National College of Ireland

Configuration Manual

MSc Research Project
Cloud Computing

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MSc Project Submission Sheet

School of Computing

Student Name: Meerath Nida Aman……

Student ID: X21228841……

Programme: MSc in Cloud Computing…… **Year:** 2023……..

Module: MSc Research Project……

Lecturer: 14/12/2023……

Submission Due Date: ……

Project Title: Integrating BERT-Based Feature Extraction with Traditional Algorithms for Low-Latency DNS Mappings in Osmotic Computing.

Word Count: 167…… **Page Count:** 7……

I hereby certify that the information contained in this (my submission) is information pertaining to research I conducted for this project. All information other than my own contribution will be fully referenced and listed in the relevant bibliography section at the rear of the project.
ALL internet material must be referenced in the bibliography section. Students are required to use the Referencing Standard specified in the report template. To use other author's written or electronic work is illegal (plagiarism) and may result in disciplinary action.

Signature: Meerath Nida Aman……

Date: 14/12/2023……

PLEASE READ THE FOLLOWING INSTRUCTIONS AND CHECKLIST

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Configuration Manual

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1 Introduction

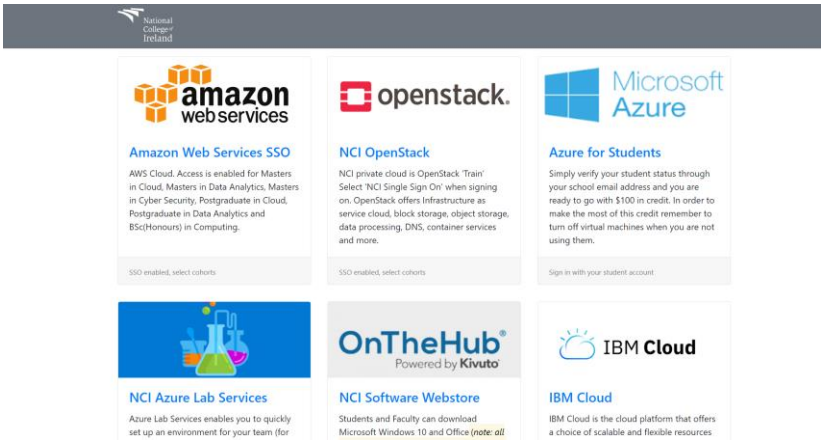
The setup process of the research work, utilizing BERT(Bidirectional Encoder Representations from Transformers)-based semantic modeling and traditional clustering algorithms like KMeans, DBSCAN and Agglomerative Clustering to enhance MicroElement identification within DNS datasets for enhanced discovery and reduced latency in Osmotic Computing is discussed in this Configuration Manual.

2 Prerequisites

1. Amazon Sagemaker

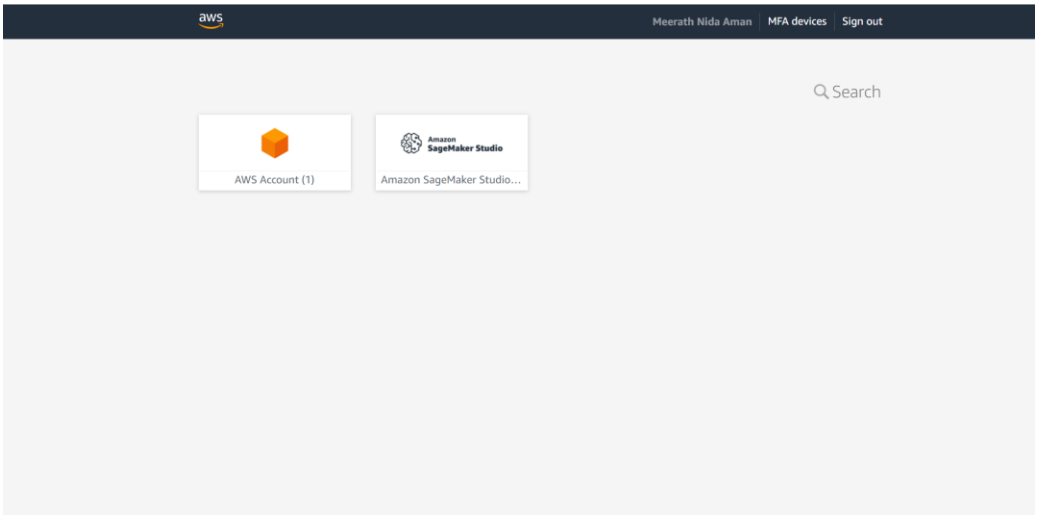
3 Prerequisite Installation

1. Go to the link https://cloud.ncirl.ie/ with appropriate access.

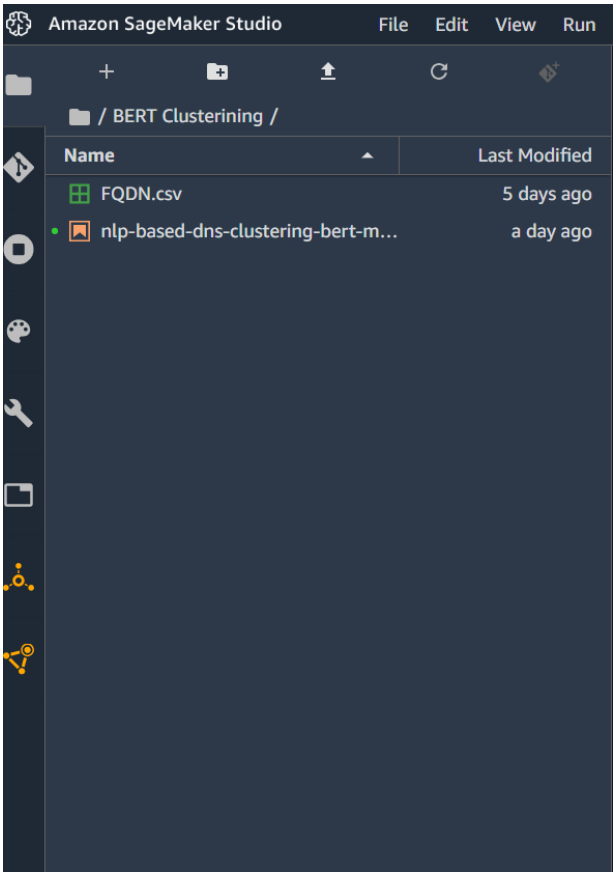


2. Click on Amazon Web Services

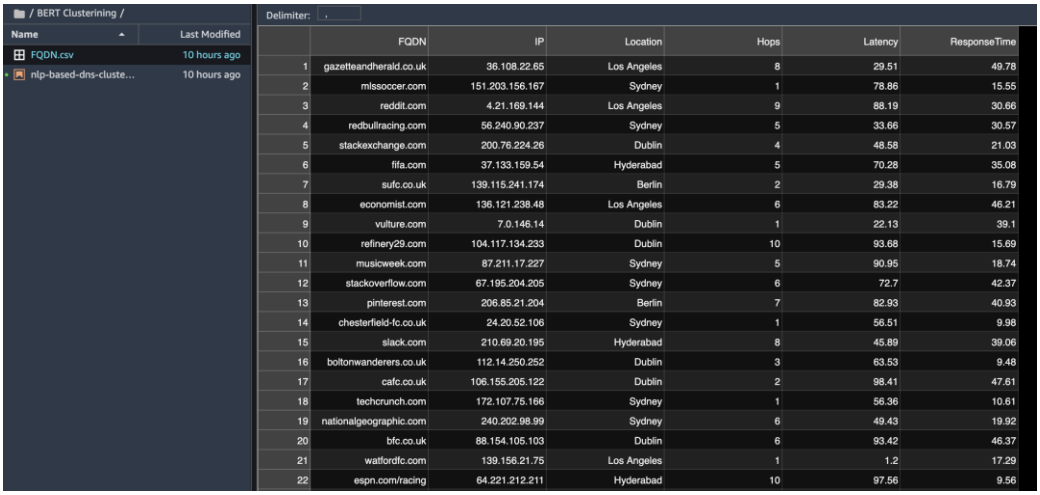
3. Select Amazon Sagemaker Studio



4. Create a Folder Called BERT and add the dataset with the code.



5. The folder FQDN.csv contains the Dataset containing 2000 DNS addresses and their features.



	FQDN	IP	Location	Hops	Latency	ResponseTime
1	gazetteandherald.co.uk	36.108.22.65	Los Angeles	8	29.51	49.78
2	mlssoccer.com	151.203.156.167	Sydney	1	78.86	15.55
3	reddit.com	4.21.169.144	Los Angeles	9	88.19	30.66
4	redbullracing.com	56.240.90.237	Sydney	5	33.66	30.57
5	stackexchange.com	200.76.224.26	Dublin	4	48.58	21.03
6	fifa.com	37.133.159.54	Hyderabad	5	70.28	35.08
7	sufc.co.uk	139.115.241.174	Berlin	2	29.38	16.79
8	economist.com	136.121.238.48	Los Angeles	6	83.22	46.21
9	vulture.com	7.0.146.14	Dublin	1	22.13	39.1
10	refinery29.com	104.117.134.233	Dublin	10	93.68	15.69
11	musicweek.com	87.211.17.227	Sydney	5	90.95	18.74
12	stackoverflow.com	67.195.204.205	Sydney	6	72.7	42.37
13	pinterest.com	206.85.21.204	Berlin	7	82.93	40.93
14	chesterfield-fc.co.uk	24.20.52.106	Sydney	1	56.51	9.98
15	slack.com	210.69.20.195	Hyderabad	8	45.89	39.06
16	boltonwanderers.co.uk	112.14.250.252	Dublin	3	63.53	9.48
17	cafc.co.uk	106.155.205.122	Dublin	2	98.41	47.61
18	techcrunch.com	172.107.75.166	Sydney	1	56.36	10.61
19	nationalgeographic.com	240.202.98.99	Sydney	6	49.43	19.92
20	bfc.co.uk	88.154.105.103	Dublin	6	93.42	46.37
21	watfordfc.com	139.156.21.75	Los Angeles	1	1.2	17.29
22	espn.com/racing	64.221.212.211	Hyderabad	10	97.56	9.56

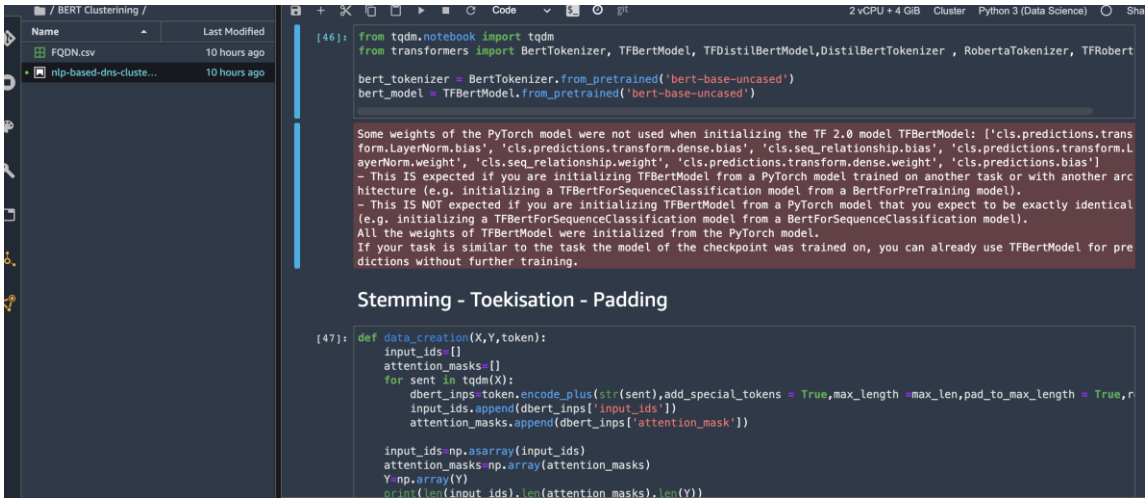
4 Running the proposed Code

1. Install all the prerequired packages by running the below part of the code.

```
!pip install tensorflow pandas scikit-learn nltk transformers
import tensorflow as tf
import pandas as pd
from sklearn.model_selection import train_test_split
import numpy as np
import re
import unicodedata
import nltk
from nltk.corpus import stopwords
from tensorflow import keras
from tensorflow.keras.layers import Dense,Dropout, Input, Reshape
from tqdm import tqdm
import pickle
from sklearn.metrics import confusion_matrix,f1_score,classification_report
import matplotlib.pyplot as plt
import itertools
from sklearn.utils import shuffle
from tensorflow.keras import regularizers
from transformers import BertTokenizer, TFBertModel, BertConfig,TFDistilBertModel,DistilBertTokenizer,DistilBertConfig
import numpy as np
import pandas as pd
# https://swatimeena989.medium.com/distilbert-text-classification-using-keras-c1201d3a3d9d
from sklearn import preprocessing
import warnings
warnings.filterwarnings("ignore")
```

```
Requirement already satisfied: tensorflow in /opt/conda/lib/python3.7/site-packages (2.11.0)
Requirement already satisfied: pandas in /opt/conda/lib/python3.7/site-packages (1.3.5)
Requirement already satisfied: scikit-learn in /opt/conda/lib/python3.7/site-packages (0.22.1)
Requirement already satisfied: nltk in /opt/conda/lib/python3.7/site-packages (3.8.1)
Requirement already satisfied: transformers in /opt/conda/lib/python3.7/site-packages (4.30.2)
Requirement already satisfied: absl-py>=1.0.0 in /opt/conda/lib/python3.7/site-packages (from tensorflow) (2.0.0)
Requirement already satisfied: astunparse>=1.6.0 in /opt/conda/lib/python3.7/site-packages (from tensorflow) (1.6.3)
Requirement already satisfied: flatbuffers>=2.0 in /opt/conda/lib/python3.7/site-packages (from tensorflow) (23.5.26)
Requirement already satisfied: gast<=0.4.0,>=0.2.1 in /opt/conda/lib/python3.7/site-packages (from tensorflow) (0.4.0)
Requirement already satisfied: google-pasta>=0.1.1 in /opt/conda/lib/python3.7/site-packages (from tensorflow) (0.2.0)
Requirement already satisfied: grpcio<2.0,>=1.24.3 in /opt/conda/lib/python3.7/site-packages (from tensorflow) (1.60.0)
Requirement already satisfied: h5py>=2.9.0 in /opt/conda/lib/python3.7/site-packages (from tensorflow) (2.10.0)
Requirement already satisfied: keras<2.12,>=2.11.0 in /opt/conda/lib/python3.7/site-packages (from tensorflow) (2.11.0)
Requirement already satisfied: libclang>=13.0.0 in /opt/conda/lib/python3.7/site-packages (from tensorflow) (16.0.6)
```

2. Preprocess the data in dataset and extract features by running the below part of the code to implement BERT.



3. Implement KMeans Clustering by running below code

```
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.datasets import make_blobs
from sklearn.cluster import KMeans
from sklearn.preprocessing import StandardScaler
from mpl_toolkits.mplot3d import Axes3D
# Create a figure with a specific size
plt.figure(figsize=(20, 10))
plt.grid(True)
# Generate synthetic data
X = dfop
# Standardize the features
X = StandardScaler().fit_transform(X)
# Standardize the features
# K-Means clustering
kmeans = KMeans(n_clusters=3, random_state=42)
kmeans_labels = kmeans.fit_predict(X)
plot_clusters(X, kmeans_labels, "K-Means Clustering")
evaluate_clusters(X, kmeans_labels)
```

4. Implement DBScan Clustering by running below code

```
# DBSCAN clustering
plt.figure(figsize=(20, 10))
plt.grid(True)
dbscan = DBSCAN(eps=0.03, min_samples=5)
dbscan_labels = dbscan.fit_predict(X)
plot_clusters(X, dbscan_labels, "DBSCAN Clustering")
# DBSCAN doesn't require specifying the number of clusters, so there's no need for evaluation
```

5. Implement Agglomerative Clustering by running below code

```
plt.figure(figsize=(20, 10))
# Agglomerative clustering
plt.figure(figsize=(20, 10))
plt.grid(True)
agglomerative = AgglomerativeClustering(n_clusters=3)
agglomerative_labels = agglomerative.fit_predict(X)
plot_clusters(X, agglomerative_labels, "Agglomerative Clustering")
evaluate_clusters(X, agglomerative_labels)
```

Video Presentation Link:
https://studentncirl-my.sharepoint.com/:v:/g/personal/x21228841_student_ncirl_ie/Ea7J3FiycLtGqCgD6Vg-FHYBfG2JZu9E8SRNV-iVMC3gSg?e=ybXLEv

References

1. Zhang, K., Tan, L., & Wang, H. (2010). Feature selection in clustering high-dimensional data: A new solution. In Proceedings of the 16th ACM SIGKDD International Conference on Knowledge Discovery and Data Mining (KDD 10).