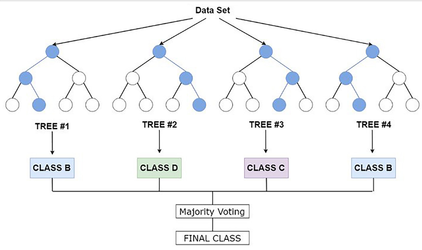
In [1]:
```
## IMPLEMENTATION OF RANDOM FOREST REGRESSION FOR POSITION OF SALARIES ##
```

In [2]:
```
# Google Drive Connect
from google.colab import drive
drive.mount('/content/drive')
```

```
Mounted at /content/drive
```

In [3]:
```
from IPython.display import display
from PIL import Image

path="/content/drive/MyDrive/Random forest regression for position of salaries/Save files/RF Algorithm.jpg"
display(Image.open(path))
```




In [4]:
```
# Project Date and time
from datetime import datetime

dt_string = datetime.now().strftime("Date: %d/%m/%Y and Time %H:%M:%S")
print(f"Updated Project: {dt_string}")
```

```
Updated Project: Date: 30/05/2022 and Time 21:00:46
```

In [5]:
```
## IMPORTING THE NECESSARY LIBRARIES ##
```

In [6]:
```
import pandas as pd # data processing, CSV file
import numpy as np # linear algebra
import matplotlib.pyplot as plt # for plotting informations on graph and images using tensors
```

In [7]:
```
## BASIC UNDERSTANDING OF THE DATA ##
```

In [8]:
```
# Importing the dataset
df = pd.read_csv('/content/drive/MyDrive/Random forest regression for position of salaries/Position_Salaries.csv')
```

In [9]:
```
# Displaying the first 5 elements
df.head()
```

Out[9]:

| | Position | Level | Salary |
|---|---|---|---|
| **0** | Senior Analyst | 1 | 30000 |
| **1** | Business Analyst | 2 | 45000 |
| **2** | Junior Consultant | 3 | 50000 |
| **3** | Senior Consultant | 4 | 60000 |
| **4** | First Manager | 5 | 80000 |

In [10]:
```
df.shape
```

Out[10]:
```
(17, 3)
```

In [11]:
```
# Getting information about the dataset
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 17 entries, 0 to 16
Data columns (total 3 columns):
 #   Column    Non-Null Count  Dtype 
---  ------    --------------  ----- 
 0   Position  17 non-null     object
 1   Level     17 non-null     int64 
 2   Salary    17 non-null     int64 
dtypes: int64(2), object(1)
memory usage: 536.0+ bytes
```

In [12]:
```
# To get basic stats about our data like mean, median, count etc.
# We use .describe() method as shown below:
df.describe()
```

Out[12]:

| | Level | Salary |
|---|---|---|
| **count** | 17.000000 | 17.000000 |
| **mean** | 9.000000 | 206470.588235 |
| **std** | 5.049752 | 239457.490394 |
| **min** | 1.000000 | 30000.000000 |
| **25%** | 5.000000 | 60000.000000 |
| **50%** | 9.000000 | 150000.000000 |
| **75%** | 13.000000 | 200000.000000 |
| **max** | 17.000000 | 1000000.000000 |

In [13]:
```
# Checking Null value in training data
df.isnull().sum()
```

Out[13]:
```
Position    0
Level       0
Salary      0
dtype: int64
```

In [14]:
```
# Deleting null value value
df.dropna(inplace=True)
```

In [15]:
```
# Checking if there are any Duplicate values
print("# Duplicated values :",df.duplicated().sum())
```

```
# Duplicated values : 0
```

In [16]:
```
# Deleting Duplicate values
df.drop_duplicates(subset=None, keep='first', inplace=True)
```

In [17]:
```
df.shape
```

Out[17]:
```
(17, 3)
```

In [18]:
```
## SPLITTING DATA ##
```

In [19]:
```
# Splitting data into dependent (input) and independent (output) variables
X = df.iloc[:, 1].values
y = df.iloc[:, 2].values
```

In [20]:
```
# Splitting our data into Test set and Training set
# It's just for illustration purpose, There is no need to split the dataset over here since
  we only have 10 values.
from sklearn.model_selection import train_test_split

# 70% for training, 30% for testing, test_size = 0.2 is 20%.
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size = 0.2, random_state = 0)
```

In [21]:
```
# For checking to ensure we have the the desired 70% train, 30% test split of the data

print("{0:0.2f}% in training set".format((len(X_train)/len(df.index)) * 100))
print("{0:0.2f}% in test set".format((len(X_test)/len(df.index)) * 100))
```

```
76.47% in training set
23.53% in test set
```

In [22]:
```
X_train.shape
```

Out[22]:
```
(13,)
```

In [23]:
```
X_test.shape
```

Out[23]:
```
(4,)
```

In [24]:
```
## CREATING A RANDOM FOREST REGRESSION MODEL ##
```

In [25]:
```
# Fitting Random Forest Regression to the dataset
from sklearn.ensemble import RandomForestRegressor

regressor = RandomForestRegressor(n_estimators = 10, random_state = 0) # For this model I've
chosen 10 trees (n_estimator=10)
regressor.fit(X.reshape(-1,1), y.reshape(-1, 1))
```

```
/usr/local/lib/python3.7/dist-packages/ipykernel_launcher.py:5: DataConversionWarning: A colu
mn-vector y was passed when a 1d array was expected. Please change the shape of y to (n_sampl
es,), for example using ravel().
  """
```

Out[25]:
```
RandomForestRegressor(n_estimators=10, random_state=0)
```

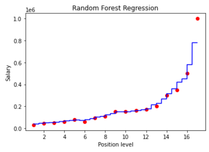
In [26]:
```
# Making predictions with our model
y_pred = regressor.predict([[6.5]])
y_pred
```

Out[26]:
```
array([77500.])
```

In [27]:
```
## VISUALIZING THE RANDOM FOREST REGRESSION RESULTS ##
```

In [29]:
```
# Visualising the results
X_grid = np.arange(min(X), max(X), 0.01)
X_grid = X_grid.reshape((len(X_grid), 1))
plt.scatter(X, y, color = 'red')
plt.plot(X_grid, regressor.predict(X_grid), color = 'blue')
plt.title('Random Forest Regression')
plt.xlabel('Position level')
plt.ylabel('Salary')

# Save graphs in the Path
PLOTS_DPI = 200  #Laibary
plt.savefig('/content/drive/MyDrive/Random forest regression for position of salaries/Save files/position of salaries RFR.jpg', dpi = PLOTS_DPI, bbox_inches = 'tight')
plt.show()
```




In [30]:
```
## SAVING THE MODEL ##
```

In [ ]:
```
# Creating model using pickle
import pickle

with open('/content/drive/MyDrive/Random forest regression for position of salaries/Save files/random_forest_regression_model.pkl', 'wb') as file:
    # dump information to that file
    pickle.dump(regressor, file)

print("Saved model to disk")
```

In [ ]:
```
# Save as ipynb to html
# !pip install nbconvert
!jupyter nbconvert --to html '/content/drive/MyDrive/Random forest regression for position of salaries/Random forest regression for position of salaries.ipynb'
```

```
[NbConvertApp] Converting notebook /content/drive/MyDrive/Random forest regression for positi
on of salaries/Random forest regression for position of salaries.ipynb to html
[NbConvertApp] Writing 930135 bytes to /content/drive/MyDrive/Random forest regression for po
sition of salaries/Random forest regression for position of salaries.html
```