INDUSTRIAL TRAINING REPORT
ON

The Complete 2020 Web Development Bootcamp/
Deep Learning A-Z: Hands-on Artificial Neural Networks

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6/B

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INTRODUCTION

WEB DEVELOPMENT : **Web development** refers to building, creating, and maintaining websites. It includes aspects such as **web design**, **web** publishing, **web programming**, and database management.Web development can range from developing a simple single static page of plain text to complex Web-based Internet applications (Web apps), electronic businesses, and social network services. Front-end web development is done using HTML, CSS and JavaScript. The backend of the web consists of the server that hosts the website, an application for running it and a database to contain the data.

WEB-DEVELOPMENT

FRONT END DEVELOPMENT

- HTML
- CSS
- JavaScript
- React

BACK END DEVELOPMENT

- Node.js
- ExpessJS
- MongoDB
- Authentication

Front End Development-

1.) HTML

HTML stands for **H**yper**t**ext **M**arkup **L**anguage, and it is the most widely used language to write Web Pages.

- **Hypertext** refers to the way in which Web pages (HTML documents) are linked together. Thus, the link available on a webpage is called Hypertext.
- As its name suggests, HTML is a **Markup Language** which means you use HTML to simply "mark-up" a text document with tags that tell a Web browser how to structure it to display.

Originally, HTML was developed with the intent of defining the structure of documents like headings, paragraphs, lists, and so forth to facilitate the sharing of scientific information between researchers.

Now, HTML is being widely used to format web pages with the help of different tags available in HTML language.

2.) CSS

Cascading **S**tyle **S**heets, fondly referred to as CSS, is a simple design language intended to simplify the process of making web pages presentable.

CSS handles the look and feel part of a web page. Using CSS, you can control the color of the text, the style of fonts, the spacing between paragraphs, how columns are sized and laid out, what background images or colors are used, layout

designs,variations in display for different devices and screen sizes as well as a variety of other effects.

CSS is easy to learn and understand but it provides powerful control over the presentation of an HTML document. Most commonly, CSS is combined with the markup languages HTML or XHTML.

3.) Bootstrap

Bootstrap is a free and open-source CSS framework directed at
responsive, mobile-first front-end web development. It contains CSS- and
(optionally) JavaScript-based design templates
for typography, forms, buttons, navigation, and other interface components.

4.) JavaScript

JavaScript is a dynamic computer programming language. It is lightweight and most commonly used as a part of web pages, whose implementations allow client-side script to interact with the user and make dynamic pages. It is an interpreted programming language with object-oriented capabilities.

The ECMA defined a standard version of the core JavaScript language.

- JavaScript is a lightweight, interpreted programming language.
- Designed for creating network-centric applications.
- Complementary to and integrated with Java.
- Complementary to and integrated with HTML.
- Open and cross-platform

Client-Side JavaScript

Client-side JavaScript is the most common form of the language. The script should be included in or referenced by an HTML document for the code to be interpreted by the browser.

It means that a web page need not be a static HTML, but can include programs that interact with the user, control the browser, and dynamically create HTML content.

The JavaScript client-side mechanism provides many advantages over traditional CGI server-side scripts. For example, you might use JavaScript to check if the user has entered a valid e-mail address in a form field.

The JavaScript code is executed when the user submits the form, and only if all the entries are valid, they would be submitted to the Web Server.

JavaScript can be used to trap user-initiated events such as button clicks, link navigation, and other actions that the user initiates explicitly or implicitly.

- Client-side JavaScript does not allow the reading or writing of files. This has been kept for security reason.
- JavaScript cannot be used for networking applications because there is no such support available.
- JavaScript doesn't have any multi-threading or multiprocessor capabilities.

Once again, JavaScript is a lightweight, interpreted programming language that allows you to build interactivity into otherwise static HTML pages.

4.) React

React (also known as **React.js** or **ReactJS**) is an open-source JavaScript library for building user interfaces or UI components. It is maintained by Facebook and a community of individual developers and companies. React can be used as a base in the development of single-page or mobile applications. However, React is only concerned with rendering data to the DOM, and so creating React applications usually requires the use of additional libraries for state management and routing.

Back End Development-

1.) Node.js

Node.js is a server-side platform built on Google Chrome's JavaScript Engine (V8 Engine).

Node.js is an open source, cross-platform runtime environment for developing server-side and networking applications. Node.js applications are written in JavaScript, and can be run within the Node.js runtime on OS X, Microsoft Windows, and Linux.

Node.js also provides a rich library of various JavaScript modules which simplifies the development of web applications using Node.js to a great extent.

2.) MongoDB

MongoDB is a cross-platform, document oriented database that provides, high performance, high availability, and easy scalability. MongoDB works on concept of collection and document.

Database

Database is a physical container for collections. Each database gets its own set of files on the file system. A single MongoDB server typically has multiple databases.

Collection

Collection is a group of MongoDB documents. It is the equivalent of an RDBMS table. A collection exists within a single database. Collections do not enforce a schema. Documents within a collection can have different fields. Typically, all documents in a collection are of similar or related purpose.

Document

A document is a set of key-value pairs. Documents have dynamic schema. Dynamic schema means that documents in the same collection do not need to have the same set of fields or structure, and common fields in a collection's documents may hold different types of data.

3.) Authentication

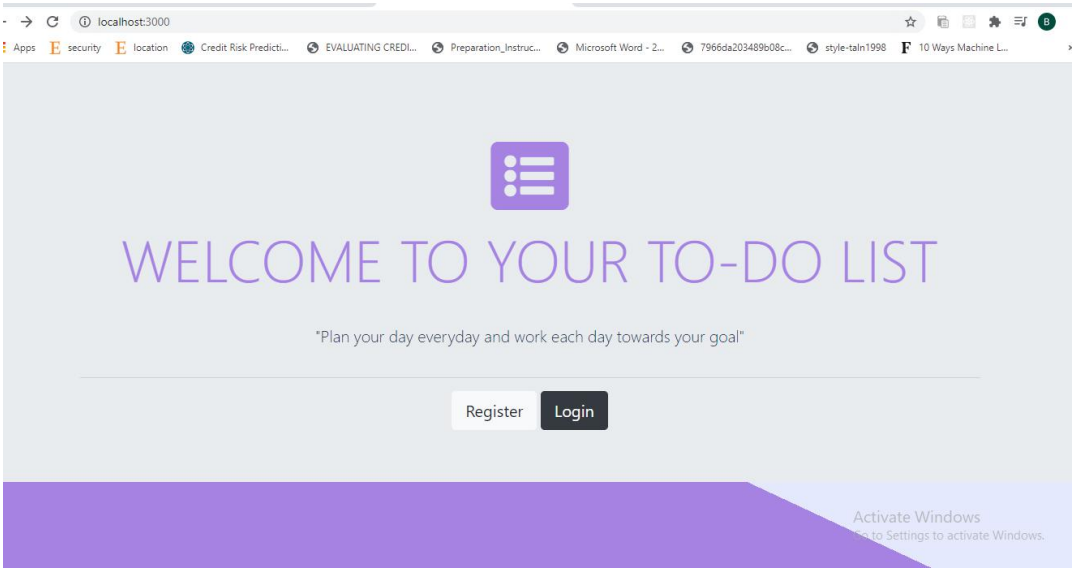
Cookie-based authentication is stateful. This means that an authentication record or session must be kept both server and client-side. The server needs to keep track of active sessions in a database, while on the front-end a cookie is created that holds a session identifier. Cookies and Sessions are implemented into the website using Passport.js. Passport.js is authentication middleware for NodeJS.

PROJECTS DONE

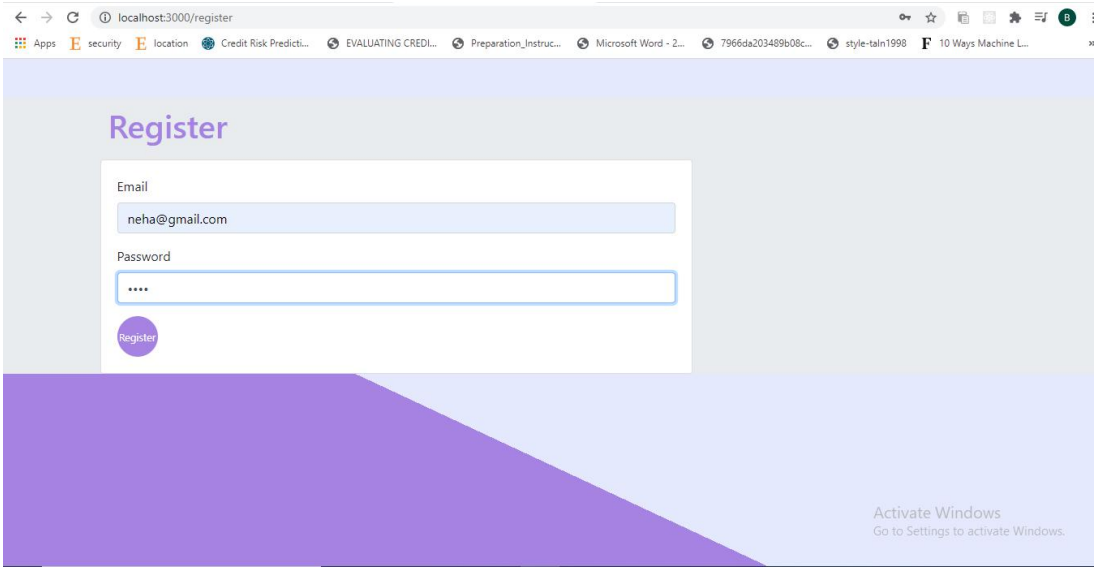
1.) TO-DO LIST APP

The front-end of this to-do app is made using HTML,CSS and Bootstrap. The backend scripting is done using NodeJS , the database is maintained using mongoDB and the data modeling is done using Mongoose .Passport.js is used for adding cookies and sessions for Authentication. The functionalities are:

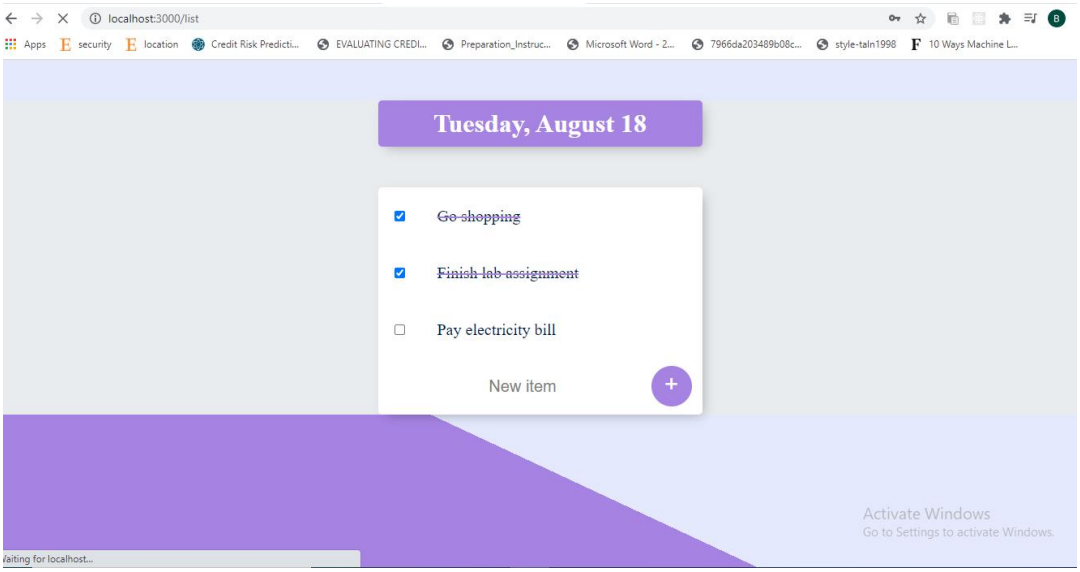
- User registers to the to-do app
- User logins to to-do app through registered userID and password
- Add items to to-do list
- Delete items from to-do list



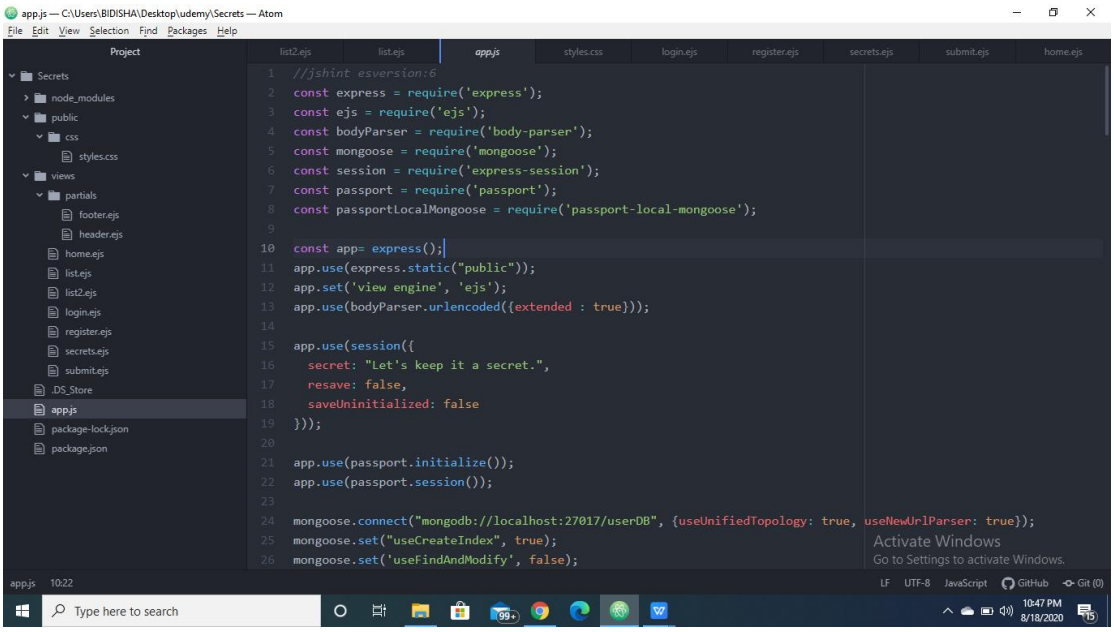
The home page. Unregistered users can register ,registered users can login.



The registration page where the user has to provide his/her email and a password.



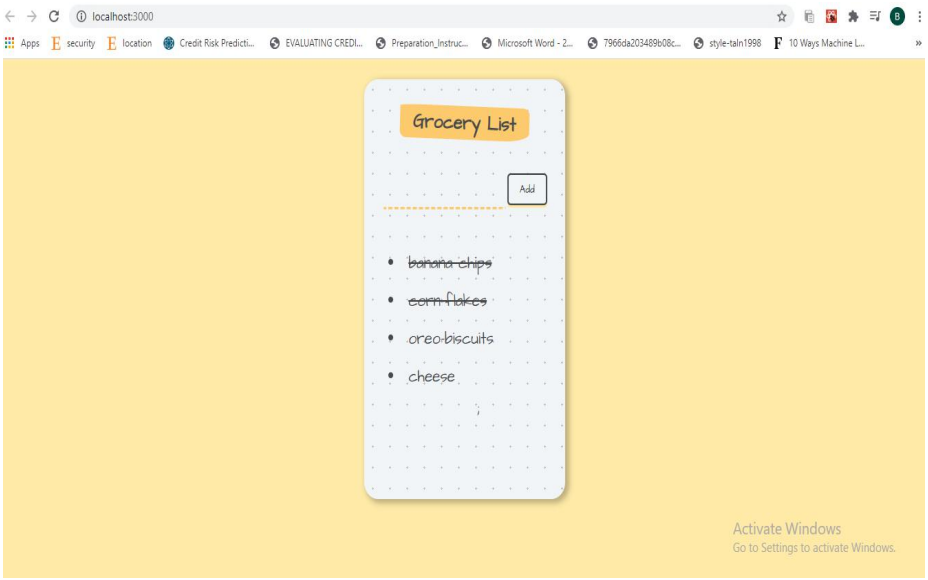
The current date gets displayed and the user can add items to the list as well as delete the items when it is done.



Using passport for Authentication

When a new user registers, a new entry gets created in the database along with his/her details. The details get stored as normal text however the password gets stored as encrypted text in the database.

2.) A Simple Grocery List App using React



A Grocery list app for adding and deleting items using the React framework and JavaScript.

DEEP LEARNING

Deep Learning is a subfield of machine learning concerned with algorithms inspired by the structure and function of the brain called **artificial neural networks**.Deep learning is an artificial intelligence (AI) function that imitates the workings of the human brain in processing data and creating patterns for use in decision making. It unravels huge amounts of unstructured data that would normally take humans decades to understand and process.

Artifial Neural Network: Artificial neural networks (ANNs), usually simply called neural networks (NNs), are computing systems vaguely inspired by the biological neural networks that constitute animal brains.

An ANN is based on a collection of connected units or nodes called artificial neurons, which loosely model the neurons in a biological brain. Each connection, like the synapses in a biological brain, can transmit a signal to other neurons. An artificial neuron that receives a signal then processes it and can signal neurons connected to it. The "signal" at a connection is a real number, and the output of each neuron is computed by some non-linear function of the sum of its inputs. The connections are called edges. Neurons and edges typically have a weight that adjusts as learning proceeds. The weight increases or decreases the strength of the signal at a connection. Neurons may have a threshold such that a signal is sent only if the aggregate signal crosses that threshold.

If the network generates a “good or desired” output, there is no need to adjust the weights. However, if the network generates a “poor or undesired” output or an error, then the system alters the weights in order to improve subsequent results.

Convolutional Neural Network: In deep learning, a convolutional neural network (CNN, or ConvNet) is a class of deep neural networks, most commonly applied to analyzing visual imagery. They have applications in image and video recognition, recommender systems, image classification, medical image analysis, natural language processing, and financial time series. Convolutional

networks were inspired by biological processes in that the connectivity pattern between neurons resembles the organization of the animal visual cortex. On the scale of connectedness and complexity, CNNs are on the lower extreme.

There are three types of layers in a convolutional neural network: convolutional layer, pooling layer, and fully connected layer.

RECURRENT NEURAL NETWORK : A recurrent neural network (RNN) is a class of artificial neural networks where connections between nodes form a directed graph along a temporal sequence. A vanilla neural network takes in a fixed size vector as input which limits its usage in situations that involve a 'series' type input with no predetermined size. RNNs are designed to take a series of input with no predetermined limit on size. Recurrent Neural Network remembers the past and it's decisions are influenced by what it has learnt from the past. RNNs learn similarly while training, in addition, they remember things learnt from prior input(s) while generating output(s). It's part of the network. RNNs can take one or more input vectors and produce one or more output vectors and the output(s) are influenced not just by weights applied on inputs like a regular NN, but also by a "hidden" state vector representing the context based on prior input(s)/output(s). So, the same input could produce a different output depending on previous inputs in the series.

PROJECT DONE ON DEEP LEARNING

"Churn Rate prediction using Artificial Neural Network"

ABSTRACT

1. The churn rate, also known as the rate of attrition or customer churn, is the rate at which customers stop doing business with an entity. In case of banking, it is the rate at which customers discontinue their subscriptions within a given time period.
2. A bank or company can compare its churn and growth rates to determine if there was overall growth or loss.
3. A high churn rate could adversely affect profits and impede growth.

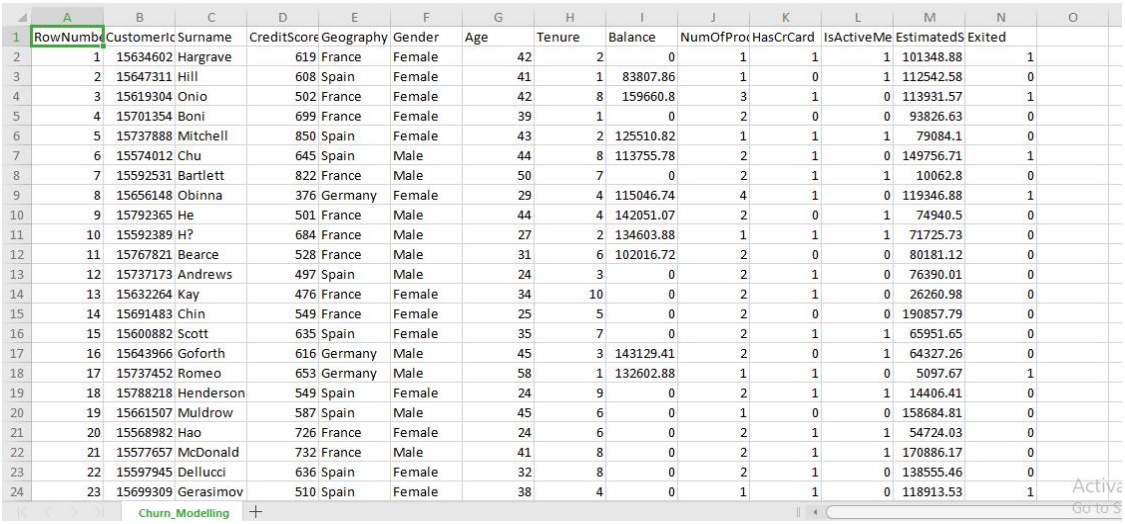
Churn rate is an important factor in banking because most banks and credit unions pour a lot of effort into marketing to lure people in, but it is of no good or profitable if the customers don't stick around.

INTRODUCTION

My project "Churn Rate Prediction using ANN' analyse customer behaviour and predict accordingly whether they will stay with the bank or leave it. Bank can use this information to identify the loyal customers and also make necessary precautions to decrease the churn rate.

The model outputs either 0 or 1. 1 means the customer has a high chance of staying with the bank and 0 means the customer has a low chance of staying with the bank.

IMPLEMENTATION



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	RowNumbe	CustomerIc	Surname	CreditScore	Geography	Gender	Age	Tenure	Balance	NumOfPro	HasCrCard	IsActiveMe	EstimatedS	Exited	
2	1	15634602	Hargrave	619	France	Female	42	2	0	1	1	1	101348.88	1	
3	2	15647311	Hill	608	Spain	Female	41	1	83807.86	1	0	1	112542.58	0	
4	3	15619304	Onio	502	France	Female	42	8	159660.8	3	1	0	113931.57	1	
5	4	15701354	Boni	699	France	Female	39	1	0	2	0	0	93826.63	0	
6	5	15737888	Mitchell	850	Spain	Female	43	2	125510.82	1	1	1	79084.1	0	
7	6	15574012	Chu	645	Spain	Male	44	8	113755.78	2	1	0	149756.71	1	
8	7	15592531	Bartlett	822	France	Male	50	7	0	2	1	1	10062.8	0	
9	8	15656148	Obinna	376	Germany	Female	29	4	115046.74	4	1	0	119346.88	1	
10	9	15792365	He	501	France	Male	44	4	142051.07	2	0	1	74940.5	0	
11	10	15592389	H?	684	France	Male	27	2	134603.88	1	1	1	71725.73	0	
12	11	15767821	Bearce	528	France	Male	31	6	102016.72	2	0	0	80181.12	0	
13	12	15737173	Andrews	497	Spain	Male	24	3	0	2	1	0	76390.01	0	
14	13	15632264	Kay	476	France	Female	34	10	0	2	1	0	26260.98	0	
15	14	15691483	Chin	549	France	Female	25	5	0	2	0	0	190857.79	0	
16	15	15600882	Scott	635	Spain	Female	35	7	0	2	1	1	65951.65	0	
17	16	15643966	Goforth	616	Germany	Male	45	3	143129.41	2	0	1	64327.26	0	
18	17	15737452	Romeo	653	Germany	Male	58	1	132602.88	1	1	0	5097.67	1	
19	18	15788218	Henderson	549	Spain	Female	24	9	0	2	1	1	14406.41	0	
20	19	15661507	Muldrow	587	Spain	Male	45	6	0	1	0	0	158684.81	0	
21	20	15568982	Hao	726	France	Female	24	6	0	2	1	1	54724.03	0	
22	21	15577657	McDonald	732	France	Male	41	8	0	2	1	1	170886.17	0	
23	22	15597945	Dellucci	636	Spain	Female	32	8	0	2	1	0	138555.46	0	
24	23	15699309	Gerasimov	510	Spain	Female	38	4	0	1	1	0	118913.53	1	

Churn_Modelling

- A brief look at the dataset

- Exited is the dependent feature,i.e, the target outputs.

- There are no null features.

```
[1 0 1 ... 1 1 0]
```

```
[6] from sklearn.preprocessing import LabelEncoder
    le = LabelEncoder()
    X[:, 2] = le.fit_transform(X[:, 2])
```

```
[7] print(X)
```

```
[[619 'France' 0 ... 1 1 101348.88]
 [608 'Spain' 0 ... 0 1 112542.58]
 [502 'France' 0 ... 1 0 113931.57]
 ...
 [709 'France' 0 ... 0 1 42085.58]
 [772 'Germany' 1 ... 1 0 92888.52]
 [792 'France' 0 ... 1 0 38190.78]]
```

```
[8] from sklearn.compose import ColumnTransformer
    from sklearn.preprocessing import OneHotEncoder
    ct = ColumnTransformer(transformers=[('encoder', OneHotEncoder(), [1])], remainder='passthrough')
    X = np.array(ct.fit_transform(X))
```

```
[9] print(X)
```

Handling categorical data:

LabelEncoder is used for label encoding the gender column.

OneHotEncoding is done on the geography column.

```
[11] 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)
```

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

We split the data set in 8:2 ratio. 80% data is used for training and rest 20% or testing.
Then we import StandardScaler or feature scaling.

```
[14] ann = tf.keras.models.Sequential()

[15] ann.add(tf.keras.layers.Dense(units=6, activation='relu'))

[16] ann.add(tf.keras.layers.Dense(units=6, activation='relu'))

[17] ann.add(tf.keras.layers.Dense(units=1, activation='sigmoid'))

[18] ann.compile(optimizer = 'adam', loss = 'binary_crossentropy', metrics = ['accuracy'])

[19] ann.fit(X_train, y_train, batch_size = 32, epochs = 100)
```

```
250/250 [==============================] - 0s 886us/step - loss: 0.3409 - accuracy: 0.8611
Epoch 73/100
250/250 [==============================] - 0s 960us/step - loss: 0.3405 - accuracy: 0.8619
Epoch 74/100
250/250 [==============================] - 0s 801us/step - loss: 0.3404 - accuracy: 0.8637
Epoch 75/100
```

We then build the ANN . We build a Sequential model.

The activation function used in the hidden layers: relu.

Number of hidden layers: 2

Number of neurons per hidden layer: 6

Number of neurons in the output layer: 1

Activation function in the output layer: sigmoid

We then train the model.

Optimizer used: Adam

Loss function used: Binary Cross Entropy

Batch size: 32

Number of epochs: 100

```
[ ] y_pred = ann.predict(X_test)
    y_pred = (y_pred > 0.5)
    print(np.concatenate((y_pred.reshape(len(y_pred),1), y_test.reshape(len(y_test),1)),1))
```

```
[[0 0]
 [0 1]
 [0 0]
 ...
 [0 0]
 [0 0]
 [0 0]]
```

```
from sklearn.metrics import confusion_matrix, accuracy_score
cm = confusion_matrix(y_test, y_pred)
print(cm)
accuracy_score(y_test, y_pred)
```

```
[[1529   66]
 [ 205  200]]
0.8645
```

Predicting the Test set results:
We keep the threshold as 0.5 which means >0.5 will give the output as 1 and <=0.5 will give the output as 0.

We use a confusion matrix to visualize the performance of our model. We then compute the accuracy of our model on the test dataset and the accuracy comes out to be 86%.

SUMMARY

Nowadays almost everything happens online - Online transactions, online banking, online shopping etc.Every company needs to maintain their website inorder to maintain communication between them and their potential clients, sell their products or services, generate leads for the business, and increase the popularity of the company and much more.Therefore a full stack web developer has become much in demand in recent years.

In a world generating millions of data on a daily basis, deep learning can help utilise those data, learn from them and effectively use that knowledge for prediction, image classiication, speech recognition and much more.

Both these courses introduced me to new technologies and helped to develop my skills which will be helpul in my work life.