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      "9998     9999    15682355  Sabbatini        772   Germany    Male   42   \n",
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      "\n",
      "      Tenure    Balance  NumOfProducts  HasCrCard  IsActiveMember  \\\n",
      "0          2       0.00              1          1               1   \n",
      "1          1   83807.86              1          0               1   \n",
      "2          8  159660.80              3          1               0   \n",
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 "print(df)"
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 "import pandas as pd\n",
 "df=pd.read_csv(\"Churn_Modelling.csv\")\n",
```

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 "M=df['CreditScore'].mean()\n",
 "\n",
 "#median of CreditScore\n",
 "Me=df['CreditScore'].median()\n",
 "\n",
 "# standard deviation of CreditScore\n",
 "std = df['CreditScore'].std()\n",
 "\n",
 "print(\"mean value of CreditScore is {}\".format(M))\n",
 "print(\"median value of CreditScore is {}\".format(Me))\n",
 "print(\"Standard deviation of CreditScore is {}\".format(std))"
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 "#frequency table for age\n",
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```
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 "print(\"Frequency table for Age is given below\")\n",
 "print(\"{}\".format(ft))"
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   "4          5    15737888  Mitchell          850     Spain  Female   43   \n",
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   "   Tenure    Balance  NumOfProducts  HasCrCard  IsActiveMember  \\\n",
   "0       2       0.00              1          1               1   \n",
   "1       1   83807.86              1          0               1   \n",
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   "1        112542.58       0  \n",
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    " 5   Gender           10000 non-null  object \n",
    " 6   Age              10000 non-null  int64  \n",
    " 7   Tenure           10000 non-null  int64  \n",
    " 8   Balance          10000 non-null  float64\n",
    " 9   NumOfProducts    10000 non-null  int64  \n",
    " 10  HasCrCard        10000 non-null  int64  \n",
    " 11  IsActiveMember   10000 non-null  int64  \n",
    " 12  EstimatedSalary  10000 non-null  float64\n",
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"     <td>0</td>\n",
"     <td>93826.63</td>\n",
"     <td>0</td>\n",
"     <td>1</td>\n",
"     <td>0</td>\n",
"     <td>0</td>\n",
"   </tr>\n",
"   <tr>\n",
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"     <td>5</td>\n",
"     <td>15737888</td>\n",
"     <td>Mitchell</td>\n",
"     <td>850</td>\n",
"     <td>0</td>\n",
"     <td>43</td>\n",
"     <td>2</td>\n",
"     <td>125510.82</td>\n",
"     <td>1</td>\n",
"     <td>1</td>\n",
"     <td>1</td>\n",
"     <td>79084.10</td>\n",
"     <td>0</td>\n",
"     <td>0</td>\n",
"     <td>0</td>\n",
"     <td>1</td>\n",
"   </tr>\n",
" </tbody>\n",
"</table>\n",
"</div>"
],
"text/plain": [
"   RowNumber  CustomerId   Surname  CreditScore  Gender  Age  Tenure \\\n",
"0          1    15634602  Hargrave          619       0   42       2   \n",
"1          2    15647311      Hill          608       0   41       1   \n",
"2          3    15619304      Onio          502       0   42       8   \n",
"3          4    15701354      Boni          699       0   39       1   \n",
"4          5    15737888  Mitchell          850       0   43       2   \n",
"\n",
"     Balance  NumOfProducts  HasCrCard  IsActiveMember  EstimatedSalary  \\\n",
"0       0.00              1          1               1        101348.88   \n",
"1   83807.86              1          0               1        112542.58   \n",
"2  159660.80              3          1               0        113931.57   \n",
"3       0.00              2          0               0         93826.63   \n",
"4  125510.82              1          1               1         79084.10   \n",
"\n",
```

```
    "   Exited  Geography_France  Geography_Germany  Geography_Spain  \n",
    "0       1                 1                  0                0  \n",
    "1       0                 0                  0                1  \n",
    "2       1                 1                  0                0  \n",
    "3       0                 1                  0                0  \n",
    "4       0                 0                  0                1  "
   ]
  },
  "execution_count": 76,
  "metadata": {},
  "output_type": "execute_result"
 }
],
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 "#one hot encoding\n",
 "ld1_main=pd.get_dummies(ld1,columns=['Geography'])\n",
 "ld1_main.head()"
]
},
{
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"id": "3b9f0319",
"metadata": {},
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 "# 8. Split the data into dependent and independent variables."
]
},
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  "text": [
   "[[1 15634602 'Hargrave' ... 1 1 101348.88]\n",
   " [2 15647311 'Hill' ... 0 1 112542.58]\n",
   " [3 15619304 'Onio' ... 1 0 113931.57]\n",
   " ...\n",
   " [9998 15584532 'Liu' ... 0 1 42085.58]\n",
   " [9999 15682355 'Sabbatini' ... 1 0 92888.52]\n",
   " [10000 15628319 'Walker' ... 1 0 38190.78]]\n"
  ]
 }
],
"source": [
 "#Splitting the Dataset into the Independent Feature Matrix\n",
 "df=pd.read_csv(\"Churn_Modelling.csv\")\n",
 "X = df.iloc[:, :-1].values\n",
 "print(X)"
]
},
{
```

```
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   "[1 0 1 ... 1 1 0]\n"
  ]
 }
],
"source": [
 "#Extracting the Dataset to Get the Dependent Vector\n",
 "Y = df.iloc[:, -1].values\n",
 "print(Y)"
]
},
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"metadata": {},
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 "# 9. Scale the independent variables"
]
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{
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    "        vertical-align: middle;\n",
    "    }\n",
    "\n",
    "    .dataframe tbody tr th {\n",
    "        vertical-align: top;\n",
    "    }\n",
    "\n",
    "    .dataframe thead th {\n",
    "        text-align: right;\n",
    "    }\n",
    "</style>\n",
    "<table border=\"1\" class=\"dataframe\">\n",
    "  <thead>\n",
    "    <tr style=\"text-align: right;\">\n",
    "      <th></th>\n",
    "      <th>Age</th>\n",
```

```
   "      <th>Balance</th>\n",
   "      <th>EstimatedSalary</th>\n",
   "    </tr>\n",
   "  </thead>\n",
   "  <tbody>\n",
   "    <tr>\n",
   "      <th>0</th>\n",
   "      <td>42</td>\n",
   "      <td>0.00</td>\n",
   "      <td>101348.88</td>\n",
   "    </tr>\n",
   "    <tr>\n",
   "      <th>1</th>\n",
   "      <td>41</td>\n",
   "      <td>83807.86</td>\n",
   "      <td>112542.58</td>\n",
   "    </tr>\n",
   "    <tr>\n",
   "      <th>2</th>\n",
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   "      <td>159660.80</td>\n",
   "      <td>113931.57</td>\n",
   "    </tr>\n",
   "    <tr>\n",
   "      <th>3</th>\n",
   "      <td>39</td>\n",
   "      <td>0.00</td>\n",
   "      <td>93826.63</td>\n",
   "    </tr>\n",
   "    <tr>\n",
   "      <th>4</th>\n",
   "      <td>43</td>\n",
   "      <td>125510.82</td>\n",
   "      <td>79084.10</td>\n",
   "    </tr>\n",
   "  </tbody>\n",
   "</table>\n",
   "</div>"
  ],
  "text/plain": [
   "   Age    Balance  EstimatedSalary\n",
   "0   42       0.00        101348.88\n",
   "1   41   83807.86        112542.58\n",
   "2   42  159660.80        113931.57\n",
   "3   39       0.00         93826.63\n",
   "4   43  125510.82         79084.10"
  ]
 },
 "execution_count": 96,
 "metadata": {},
 "output_type": "execute_result"
}
],
"source": [
 "w = df.head()\n",
```

```
 "q = w[['Age','Balance','EstimatedSalary']] #spliting the dataset into measureable values\n",
 "q"
]
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"metadata": {},
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    "       [0.5       , 0.52491194, 0.96014087],\n",
    "       [0.75      , 1.        , 1.        ],\n",
    "       [0.        , 0.        , 0.42305883],\n",
    "       [1.        , 0.78610918, 0.        ]])"
   ]
  },
  "execution_count": 101,
  "metadata": {},
  "output_type": "execute_result"
 }
],
"source": [
 "from sklearn.preprocessing import scale # library for scallling\n",
 "from sklearn.preprocessing import MinMaxScaler\n",
 "mm = MinMaxScaler()\n",
 "\n",
 "x_scaled = mm.fit_transform(q)\n",
 "x_scaled"
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"metadata": {},
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   "text/plain": [
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    "       [-0.29488391,  0.15434425,  0.96285595],\n",
    "       [ 0.44232587,  1.32369179,  1.07074687],\n",
    "       [-1.76930347, -1.13763618, -0.49092058],\n",
    "       [ 1.17953565,  0.79723632, -1.6360585 ]])"
   ]
  },
  "execution_count": 103,
  "metadata": {},
  "output_type": "execute_result"
 }
],
```

```
 "source": [
  "from sklearn.preprocessing import StandardScaler\n",
  "sc =  StandardScaler()\n",
  "x_ss = sc.fit_transform(q)\n",
  "x_ss"
 ]
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{
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     "        vertical-align: middle;\n",
     "    }\n",
     "\n",
     "    .dataframe tbody tr th {\n",
     "        vertical-align: top;\n",
     "    }\n",
     "\n",
     "    .dataframe thead th {\n",
     "        text-align: right;\n",
     "    }\n",
     "</style>\n",
     "<table border=\"1\" class=\"dataframe\">\n",
     "  <thead>\n",
     "    <tr style=\"text-align: right;\">\n",
     "      <th></th>\n",
     "      <th>Age</th>\n",
     "      <th>Balance</th>\n",
     "      <th>EstimatedSalary</th>\n",
     "    </tr>\n",
     "  </thead>\n",
     "  <tbody>\n",
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     "      <td>-1.137636</td>\n",
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     "      <th>2</th>\n",
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```

```
    "      <td>1.323692</td>\n",
    "      <td>1.070747</td>\n",
    "    </tr>\n",
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    "      <th>3</th>\n",
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    "      <td>-0.490921</td>\n",
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    "      <th>4</th>\n",
    "      <td>1.179536</td>\n",
    "      <td>0.797236</td>\n",
    "      <td>-1.636059</td>\n",
    "    </tr>\n",
    "  </tbody>\n",
    "</table>\n",
    "</div>"
   ],
   "text/plain": [
    "        Age   Balance  EstimatedSalary\n",
    "0  0.442326 -1.137636         0.093376\n",
    "1 -0.294884  0.154344         0.962856\n",
    "2  0.442326  1.323692         1.070747\n",
    "3 -1.769303 -1.137636        -0.490921\n",
    "4  1.179536  0.797236        -1.636059"
   ]
  },
  "execution_count": 110,
  "metadata": {},
  "output_type": "execute_result"
 }
],
"source": [
 "from sklearn.preprocessing import scale\n",
 "X_scaled=pd.DataFrame(scale(q),columns=q.columns)\n",
 "X_scale=X_scaled.head()\n",
 "X_scale"
]
},
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 "# 10. Split the data into training and testing"
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  "    }\n",
  "\n",
  "    .dataframe tbody tr th {\n",
  "        vertical-align: top;\n",
  "    }\n",
  "\n",
  "    .dataframe thead th {\n",
  "        text-align: right;\n",
  "    }\n",
  "</style>\n",
  "<table border=\"1\" class=\"dataframe\">\n",
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  "    <tr style=\"text-align: right;\">\n",
  "      <th></th>\n",
  "      <th>Age</th>\n",
  "      <th>Balance</th>\n",
  "      <th>EstimatedSalary</th>\n",
  "    </tr>\n",
  "  </thead>\n",
  "  <tbody>\n",
  "    <tr>\n",
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  "      <td>42</td>\n",
  "      <td>0.00</td>\n",
  "      <td>101348.88</td>\n",
  "    </tr>\n",
  "    <tr>\n",
  "      <th>1</th>\n",
  "      <td>41</td>\n",
  "      <td>83807.86</td>\n",
  "      <td>112542.58</td>\n",
  "    </tr>\n",
  "    <tr>\n",
  "      <th>2</th>\n",
  "      <td>42</td>\n",
  "      <td>159660.80</td>\n",
  "      <td>113931.57</td>\n",
  "    </tr>\n",
  "    <tr>\n",
  "      <th>3</th>\n",
  "      <td>39</td>\n",
  "      <td>0.00</td>\n",
  "      <td>93826.63</td>\n",
  "    </tr>\n",
  "    <tr>\n",
  "      <th>4</th>\n",
  "      <td>43</td>\n",
  "      <td>125510.82</td>\n",
  "      <td>79084.10</td>\n",
  "
```

```
 "    </tr>\n",
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 "      <th>...</th>\n",
 "      <td>...</td>\n",
 "      <td>...</td>\n",
 "      <td>...</td>\n",
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 "    <tr>\n",
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 "      <td>101699.77</td>\n",
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 "    <tr>\n",
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 "      <td>42</td>\n",
 "      <td>75075.31</td>\n",
 "      <td>92888.52</td>\n",
 "    </tr>\n",
 "    <tr>\n",
 "      <th>9999</th>\n",
 "      <td>28</td>\n",
 "      <td>130142.79</td>\n",
 "      <td>38190.78</td>\n",
 "    </tr>\n",
 "  </tbody>\n",
 "</table>\n",
 "<p>10000 rows × 3 columns</p>\n",
 "</div>"
],
"text/plain": [
 "      Age    Balance  EstimatedSalary\n",
 "0      42       0.00        101348.88\n",
 "1      41   83807.86        112542.58\n",
 "2      42  159660.80        113931.57\n",
 "3      39       0.00         93826.63\n",
 "4      43  125510.82         79084.10\n",
 "...   ...        ...              ...\n",
 "9995   39       0.00         96270.64\n",
 "9996   35   57369.61        101699.77\n",
 "9997   36       0.00         42085.58\n",
 "9998   42   75075.31         92888.52\n",
 "9999   28  130142.79         38190.78\n",
```

```
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    "[10000 rows x 3 columns]"
   ]
  },
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  "metadata": {},
  "output_type": "execute_result"
 }
],
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 "x"
]
},
{
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"metadata": {
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},
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    "1       83807.86\n",
    "2      159660.80\n",
    "3           0.00\n",
    "4      125510.82\n",
    "          ...   \n",
    "9995        0.00\n",
    "9996    57369.61\n",
    "9997        0.00\n",
    "9998    75075.31\n",
    "9999   130142.79\n",
    "Name: Balance, Length: 10000, dtype: float64"
   ]
  },
  "execution_count": 116,
  "metadata": {},
  "output_type": "execute_result"
 }
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"source": [
 "y = df['Balance']\n",
 "y"
]
},
{
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```

```
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    "       [ 0.19816383,  0.11735002,  0.21653375],\n",
    "       [ 0.29351742,  1.33305335,  0.2406869 ],\n",
    "       ...,\n",
    "       [-0.27860412, -1.22584767, -1.00864308],\n",
    "       [ 0.29351742, -0.02260751, -0.12523071],\n",
    "       [-1.04143285,  0.85996499, -1.07636976]])"
   ]
  },
  "execution_count": 118,
  "metadata": {},
  "output_type": "execute_result"
 }
],
"source": [
 "#scaling\n",
 "from sklearn.preprocessing import StandardScaler, MinMaxScaler\n",
 "sc = StandardScaler()\n",
 "x_scaled1 = sc.fit_transform(x)\n",
 "x_scaled1"
]
},
{
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"execution_count": 119,
"id": "75315a1e",
"metadata": {},
"outputs": [],
"source": [
 "#train and test data\n",
 "from sklearn.model_selection import train_test_split\n",
 "x_train, x_test, y_train, y_test = train_test_split(x_scaled1, y, test_size = 0.3, random_state = 0)"
]
},
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"metadata": {},
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  "data": {
   "text/plain": [
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    "       [ 0.00745665, -1.22584767, -1.39576675],\n",
    "       [ 3.53553951,  1.35419118, -1.49965629],\n",
    "       ...,\n",
    "       [-0.37395771,  1.35890908,  1.41441489],\n",
    "       [-0.08789694, -1.22584767,  0.84614739],\n",
    "       [ 0.86563897,  0.50630343,  0.32630495]])"
   ]
  },
```

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"metadata": {},
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    "(7000, 3)"
   ]
  },
  "execution_count": 121,
  "metadata": {},
  "output_type": "execute_result"
 }
],
"source": [
 "x_train.shape"
]
},
{
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"execution_count": 122,
"id": "38c6ee3a",
"metadata": {},
"outputs": [
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   "text/plain": [
    "array([[-0.37395771,  0.87532296,  1.61304597],\n",
    "       [ 0.10281024,  0.42442221,  0.49753166],\n",
    "       [ 0.29351742,  0.30292727, -0.4235611 ],\n",
    "       ...,\n",
    "       [ 0.10281024,  1.46672809,  1.17045451],\n",
    "       [ 2.86806437,  1.25761599, -0.50846777],\n",
    "       [ 0.96099256,  0.19777742, -1.15342685]])"
   ]
  },
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  "metadata": {},
  "output_type": "execute_result"
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 "x_test"
```

```
 ]
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 "metadata": {},
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    ]
   },
   "execution_count": 123,
   "metadata": {},
   "output_type": "execute_result"
  }
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  "x_test.shape"
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},
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     "9031         0.00\n",
     "3691    160979.68\n",
     "202          0.00\n",
     "5625    143262.04\n",
     "           ...    \n",
     "9225    120074.97\n",
     "4859    114440.24\n",
     "3264    161274.05\n",
     "9845         0.00\n",
     "2732    108076.33\n",
     "Name: Balance, Length: 7000, dtype: float64"
    ]
   },
   "execution_count": 124,
   "metadata": {},
   "output_type": "execute_result"
  }
 ],
 "source": [
  "y_train"
 ]
},
```

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      "898     102967.41\n",
      "2398     95386.82\n",
      "5906    112079.58\n",
      "2343    163034.82\n",
      "          ...    \n",
      "4004         0.00\n",
      "7375     80926.02\n",
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     "1           2    15647311       Hill        608     Spain  Female   41   \n",
     "2           3    15619304       Onio        502    France  Female   42   \n",
     "3           4    15701354       Boni        699    France  Female   39   \n",
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     "9996     9997    15569892  Johnstone        516    France    Male   35   \n",
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     "9998     9999    15682355  Sabbatini        772   Germany    Male   42   \n",
     "9999    10000    15628319     Walker        792    France  Female   28   \n",
     "\n",
     "      Tenure    Balance  NumOfProducts  HasCrCard  IsActiveMember  \\\n",
     "0         2       0.00              1          1               1   \n",
     "1         1   83807.86              1          0               1   \n",
     "2         8  159660.80              3          1               0   \n",
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```

```
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   "9999       4  130142.79            1          1             0   \n",
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   "[10000 rows x 14 columns]\n"
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```

```
 }
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 "\n",
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 "\n",
 "#mean of CreditScore\n",
 "M=df['CreditScore'].mean()\n",
 "\n",
 "#median of CreditScore\n",
 "Me=df['CreditScore'].median()\n",
 "\n",
 "# standard deviation of CreditScore\n",
 "std = df['CreditScore'].std()\n",
 "\n",
 "print(\"mean value of CreditScore is {}\".format(M))\n",
 "print(\"median value of CreditScore is {}\".format(Me))\n",
 "print(\"Standard deviation of CreditScore is {}\".format(std))"
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   "34    447\n",
   "     ... \n",
   "92      2\n",
   "82      1\n",
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 "\n",
 "print(\"Frequency table for Age is given below\")\n",
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   "4          5    15737888  Mitchell          850     Spain  Female   43   \n",
   "\n",
   "   Tenure    Balance  NumOfProducts  HasCrCard  IsActiveMember  \\\n",
   "0       2       0.00              1          1               1   \n",
   "1       1   83807.86              1          0               1   \n",
   "2       8  159660.80              3          1               0   \n",
   "3       1       0.00              2          0               0   \n",
   "4       2  125510.82              1          1               1   \n",
   "\n",
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   "1        112542.58       0  \n",
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   " 7   Tenure          10000 non-null  int64  \n",
   " 8   Balance         10000 non-null  float64\n",
   " 9   NumOfProducts   10000 non-null  int64  \n",
   " 10  HasCrCard       10000 non-null  int64  \n",
   " 11  IsActiveMember  10000 non-null  int64  \n",
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```
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 "from sklearn.preprocessing import LabelEncoder\n",
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 "ld1.Gender= le.fit_transform(ld1.Gender)\n",
 "ld1.head(5)"
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    "      <th>Gender</th>\n",
    "      <th>Age</th>\n",
    "      <th>Tenure</th>\n",
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    "      <th>NumOfProducts</th>\n",
    "      <th>HasCrCard</th>\n",
    "      <th>IsActiveMember</th>\n",
    "      <th>EstimatedSalary</th>\n",
    "      <th>Exited</th>\n",
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    "      <th>Geography_Spain</th>\n",
```

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```

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"1          2    15647311      Hill          608       0   41       1  \n",
"2          3    15619304      Onio          502       0   42       8  \n",
"3          4    15701354      Boni          699       0   39       1  \n",
"4          5    15737888  Mitchell          850       0   43       2  \n",
"\n",
```

```
   "    Balance  NumOfProducts  HasCrCard  IsActiveMember  EstimatedSalary  \\\n",
   "0      0.00              1          1               1        101348.88   \n",
   "1   83807.86              1          0               1        112542.58   \n",
   "2  159660.80              3          1               0        113931.57   \n",
   "3      0.00              2          0               0         93826.63   \n",
   "4  125510.82              1          1               1         79084.10   \n",
   "\n",
   "   Exited  Geography_France  Geography_Germany  Geography_Spain  \n",
   "0       1                 1                  0                0  \n",
   "1       0                 0                  0                1  \n",
   "2       1                 1                  0                0  \n",
   "3       0                 1                  0                0  \n",
   "4       0                 0                  0                1  "
  ]
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 }
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 "ld1_main.head()"
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 "# 8. Split the data into dependent and independent variables."
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   " [3 15619304 'Onio' ... 1 0 113931.57]\n",
   " ...\n",
   " [9998 15584532 'Liu' ... 0 1 42085.58]\n",
   " [9999 15682355 'Sabbatini' ... 1 0 92888.52]\n",
   " [10000 15628319 'Walker' ... 1 0 38190.78]]\n"
  ]
 }
],
"source": [
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 "#Splitting the Dataset into the Independent Feature Matrix\n",
 "df=pd.read_csv(\"Churn_Modelling.csv\")\n",
 "X = df.iloc[:, :-1].values\n",
 "print(X)"
]
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  ]
 }
],
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 "Y = df.iloc[:, -1].values\n",
 "print(Y)"
]
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{
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 "# 9. Scale the independent variables"
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    "\n",
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    "\n",
    "    .dataframe thead th {\n",
    "        text-align: right;\n",
```

```
 "    }\n",
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 "    </tr>\n",
 "  </tbody>\n",
 "</table>\n",
 "</div>"
],
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 "2   42  159660.80        113931.57\n",
 "3   39       0.00         93826.63\n",
 "4   43  125510.82         79084.10"
]
},
```

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  "q = w[['Age','Balance','EstimatedSalary']] #spliting the dataset into measureable values\n",
  "q"
 ]
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     "       [0.5       , 0.52491194, 0.96014087],\n",
     "       [0.75      , 1.        , 1.        ],\n",
     "       [0.        , 0.        , 0.42305883],\n",
     "       [1.        , 0.78610918, 0.        ]])"
    ]
   },
   "execution_count": 101,
   "metadata": {},
   "output_type": "execute_result"
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 "source": [
  "from sklearn.preprocessing import scale # library for scallling\n",
  "from sklearn.preprocessing import MinMaxScaler\n",
  "mm = MinMaxScaler()\n",
  "\n",
  "x_scaled = mm.fit_transform(q)\n",
  "x_scaled"
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     "       [ 0.44232587,  1.32369179,  1.07074687],\n",
     "       [-1.76930347, -1.13763618, -0.49092058],\n",
     "       [ 1.17953565,  0.79723632, -1.6360585 ]])"
```

```
   ]
  },
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 "sc =  StandardScaler()\n",
 "x_ss = sc.fit_transform(q)\n",
 "x_ss"
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    "    .dataframe tbody tr th {\n",
    "        vertical-align: top;\n",
    "    }\n",
    "\n",
    "    .dataframe thead th {\n",
    "        text-align: right;\n",
    "    }\n",
    "</style>\n",
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    "      <th>Age</th>\n",
    "      <th>Balance</th>\n",
    "      <th>EstimatedSalary</th>\n",
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```

```
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    "      <td>-1.636059</td>\n",
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    "</table>\n",
    "</div>"
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    "1 -0.294884  0.154344         0.962856\n",
    "2  0.442326  1.323692         1.070747\n",
    "3 -1.769303 -1.137636        -0.490921\n",
    "4  1.179536  0.797236        -1.636059"
   ]
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 "X_scaled=pd.DataFrame(scale(q),columns=q.columns)\n",
 "X_scale=X_scaled.head()\n",
 "X_scale"
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     "    }\n",
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```

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"    <tr>\n",
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"      <td>130142.79</td>\n",
"      <td>38190.78</td>\n",
"    </tr>\n",
"  </tbody>\n",
"</table>\n",
"<p>10000 rows × 3 columns</p>\n",
"</div>"
],
"text/plain": [
"      Age    Balance  EstimatedSalary\n",
"0      42       0.00        101348.88\n",
"1      41   83807.86        112542.58\n",
"2      42  159660.80        113931.57\n",
"3      39       0.00         93826.63\n",
```

```
    "4      43  125510.82         79084.10\n",
    "...   ...        ...              ...\n",
    "9995   39       0.00         96270.64\n",
    "9996   35   57369.61        101699.77\n",
    "9997   36       0.00         42085.58\n",
    "9998   42   75075.31         92888.52\n",
    "9999   28  130142.79         38190.78\n",
    "\n",
    "[10000 rows x 3 columns]"
   ]
  },
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 "x"
]
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    "4      125510.82\n",
    "          ...   \n",
    "9995        0.00\n",
    "9996    57369.61\n",
    "9997        0.00\n",
    "9998    75075.31\n",
    "9999   130142.79\n",
    "Name: Balance, Length: 10000, dtype: float64"
   ]
  },
  "execution_count": 116,
  "metadata": {},
  "output_type": "execute_result"
 }
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"source": [
 "y = df['Balance']\n",
 "y"
]
```

```
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     "       [ 0.29351742,  1.33305335,  0.2406869 ],\n",
     "       ...,\n",
     "       [-0.27860412, -1.22584767, -1.00864308],\n",
     "       [ 0.29351742, -0.02260751, -0.12523071],\n",
     "       [-1.04143285,  0.85996499, -1.07636976]])"
    ]
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   "execution_count": 118,
   "metadata": {},
   "output_type": "execute_result"
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  "#scaling\n",
  "from sklearn.preprocessing import StandardScaler, MinMaxScaler\n",
  "sc = StandardScaler()\n",
  "x_scaled1 = sc.fit_transform(x)\n",
  "x_scaled1"
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  "from sklearn.model_selection import train_test_split\n",
  "x_train, x_test, y_train, y_test = train_test_split(x_scaled1, y, test_size = 0.3, random_state = 0)"
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```

```
    "       [ 3.53553951,  1.35419118, -1.49965629],\n",
    "       ...,\n",
    "       [-0.37395771,  1.35890908,  1.41441489],\n",
    "       [-0.08789694, -1.22584767,  0.84614739],\n",
    "       [ 0.86563897,  0.50630343,  0.32630495]])"
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    "       [ 0.29351742,  0.30292727, -0.4235611 ],\n",
    "       ...,\n",
    "       [ 0.10281024,  1.46672809,  1.17045451],\n",
    "       [ 2.86806437,  1.25761599, -0.50846777],\n",
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    "3691    160979.68\n",
    "202          0.00\n",
    "5625    143262.04\n",
    "           ...    \n",
    "9225    120074.97\n",
    "4859    114440.24\n",
    "3264    161274.05\n",
    "9845         0.00\n",
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      "           ...    \n",
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