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AI-Powered Spam Classifier

TEAM : 01

Build a Spam Classifier with Machine Learning Algorithm

With deep learning and AI, handling spam content has gotten easier and easier. Over time (and with the aid of direct user feedback) our spam classifier will rarely produce erroneous results.

This is the first part of a multi-part series covering how to:

- Build an AI Model (this one)
- Integrate a NoSQL Database (inference result storing)
- Deploy an AI Model into Production

Prerequisites:

- Prepare your dataset using this notebook .
- Convert your dataset into trainable vectors in this notebook (Either way, this notebook will run this step for us).

Running this notebook:

- Recommended: Use Colab as it offers free GPUs for training models. Launch this notebook here
- Fork the AI as an API repo and run guides/spam-classifier/Spam_Classifier_with_Keras.ipynb whenever you'd like.

```
!pip install boto3

# !pip install pandas tensorflow
```

Packages:

```
import boto3

import os

import pathlib

import pandas as pd

import pickle


from tensorflow.keras.layers import Dense, Input

from tensorflow.keras.layers import Conv1D, MaxPooling1D, Embedding, LSTM, SpatialDropout1D

from tensorflow.keras.models import Model, Sequential
from tensorflow.keras.preprocessing.text import Tokenizer

from tensorflow.keras.preprocessing.sequence import pad_sequences

EXPORT_DIR = pathlib.Path('/datasets/exports/')

GUIDES_DIR = pathlib.Path("/guides/spam-classifier/")

DATASET_CSV_PATH = EXPORT_DIR / 'spam-dataset.csv'

TRAINING_DATA_PATH = EXPORT_DIR / 'spam-training-data.pkl'

PART_TWO_GUIDE_PATH = GUIDES_DIR / "2 - Convert Dataset into
Vectors.ipynb"
```

Prepare Dataset:

Creating a dataset rarely happens next to where you run the training. The below cells are a method for us to extract the needed data to perform training against.

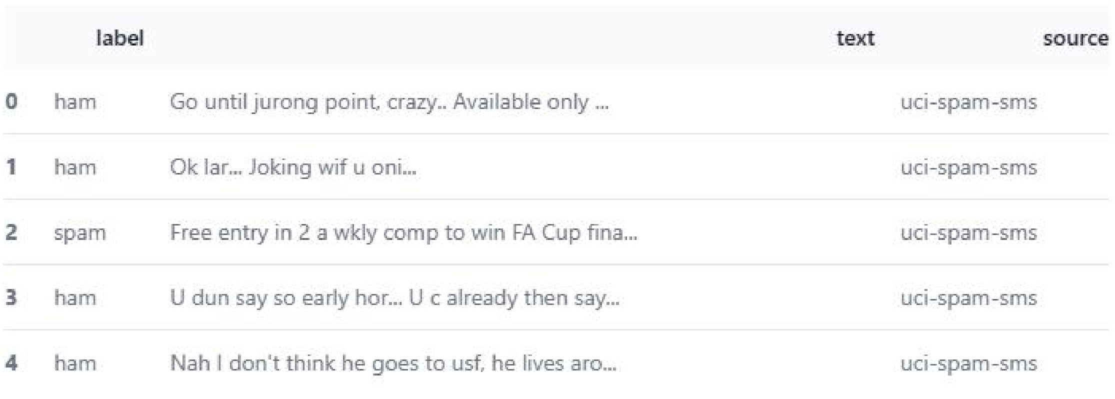
```
!mkdir -p "$EXPORT_DIR"

!mkdir -p "$GUIDES_DIR"

!curl
"https://raw.githubusercontent.com/codingforentrepreneurs/AI-as-an-A
PI/main/datasets/exports/spam-dataset.csv" -o "$DATASET_CSV_PATH"

!curl
"https://raw.githubusercontent.com/codingforentrepreneurs/AI-as-an-A
PI/main/guides/spam-classifier/2%20-%20Convert%20Dataset%20into%
20Vectors.ipynb" -o "$PART_TWO_GUIDE_PATH"
```

OutPut:

```
 % Total    % Received % Xferd  Average Speed   Time    Time     Time
Current
                                 Dload  Upload   Total   Spent    Left  Speed
100  729k  100  729k    0     0  1175k      0 --:--:-- --:--:-- --:--:-- 1173k
 % Total    % Received % Xferd  Average Speed   Time    Time     Time
Current
                                 Dload  Upload   Total   Spent    Left  Speed
100 15408  100 15408    0     0  40547      0 --:--:-- --:--:-- --:--:-- 40547
```

Data Set:

```
df = pd.read_csv(DATASET_CSV_PATH)
df.head()
```



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

```
%run "$PART_TWO_GUIDE_PATH"
BASE_DIR is /
Random Index 2234
Found 9538 unique tokens.
```

Extract prepared training dataset results:

```
data = {}


with open(TRAINING_DATA_PATH, 'rb') as f:
    data = pickle.load(f)
```

Transform Extracted Dataset:

```
X_test = data['X_test']

X_train = data['X_train']

y_test = data['y_test']

y_train = data['y_train']

labels_legend_inverted = data['labels_legend_inverted']

legend = data['legend']

max_sequence = data['max_sequence']

max_words = data['max_words']

tokenizer = data['tokenizer']
```

Create our LSTM Model:

```
embed_dim = 128

lstm_out = 196

model = Sequential()

model.add(Embedding(MAX_NUM_WORDS, embed_dim,
input_length=X_train.shape[1]))
```

```
model.add(SpatialDropout1D(0.4))

model.add(LSTM(lstm_out, dropout=0.3, recurrent_dropout=0.3))

model.add(Dense(2, activation='softmax'))

model.compile(loss='categorical_crossentropy', optimizer="adam",
metrics=['accuracy'])

print(model.summary())

WARNING:tensorflow:Layer lstm will not use cuDNN kernels since it
doesn't meet the criteria. It will use a generic GPU kernel as fallback when
running on GPU.

Model: "sequential"

_________________________________________________________________

Layer (type)                 Output Shape              Param #

=================================================================

embedding (Embedding)        (None, 280, 128)          35840

_________________________________________________________________

spatial_dropout1d (SpatialDr (None, 280, 128)          0

_________________________________________________________________

lstm (LSTM)                  (None, 196)               254800

_________________________________________________________________

dense (Dense)                (None, 2)                 394
```

```
=================================================================
=================
Total params: 291,034
Trainable params: 291,034
Non-trainable params: 0
```

```
None
batch_size = 32
epochs = 5
model.fit(X_train, y_train, validation_data=(X_test, y_test),
batch_size=batch_size, verbose=1, epochs=epochs)
Epoch 1/5
163/163 [==============================] - 278s 2s/step -
loss: 0.2675 - accuracy: 0.8958 - val_loss: 0.1621 - val_accuracy: 0.9446
Epoch 2/5
163/163 [==============================] - 271s 2s/step -
loss: 0.1256 - accuracy: 0.9577 - val_loss: 0.1075 - val_accuracy: 0.9664
Epoch 3/5
163/163 [==============================] - 270s 2s/step -
loss: 0.1087 - accuracy: 0.9619 - val_loss: 0.1113 - val_accuracy: 0.9610
Epoch 4/5
```

```
163/163 [==============================] - 268s 2s/step -
loss: 0.0961 - accuracy: 0.9650 - val_loss: 0.0910 - val_accuracy: 0.9703

Epoch 5/5

163/163 [==============================] - 261s 2s/step -
loss: 0.0904 - accuracy: 0.9681 - val_loss: 0.0969 - val_accuracy: 0.9653

<keras.callbacks.History at 0x7ff640316f50>
```

```
MODEL_EXPORT_PATH = EXPORT_DIR / 'spam-model.h5'

model.save(str(MODEL_EXPORT_PATH))
```

Predict new data:

```
import numpy as np

def predict(text_str, max_words=280, max_sequence = 280,
tokenizer=None):

  if not tokenizer:

    return None

  sequences = tokenizer.texts_to_sequences([text_str])

  x_input = pad_sequences(sequences, maxlen=max_sequence)

  y_output = model.predict(x_input)

  top_y_index = np.argmax(y_output)

  preds = y_output[top_y_index]

  labeled_preds = [{f"{labels_legend_inverted[str(i)]}": x} for i, x in
enumerate(preds)]
```

```
  return labeled_preds

predict("Hello world", max_words=max_words,
max_sequence=max_sequence, tokenizer=tokenizer)

[{'ham': 0.96744573}, {'spam': 0.032554302}]
```

Exporting Tokenizer & Metadata:

```
import json

metadata = {

    "labels_legend_inverted": labels_legend_inverted,

    "legend": legend,

    "max_sequence": max_sequence,

    "max_words": max_words,

}


METADATA_EXPORT_PATH = EXPORT_DIR /
'spam-classifer-metadata.json'

METADATA_EXPORT_PATH.write_text(json.dumps(metadata, indent=4))

187

tokenizer_as_json = tokenizer.to_json()

TOKENIZER_EXPORT_PATH = EXPORT_DIR /
'spam-classifer-tokenizer.json'
```

```
TOKENIZER_EXPORT_PATH.write_text(tokenizer_as_json)

827612
```

Upload Model, Tokenizer, & Metadata to Object Storage:

Object Storage options include:

- AWS S3
- Linode Object Storage
- DigitalOcean Spaces

```
# AWS S3 Config

ACCESS_KEY = "<your_aws_iam_key_id>"

SECRET_KEY = "<your_aws_iam_secret_key>"

# You should not have to set this

ENDPOINT = None

# Your s3-bucket region

REGION = 'us-west-1'

BUCKET_NAME = '<your_s3_bucket_name>'
```

Linode Object Storage Config:

```
ACCESS_KEY = "<your_linode_object_storage_access_key>"

SECRET_KEY = "<your_linode_object_storage_secret_key>"

# Object Storage Endpoint URL

ENDPOINT = "https://cfe3.us-east-1.linodeobjects.com"
```

Object Storage Endpoint Region (also in your endpoint url)

REGION = 'us-east-1'

Set this to a valid slug (without a "/")

BUCKET_NAME = 'datasets'

DigitalOcean Spaces Config:

ACCESS_KEY = "<your_do_spaces_access_key>"

SECRET_KEY = "<your_do_spaces_secret_key>"

# Space Endpoint URL

ENDPOINT = "https://ai-cfe-1.nyc3.digitaloceanspaces.com"

# Space Region (also in your endpoint url)

REGION = 'nyc3'

# Set this to a valid slug (without a "/")

BUCKET_NAME = 'datasets'

Perform Upload with Boto3:

os.environ["AWS_ACCESS_KEY_ID"] = ACCESS_KEY

os.environ["AWS_SECRET_ACCESS_KEY"] = SECRET_KEY

# Upload paths

**MODEL_KEY_NAME =
f"exports/spam-sms/{MODEL_EXPORT_PATH.name}"**

TOKENIZER_KEY_NAME =

```
f"exports/spam-sms/{TOKENIZER_EXPORT_PATH.name}"

METADATA_KEY_NAME =
f"exports/spam-sms/{METADATA_EXPORT_PATH.name}"

session = boto3.session.Session()

client = session.client('s3', region_name=REGION,
endpoint_url=ENDPOINT)

client.upload_file(str(MODEL_EXPORT_PATH), BUCKET_NAME,
MODEL_KEY_NAME)

client.upload_file(str(TOKENIZER_EXPORT_PATH), BUCKET_NAME,
TOKENIZER_KEY_NAME)

client.upload_file(str(METADATA_EXPORT_PATH), BUCKET_NAME,
METADATA_KEY_NAME)

client.download_file(BUCKET_NAME, MODEL_KEY_NAME,
pathlib.Path(MODEL_KEY_NAME).name)

client.download_file(BUCKET_NAME, TOKENIZER_KEY_NAME,
pathlib.Path(TOKENIZER_KEY_NAME).name)

client.download_file(BUCKET_NAME, METADATA_KEY_NAME,
pathlib.Path(METADATA_KEY_NAME).name)


'
```