ads-phase3

October 26, 2023

[ ]:
```
#Uploading and Displaying Dataset
import pandas as pd
df = pd.read_csv('/content/creditcard.csv')
print(df)
```

```
        Time        V1        V2        V3        V4        V5        V6  \
0          0 -1.359807 -0.072781  2.536347  1.378155 -0.338321  0.462388
1          0  1.191857  0.266151  0.166480  0.448154  0.060018 -0.082361
2          1 -1.358354 -1.340163  1.773209  0.379780 -0.503198  1.800499
3          1 -0.966272 -0.185226  1.792993 -0.863291 -0.010309  1.247203
4          2 -1.158233  0.877737  1.548718  0.403034 -0.407193  0.095921
…      …       …       …       …       …       …       …
61486  49862 -0.987401  1.056011  1.184880 -0.738908 -0.080874 -0.167563
61487  49862  0.910338 -0.976578  1.308543  0.352233 -1.228617  1.053119
61488  49863  1.033813 -0.261495  1.329732  1.820041 -0.974670  0.384867
61489  49863  1.446884 -0.263871 -0.192448 -0.660946 -0.598712 -1.387964
61490  49863 -1.256173  0.190250  0.486835  0.174933  0.615589  0.667585

             V7        V8        V9  …       V21       V22       V23  \
0      0.239599  0.098698  0.363787  … -0.018307  0.277838 -0.110474
1     -0.078803  0.085102 -0.255425  … -0.225775 -0.638672  0.101288
2      0.791461  0.247676 -1.514654  …  0.247998  0.771679  0.909412
3      0.237609  0.377436 -1.387024  … -0.108300  0.005274 -0.190321
4      0.592941 -0.270533  0.817739  … -0.009431  0.798278 -0.137458
…         …       …       …  …       …       …       …
61486  0.224570  0.650254 -0.454139  … -0.069511 -0.149341 -0.022932
61487 -1.189630  0.422435 -0.756288  …  0.081774  0.571815 -0.057231
61488 -0.580740  0.317767  1.384514  … -0.398950 -0.748977  0.126709
61489 -0.001654 -0.430535 -1.207218  …  0.194922  0.511846 -0.170092
61490  0.983123  0.049528  0.077344  … -0.024591  0.195936 -0.204945

             V24       V25       V26       V27       V28  Amount  Class
0      0.066928  0.128539 -0.189115  0.133558 -0.021053  149.62    0.0
1     -0.339846  0.167170  0.125895 -0.008983  0.014724    2.69    0.0
2     -0.689281 -0.327642 -0.139097 -0.055353 -0.059752  378.66    0.0
3     -1.175575  0.647376 -0.221929  0.062723  0.061458  123.50    0.0
4      0.141267 -0.206010  0.502292  0.219422  0.215153   69.99    0.0
…         …       …       …       …       …     …    …
```

```
61486  0.040407 -0.291335  0.307241  0.190307  0.104660    1.00    0.0
61487 -0.292605  0.065126 -0.226463  0.114948  0.054243  129.50    0.0
61488  0.367238  0.342699 -0.527094  0.082915  0.031702   22.02    0.0
61489  0.445334  0.805625 -0.086404 -0.026795  0.002982   15.00    0.0
61490 -0.850277 -0.393942 -0.584722 -0.117240  0.287411     NaN    NaN

[61491 rows x 31 columns]
```

[ ]:
```python
import pandas as pd
df = pd.read_csv('/content/creditcard.csv')

# creating a list of column names
Column_name = pd.DataFrame(df.columns)
print('List of column names :',Column_name)
```

```
List of column names :          0
0     Time
1       V1
2       V2
3       V3
4       V4
5       V5
6       V6
7       V7
8       V8
9       V9
10     V10
11     V11
12     V12
13     V13
14     V14
15     V15
16     V16
17     V17
18     V18
19     V19
20     V20
21     V21
22     V22
23     V23
24     V24
25     V25
26     V26
27     V27
28     V28
29  Amount
30   Class
```

[ ]:
```
import pandas as pd
df = pd.read_csv('/content/creditcard.csv')

#Displaying First 5 rows
print(df.head())
```

```
   Time        V1        V2        V3        V4        V5        V6        V7  \
0     0 -1.359807 -0.072781  2.536347  1.378155 -0.338321  0.462388  0.239599
1     0  1.191857  0.266151  0.166480  0.448154  0.060018 -0.082361 -0.078803
2     1 -1.358354 -1.340163  1.773209  0.379780 -0.503198  1.800499  0.791461
3     1 -0.966272 -0.185226  1.792993 -0.863291 -0.010309  1.247203  0.237609
4     2 -1.158233  0.877737  1.548718  0.403034 -0.407193  0.095921  0.592941

         V8        V9  …       V21       V22       V23       V24       V25  \
0  0.098698  0.363787  … -0.018307  0.277838 -0.110474  0.066928  0.128539
1  0.085102 -0.255425  … -0.225775 -0.638672  0.101288 -0.339846  0.167170
2  0.247676 -1.514654  …  0.247998  0.771679  0.909412 -0.689281 -0.327642
3  0.377436 -1.387024  … -0.108300  0.005274 -0.190321 -1.175575  0.647376
4 -0.270533  0.817739  … -0.009431  0.798278 -0.137458  0.141267 -0.206010

        V26       V27       V28  Amount  Class
0 -0.189115  0.133558 -0.021053  149.62    0.0
1  0.125895 -0.008983  0.014724    2.69    0.0
2 -0.139097 -0.055353 -0.059752  378.66    0.0
3 -0.221929  0.062723  0.061458  123.50    0.0
4  0.502292  0.219422  0.215153   69.99    0.0

[5 rows x 31 columns]
```

[ ]:
```
import pandas as pd
df = pd.read_csv('/content/creditcard.csv')

#Displaying Last 5 rows
print(df.tail())
```

```
       Time        V1        V2        V3        V4        V5        V6  \
75352  56019 -0.330203  1.265306  0.703968  0.943073  0.020692 -0.334221
75353  56020 -0.824159  0.689632  0.238364  0.843827 -1.723679  2.003802
75354  56020  0.929735 -0.299633  0.394750  0.540756  0.272645  1.656454
75355  56021 -1.657683 -0.426294  1.687198 -1.454421 -2.383477  1.305648
75356  56021 -1.711121 -0.369377  1.440787  0.136071  0.517265  0.196718

             V7        V8        V9  …       V21       V22       V23  \
75352  0.406527  0.313829 -0.924290  …  0.222834  0.653481 -0.024697
75353  3.194546 -0.727345 -0.680086  … -0.092779  0.491220 -0.376126
75354 -0.410577  0.600046  0.184701  … -0.038120  0.102605  0.094452
75355  0.658390  0.543973 -1.068176  …  0.166907  0.460901 -0.059376
75356 -0.006951  0.325528 -1.817459  … -0.365864 -0.524456  0.085383
```

```
            V24       V25       V26       V27       V28  Amount  Class
75352  0.123168 -0.154517 -0.303343 -0.020581 -0.017914   17.45    0.0
75353 -0.768536 -0.152191 -0.255962  0.014022 -0.227837  570.00    0.0
75354 -0.985089  0.094890  0.376660  0.038140 -0.005591   44.43    0.0
75355  0.079649  0.353229 -0.323458  0.023944 -0.176926  375.01    0.0
75356 -0.342706  0.281718 -0.280851       NaN       NaN     NaN    NaN

[5 rows x 31 columns]
```

[ ]:
```python
import pandas as pd
df = pd.read_csv('/content/creditcard.csv')

#Data Manipulation
print("shape of dataframe", df.shape)
print("number of rows : ", df.shape[0])
print("number of columns : ", df.shape[1])
print("DataFrame Size : ", df.size)
print('Info: ', df.info())
print('Correlation: ', df.corr())
```

```
shape of dataframe (81299, 31)
number of rows :  81299
number of columns :  31
DataFrame Size :  2520269
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 81299 entries, 0 to 81298
Data columns (total 31 columns):
 #   Column  Non-Null Count  Dtype
---  ------  --------------  -----
 0   Time    81299 non-null  int64
 1   V1      81299 non-null  float64
 2   V2      81299 non-null  float64
 3   V3      81299 non-null  float64
 4   V4      81299 non-null  float64
 5   V5      81299 non-null  float64
 6   V6      81298 non-null  float64
 7   V7      81298 non-null  float64
 8   V8      81298 non-null  float64
 9   V9      81298 non-null  float64
 10  V10     81298 non-null  float64
 11  V11     81298 non-null  float64
 12  V12     81298 non-null  float64
 13  V13     81298 non-null  float64
 14  V14     81298 non-null  float64
 15  V15     81298 non-null  float64
 16  V16     81298 non-null  float64
 17  V17     81298 non-null  float64
```

```
 18  V18     81298 non-null  float64
 19  V19     81298 non-null  float64
 20  V20     81298 non-null  float64
 21  V21     81298 non-null  float64
 22  V22     81298 non-null  float64
 23  V23     81298 non-null  float64
 24  V24     81298 non-null  float64
 25  V25     81298 non-null  float64
 26  V26     81298 non-null  float64
 27  V27     81298 non-null  float64
 28  V28     81298 non-null  float64
 29  Amount  81298 non-null  float64
 30  Class   81298 non-null  float64
dtypes: float64(30), int64(1)
memory usage: 19.2 MB
Info:  None
Correlation:              Time        V1        V2        V3        V4        V5
V6  \
Time    1.000000 -0.013925 -0.082910 -0.043661 -0.032350 -0.055022 -0.009466
V1     -0.013925  1.000000  0.057876  0.254591 -0.084183  0.033767  0.081312
V2     -0.082910  0.057876  1.000000 -0.102670  0.053015 -0.065598  0.014305
V3     -0.043661  0.254591 -0.102670  1.000000 -0.105437  0.243695 -0.049882
V4     -0.032350 -0.084183  0.053015 -0.105437  1.000000 -0.015254 -0.046189
V5     -0.055022  0.033767 -0.065598  0.243695 -0.015254  1.000000  0.034152
V6     -0.009466  0.081312  0.014305 -0.049882 -0.046189  0.034152  1.000000
V7     -0.001258  0.105001 -0.048966  0.236764 -0.044037 -0.027642  0.088006
V8      0.019882 -0.027238  0.043323 -0.175038  0.060421 -0.047753 -0.054060
V9     -0.294523 -0.042588 -0.017073  0.136133  0.037307  0.054927  0.043671
V10     0.075641  0.043634 -0.015647  0.153577 -0.095702  0.111052 -0.001510
V11    -0.189116 -0.009836  0.037342 -0.092946  0.014902 -0.030613 -0.094684
V12     0.412812  0.008630 -0.065674  0.099716 -0.011019  0.036390  0.017711
V13    -0.301344 -0.001360  0.044314 -0.039569 -0.005934  0.047681 -0.003970
V14    -0.235872  0.078422 -0.020341  0.124337 -0.035336  0.055604  0.037352
V15     0.123733  0.049936  0.055277 -0.177173 -0.055727  0.095087 -0.116123
V16     0.008486  0.045083 -0.015888 -0.027388 -0.103932  0.114180 -0.011983
V17    -0.109927  0.071585 -0.070864  0.138581 -0.016371  0.003875  0.018168
V18    -0.025804  0.007413 -0.017925  0.018758 -0.038497  0.061610  0.053234
V19     0.021510 -0.002274  0.002709 -0.040243  0.004703  0.016228  0.085536
V20    -0.002366 -0.015352 -0.092247 -0.091617  0.019320 -0.063414  0.045452
V21     0.008656 -0.011930 -0.012513  0.031584  0.013247 -0.055142  0.014881
V22     0.027918 -0.050380 -0.029431  0.233243  0.028736 -0.068673  0.036349
V23     0.001374 -0.072715  0.008274  0.054219 -0.012430  0.022209 -0.018858
V24    -0.002721 -0.011388 -0.025602  0.023076  0.000122 -0.017287 -0.003973
V25     0.015738  0.184268 -0.087388 -0.183585 -0.001243 -0.011857  0.044941
V26    -0.001105  0.021676 -0.022378  0.044984 -0.013533 -0.039077  0.005438
V27    -0.015549 -0.051987  0.005089 -0.091089  0.050494 -0.037045 -0.011696
V28    -0.006571  0.127100  0.002739  0.038353 -0.005517  0.012376 -0.016829
Amount  0.054356 -0.253333 -0.554004 -0.225941  0.093923 -0.400681  0.215518
```

```
Class  -0.013894 -0.162574  0.137032 -0.333239  0.180734 -0.158985 -0.078666

              V7        V8        V9  …       V21       V22       V23  \
Time   -0.001258  0.019882 -0.294523  …  0.008656  0.027918  0.001374
V1      0.105001 -0.027238 -0.042588  … -0.011930 -0.050380 -0.072715
V2     -0.048966  0.043323 -0.017073  … -0.012513 -0.029431  0.008274
V3      0.236764 -0.175038  0.136133  …  0.031584  0.233243  0.054219
V4     -0.044037  0.060421  0.037307  …  0.013247  0.028736 -0.012430
V5     -0.027642 -0.047753  0.054927  … -0.055142 -0.068673  0.022209
V6      0.088006 -0.054060  0.043671  …  0.014881  0.036349 -0.018858
V7      1.000000 -0.051467  0.054032  …  0.022815 -0.040019  0.069559
V8     -0.051467  1.000000 -0.038433  …  0.054271  0.015439 -0.017122
V9      0.054032 -0.038433  1.000000  … -0.002439  0.031733 -0.045455
V10     0.096803 -0.078103 -0.047429  … -0.014369 -0.045958 -0.007092
V11    -0.040472  0.009657  0.011211  …  0.032944  0.064967  0.025463
V12     0.098922 -0.061677 -0.087678  … -0.001387  0.060334 -0.016007
V13     0.008785 -0.006662  0.058764  … -0.002050 -0.030179 -0.012066
V14     0.054294 -0.055198  0.121347  … -0.047152 -0.071733  0.021075
V15     0.070667 -0.038075 -0.142897  …  0.018090  0.003075  0.019800
V16     0.100726 -0.069454 -0.044932  … -0.019515  0.028570 -0.014112
V17     0.080897 -0.060492  0.139072  … -0.035270  0.049571  0.031509
V18     0.065408 -0.027215  0.014743  … -0.051807 -0.108083  0.008027
V19    -0.044750  0.030207 -0.002049  …  0.006943  0.015623  0.002206
V20     0.065459 -0.002663 -0.002665  …  0.010473 -0.023015 -0.033039
V21     0.022815  0.054271 -0.002439  …  1.000000 -0.113310 -0.024161
V22    -0.040019  0.015439  0.031733  … -0.113310  1.000000  0.071515
V23     0.069559 -0.017122 -0.045455  … -0.024161  0.071515  1.000000
V24     0.000048  0.007096  0.011220  …  0.002170 -0.001147  0.001182
V25    -0.098344  0.015210  0.111125  … -0.015111 -0.008739  0.110282
V26    -0.034239  0.005321  0.109188  … -0.027972 -0.081681  0.034052
V27    -0.099873  0.005151 -0.018785  … -0.031751 -0.008068 -0.034120
V28    -0.034944  0.029829 -0.008674  …  0.053049 -0.033607  0.040300
Amount  0.387053 -0.098580 -0.022131  …  0.139633 -0.085768 -0.146106
Class  -0.266607  0.118478 -0.133856  …  0.052548 -0.003990 -0.014415

              V24       V25       V26       V27       V28    Amount     Class
Time   -0.002721  0.015738 -0.001105 -0.015549 -0.006571  0.054356 -0.013894
V1     -0.011388  0.184268  0.021676 -0.051987  0.127100 -0.253333 -0.162574
V2     -0.025602 -0.087388 -0.022378  0.005089  0.002739 -0.554004  0.137032
V3      0.023076 -0.183585  0.044984 -0.091089  0.038353 -0.225941 -0.333239
V4      0.000122 -0.001243 -0.013533  0.050494 -0.005517  0.093923  0.180734
V5     -0.017287 -0.011857 -0.039077 -0.037045  0.012376 -0.400681 -0.158985
V6     -0.003973  0.044941  0.005438 -0.011696 -0.016829  0.215518 -0.078666
V7      0.000048 -0.098344 -0.034239 -0.099873 -0.034944  0.387053 -0.266607
V8      0.007096  0.015210  0.005321  0.005151  0.029829 -0.098580  0.118478
V9      0.011220  0.111125  0.109188 -0.018785 -0.008674 -0.022131 -0.133856
V10     0.004753  0.011314 -0.019610 -0.067253  0.015601 -0.134701 -0.300631
V11     0.034763 -0.102636  0.000187  0.019101  0.016485 -0.015314  0.202480
```

```
V12     0.009741  0.012421  0.020705 -0.023450 -0.008842  0.029181 -0.308905
V13    -0.012051  0.038934  0.001649 -0.001168 -0.004819 -0.009559  0.000711
V14     0.024351 -0.063342  0.023317 -0.036010 -0.003872  0.004561 -0.393122
V15    -0.001744 -0.088926 -0.017775  0.017499 -0.006796 -0.035699  0.002375
V16    -0.003343  0.103633  0.023723 -0.014902 -0.028925 -0.005469 -0.275815
V17    -0.006534 -0.079071 -0.069495 -0.027731 -0.025454  0.016563 -0.437197
V18    -0.016236  0.018811  0.019509 -0.019647  0.000474  0.043009 -0.175555
V19    -0.008071 -0.010355 -0.005147  0.005555 -0.011828 -0.054247  0.049155
V20    -0.009344 -0.035345 -0.000856 -0.047559  0.123477  0.436861  0.021748
V21     0.002170 -0.015111 -0.027972 -0.031751  0.053049  0.139633  0.052548
V22    -0.001147 -0.008739 -0.081681 -0.008068 -0.033607 -0.085768 -0.003990
V23     0.001182  0.110282  0.034052 -0.034120  0.040300 -0.146106 -0.014415
V24     1.000000 -0.037993 -0.007921  0.002140 -0.006432  0.019843 -0.008330
V25    -0.037993  1.000000 -0.112286  0.043842  0.062729 -0.068349  0.010672
V26    -0.007921 -0.112286  1.000000 -0.002866  0.000062 -0.002276  0.006278
V27     0.002140  0.043842 -0.002866  1.000000 -0.084928  0.013230  0.071564
V28    -0.006432  0.062729  0.000062 -0.084928  1.000000  0.020746  0.007709
Amount  0.019843 -0.068349 -0.002276  0.013230  0.020746  1.000000 -0.000752
Class  -0.008330  0.010672  0.006278  0.071564  0.007709 -0.000752  1.000000

[31 rows x 31 columns]
```

[ ]:
```
import pandas as pd
df = pd.read_csv('/content/creditcard.csv')

#Dropping Empty Cells
Emp_drop = df.dropna(how= "all", axis=1)
print(df)
```

```
        Time        V1        V2        V3        V4        V5        V6  \
0          0 -1.359807 -0.072781  2.536347  1.378155 -0.338321  0.462388
1          0  1.191857  0.266151  0.166480  0.448154  0.060018 -0.082361
2          1 -1.358354 -1.340163  1.773209  0.379780 -0.503198  1.800499
3          1 -0.966272 -0.185226  1.792993 -0.863291 -0.010309  1.247203
4          2 -1.158233  0.877737  1.548718  0.403034 -0.407193  0.095921
…      …       …       …       …       …       …       …
83274  59766 -0.465927  0.740705  1.731343  0.036013  0.098876  0.055606
83275  59767 -0.725577  0.379742  1.468039  1.356958  0.546077  0.109718
83276  59768 -1.711347  1.308095 -0.232786 -1.607585 -1.299910 -0.627938
83277  59768  1.471591 -1.234024  0.279178 -1.595504 -1.344324 -0.101130
83278  59769  1.135220  0.124163  0.109082  0.902728  0.038998  0.004539

             V7        V8        V9  …       V21       V22       V23  \
0      0.239599  0.098698  0.363787  … -0.018307  0.277838 -0.110474
1     -0.078803  0.085102 -0.255425  … -0.225775 -0.638672  0.101288
2      0.791461  0.247676 -1.514654  …  0.247998  0.771679  0.909412
3      0.237609  0.377436 -1.387024  … -0.108300  0.005274 -0.190321
4      0.592941 -0.270533  0.817739  … -0.009431  0.798278 -0.137458
```

```
…          …         …         …  …         …         …         …
83274   0.472815  0.134921 -0.302919  …  0.032294  0.287631 -0.337062
83275   0.416071  0.180774 -0.273686  …  0.006224  0.017405 -0.101053
83276  -1.562053 -1.722859 -1.534618  … -0.902970  1.269219  0.178712
83277  -1.249330  0.030445 -1.813220  …  0.000785  0.310947 -0.194016
83278   0.007332  0.113029 -0.000000  …       NaN       NaN       NaN

             V24       V25       V26       V27       V28  Amount  Class
0       0.066928  0.128539 -0.189115  0.133558 -0.021053  149.62    0.0
1      -0.339846  0.167170  0.125895 -0.008983  0.014724    2.69    0.0
2      -0.689281 -0.327642 -0.139097 -0.055353 -0.059752  378.66    0.0
3      -1.175575  0.647376 -0.221929  0.062723  0.061458  123.50    0.0
4       0.141267 -0.206010  0.502292  0.219422  0.215153   69.99    0.0
…            …         …         …         …         …     …     …
83274   0.079929  0.091760  0.396666  0.078020  0.093914    1.00    0.0
83275  -0.294967  0.164357 -0.166337  0.114452  0.115366   46.96    0.0
83276   0.527195 -0.313104 -0.365365  0.216308  0.181065   10.00    0.0
83277  -0.504003  0.513079  0.008417  0.029493  0.007596   40.00    0.0
83278         NaN       NaN       NaN       NaN       NaN     NaN    NaN

[83279 rows x 31 columns]
```

[ ]:
```
import pandas as pd
df = pd.read_csv('/content/creditcard.csv')

#Dropping Empty Cells
df = df.drop(columns=df.columns[1:3], inplace=True)
print(df)
```

```
None
```

[ ]:
```
import pandas as pd
df = pd.read_csv('/content/creditcard.csv')

#Dropping Empty Cells
df = df.dropna()
print(df)
```

```
        Time        V1        V2        V3        V4        V5        V6  \
0          0 -1.359807 -0.072781  2.536347  1.378155 -0.338321  0.462388
1          0  1.191857  0.266151  0.166480  0.448154  0.060018 -0.082361
2          1 -1.358354 -1.340163  1.773209  0.379780 -0.503198  1.800499
3          1 -0.966272 -0.185226  1.792993 -0.863291 -0.010309  1.247203
4          2 -1.158233  0.877737  1.548718  0.403034 -0.407193  0.095921
…      …       …         …         …         …         …         …
95156  65189 -0.327858  0.966095  1.541728  0.745525  0.042368 -1.097118
95157  65189  1.142364 -1.090177  0.511068 -0.792356 -1.160044  0.134166
95158  65190 -2.145283  1.280406  0.014577 -2.003358  1.479294  4.673049
```

```
95159  65190 -3.715715  3.870511 -1.525809  0.082535 -0.244009 -0.901579
95160  65190 -5.164795  4.510526 -0.994499 -1.110853 -0.913228 -0.889076

             V7        V8        V9  …       V21       V22       V23  \
0      0.239599  0.098698  0.363787  … -0.018307  0.277838 -0.110474
1     -0.078803  0.085102 -0.255425  … -0.225775 -0.638672  0.101288
2      0.791461  0.247676 -1.514654  …  0.247998  0.771679  0.909412
3      0.237609  0.377436 -1.387024  … -0.108300  0.005274 -0.190321
4      0.592941 -0.270533  0.817739  … -0.009431  0.798278 -0.137458
…           …         …       …  …       …         …         …
95156  0.559739 -0.171171 -0.762272  … -0.125798 -0.371319  0.089315
95157 -0.997184  0.236721 -0.583865  …  0.399798  0.815983 -0.172587
95158 -2.008023 -2.933663  0.036717  …  0.276433 -0.038006  0.085076
95159  0.708830  0.070491  2.349423  … -0.327180  0.573451  0.266379
95160  0.373572  0.361552  3.841062  … -0.908623 -1.154210  0.300341

            V24       V25       V26       V27       V28  Amount  Class
0      0.066928  0.128539 -0.189115  0.133558 -0.021053  149.62    0.0
1     -0.339846  0.167170  0.125895 -0.008983  0.014724    2.69    0.0
2     -0.689281 -0.327642 -0.139097 -0.055353 -0.059752  378.66    0.0
3     -1.175575  0.647376 -0.221929  0.062723  0.061458  123.50    0.0
4      0.141267 -0.206010  0.502292  0.219422  0.215153   69.99    0.0
…           …         …         …         …         …     …    …
95156  0.695077 -0.671527  0.134372  0.129250  0.171650    2.97    0.0
95157 -0.298962  0.310993 -0.077793  0.011223  0.019004  106.00    0.0
95158  1.049870  0.489570  1.045371 -0.363337 -0.222526   34.61    0.0
95159  0.040564 -0.175983 -0.494220  0.257349 -0.309196    0.89    0.0
95160 -0.102776  0.817800  0.201861  2.384092  1.576142    7.18    0.0

[95161 rows x 31 columns]
```

[ ]:
```
import pandas as pd
df = pd.read_csv('/content/creditcard.csv')

#Dropping Empty Cells
df=df. dropna(subset = ['V5'])
df=df. dropna(subset = ['Time'])
print(df)
```

```
         Time        V1        V2        V3        V4        V5        V6  \
0           0 -1.359807 -0.072781  2.536347  1.378155 -0.338321  0.462388
1           0  1.191857  0.266151  0.166480  0.448154  0.060018 -0.082361
2           1 -1.358354 -1.340163  1.773209  0.379780 -0.503198  1.800499
3           1 -0.966272 -0.185226  1.792993 -0.863291 -0.010309  1.247203
4           2 -1.158233  0.877737  1.548718  0.403034 -0.407193  0.095921
…       …         …         …         …         …         …         …
124855  77448 -0.358736  1.088973  1.182810 -0.134401  0.274668 -0.469507
124856  77448 -0.835868  0.673600  1.904021 -0.263201  0.351435  0.236937
```

```
124857  77448 -2.817937 -0.107162  0.402607 -0.980962  0.682698  0.980801
124858  77449 -1.262504  1.434804  0.290138 -0.436888  0.801078  0.380510
124859  77449  1.087845  0.522904  0.275704  2.474583  0.213114 -0.225345

              V7        V8        V9  …       V21       V22       V23  \
0       0.239599  0.098698  0.363787  … -0.018307  0.277838 -0.110474
1      -0.078803  0.085102 -0.255425  … -0.225775 -0.638672  0.101288
2       0.791461  0.247676 -1.514654  …  0.247998  0.771679  0.909412
3       0.237609  0.377436 -1.387024  … -0.108300  0.005274 -0.190321
4       0.592941 -0.270533  0.817739  … -0.009431  0.798278 -0.137458
…            …         …       …  …         …         …
124855  0.604681  0.085536 -0.659111  … -0.232968 -0.622835 -0.075680
124856  0.223675  0.334808 -0.232802  …  0.114441  0.182323 -0.105240
124857  0.117625  1.387942 -0.779965  …  0.280573  0.323453 -0.374319
124858  0.399066  0.554237 -0.531654  …  0.195197  0.383922 -0.281029
124859  0.389247 -0.100848 -0.960723  …  0.007535 -0.054694 -0.061887

              V24       V25       V26       V27       V28  Amount  Class
0       0.066928  0.128539 -0.189115  0.133558 -0.021053  149.62    0.0
1      -0.339846  0.167170  0.125895 -0.008983  0.014724    2.69    0.0
2      -0.689281 -0.327642 -0.139097 -0.055353 -0.059752  378.66    0.0
3      -1.175575  0.647376 -0.221929  0.062723  0.061458  123.50    0.0
4       0.141267 -0.206010  0.502292  0.219422  0.215153   69.99    0.0
…            …         …       …         …         …     …    …
124855 -0.048200 -0.140704  0.074554  0.243321  0.085024    0.89    0.0
124856 -0.357454 -0.357218 -0.704835  0.014996  0.144135    4.99    0.0
124857 -0.962394  0.422271  0.402743 -0.288024 -0.339470  115.00    0.0
124858 -1.152876  0.030816 -0.486364 -0.148485  0.121988    1.07    0.0
124859  0.083010  0.527815  0.030754 -0.017737  0.020217   45.95    0.0

[124860 rows x 31 columns]
```

[ ]:
```
print('Correlation: ', df.corr())
```

```
Correlation:              Time        V1        V2        V3        V4        V5
V6  \
Time    1.000000 -0.001731 -0.016649 -0.027271 -0.026884 -0.032948 -0.015875
V1     -0.001731  1.000000  0.034695  0.207392 -0.057541  0.013500  0.055785
V2     -0.016649  0.034695  1.000000 -0.082420  0.037251 -0.034903  0.014035
V3     -0.027271  0.207392 -0.082420  1.000000 -0.074047  0.179836 -0.076819
V4     -0.026884 -0.057541  0.037251 -0.074047  1.000000  0.003631 -0.039537
V5     -0.032948  0.013500 -0.034903  0.179836  0.003631  1.000000  0.048400
V6     -0.015875  0.055785  0.014035 -0.076819 -0.039537  0.048400  1.000000
V7     -0.002300  0.074587 -0.020980  0.183199 -0.008168 -0.037217  0.040139
V8      0.018370 -0.013531  0.009422 -0.118408  0.033319 -0.020964 -0.041360
V9     -0.228759 -0.060808  0.000264  0.106021  0.050187  0.032609  0.043028
V10     0.057180  0.003614  0.017297  0.093117 -0.093751  0.057504 -0.014579
V11    -0.155421  0.007005  0.027791 -0.077015  0.004255 -0.016998 -0.090787
```

```
V12     0.359075 -0.011586 -0.021159  0.069677  0.036061  0.022932  0.009588
V13    -0.211731 -0.000922  0.034834 -0.054465 -0.015588  0.047990 -0.014092
V14    -0.182534  0.040881 -0.007710  0.061805 -0.009655  0.031442  0.019828
V15     0.109789  0.049571  0.076964 -0.192634 -0.029724  0.112446 -0.119873
V16     0.007012  0.026197  0.021932 -0.058463 -0.080473  0.106973 -0.019527
V17    -0.088058  0.040200 -0.061148  0.090980  0.007361 -0.043552  0.003437
V18    -0.003972 -0.001203 -0.019662 -0.023103 -0.033652  0.045294  0.045135
V19     0.012287 -0.000434  0.008021 -0.029651  0.013725  0.021349  0.097323
V20    -0.001224 -0.037519 -0.087105 -0.088143  0.014125 -0.034410  0.036281
V21    -0.006755 -0.024190 -0.019134  0.032217  0.024608 -0.049929  0.013744
V22    -0.004826 -0.054859 -0.021969  0.247679  0.035689 -0.088336  0.047566
V23     0.007458 -0.075960  0.024361  0.043088 -0.010482  0.010918 -0.016348
V24     0.003518 -0.017771 -0.018493  0.026454 -0.000922 -0.018686 -0.006352
V25    -0.001881  0.203496 -0.090811 -0.192733  0.000069 -0.012302  0.049216
V26     0.002957  0.016352 -0.029063  0.039059 -0.033655 -0.047352  0.006177
V27    -0.011496 -0.009894 -0.005468 -0.056625  0.039821 -0.014892 -0.011501
V28    -0.004022  0.158473  0.025303  0.034221 -0.006167 -0.008885 -0.005152
Amount  0.007181 -0.246225 -0.552406 -0.230229  0.095720 -0.398748  0.206234
Class  -0.015757 -0.134643  0.111500 -0.280966  0.150421 -0.128631 -0.055980

                V7        V8        V9  …       V21       V22       V23  \
Time    -0.002300  0.018370 -0.228759  … -0.006755 -0.004826  0.007458
V1       0.074587 -0.013531 -0.060808  … -0.024190 -0.054859 -0.075960
V2      -0.020980  0.009422  0.000264  … -0.019134 -0.021969  0.024361
V3       0.183199 -0.118408  0.106021  …  0.032217  0.247679  0.043088
V4      -0.008168  0.033319  0.050187  …  0.024608  0.035689 -0.010482
V5      -0.037217 -0.020964  0.032609  … -0.049929 -0.088336  0.010918
V6       0.040139 -0.041360  0.043028  …  0.013744  0.047566 -0.016348
V7       1.000000  0.006108  0.043743  … -0.000291 -0.045846  0.067208
V8       0.006108  1.000000 -0.016782  …  0.024654  0.033789 -0.022804
V9       0.043743 -0.016782  1.000000  …  0.005793  0.047020 -0.051603
V10      0.055038 -0.038591 -0.018848  … -0.027016 -0.048318 -0.012671
V11     -0.001759 -0.007690 -0.011560  …  0.039156  0.060644  0.031058
V12      0.061941 -0.037606 -0.023319  … -0.012814  0.052172 -0.014010
V13      0.021356 -0.001678 -0.016396  … -0.000373 -0.023536 -0.012013
V14      0.023922 -0.017589  0.027150  … -0.051646 -0.068516  0.020988
V15      0.088714 -0.043979 -0.124072  …  0.005929 -0.021919  0.025834
V16      0.071073 -0.040617 -0.051200  … -0.020259  0.032575 -0.021773
V17      0.017742 -0.022144  0.080219  … -0.029595  0.078478  0.030268
V18      0.040412 -0.013631 -0.035553  … -0.057267 -0.117504  0.002944
V19     -0.040987  0.028988  0.010052  …  0.012069  0.019012  0.000281
V20      0.061584 -0.021565  0.026754  … -0.016810 -0.009024 -0.019887
V21     -0.000291  0.024654  0.005793  …  1.000000 -0.096912 -0.001906
V22     -0.045846  0.033789  0.047020  … -0.096912  1.000000  0.051094
V23      0.067208 -0.022804 -0.051603  … -0.001906  0.051094  1.000000
V24     -0.000040  0.006951  0.012873  …  0.004337 -0.000268  0.009821
V25     -0.098119  0.012248  0.121999  … -0.012958 -0.011344  0.096890
V26     -0.031692  0.010040  0.111252  … -0.027034 -0.091848  0.037266
```

```
V27    -0.087161  0.011159 -0.030038  … -0.013856 -0.015287 -0.017093
V28    -0.043675  0.018065 -0.036978  …  0.049342 -0.035736  0.024326
Amount  0.380759 -0.091063 -0.018740  …  0.130499 -0.077105 -0.136018
Class  -0.226664  0.054860 -0.105946  …  0.082287 -0.014888 -0.005658

              V24       V25       V26       V27       V28    Amount     Class
Time     0.003518 -0.001881  0.002957 -0.011496 -0.004022  0.007181 -0.015757
V1      -0.017771  0.203496  0.016352 -0.009894  0.158473 -0.246225 -0.134643
V2      -0.018493 -0.090811 -0.029063 -0.005468  0.025303 -0.552406  0.111500
V3       0.026454 -0.192733  0.039059 -0.056625  0.034221 -0.230229 -0.280966
V4      -0.000922  0.000069 -0.033655  0.039821 -0.006167  0.095720  0.150421
V5      -0.018686 -0.012302 -0.047352 -0.014892 -0.008885 -0.398748 -0.128631
V6      -0.006352  0.049216  0.006177 -0.011501 -0.005152  0.206234 -0.055980
V7      -0.000040 -0.098119 -0.031692 -0.087161 -0.043675  0.380759 -0.226664
V8       0.006951  0.012248  0.010040  0.011159  0.018065 -0.091063  0.054860
V9       0.012873  0.121999  0.111252 -0.030038 -0.036978 -0.018740 -0.105946
V10      0.004571  0.022135 -0.023164 -0.071278 -0.038361 -0.129267 -0.248719
V11      0.037871 -0.103821 -0.008451  0.009765 -0.002398 -0.011857  0.169400
V12      0.011255  0.012831  0.027530 -0.018287 -0.005782  0.014459 -0.280580
V13     -0.020292  0.045123  0.001219 -0.001160 -0.004636 -0.004004 -0.004530
V14      0.029491 -0.068786  0.019904 -0.019526  0.019863  0.016120 -0.354402
V15     -0.002059 -0.094524 -0.014405  0.007960 -0.010206 -0.040925  0.001032
V16     -0.006498  0.104621  0.021533 -0.003670 -0.016621 -0.021677 -0.232216
V17     -0.006226 -0.077231 -0.071875 -0.006536 -0.011389  0.020056 -0.379155
V18     -0.019283  0.024451  0.017732 -0.012131  0.002233  0.051106 -0.141271
V19     -0.013462 -0.009305 -0.001971  0.000394 -0.004995 -0.056512  0.042667
V20     -0.005633 -0.022870  0.005235 -0.017929  0.097327  0.422955  0.012551
V21      0.004337 -0.012958 -0.027034 -0.013856  0.049342  0.130499  0.082287
V22     -0.000268 -0.011344 -0.091848 -0.015287 -0.035736 -0.077105 -0.014888
V23      0.009821  0.096890  0.037266 -0.017093  0.024326 -0.136018 -0.005658
V24      1.000000 -0.041055 -0.006681 -0.008176 -0.006570  0.018339 -0.009232
V25     -0.041055  1.000000 -0.112424  0.051270  0.058479 -0.061672  0.007702
V26     -0.006681 -0.112424  1.000000  0.000782  0.004712  0.006370  0.003130
V27     -0.008176  0.051270  0.000782  1.000000  0.031998  0.009893  0.058279
V28     -0.006570  0.058479  0.004712  0.031998  1.000000  0.011129  0.011325
Amount  0.018339 -0.061672  0.006370  0.009893  0.011129  1.000000  0.004205
Class  -0.009232  0.007702  0.003130  0.058279  0.011325  0.004205  1.000000

[31 rows x 31 columns]
```

[ ]:
```python
import pandas as pd
df = pd.read_csv('/content/creditcard.csv')

#Create Duplicate Columns
pd.get_dummies(df)
```

[ ]:

	Time	V1	V2	V3	V4	V5	V6	\
0	0	-1.359807	-0.072781	2.536347	1.378155	-0.338321	0.462388	
1	0	1.191857	0.266151	0.166480	0.448154	0.060018	-0.082361	
2	1	-1.358354	-1.340163	1.773209	0.379780	-0.503198	1.800499	
3	1	-0.966272	-0.185226	1.792993	-0.863291	-0.010309	1.247203	
4	2	-1.158233	0.877737	1.548718	0.403034	-0.407193	0.095921	
…	…	…	…	…	…	…	…	
130797	79434	-5.466097	2.517599	-2.343553	4.215289	-3.280618	-0.287955	
130798	79434	-0.400431	1.081795	1.398292	-0.004797	-0.018701	-0.773994	
130799	79435	-0.061008	-0.744399	1.800945	-2.150292	-1.040646	0.448124	
130800	79435	1.064540	-0.651524	0.504264	-0.180169	-0.255126	1.240949	
130801	79435	-0.743444	0.539346	2.515842	-1.960928	-0.421662	-0.724772	

	V7	V8	V9	…	V21	V22	V23	\
0	0.239599	0.098698	0.363787	…	-0.018307	0.277838	-0.110474	
1	-0.078803	0.085102	-0.255425	…	-0.225775	-0.638672	0.101288	
2	0.791461	0.247676	-1.514654	…	0.247998	0.771679	0.909412	
3	0.237609	0.377436	-1.387024	…	-0.108300	0.005274	-0.190321	
4	0.592941	-0.270533	0.817739	…	-0.009431	0.798278	-0.137458	
…	…	…	…	…	…	…	…	
130797	-2.296688	3.464467	-2.399703	…	0.359007	-0.339049	0.336488	
130798	0.616732	0.061465	-0.666232	…	-0.198177	-0.540952	0.001058	
130799	-0.344005	-0.007536	-2.311161	…	0.059198	0.617976	-0.030908	
130800	-0.660998	0.327149	0.820702	…	-0.178904	-0.367111	-0.159203	
130801	0.537915	-0.156173	1.292790	…	-0.054806	0.321604	-0.410774	

	V24	V25	V26	V27	V28	Amount	Class
0	0.066928	0.128539	-0.189115	0.133558	-0.021053	149.62	0.0
1	-0.339846	0.167170	0.125895	-0.008983	0.014724	2.69	0.0
2	-0.689281	-0.327642	-0.139097	-0.055353	-0.059752	378.66	0.0
3	-1.175575	0.647376	-0.221929	0.062723	0.061458	123.50	0.0
4	0.141267	-0.206010	0.502292	0.219422	0.215153	69.99	0.0
…	…	…	…	…	…	…	…
130797	0.373767	-0.522598	-0.237532	-2.033451	-0.874593	39.32	0.0
130798	0.483626	-0.218053	0.041827	0.241530	0.090224	4.49	0.0
130799	-0.313231	-0.141417	-0.142070	-0.096524	-0.202511	79.00	0.0
130800	-1.226536	0.230462	1.026093	-0.029286	0.004010	89.99	0.0
130801	0.417508	NaN	NaN	NaN	NaN	NaN	NaN

[130802 rows x 31 columns]

[ ]:
```
import pandas as pd
df = pd.read_csv('/content/creditcard.csv')

#Take care of missing data(just for first 5 rows)
df = df.head(5)
df.notnull()
```

[ ]:
```
   Time    V1    V2    V3    V4    V5    V6    V7    V8    V9  …   V21  \
0  True  True  True  True  True  True  True  True  True  True  …  True
1  True  True  True  True  True  True  True  True  True  True  …  True
2  True  True  True  True  True  True  True  True  True  True  …  True
3  True  True  True  True  True  True  True  True  True  True  …  True
4  True  True  True  True  True  True  True  True  True  True  …  True

    V22   V23   V24   V25   V26   V27   V28  Amount  Class
0  True  True  True  True  True  True  True    True   True
1  True  True  True  True  True  True  True    True   True
2  True  True  True  True  True  True  True    True   True
3  True  True  True  True  True  True  True    True   True
4  True  True  True  True  True  True  True    True   True

[5 rows x 31 columns]
```

[ ]:
```
import pandas as pd
df = pd.read_csv('/content/creditcard.csv')

#Change data to Numpy
df.to_numpy()
```

```
<ipython-input-14-7a866dd08d87>:2: DtypeWarning: Columns (28) have mixed types.
Specify dtype option on import or set low_memory=False.
  df = pd.read_csv('/content/creditcard.csv')
```

[ ]:
```
array([[0, -1.3598071336738, -0.0727811733098497, …,
        -0.0210530534538215, 149.62, 0.0],
       [0, 1.19185711131486, 0.26615071205963, …, 0.0147241691924927,
        2.69, 0.0],
       [1, -1.35835406159823, -1.34016307473609, …,
        -0.0597518405929204, 378.66, 0.0],
       …,
       [81845, 1.06740445339533, 0.0871526496833023, …,
        '0.0222817106909724', 85.9, 0.0],
       [81846, -0.833219444483895, 0.746825586488521, …,
        '0.0384589819489235', 6.8, 0.0],
       [81847, -0.418804707094463, 0.740210337181224, …, '-', nan, nan]],
      dtype=object)
```

[ ]:
```
import pandas as pd
df = pd.read_csv('/content/creditcard.csv')

# Shuffle dataframe
df = df.sample(frac=1)
print(df)
```

```
         Time        V1        V2        V3        V4        V5        V6  \
```

```
103292  68588  1.016117 -0.035096  0.307863  0.833742  0.559375  1.824413
26645   34181 -1.012508  2.345409 -3.203335  1.733481 -0.476341 -1.683988
28141   34871 -0.581294  1.327858  1.206441  0.007123  0.067904 -1.006753
99618   67202 -0.771040 -1.978799  0.819289 -0.569889 -2.304708  0.623287
44496   41971 -0.342552  1.193489  1.311542  0.054581  0.104088 -0.960848
…       …       …       …       …       …       …       …
54915   46685  0.971260 -0.254421  0.511950  1.146945 -0.618884 -0.229477
51650   45059  1.143427  0.235989 -0.076281  1.177647 -0.113112 -0.936325
100880  67655  1.229858  0.310747  0.193094  0.499643 -0.123778 -0.550250
11585   19910 -0.287009  0.250399  1.712981 -0.872371 -0.683187 -0.681445
32866   36996  1.232573  0.149492  0.479569  0.639037 -0.560774 -1.003719

              V7        V8        V9  …       V21       V22       V23  \
103292 -0.423823  0.666053  0.128384  … -0.069706  0.020362  0.104289
26645   0.144158  1.088745 -0.704785  … -0.070167 -0.110774  0.402346
28141   0.718263 -0.096415 -0.294980  … -0.288499 -0.661535 -0.018665
99618   0.072131 -0.019383 -1.931263  …  0.131476  1.184782  1.342933
44496   0.777579 -0.124738 -0.531466  … -0.252685 -0.615717 -0.022604
…          …       …       …  …       …       …       …
54915  -0.173476  0.150363  0.176163  … -0.118085 -0.734289 -0.011911
51650   0.417738 -0.155531 -0.065475  …  0.054307  0.091272 -0.086392
100880  0.007009 -0.057952 -0.261950  … -0.251004 -0.749065  0.068659
11585  -0.074780 -0.139561  0.494561  … -0.093508 -0.058258 -0.142823
32866   0.028859 -0.165630  0.159376  … -0.257898 -0.815284  0.132604

             V24       V25       V26       V27       V28  Amount  Class
103292 -1.376160  0.214000 -0.379246  0.093677 -0.004731    1.00    0.0
26645   0.181389 -0.320410 -0.404628  0.226855 -0.221503   89.99    0.0
28141   0.348269 -0.089580  0.074641  0.359116  0.159540    1.78    0.0
99618   0.052859 -1.459349 -0.019029  0.481530  0.087172  345.00    0.0
44496   0.358666 -0.129821  0.068806  0.251077  0.100312    4.49    0.0
…          …       …       …       …       …     …    …
54915  -0.096452  0.197764 -0.609371 -0.002517  0.036314  116.00    0.0
51650   0.378940  0.669354 -0.285210 -0.008010  0.013372   35.90    0.0
100880 -0.026469  0.241188  0.095673 -0.025545  0.018746    5.37    0.0
11585   0.307129  0.022700 -0.331559 -0.100278  0.040143    5.00    0.0
32866   0.354537  0.186945  0.095908 -0.036743  0.019808   16.00    0.0

[140703 rows x 31 columns]
```