Foot length outliers:",len(find_outliers(gender_df["FOOT_LENGTH"])))


#Model:
mdl  = LogisticRegression()

X = gender_df.drop("GENDER", axis = 1).values

y = gender_df["GENDER"]

mdl.fit(X, y)

pickle.dump(mdl, open('model.pkl','wb'))
```

```
Column data Types:
GENDER            int64
HEIGHT          float64
HAND_LENGTH     float64
FOOT_LENGTH     float64
dtype: object

Number of NA's:
GENDER          0
HEIGHT          0
HAND_LENGTH     0
FOOT_LENGTH     0
dtype: int64

Number of NUll's:
GENDER          0
HEIGHT          0
HAND_LENGTH     0
FOOT_LENGTH     0
dtype: int64

Before outlier removal:
Height outliers: 0
Hand length outliers: 2
Foot length outliers: 0

After outlier removal:
Height outliers: 0
Hand length outliers: 0
Foot length outliers: 0
```

This is the Flask code (app.py). It receives a request upon the form submission on the home page. The three form inputs are used by the trained model to make a gender prediction. Then it renders the original home page with a text that includes the output gender prediction.

```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
    '''

    float_features = [float(x) for x in request.form.values()]

    prediction = model.predict([np.array(float_features)])

    output = "Male" if prediction[0] == 1 else "Female"

    return render_template('index.html', prediction_text='Gender is '+ output)



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

This is the index.html code with the form modified so that the inputs correspond to the feature inputs of my model.

```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 Gender</h1>

    <!-- Main Input For Receiving Query to our ML -->
    <form action="{{ url_for('predict')}}"method="post">
    <input type="text" name="Height" placeholder="Height (mm)" required="required" />
      <input type="text" name="Hand Length" placeholder="Hand Length (mm)" required="required" />
    <input type="text" name="Foot Length" placeholder="Foot Length (mm)" 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>
```

Procfile:

```
web: gunicorn app:app
```

requirements.txt:

```
(.venv) D:\repos\Week_5>pip freeze -> requirements.txt
```

```
blinker==1.8.2
click==8.1.7
colorama==0.4.6
Flask==3.0.3
gunicorn==22.0.0
itsdangerous==2.2.0
Jinja2==3.1.4
joblib==1.4.2
MarkupSafe==2.1.5
numpy==1.26.4
packaging==24.0
pandas==2.2.2
python-dateutil==2.9.0.post0
pytz==2024.1
scikit-learn==1.5.0
scipy==1.13.1
six==1.16.0
threadpoolctl==3.5.0
tzdata==2024.1
Werkzeug==3.0.3
```

runtime.txt:

```
python-3.10.7
```

.gitignore:

```
.venv
/.venv
```

Heroku login:

```
(.venv) D:\repos\Week_5>heroku login
»   Warning: heroku update available from 8.10.0 to 8.11.5.
heroku: Press any key to open up the browser to login or q to exit:
Opening browser to https://cli-auth.heroku.com/auth/cli/browser/9e10e42b-798a-49ad-a7ea-04e692af4184?requestor=SFMyNTY.g2gDb
QAAAAw5OC4zNy4yNTIuMTBuBgjwFiAAFRgA.VqkN-D9JnQKqjtQkidTFtYClucgI5vQJRBu-Mv-xeHk
Logging in... done
Logged in as jacksonian.r.taylor@gmail.com
```

Create app:

```
(.venv) D:\repos\Week_5>heroku create gender-prediction-app
»   Warning: heroku update available from 8.10.0 to 8.11.5.
Creating ● gender-prediction-app... done
https://gender-prediction-app-9f322ea4bed0.herokuapp.com/ | https://git.heroku.com/gender-prediction-app.git
```

Set remote:

```
(.venv) D:\repos\Week_5>heroku git:remote -a gender-prediction-app
»   Warning: heroku update available from 8.10.0 to 8.11.5.
set git remote heroku to https://git.heroku.com/gender-prediction-app.git
```

Push code to Heroku part 1:

```
(.venv) D:\repos\Week_5>git push heroku master
Enumerating objects: 38, done.
Counting objects: 100% (38/38), done.
Delta compression using up to 8 threads
Compressing objects: 100% (30/30), done.
Writing objects: 100% (38/38), 15.11 KiB | 2.52 MiB/s, done.
Total 38 (delta 11), reused 0 (delta 0), pack-reused 0
remote: Updated 11 paths from 6ec68ab
remote: Compressing source files... done.
remote: Building source:
remote:
remote: -----> Building on the Heroku-22 stack
remote: -----> Determining which buildpack to use for this app
remote: -----> Python app detected
remote: -----> Using Python version specified in runtime.txt
remote:  !
remote:  !     A Python security update is available! Upgrade as soon as possible to: python-3.10.14
remote:  !     See: https://devcenter.heroku.com/articles/python-runtimes
remote:  !
remote: -----> Installing python-3.10.7
remote: -----> Installing pip 24.0, setuptools 69.2.0 and wheel 0.43.0
remote: -----> Installing SQLite3
remote: -----> Installing requirements with pip
```

Push code to Heroku part 2:

```
remote:        Collecting blinker==1.8.2 (from -r requirements.txt (line 1))
remote:          Downloading blinker-1.8.2-py3-none-any.whl.metadata (1.6 kB)
remote:        Collecting click==8.1.7 (from -r requirements.txt (line 2))
remote:          Downloading click-8.1.7-py3-none-any.whl.metadata (3.0 kB)
remote:        Collecting colorama==0.4.6 (from -r requirements.txt (line 3))
remote:          Downloading colorama-0.4.6-py2.py3-none-any.whl.metadata (17 kB)
remote:        Collecting Flask==3.0.3 (from -r requirements.txt (line 4))
remote:          Downloading flask-3.0.3-py3-none-any.whl.metadata (3.2 kB)
remote:        Collecting gunicorn==22.0.0 (from -r requirements.txt (line 5))
remote:          Downloading gunicorn-22.0.0-py3-none-any.whl.metadata (4.4 kB)
remote:        Collecting itsdangerous==2.2.0 (from -r requirements.txt (line 6))
remote:          Downloading itsdangerous-2.2.0-py3-none-any.whl.metadata (1.9 kB)
remote:        Collecting Jinja2==3.1.4 (from -r requirements.txt (line 7))
remote:          Downloading jinja2-3.1.4-py3-none-any.whl.metadata (2.6 kB)
remote:        Collecting joblib==1.4.2 (from -r requirements.txt (line 8))
remote:          Downloading joblib-1.4.2-py3-none-any.whl.metadata (5.4 kB)
remote:        Collecting MarkupSafe==2.1.5 (from -r requirements.txt (line 9))
remote:          Downloading MarkupSafe-2.1.5-cp310-cp310-manylinux_2_17_x86_64.manylinux2014_x86_64.whl.metadata (3.0 kB)
remote:        Collecting numpy==1.26.4 (from -r requirements.txt (line 10))
remote:          Downloading numpy-1.26.4-cp310-cp310-manylinux_2_17_x86_64.manylinux2014_x86_64.whl.metadata (61 kB)
remote:        Collecting packaging==24.0 (from -r requirements.txt (line 11))
remote:          Downloading packaging-24.0-py3-none-any.whl.metadata (3.2 kB)
remote:        Collecting pandas==2.2.2 (from -r requirements.txt (line 12))
remote:          Downloading pandas-2.2.2-cp310-cp310-manylinux_2_17_x86_64.manylinux2014_x86_64.whl.metadata (19 kB)
remote:        Collecting python-dateutil==2.9.0.post0 (from -r requirements.txt (line 13))
remote:          Downloading python_dateutil-2.9.0.post0-py2.py3-none-any.whl.metadata (8.4 kB)
remote:        Collecting pytz==2024.1 (from -r requirements.txt (line 14))
remote:          Downloading pytz-2024.1-py2.py3-none-any.whl.metadata (22 kB)
remote:        Collecting scikit-learn==1.5.0 (from -r requirements.txt (line 15))
remote:          Downloading scikit_learn-1.5.0-cp310-cp310-manylinux_2_17_x86_64.manylinux2014_x86_64.whl.metadata (11 kB)
remote:        Collecting scipy==1.13.1 (from -r requirements.txt (line 16))
remote:          Downloading scipy-1.13.1-cp310-cp310-manylinux_2_17_x86_64.manylinux2014_x86_64.whl.metadata (60 kB)
remote:        Collecting six==1.16.0 (from -r requirements.txt (line 17))
remote:          Downloading six-1.16.0-py2.py3-none-any.whl.metadata (1.8 kB)
remote:        Collecting threadpoolctl==3.5.0 (from -r requirements.txt (line 18))
remote:          Downloading threadpoolctl-3.5.0-py3-none-any.whl.metadata (13 kB)
remote:        Collecting tzdata==2024.1 (from -r requirements.txt (line 19))
remote:          Downloading tzdata-2024.1-py2.py3-none-any.whl.metadata (1.4 kB)
remote:        Collecting Werkzeug==3.0.3 (from -r requirements.txt (line 20))
remote:          Downloading werkzeug-3.0.3-py3-none-any.whl.metadata (3.7 kB)
```
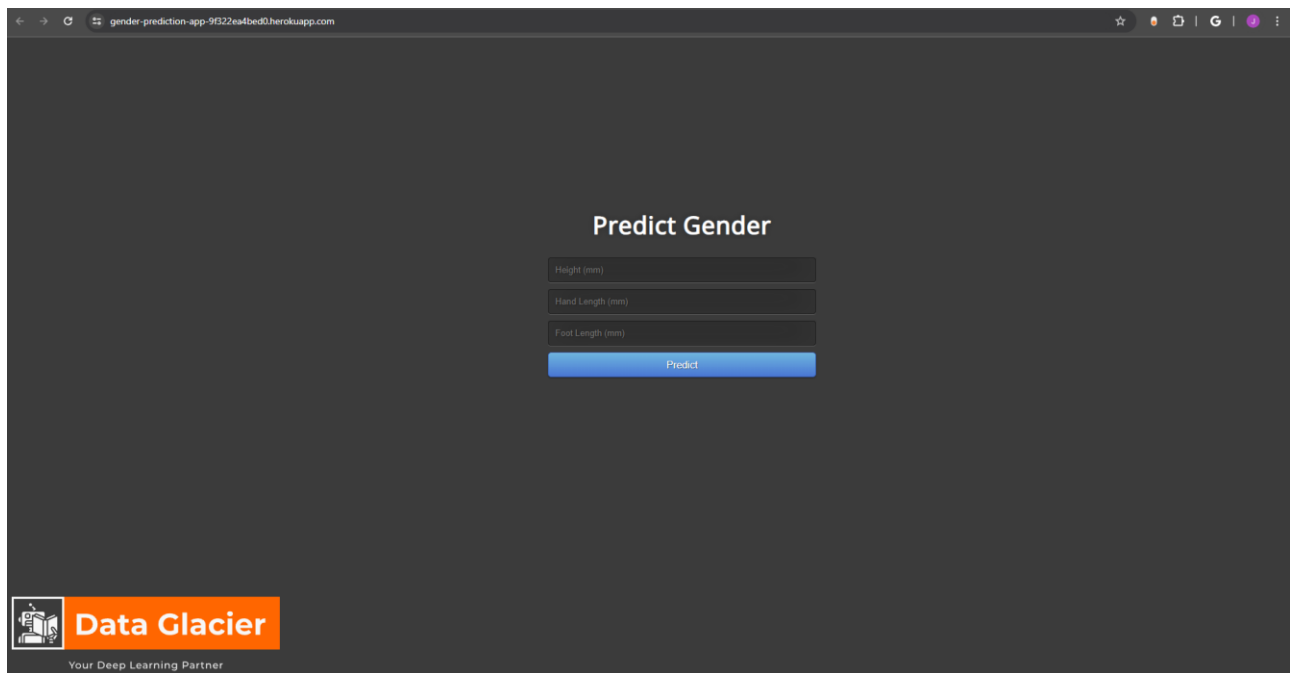
Push code to Heroku part 3:

```
remote:          Downloading blinker-1.8.2-py3-none-any.whl (9.5 kB)
remote:          Downloading click-8.1.7-py3-none-any.whl (97 kB)
remote:          Downloading colorama-0.4.6-py2.py3-none-any.whl (25 kB)
remote:          Downloading flask-3.0.3-py3-none-any.whl (101 kB)
remote:          Downloading colorama-0.4.6-py2.py3-none-any.whl (25 kB)
remote:          Downloading flask-3.0.3-py3-none-any.whl (101 kB)
remote:          Downloading gunicorn-22.0.0-py3-none-any.whl (84 kB)
remote:          Downloading colorama-0.4.6-py2.py3-none-any.whl (25 kB)
remote:          Downloading flask-3.0.3-py3-none-any.whl (101 kB)
remote:          Downloading colorama-0.4.6-py2.py3-none-any.whl (25 kB)
remote:          Downloading flask-3.0.3-py3-none-any.whl (101 kB)
remote:          Downloading gunicorn-22.0.0-py3-none-any.whl (84 kB)
remote:          Downloading itsdangerous-2.2.0-py3-none-any.whl (16 kB)
remote:          Downloading jinja2-3.1.4-py3-none-any.whl (133 kB)
remote:          Downloading joblib-1.4.2-py3-none-any.whl (301 kB)
remote:          Downloading MarkupSafe-2.1.5-cp310-cp310-manylinux_2_17_x86_64.manylinux2014_x86_64.whl (25 kB)
remote:          Downloading numpy-1.26.4-cp310-cp310-manylinux_2_17_x86_64.manylinux2014_x86_64.whl (18.2 MB)
remote:          Downloading packaging-24.0-py3-none-any.whl (53 kB)
remote:          Downloading pandas-2.2.2-cp310-cp310-manylinux_2_17_x86_64.manylinux2014_x86_64.whl (13.0 MB)
remote:          Downloading python_dateutil-2.9.0.post0-py2.py3-none-any.whl (229 kB)
remote:          Downloading pytz-2024.1-py2.py3-none-any.whl (505 kB)
remote:          Downloading scikit_learn-1.5.0-cp310-cp310-manylinux_2_17_x86_64.manylinux2014_x86_64.whl (13.3 MB
remote:          Downloading scipy-1.13.1-cp310-cp310-manylinux_2_17_x86_64.manylinux2014_x86_64.whl (38.6 MB)
remote:          Downloading six-1.16.0-py2.py3-none-any.whl (11 kB)
remote:          Downloading threadpoolctl-3.5.0-py3-none-any.whl (18 kB)
remote:          Downloading tzdata-2024.1-py2.py3-none-any.whl (345 kB)
remote:          Downloading werkzeug-3.0.3-py3-none-any.whl (227 kB)
remote:          Installing collected packages: pytz, tzdata, threadpoolctl, six, packaging, numpy, MarkupSafe, job
remote:          Installing collected packages: pytz, tzdata, threadpoolctl, six, packaging, numpy, MarkupSafe, job
remote:          Successfully installed Flask-3.0.3 Jinja2-3.1.4 MarkupSafe-2.1.5 Werkzeug-3.0.3 blinker-1.8.2 clic
4.1 scikit-learn-1.5.0 scipy-1.13.1 six-1.16.0 threadpoolctl-3.5.0 tzdata-2024.1
remote: -----> Discovering process types
remote:          Procfile declares types -> web
remote:
remote: -----> Compressing...
remote:          Done: 116.2M
remote: -----> Launching...
remote:          Released v3
remote:          https://gender-prediction-app-9f322ea4bed0.herokuapp.com/ deployed to Heroku
remote:
remote: Verifying deploy... done.
To https://git.heroku.com/gender-prediction-app.git
 * [new branch]      master -> master
```
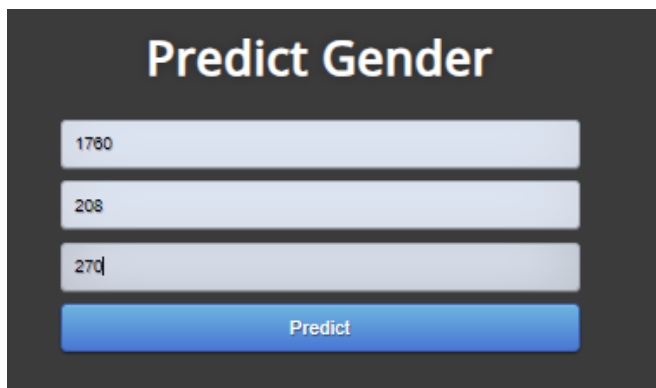
Open deployed cloud hosted app:

```
(.venv) D:\repos\Week_5>heroku open
 »   Warning: heroku update available from 8.10.0 to 8.11.5.
```

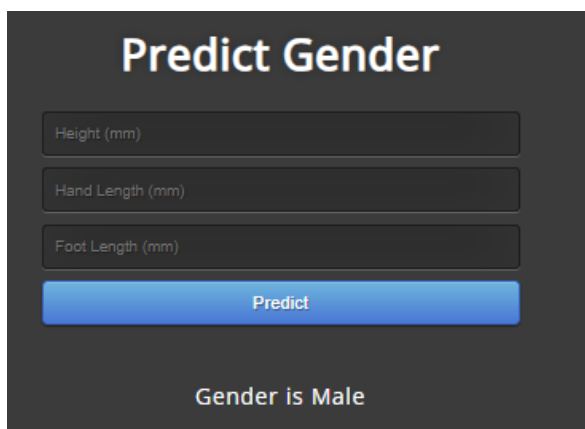Full home page of the cloud hosted app:

Form Completed:

Output after the form was submitted (pressing predict button) with the inputs above: