Deploying a machine learning model in AWS Cloud (EC2 Instance) – Linux

Step 1: Develop a model (Regression or Classification)

The below model predicts “Salary” for the given “Years of Experience”. It’s a regression model. Hence the model is developed by using “Linear Regression”.

```
import pandas as pd
import numpy as np
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LinearRegression

# Read the input file
df = pd.read_csv("D:\Model Deployment  - 01Feb\ML-Deployement-master\ML-Deployement-
master\Regression_Deployement\SalaryData.csv")

# Split the dataset for training and testing
train_set, test_set = train_test_split(df, test_size=0.2, random_state=42)

df_copy = train_set.copy()

test_set_full = test_set.copy()
test_set = test_set.drop(["Salary"], axis=1)

train_labels = df_copy["Salary"]

train_set_full = train_set.copy()
train_set = train_set.drop(["Salary"], axis=1)

# Create a model object
lin_reg = LinearRegression()

# Train the model
lin_reg.fit(train_set, train_labels)

# Predict the test data
salary_pred = lin_reg.predict(test_set)

# Display predicted values
salary_pred
```

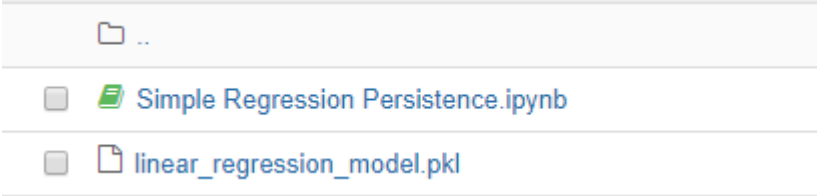
Step 2: Ensure that the model predicts as expected for the unseen data. I have inputed “10.0” years of experience as input and got the precited value as “119559.74”

```
lin_reg.predict([[10.0]])
```

Step 3: In this step, we will create the pickle (serialization) file, which will be used for prediction in deployed environment.

```
# Import the required library for pickling
from sklearn.externals import joblib

# Create a pickle object for the model
joblib.dump(lin_reg, "linear_regression_model.pkl")
```

Ensure the the pickled object is created successfully in the project folder.



Step 4: Since the model will be invoked from a webpage, create a required web pages for busiess user usage. For this simple regression model, we will create 2 html files.

- First file, will take inputs from the user and pass on to the model
- Second file, will display the predicted value (salary, in our case) received from the model.

HTML code snippet:

Index.html

```
<html>
<body>
    <h3>Salary Prediction Form</h3>

<div>
  <form action="/result" method="POST">
    <label for="experience">Years of Experience : </label>
    <input type="text" id="experience" name="experience">
    <br>
    <br>
    <input type="submit" value="Submit">
  </form>
</div>
</body>
</html>
```

Result.html

```
<!doctype html>
<html>
   <body>
       <h1> Predicted Salary is : {{ prediction }}</h1>
   </body>
</html>
```

Note: Both the files should be placed in “templates” folder.

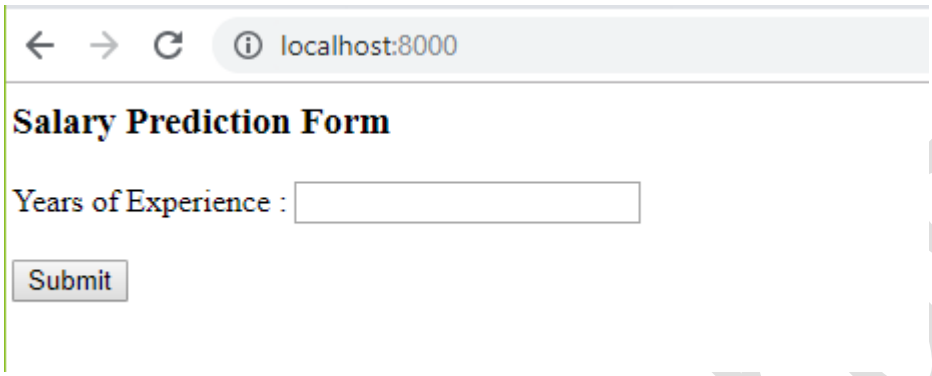
Step 5: Create a flask program to invoke the model

```
#importing libraries
from flask import Flask, render_template, request
from sklearn.externals import joblib

#creating instance of the class
app=Flask(__name__)

#to tell flask what url shoud trigger the function index()
@app.route('/')
def index():
    return render_template('index.html')

@app.route("/result", methods=['POST'])
def predict():
    print("I am here in predict function")
    print(request.method)
    if request.method == 'POST':
        try:
            data = request.form.to_dict()
            print(data)
            years_of_experience = float(data["experience"])
            print(years_of_experience)

            # load the model from disk
            lin_reg = joblib.load("./linear_regression_model.pkl")
            print(lin_reg.intercept_)

        except ValueError:
            return render_template("result.html", salary="Please enter a
number.")

        print("Prediction = ", lin_reg.predict([[years_of_experience]]))
        Prediction = lin_reg.predict([[years_of_experience]])

    print(type(Prediction))
    salary = Prediction.tolist()
    print(salary)

    return render_template("result.html", prediction=salary[0])

if __name__ == "__main__":
    app.run(port = 8000, debug=False)
```

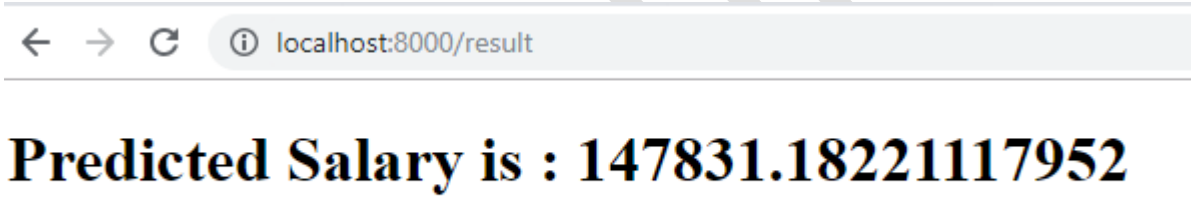
Step 6: Run the above flask program. The code will create a web server (localhost or your computer) and deploy the model as a web service.

```
 * Serving Flask app "__main__" (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: off
 * Running on http://127.0.0.1:8000/ (Press CTRL+C to quit)
```

Go to the browser and open “localhost:8000” or http://127.0.0.1:8000/

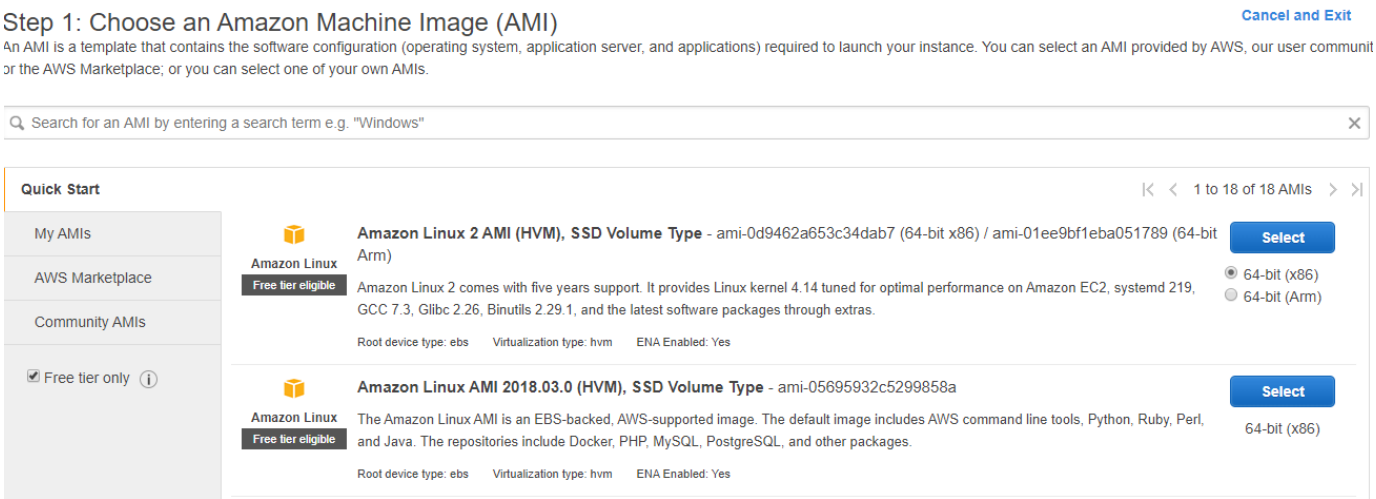


Enter “Years of Experience” value and click “Submit”



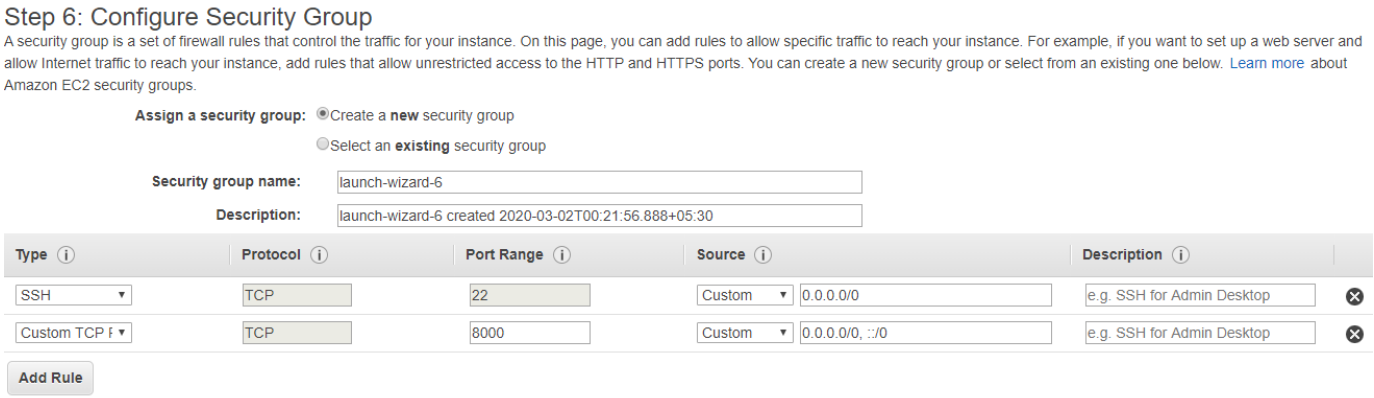
Deploying the model in AWS Cloud

Step 1: Choose the AMI

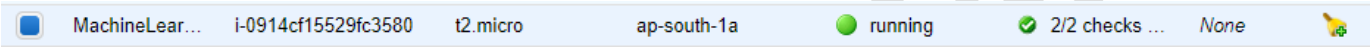


For this exercise, I have used "**Amazon Linux 2 AMI (HVM), SSD Volume Type** - ami-0d9462a653c34dab7 (64-bit x86) / ami-01ee9bf1eba051789 (64-bit Arm)"

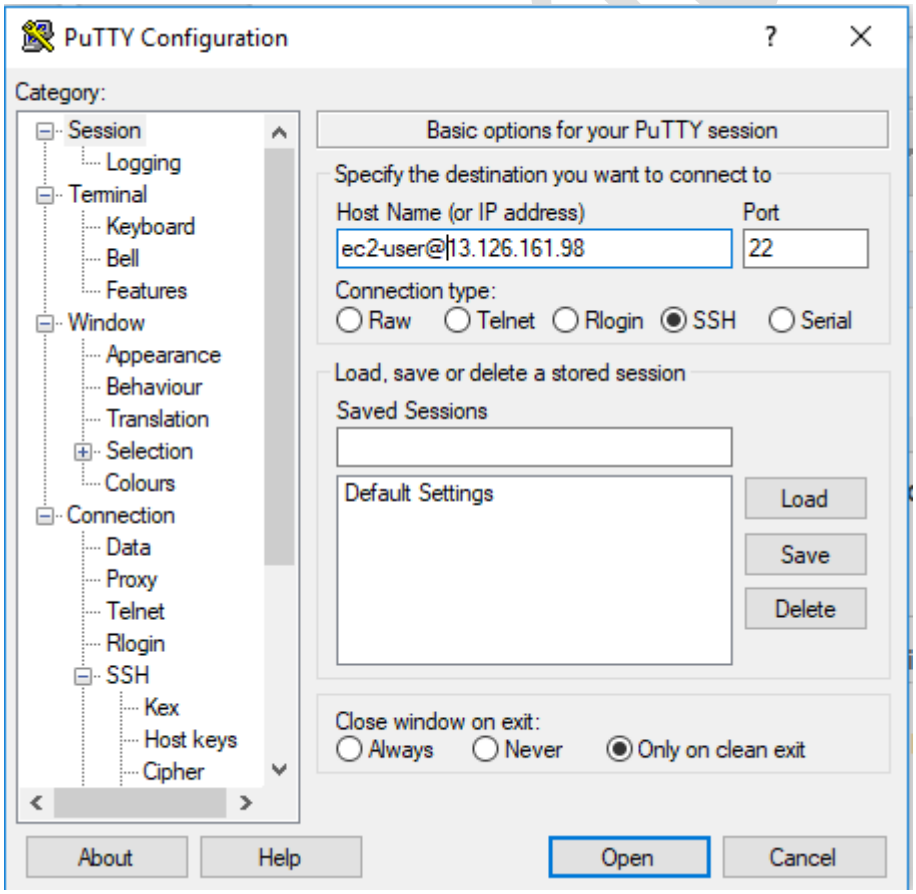
Step 2: Create the instance with a security group

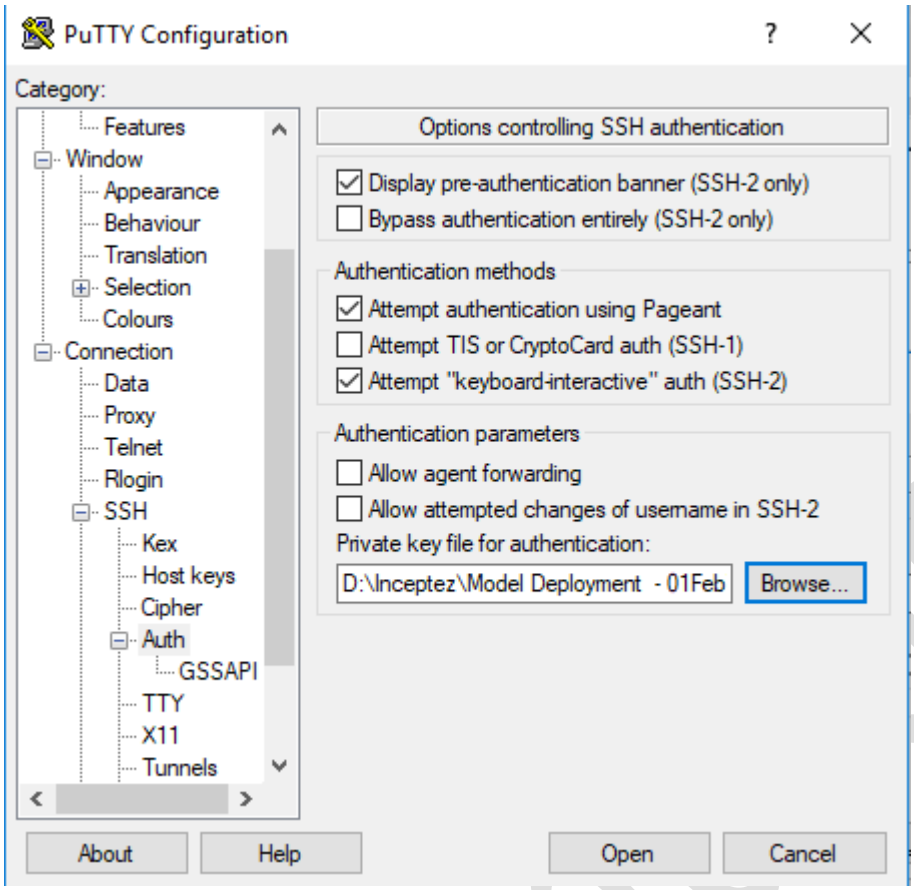


Step 3: Ensure that the EC2 instance is up and running

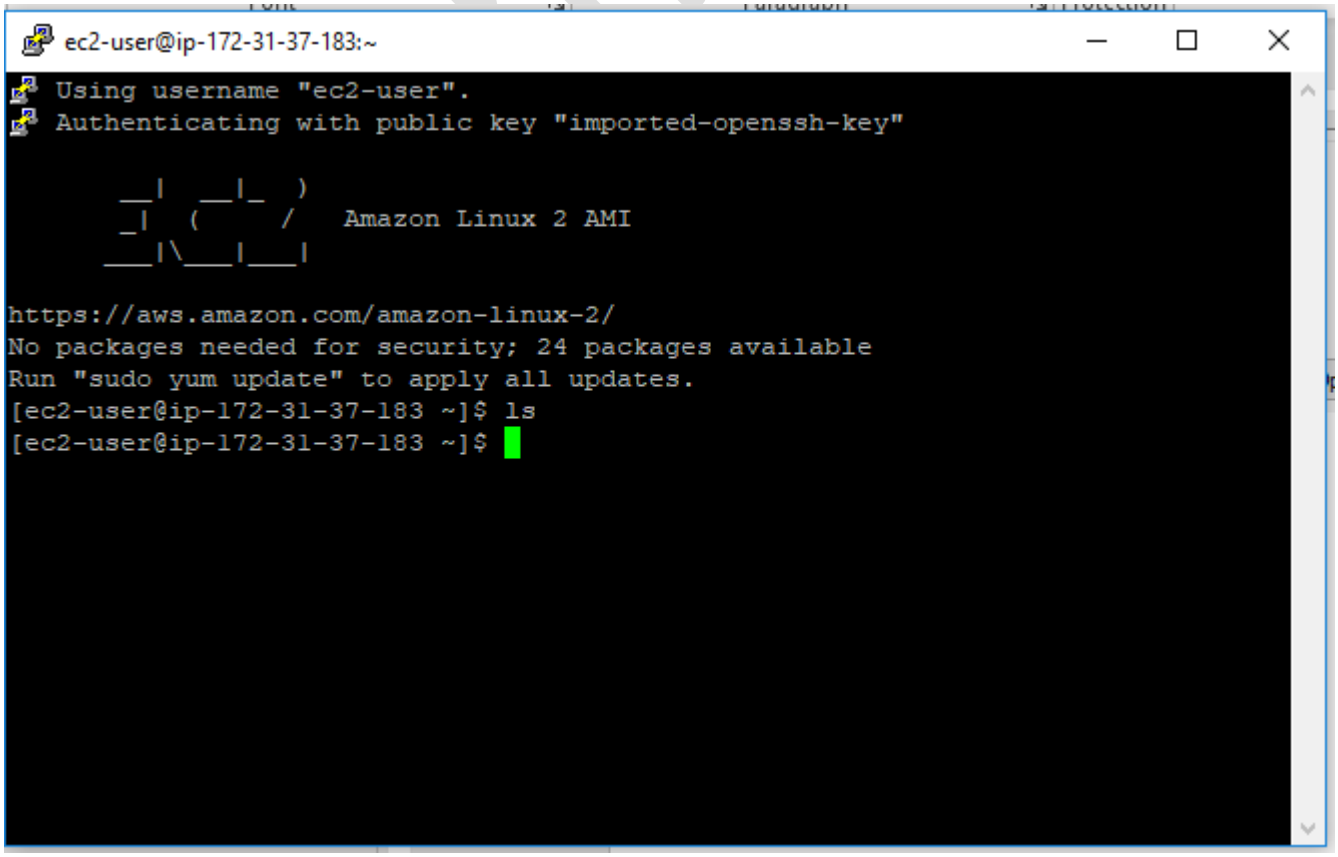


Step 4: Since, it is a Linux instance, use PuTTy to connect to the instance. Before that, use PuTTY Gen to generate the "Private Key" by using the .pem file.





Connected to Linux Instance. You will get the below screen.



Note: The newly instantiated Linux machine won't have git, python and all the required packages. These have to be installed.

For installing git, use the below commands:

- `sudo yum upgrade`
- `sudo yum install git`

Then, download the deployable components from the github by using the below command:

- `git clone <github link>`

Install Python by using the below command in Linux:

- `sudo yum install python3.7`
- `python3.7 --version`

Install pip

- **curl -O https://bootstrap.pypa.io/get-pip.py**
- **python3.7 get-pip.py --user**

Install and starting the flask server

- **sudo yum install python-setuptools**
- **sudo easy_install pip**
- **sudo pip install flask**
- **pip3.7 install sklearn**

Edit the flask program to include the host as '0.0.0.0'

```
if __name__ == "__main__":
        app.run(host='0.0.0.0', port = 8000, debug=True)
```

Now, invoke the model from anywhere in the world 😊