**Title: Applying deep learning methods to solve an applicaton.**

**Ex. No : 10 Reg.No. : RA2011003011334**

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**Aim:**

Applying deep learning for spam mail detection.

**Algorithm:**

# Import libraries

import pandas as pd

from sklearn.model\_selection import train\_test\_split

from sklearn.feature\_extraction.text import CountVectorizer

from sklearn.naive\_bayes import MultinomialNB

from sklearn.metrics import accuracy\_score, precision\_score, recall\_score, f1\_score

# Load dataset

data = pd.read\_csv('spam\_data.csv')

# Preprocess data

data['text'] = data['text'].str.lower()

data['text'] = data['text'].str.replace('[^\w\s]','')

data['text'] = data['text'].str.replace('\d+', '')

data['text'] = data['text'].str.strip()

# Split data into training and testing sets

X\_train, X\_test, y\_train, y\_test = train\_test\_split(data['text'], data['label'], test\_size=0.2, random\_state=42)

# Extract features from text using bag-of-words

vectorizer = CountVectorizer()

X\_train = vectorizer.fit\_transform(X\_train)

X\_test = vectorizer.transform(X\_test)

# Train Naive Bayes classifier

clf = MultinomialNB()

clf.fit(X\_train, y\_train)

# Make predictions on test data

y\_pred = clf.predict(X\_test)

# Evaluate performance

accuracy = accuracy\_score(y\_test, y\_pred)

precision = precision\_score(y\_test, y\_pred, pos\_label='spam')

recall = recall\_score(y\_test, y\_pred, pos\_label='spam')

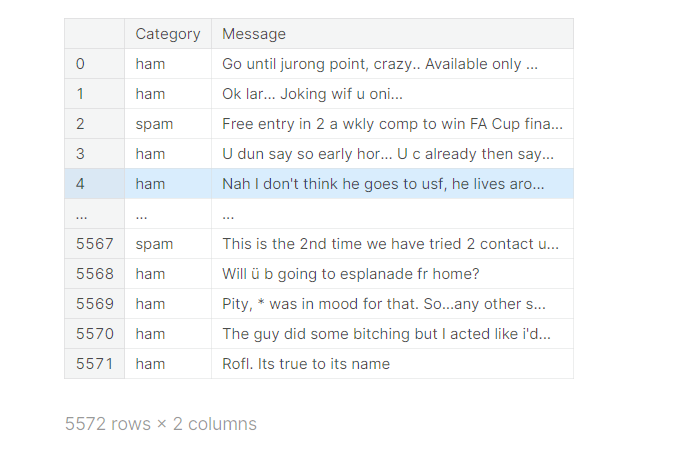
f1 = f1\_score(y\_test, y\_pred, pos\_label='spam')

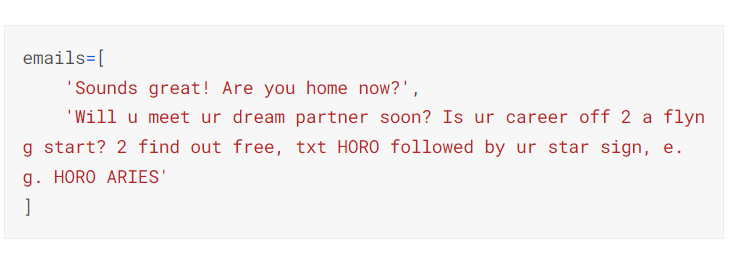
print("Accuracy: ", accuracy)

print("Precision: ", precision)

print("Recall: ", recall)

print("F1 Score: ", f1)

**Output:**

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**Result:**

Successfully Implemented NLP Program for spam mail detection.