Building a Neural Network Model Using Python

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Case Study – Predicting Loan Defaulters

Background

• The bank possesses demographic and transactional data of its loan customers. If the bank has a robust model to predict defaulters it can undertake better resource allocation.

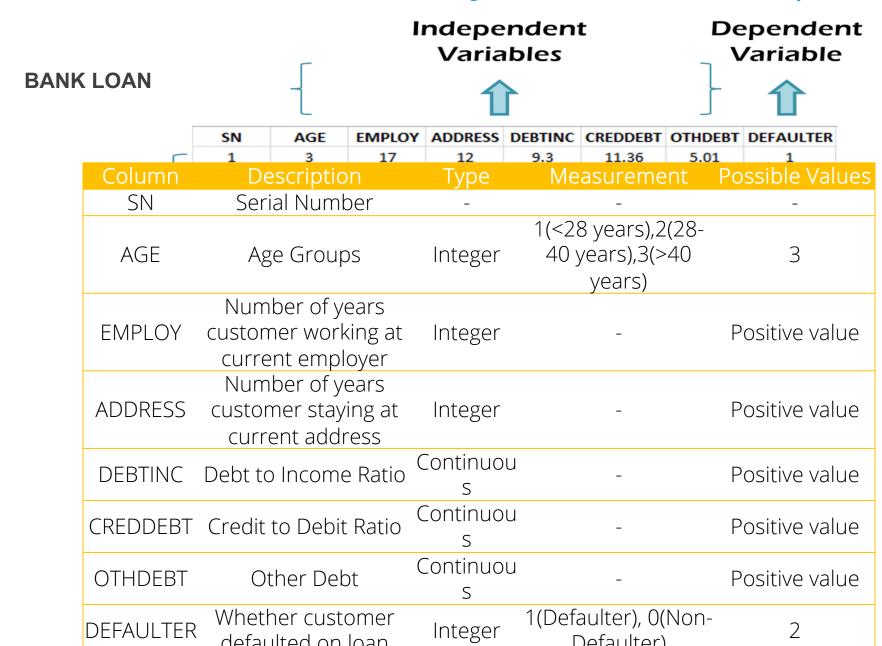
Objective

• To predict whether the customer applying for the loan will be a defaulter

Available Information

- Sample size is 700
- Age group, Years at current address, Years at current employer, Debt to Income Ratio, Credit Card Debts, Other Debts are the independent variables
- **Defaulter** (=1 if defaulter, 0 otherwise) is the dependent variable

Neural Network in Python...Data Snapshot



Data Pre-Processing

- Since AGE is categorical variable, we create dummy variables before proceeding to neural network model.
- To set up a neural network to a dataset it is very important that we ensure a proper scaling of data. The scaling of data is essential because otherwise, a variable may have a large impact on the prediction variable only because of its scale.
- The common techniques to scale data are min-max normalization and Zscore normalization
- □ The min-max normalization transforms the data into a common range, thus removing the scaling effect from all the variables. Here we are using min-max normalization for scaling data.

Neural Network in Python - Classifying Loan Defaulters...

```
import os
os.chdir("D:/SANKHYA/Neural Networks")
import pandas as pd
bankloan = pd.read csv("BANK LOAN.csv")
dummies = pd.get_dummies(bankloan['AGE'],prefix='AGE',drop_first=True)
bankloan = pd.concat([bankloan, dummies], axis=1)
from sklearn.preprocessing import MinMaxScaler
import numpy as np
scaler = MinMaxScaler()
bankloan['EMPLOY']=scaler.fit transform(np.array(bankloan['EMPLOY']).r
eshape(-1, 1))
bankloan['ADDRESS']=scaler.fit transform(np.array(bankloan['ADDRESS'])
.reshape(-1, 1))
bankloan['DEBTINC']=scaler.fit_transform(np.array(bankloan['DEBTINC'])
.reshape(-1, 1))
bankloan['CREDDEBT']=scaler.fit_transform(np.array(bankloan['CREDDEBT'
]).reshape(-1, 1))
bankloan['OTHDEBT']=scaler.fit_transform(np.array(bankloan['OTHDEBT'])
.reshape(-1, 1))
```

Neural Network in Python-Classifying Loan Defaulters...

```
from sklearn.neural_network import MLPClassifier
classifier = MLPClassifier(hidden_layer_sizes=(3,), max_iter=300,
                           activation =
'relu',solver='adam',random state=1)
from sklearn.model_selection import train_test_split
X = bankloan.loc[:,bankloan.columns != 'DEFAULTER']
y = bankloan.loc[:, 'DEFAULTER']
X train, X test, y train, y test = train test split(X, y,
                                                   test size=0.30,
                                                   random state = 999)
classifier.fit(X_train, y_train)
```

Neural Network in Python-Classifying Loan Defaulters...

```
y_pred = classifier.predict_proba(X_test)[0:210,1]

predicted_class=np.zeros(y_pred.shape)
predicted_class[y_pred>0.3]=1
from sklearn.metrics import classification_report
print(classification_report(y_test,predicted_class))
```

Output

	precision	recall	f1-score	support
0 1	0.77 0.27	0.39 0.66	0.52 0.38	157 53
accuracy macro avg weighted avg	0.52 0.64	0.52 0.46	0.46 0.45 0.48	210 210 210

More About ANN Work

- Applications in Artificial Intelligence Handwriting or Face Recognition, Voice Analysis
- The "building blocks" of neural networks are the neurons. In technical systems, we also refer to them as units or nodes.
- Basically, each neuron receives input from many other neurons, changes its internal state (activation) based on the current input, sends one output signal to many other neurons, possibly including its input neurons (recurrent network)
- Information is transmitted as a series of electric impulses, so-called spikes.
- The frequency and phase of these spikes encodes the information.
- In biological systems, one neuron can be connected to as many as 10,000 other neurons.
- Neurons of similar functionality are usually organized in separate areas (or layers).
- Often, there is a hierarchy of interconnected layers with the lowest layer receiving sensory input and neurons in higher layers computing more complex functions.

Quick Recap

Neural Networks in Python

• Library "sklearn" has MLPClassifier () that trains a neural network model