Classification with Artificial Neural Networks (ANN)

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Introduction:

In this project, we are going to use one of the most powerful concepts in deep learning -artificial neural Networks- to solve a classification business problem. This time, we will use Python as our main programming language. We will also include the Keras library which uses both Theano and TensorFlow libraries to build the networks. The network that we are creating in this project is only one feasible way to solve the presented problem and it could be designed in many other different ways. In this document, you will find the step by step code implementation of the ANN. If you want to copy and paste the code into your machine, make sure that have installed all the required libraries (Keras, TensorFlow and Theano) before running it.

Data:

We have obtained the data for this project from https://www.superdatascience.com/. The data contains ten thousand data lines of bank customers. Our job is to predict whether a customer is more likely to leave the bank or not based on the presented data in the CSV file.

Classification with Artificial Neural Networks (ANN):

The first step is to read the data, preprocess the data and remove all the unnecessary variables that do not impact the output. In the case of our data, we can remove “Row number”, “Surname” and “Customer ID” as the do not affect the decision of a customer. Also, we need to define our output data which in our case is the “Exited” Value. This is done as follows:

```
# Classification with Artificial Neural Networks
# Importing the libraries
import numpy
import matplotlib.pyplot as matplot
import pandas
import keras

# Importing the dataset
dataset = pandas.read_csv('Bank Data.csv')
X = dataset.iloc[:, 3:13].values
y = dataset.iloc[:, 13].values
```

The step that follows is encoding the categorical variables such as “Geography” and “Gender”, splitting the data into “Training set” and “Test set” as well as performing some feature scaling to avoid any bias in our calculations within the neural networks:

```
# Encoding categorical data
from sklearn.preprocessing import LabelEncoder, OneHotEncoder
labelencoder_X_1 = LabelEncoder()
X[:, 1] = labelencoder_X_1.fit_transform(X[:, 1])
labelencoder_X_2 = LabelEncoder()
X[:, 2] = labelencoder_X_2.fit_transform(X[:, 2])
onehotencoder = OneHotEncoder(categorical_features = [1])
X = onehotencoder.fit_transform(X).toarray()
X = X[:, 1:]

# Splitting the dataset into the Training set and Test set
from sklearn.model_selection import train_test_split
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size = 0.2, random_state = 0)

# Feature Scaling
from sklearn.preprocessing import StandardScaler
sc = StandardScaler()
X_train = sc.fit_transform(X_train)
X_test = sc.transform(X_test)
```

After we have finished with pre-processing our data, we can start by building out ANN layers. This will be done mainly by using the packages that come with Keras Library:

```
# Design the Artificial Neural Networks (ANN)
from keras.models import Sequential
from keras.layers import Dense
classifier = Sequential()
classifier.add(Dense(output_dim = 6, init = 'uniform', activation = 'relu', input_dim = 11))
classifier.add(Dense(output_dim = 6, init = 'uniform', activation = 'relu'))
classifier.add(Dense(output_dim = 1, init = 'uniform', activation = 'sigmoid'))

# Compiling the ANN
classifier.compile(optimizer = 'adam', loss = 'binary_crossentropy', metrics = ['accuracy'])
```

Now that we have built our networks, We need first to train our system with the data the we specified for training and then we test the system with test set:

```
#Train and test the system
classifier.fit(X_train, y_train, batch_size = 10, nb_epoch = 100)
y_pred = classifier.predict(X_test)
y_pred = (y_pred > 0.5)
```

Conclusion:

This was just a quick example for how to use ANNs to achieve prediction when you are given a similar problem. I have assumed in this project that you are familiar with the topic as well as with Python programming. Also, this project was part of my ANNs learning that I wanted to share with the public.