Week5:
Cloud and API deployment

Name: Rayhanul Islam Rumel
Batch Code: LISUM17
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Agenda

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Try Yourself - Dummy Dataset

Project Overview

Project Overview

- **Dataset:** Spam text message classification
- **No of columns:** 2 (Message, Category)
- **ML Model:** Random Forest Classifier
- **Target:** We will input a text, the model will predict whether the text is spam or not.
- **Front-end:** HTML, CSS, and JavaScript
- **Back-end:** Flask, ML Model (Random Forest Classifier)

Explore and Understand the Dataset

Explore and Understand the dataset

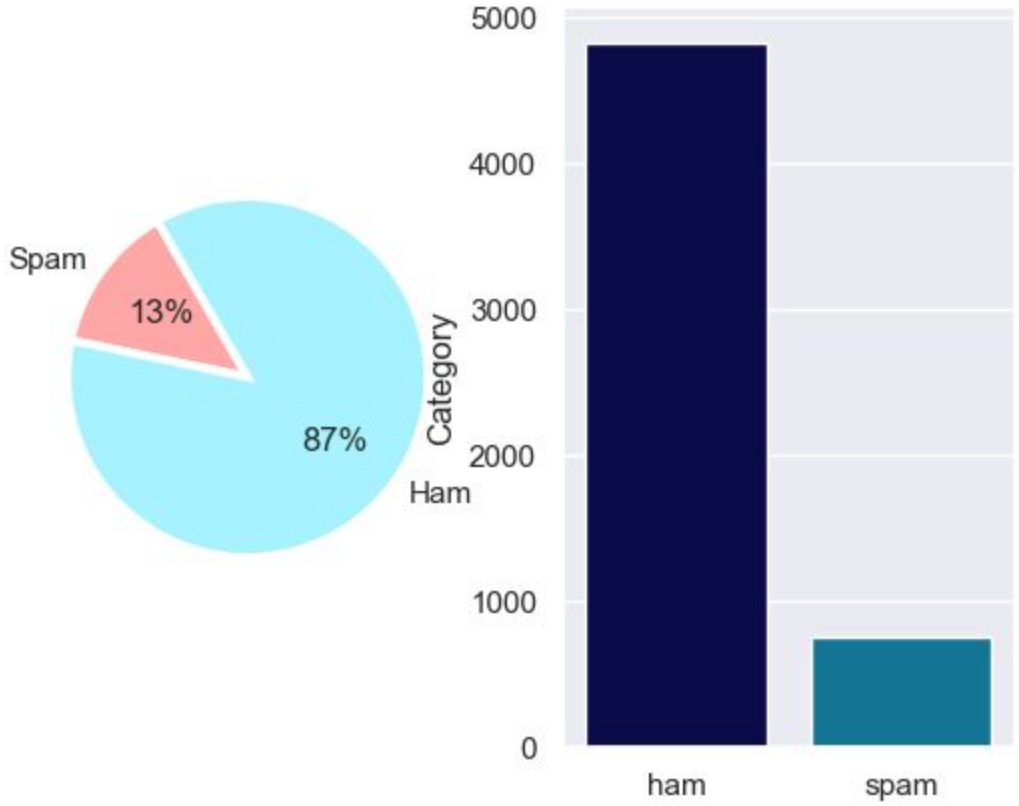
- The dataset has 2 columns: Category, Message
- The shape of the dataset is: 5572, 2
- The dataset contains no null or duplicate values

```
ds.head()
```

	Category	Message
0	ham	Go until jurong point, crazy.. Available only ...
1	ham	Ok lar... Joking wif u oni...
2	spam	Free entry in 2 a wkly comp to win FA Cup fina...
3	ham	U dun say so early hor... U c already then say...
4	ham	Nah I don't think he goes to usf, he lives aro...

Explore and Understand the dataset

- In total 13% of the total messages are spam and the rest (87%) is ham messages.



Preprocessing the dataset

Preprocessing the dataset

- Before preparing the train and test set, we processed the Message column with the following steps:
  - Standardized the messages by converting all of the text to lowercase
  - Filtered all of the message in order to remove any hyperlinks available in the message
  - Removed punctuation from the message
  - Removed stop words from the corpus
  - Stemmed the words of each text

- Then I split the dataset into training set and test set:
  - 80% of the dataset is used as Training set, 20% of the dataset is used as Test set

- With TF-IDF I extracted the features of each message of the both train and test set as vectors

Build the ML model

Build the ML model

- Then I defined random forest classifier:

```
rfc = RandomForestClassifier(n_estimators= 300)
```

- Once the model is defined, with train and test sets, I trained the model and evaluated the model accuracy
- The model accuracy is approximately 98%

Building Webapp using Flask

Building Webapp using Flask

- app.py : The controller that controls the app.
- Here I created two app routes:
  - **home**

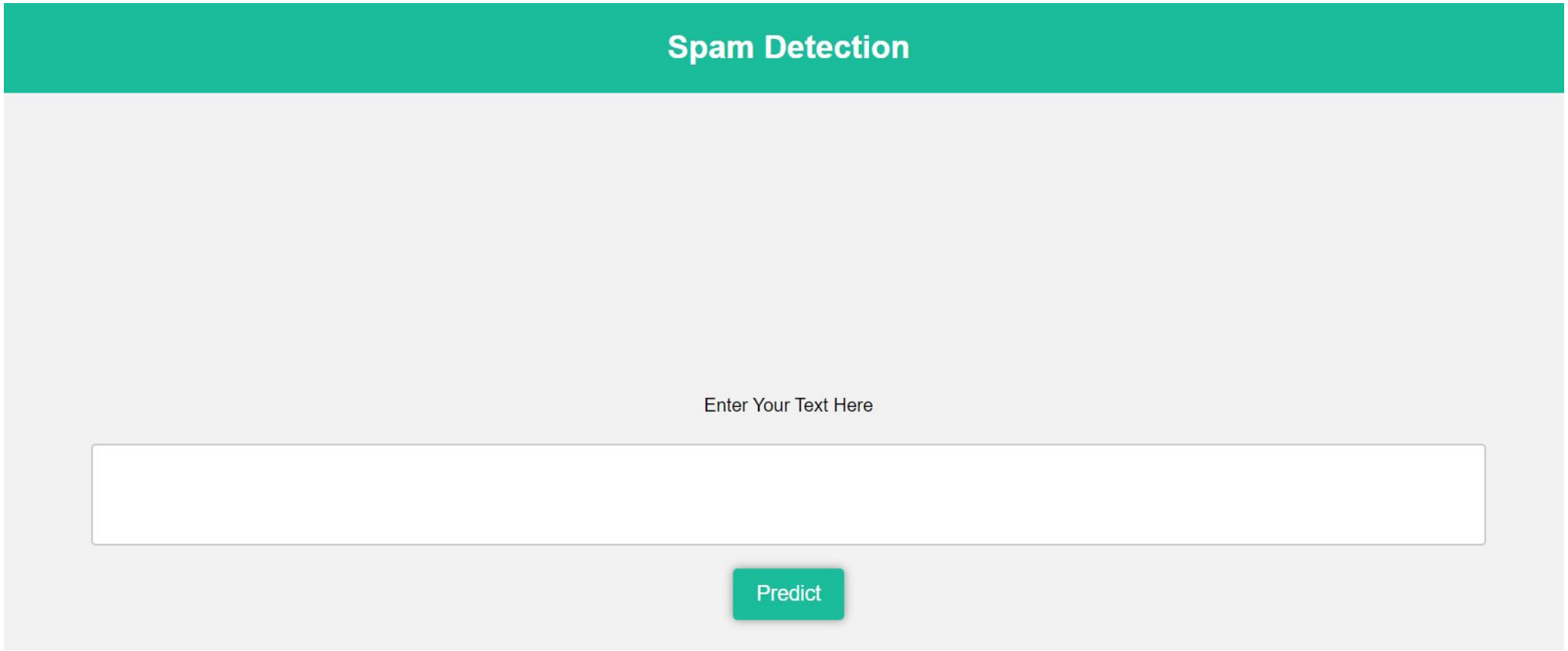
```python
@app.route('/')
def home():
    return render_template('home.html')
```

  - home renders an HTML file where I created a simple form with one text field and a submit button.
    - Users will type text message in the text field and would click on the *Predict* button

```html
<div class="ml-container">

    <form action="{{ url_for('predict')}}" method="POST">
        <p>Enter Your Text Here</p>
        <textarea name="text" rows="4" cols="50"></textarea>
        <br />

        <input type="submit" class="btn-info cool-button" value="Predict">

    </form>

</div>
```

Building Webapp using Flask

- With CSS, the home.html looks like this:



Building Webapp using Flask

- app.py : The controller that controls the app.
- Here I created two app routes:
    - **predict** route, on the other hand loads the trained random forest classifier model
    - Receives the user submitted text from home.html
    - Extracts the features as vectors from the text using TF-IDF that was used during training phase
    - With the help of the trained model, predict the text
    - Forwards the predicted result to result.html

```
@app.route('/predict',methods=['POST'])
def predict():
    with open(model_file, 'rb') as f:
        loaded_model = pickle.load(f)
    loaded_tfidf = pickle.load(open(filename, 'rb'))

    if request.method == 'POST':
        text = request.form['text']
        data = [text]
        data = np.asarray(data)
        data = loaded_tfidf.transform(data).toarray()
        my_prediction = loaded_model.predict(data)
        print(my_prediction[0])
        return render_template('result.html', prediction = my_prediction[0])
```

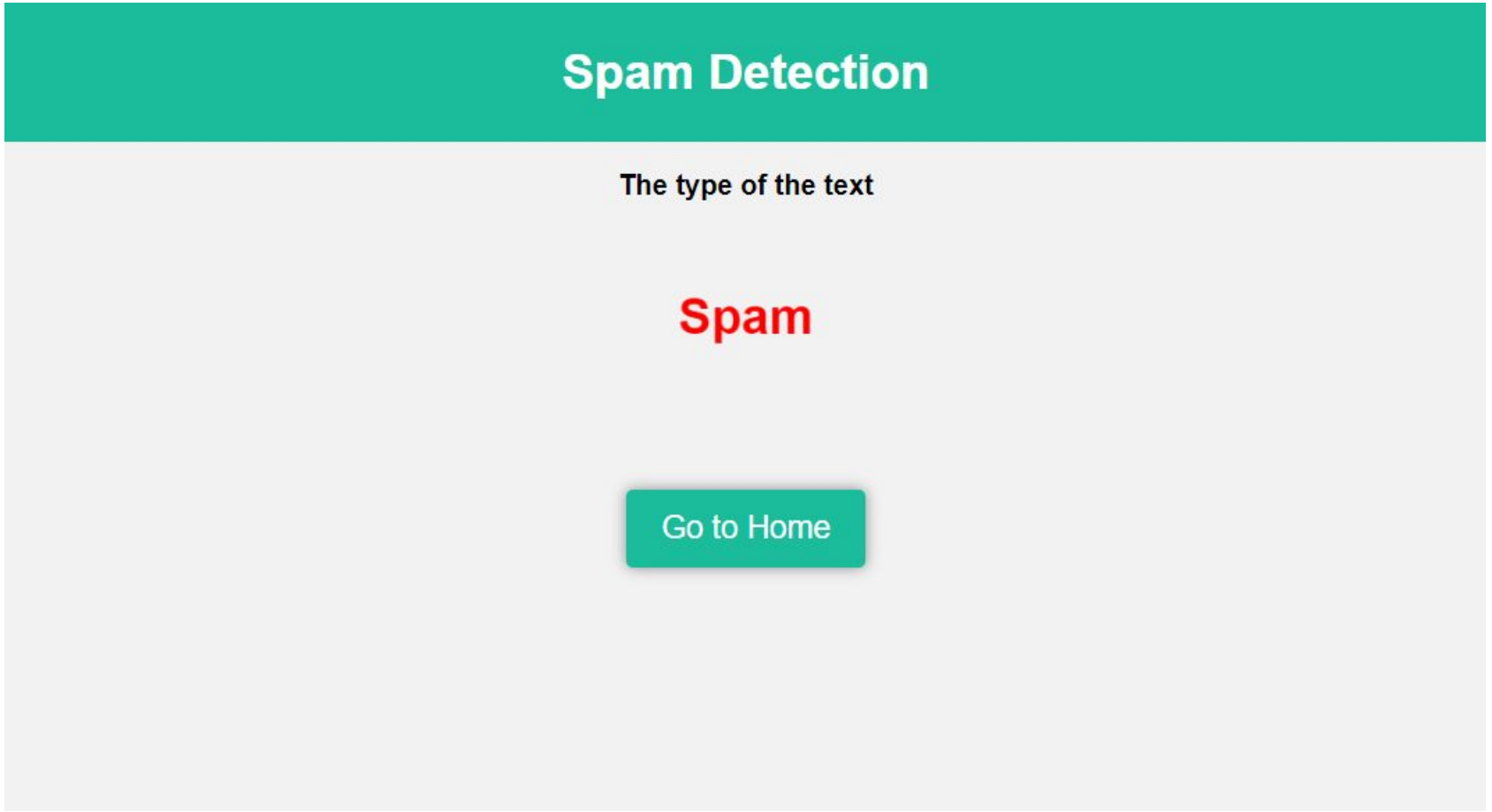
Building Webapp using Flask

- result.html:
  - It receives the value of prediction from predict and prints whether the text is spam or ham
  - Once a user submits a text, he/she views this page the next

```
<body>

    <header>
        <div class="container">

            <h2>Spam Detection</h2>

        </div>
    </header>
    <p style="color:black;font-size:20;text-align: center;"><b>The type of the text</b></p>
    <div class="results">



        {% if prediction == 'spam' %}
        <h2 class="animate-message spam-color">Spam</h2>
        {% elif prediction == 'ham' %}
        <h2 class="animate-message ham-color">It is a Ham</h2>
        {% endif %}
        <div style="margin-top: 2cm;"></div>
        <button type="button" class="cool-button" onclick="location.href='{{ url_for('home') }}'">Go to Home</button>



    </div>

</body>
```

Building Webapp using Flask

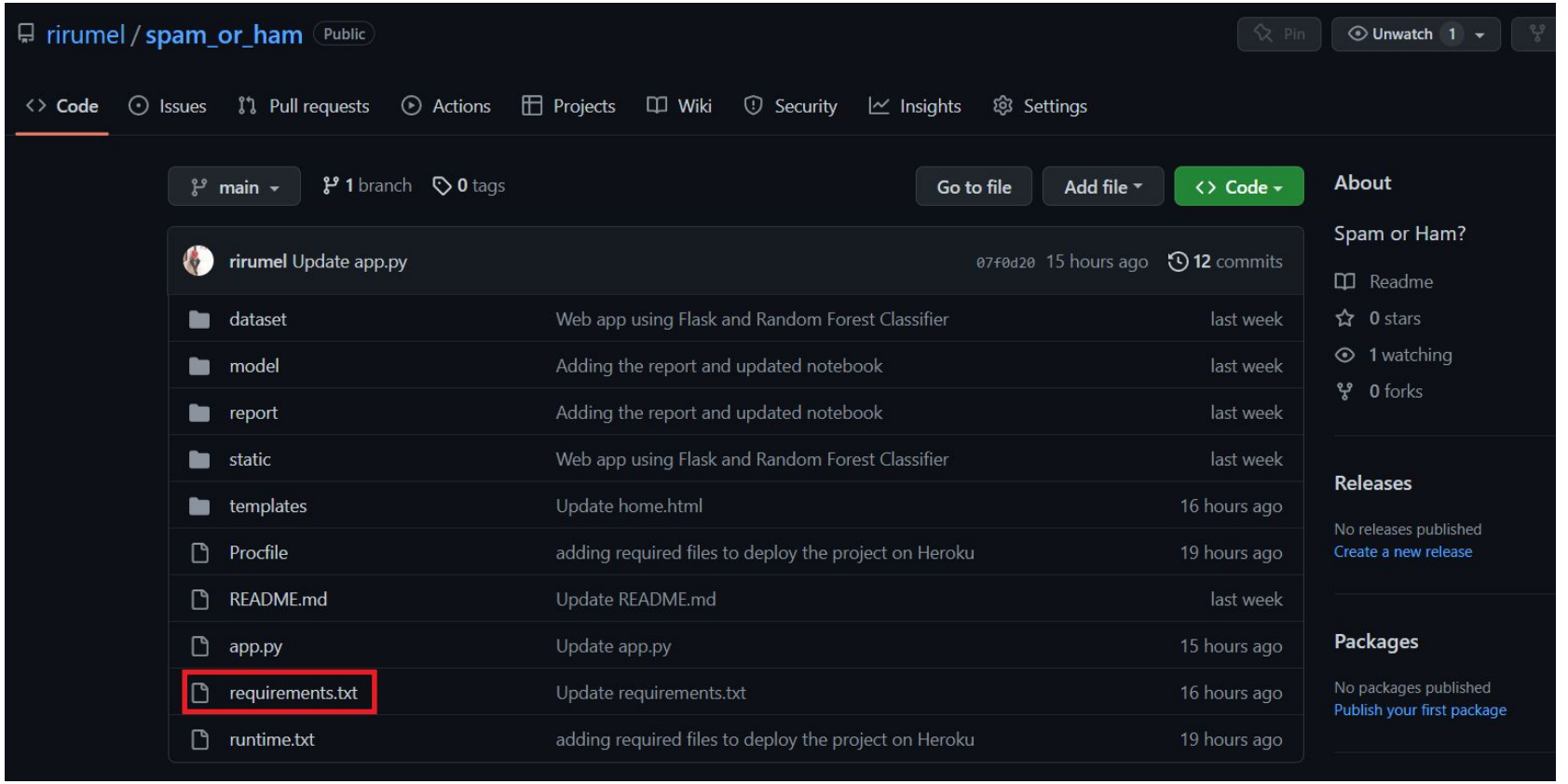
- With CSS, the result.html looks like this:



Deploying Spam Detection web app using Render

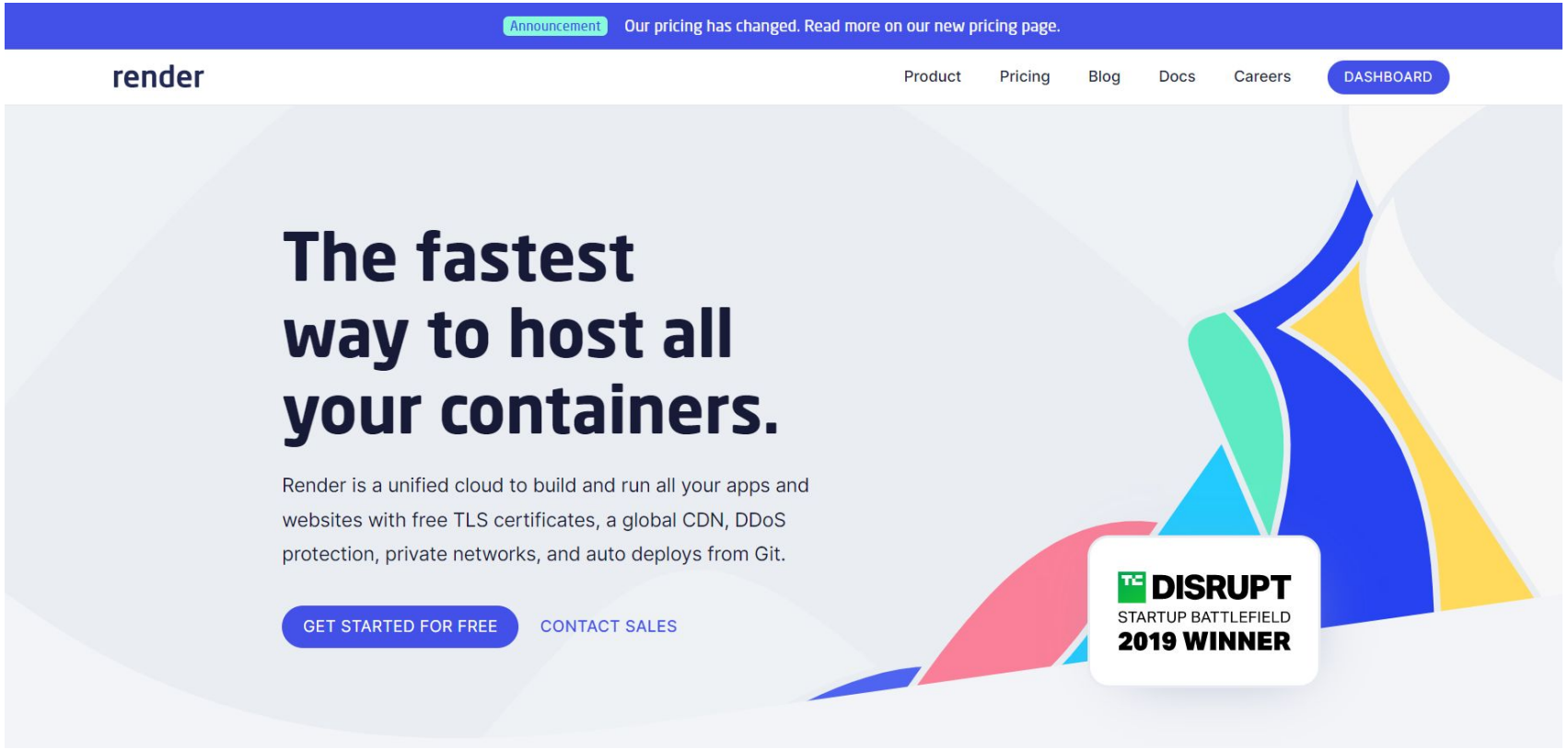
Deploy Spam Detection web app using Render

- I created a Git repository where I added project files and folders, and also added **requirements.txt** which contains a list of project dependencies which is mandatory to deploy my web app.



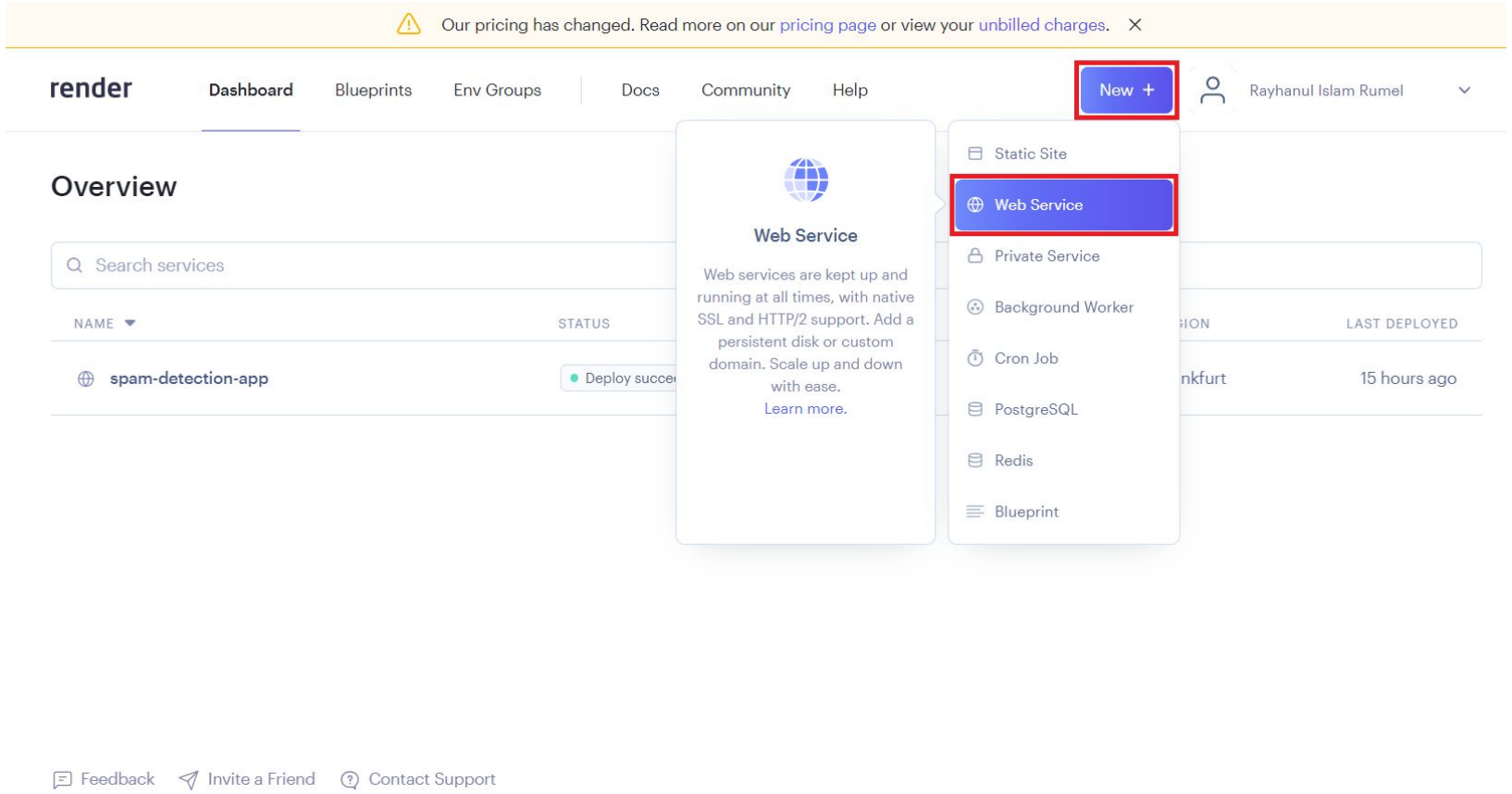
Deploy Spam Detection web app using Render

- Also, created an account at https://render.com/ and logged into the website with my created account.



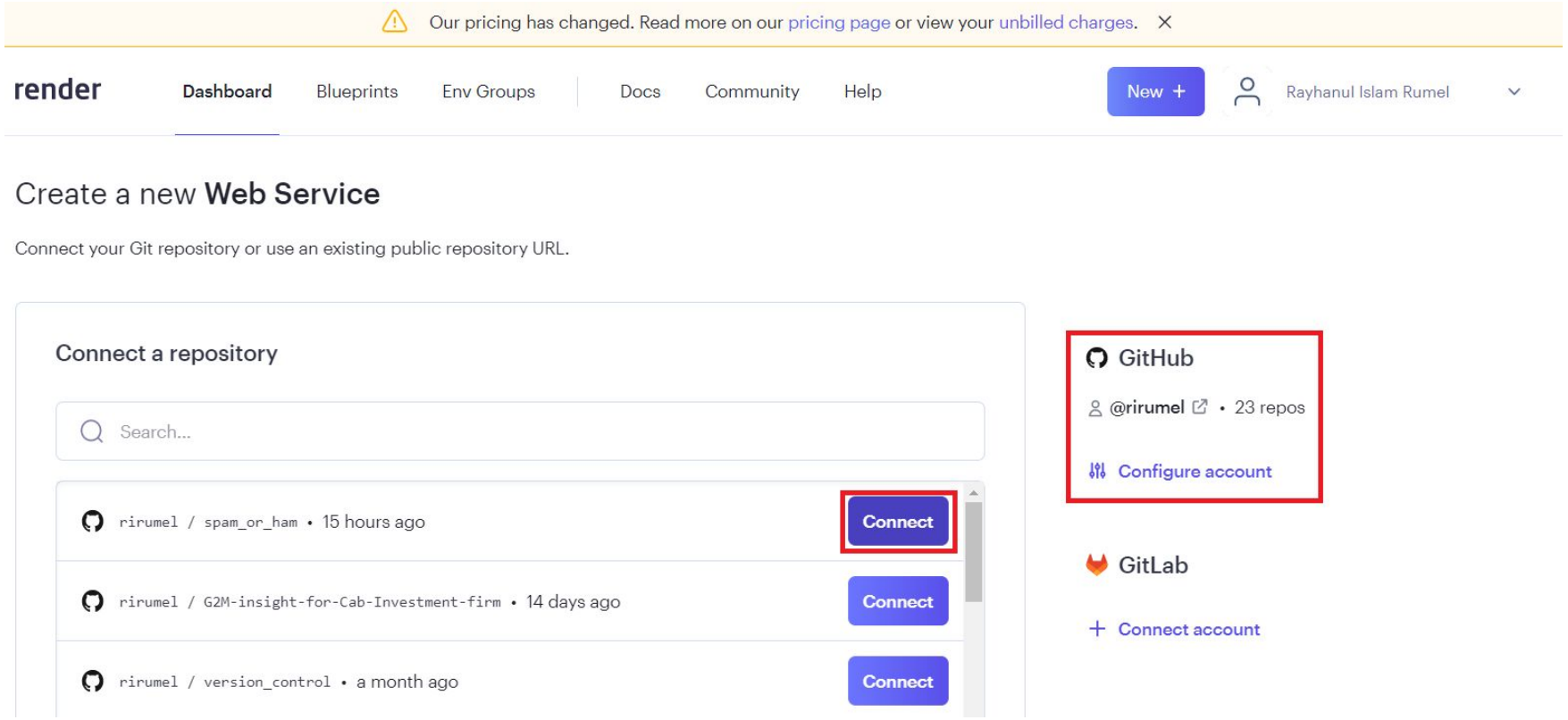
Deploy Spam Detection web app using Render

- Then, I selected the “Web Service” option by clicking on the “New” button.



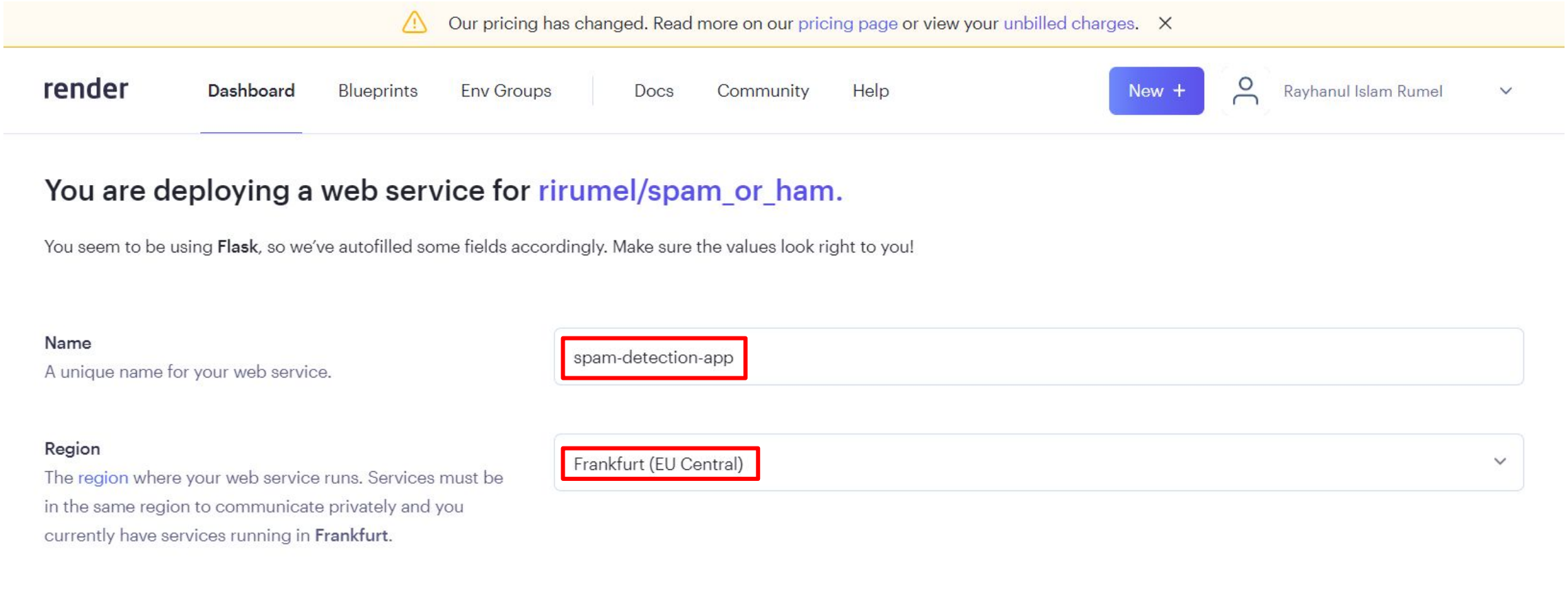
Deploy Spam Detection web app using Render

- Then, I needed to add my GitHub project repository. There are a couple of ways to do it. I signed into my GitHub account from the right panel shown in the picture. As a result, all of my projects are now showing at the center of the page. I clicked on the “Connect” available next to spam_or_ham repository.



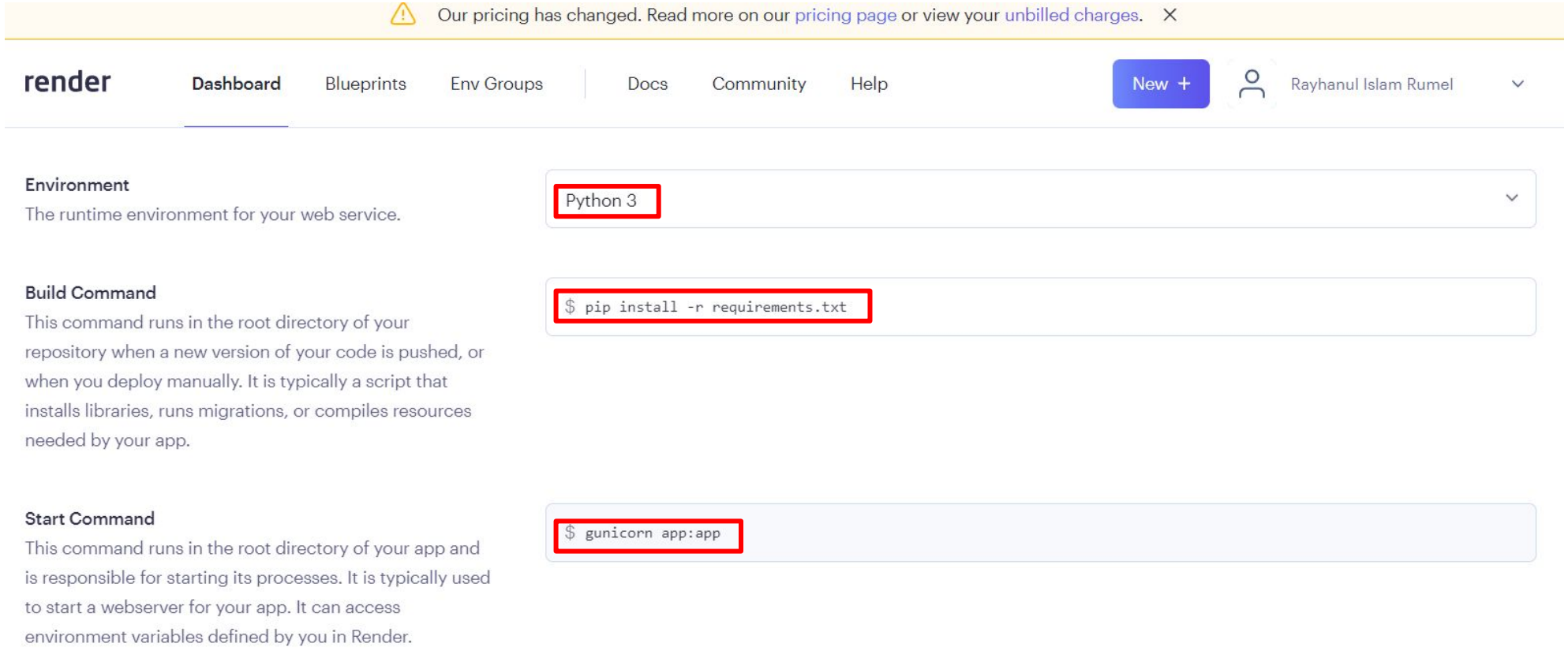
Deploy Spam Detection web app using Render

- Then, it redirected me to a page where I need to fill up a few information in order to successfully start deploying my web app. In this picture, we see that I needed to give info like the name of the web app and region where my app belongs to.



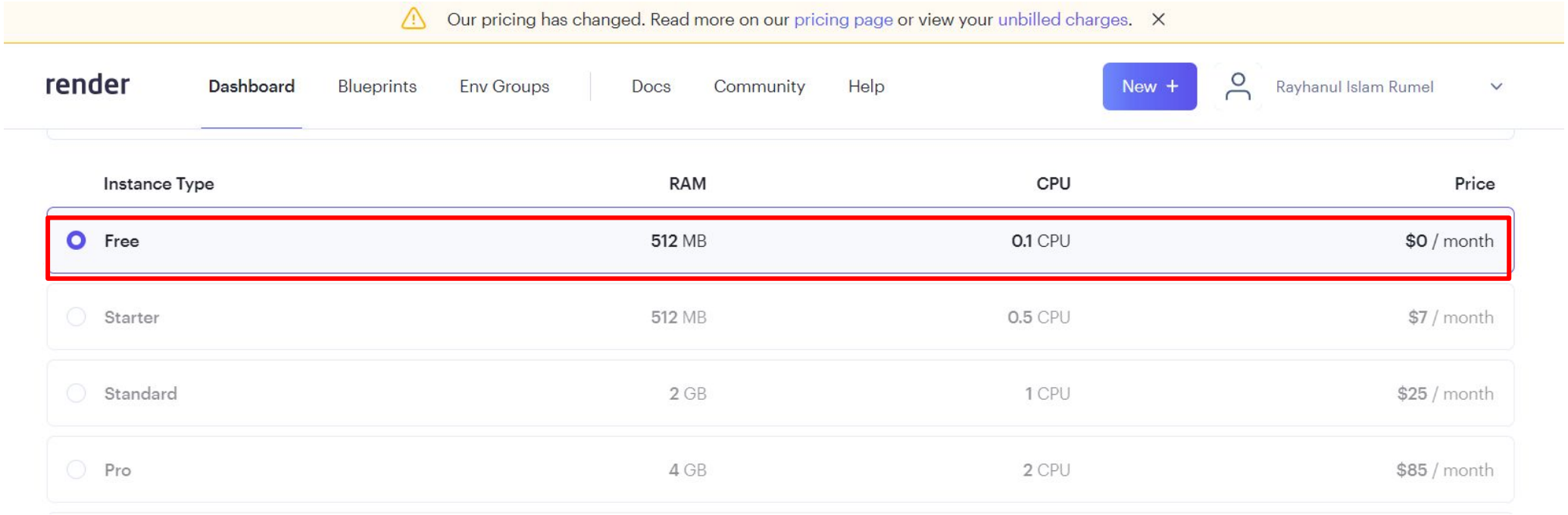
Deploy Spam Detection web app using Render

- Later, I needed to give information like *Environment*, **Python3** in my case, *Build Command,* here I mentioned to install all the packages and dependencies from **requirements.txt**, and *Start Command,* which file to execute at the beginning of the application, in my case it's app.py.



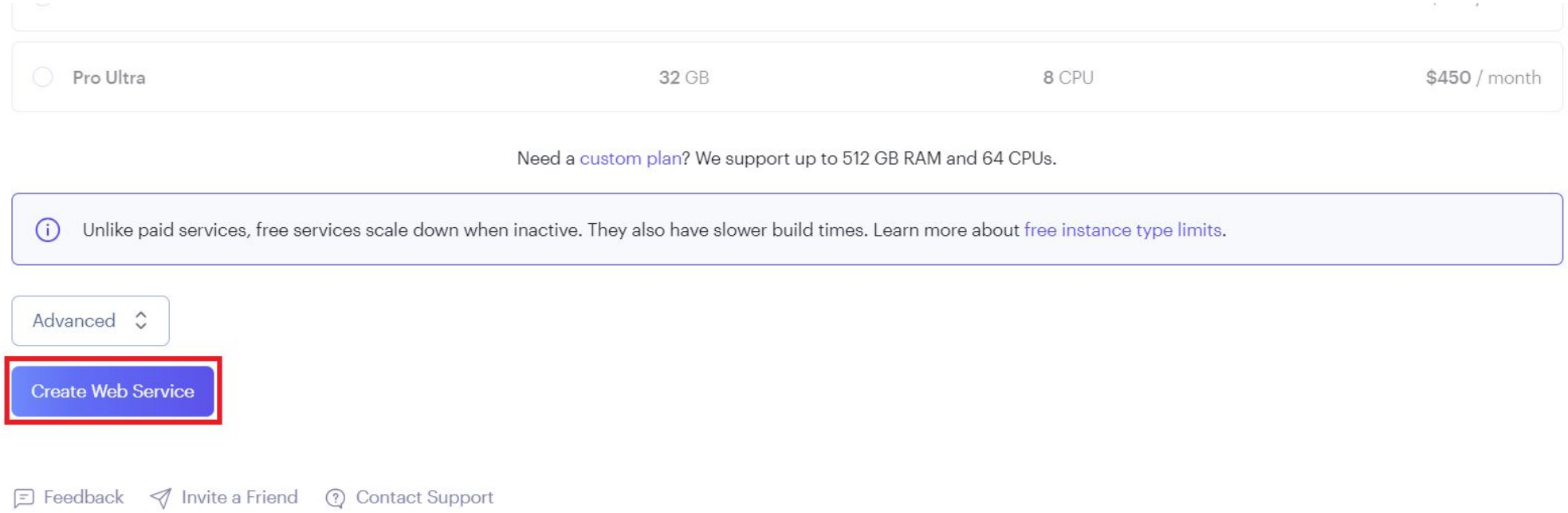
Deploy Spam Detection web app using Render

- Then I needed to choose the insurance type to successfully deploy my web app. There are different plans available. However, for this project I chose the free one.



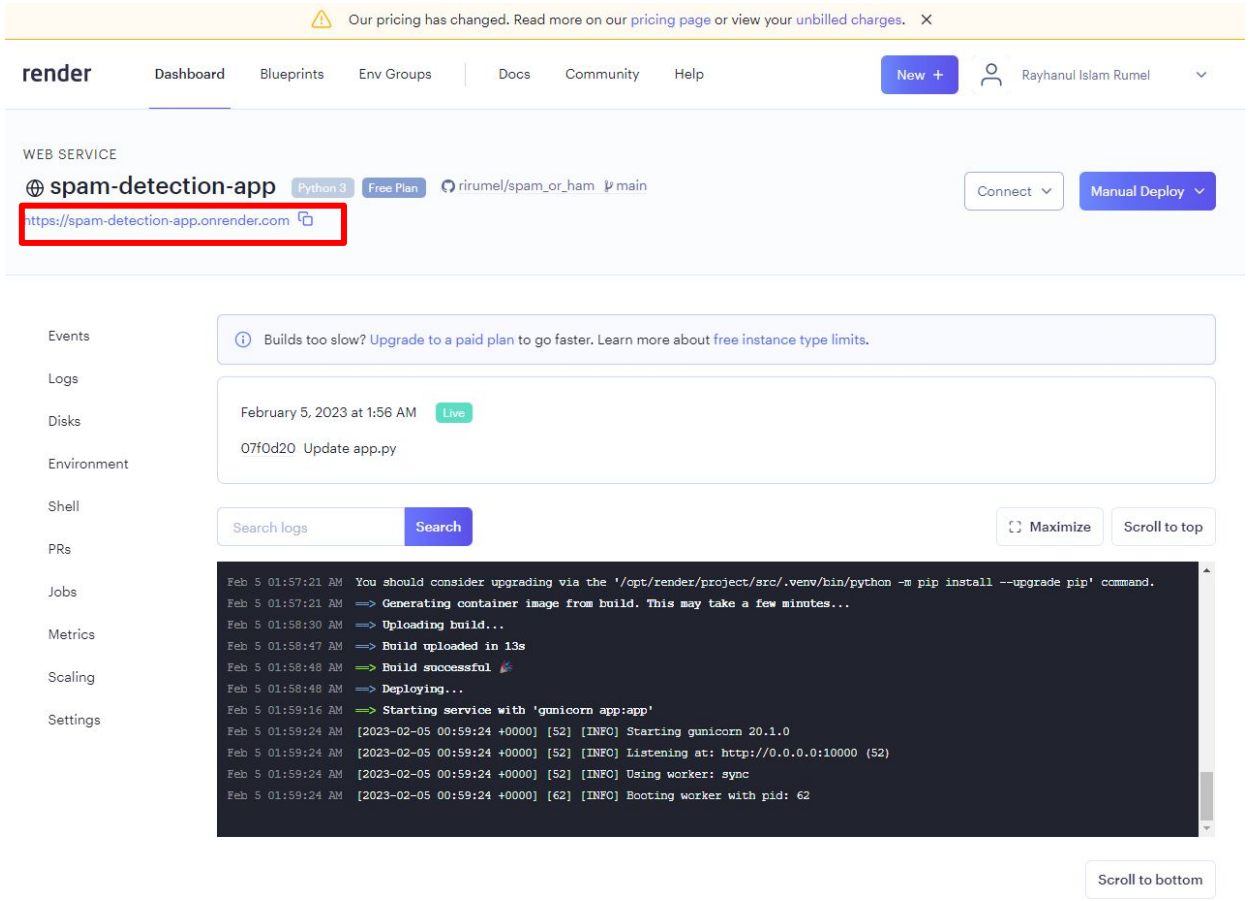
Deploy Spam Detection web app using Render

- Last but not least, I clicked on the “Create Web Service” button to start the deployment process.



Deploy Spam Detection web app using Render

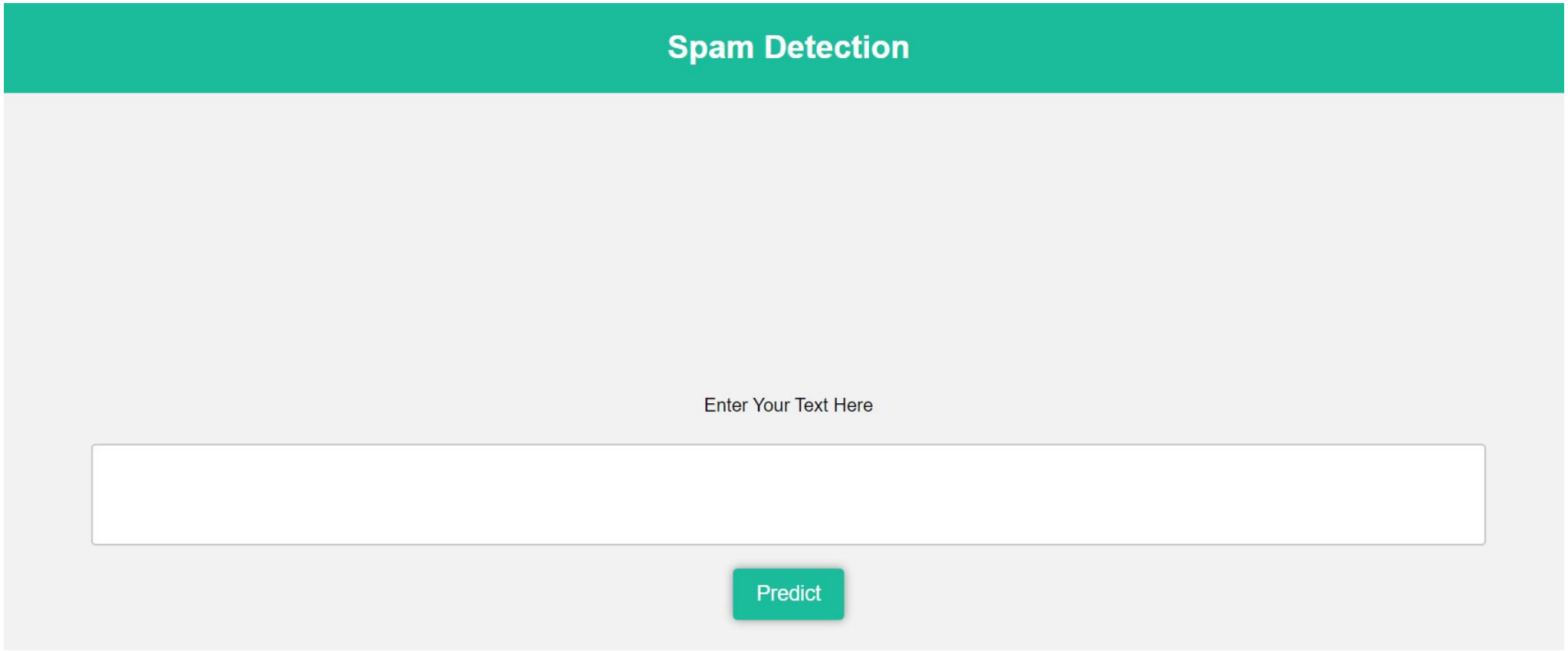
- It took a few minutes to install all the dependencies and deploy the web app. After successful deployment, the web app is now live at: https://spam-detection-app.onrender.com/



User Guide

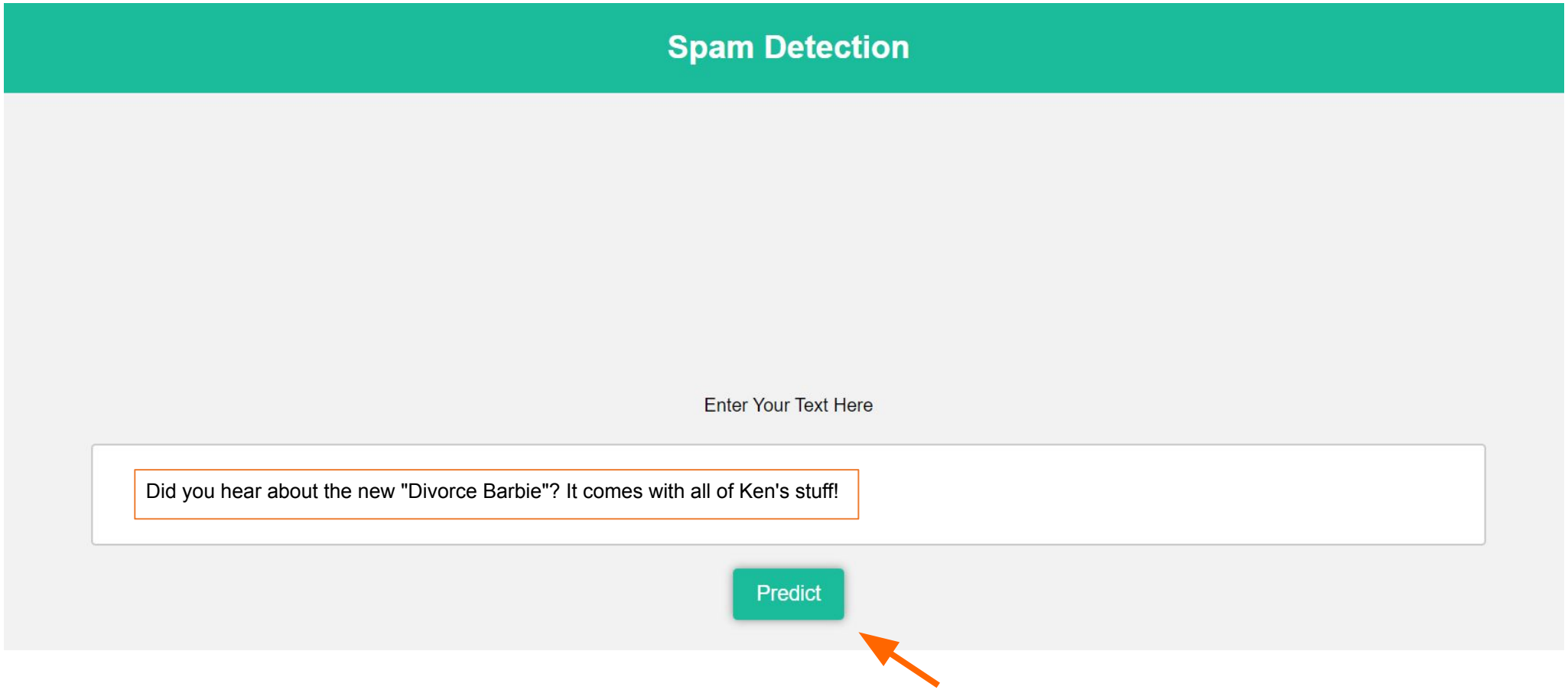
User Guide

- After visiting the homepage of Spam Detection, you would see the following user interface.



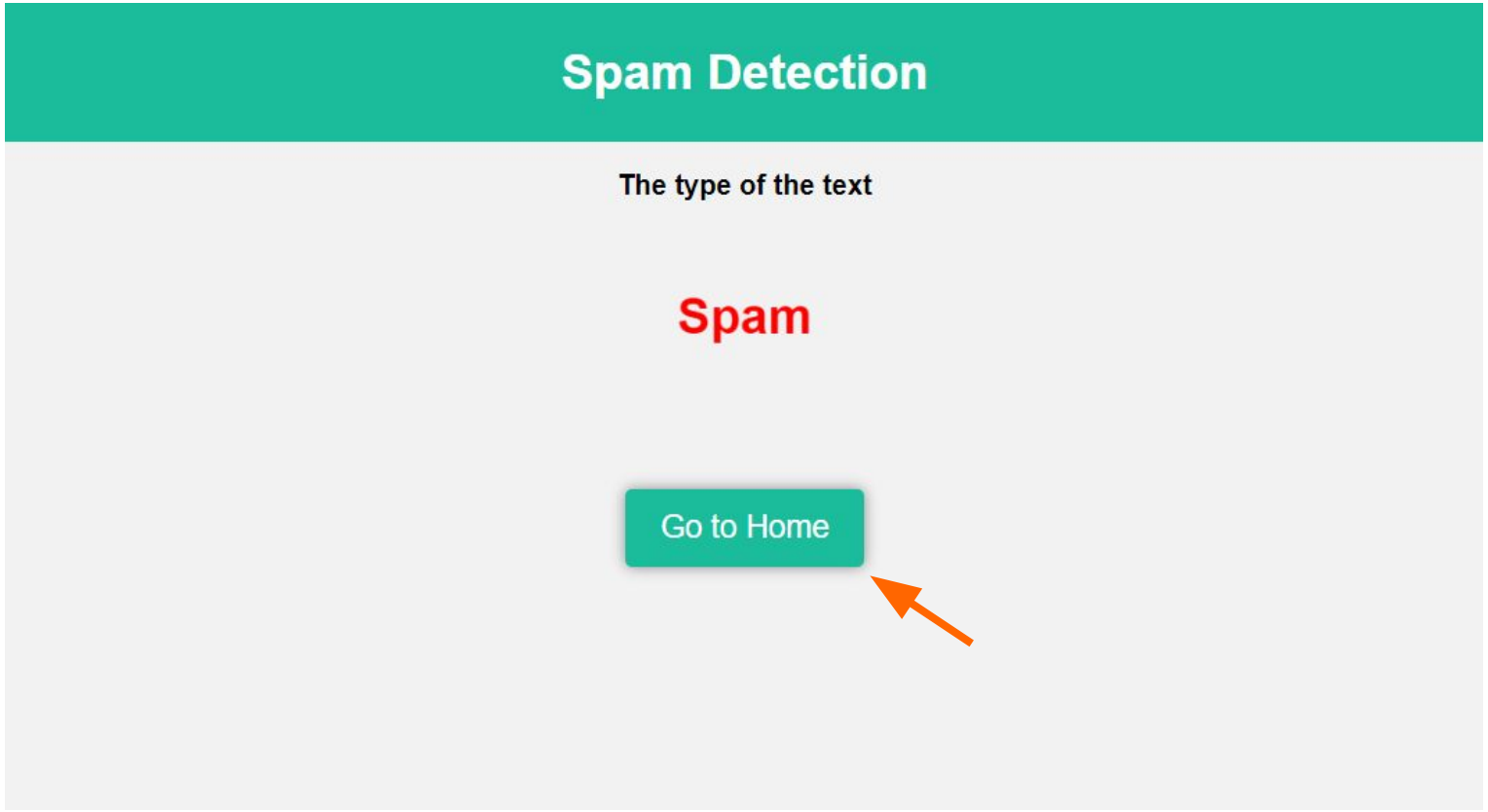
User Guide

- Type your text in the text field and click on the ‘Predict’ button.



User guide

- The app will redirect you to the next page and will show you the type of text you entered.
- You can click on ‘Go to Home’ button to visit the homepage of the app.



Try Yourself
Dummy Dataset

Try Yourself

- Since the model would be expecting unseen text comes from the similar distribution as the training set, I generated some unseen text messages, both spam and ham to check how the app performs in an unseen situation.
- You will find those messages in the next two slides.
- All the messages are grouped into two groups: Spam messages, and Ham messages
- In total 10 text messages are available. Each group contains 5 text messages.
- Copy a message from those slides and paste it on the app to see how good the app performs.

Dummy Unseen Data (Spam)

- **SPAM TEXTS:**

  1) Congratulations! You have been chosen to receive a £1000 prize reward as a valued network customer. Call 09061701461 to claim. Use code KL342. Limited time offer.

  2) Exciting news! You have won a £800 prize reward as a valued network customer. Call 09061701461 to claim your prize. Code KL343. Offer expires in 24 hours.

  3) Hurry! As a valued network customer, you have been selected to receive a £500 prize reward. Call 09061701461 to claim. Code KL344. Offer valid for only 12 hours.

  4) You're a winner! As a valued network customer, you have been selected for a £1200 prize reward. Call 09061701461 to claim. Code KL345. Time-sensitive offer.

  5) Lucky you! You have been selected to receive a £700 prize reward as a valued network customer. Call 09061701461 to claim. Use code KL346. Offer valid for limited hours only.

Dummy Unseen Data (Ham)

- **HAM TEXTS:**

  1) I am at a loss for words to express my gratitude for your kindness. I vow to repay your generosity and keep my word. You have been a constant source of support and a true blessing.

  2) I have been struggling to find the right way to say thank you for this moment of respite. I swear I will not take your generosity for granted and will live up to my promise. Your unwavering support and blessings have been invaluable.

  3) I am overwhelmed by the kindness you have shown me and I am searching for the perfect words to express my thanks. I promise to repay your help and keep my commitment. Your love and blessings have been a constant source of strength.

  4) I cannot find the words to adequately express my gratitude for this break you have given me. I assure you I will not waste your generosity and will honor my promise. You have been a wonderful friend and a constant source of blessings.

  5) My heart is filled with gratitude and I am searching for the right words to thank you for this moment of peace. I will not forget your help and will fulfill my obligations. Your selflessness and blessings have been a true blessing in my life.

Thank You