# 4222- SURYA GROUP OF INSTITUTIONS

VIKARAVANDI-605652

**PROJECT NAME:**

**EARTHQUAKE-PRRREDICTION-USING-PYTHON**

**PHASE2- INNOVATION**

### hyperparameter tuning

In [18]:

from keras.wrappers.scikit\_learn import KerasClassifier

model = KerasClassifier(build\_fn=create\_model, verbose=0)

*# param\_grid = {*

*# "neurons": [16, 64],*

*# "batch\_size": [10, 20],*

*# "epochs": [10],*

*# "activation": ['sigmoid', 'relu'],*

*# "optimizer": ['SGD', 'Adadelta'],*

*# "loss": ['squared\_hinge']*

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In [19]:

X\_train = np.asarray(X\_train).astype(np.float32)

y\_train = np.asarray(y\_train).astype(np.float32)

X\_test = np.asarray(X\_test).astype(np.float32)

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In [20]:

grid = GridSearchCV(estimator=model, param\_grid=param\_grid, n\_jobs=-1)

grid\_result = grid.fit(X\_train, y\_train)

best\_params = grid\_result.best\_params\_

best\_params

2023-02-12 14:30:16.688729: I tensorflow/core/common\_runtime/process\_util.cc:146] Creating new thread pool with default inter op setting: 4. Tune using inter\_op\_parallelism\_threads for best performance.

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Out[20]:

{'activation': 'sigmoid',

'batch\_size': 20,

'epochs': 10,

'loss': 'squared\_hinge',

'neurons': 16,

'optimizer': 'SGD'}

**PREPARED BY:**

**S.SUBASRI**

**REG NO: 422221106310**

**ECE DEPARTMENT**

**INNOVATION:**

**In this phase consider advanced techniques such as hyperparameter tuning and feature engineering to improve the prediction models performance.**

**INTRODUCTION:**

This dataset includes a record of the date, time, location, depth, magnitude, and source of every earthquake with a reported magnitude 5.5 or higher since 1965.

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data['Month'] = data['Date'].apply(lambda x: x[0:2])  
data['Year'] = data['Date'].apply(lambda x: x[-4:])  
  
data = data.drop('Date', axis=1)

data['Month'] = data['Month'].astype(np.int)

data[data['Year'].str.contains('Z')]

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Time | Latitude | Longitude | Type | Depth | Magnitude | Magnitude Type | Root Mean Square | Source | Location Source | Magnitude Source | Status | Month | Year |
| 3378 | 1975-02-23T02:58:41.000Z | 8.017 | 124.075 | Earthquake | 623.0 | 5.6 | MB | 1.022784 | US | US | US | Reviewed | 19 | 000Z |
| 7510 | 1985-04-28T02:53:41.530Z | -32.998 | -71.766 | Earthquake | 33.0 | 5.6 | MW | 1.300000 | US | US | HRV | Reviewed | 19 | 530Z |
| 20647 | 2011-03-13T02:23:34.520Z | 36.344 | 142.344 | Earthquake | 10.1 | 5.8 | MWC | 1.060000 | US | US | GCMT | Reviewed | 20 | 520Z |

In [17]:

invalid\_year\_indices = data[data['Year'].str.contains('Z')].index  
  
data = data.drop(invalid\_year\_indices, axis=0).reset\_index(drop=True)

data['Year'] = data['Year'].astype(np.int)

data['Hour'] = data['Time'].apply(lambda x: np.int(x[0:2]))  
  
data = data.drop('Time', axis=1)

data

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Latitude | Longitude | Type | Depth | Magnitude | Magnitude Type | Root Mean Square | Source | Location Source | Magnitude Source | Status | Month | Year | Hour |
| 0 | 19.2460 | 145.6160 | Earthquake | 131.60 | 6.0 | MW | 1.022784 | ISCGEM | ISCGEM | ISCGEM | Automatic | 1 | 1965 | 13 |
| 1 | 1.8630 | 127.3520 | Earthquake | 80.00 | 5.8 | MW | 1.022784 | ISCGEM | ISCGEM | ISCGEM | Automatic | 1 | 1965 | 11 |
| 2 | -20.5790 | -173.9720 | Earthquake | 20.00 | 6.2 | MW | 1.022784 | ISCGEM | ISCGEM | ISCGEM | Automatic | 1 | 1965 | 18 |
| 3 | -59.0760 | -23.5570 | Earthquake | 15.00 | 5.8 | MW | 1.022784 | ISCGEM | ISCGEM | ISCGEM | Automatic | 1 | 1965 | 18 |
| 4 | 11.9380 | 126.4270 | Earthquake | 15.00 | 5.8 | MW | 1.022784 | ISCGEM | ISCGEM | ISCGEM | Automatic | 1 | 1965 | 13 |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| 23401 | 38.3917 | -118.8941 | Earthquake | 12.30 | 5.6 | ML | 0.189800 | NN | NN | NN | Reviewed | 12 | 2016 | 8 |
| 23402 | 38.3777 | -118.8957 | Earthquake | 8.80 | 5.5 | ML | 0.218700 | NN | NN | NN | Reviewed | 12 | 2016 | 9 |
| 23403 | 36.9179 | 140.4262 | Earthquake | 10.00 | 5.9 | MWW | 1.520000 | US | US | US | Reviewed | 12 | 2016 | 12 |
| 23404 | -9.0283 | 118.6639 | Earthquake | 79.00 | 6.3 | MWW | 1.430000 | US | US | US | Reviewed | 12 | 2016 | 22 |
| 23405 | 37.3973 | 141.4103 | Earthquake | 11.94 | 5.5 | MB | 0.910000 | US | US | US | Reviewed | 12 | 2016 | 20 |

23406 rows × 14 columns

data['Status'].unique()

array(['Automatic', 'Reviewed'], dtype=object)

data['Status'] = data['Status'].apply(lambda x: 1 if x == 'Reviewed' else 0)

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