OUTPUT

Df.head() of creditcard.csv

```
#loading the data
df=pd.read_csv('/content/drive/MyDrive/NM-Project/creditcard_new.csv') # Changed the file path
df.head()
```

V12	V13	V14	V15	V16	V17	V18	V19	V20	V21	V22	V23	V24	V25	V26	V27	V28	Amount	Class
-0.617801	-0.991390	-0.311169	1.468177	-0.470401	0.207971	0.025791	0.403993	0.251412	-0.018307	0.277838	-0.110474	0.066928	0.128539	-0.189115	0.133558	-0.021053	149.62	0
1.065235	0.489095	-0.143772	0.635558	0.463917	-0.114805	-0.183361	-0.145783	-0.069083	-0.225775	-0.638672	0.101288	-0.339846	0.167170	0.125895	-0.008983	0.014724	2.69	0
0.066084	0.717293	-0.165946	2.345865	-2.890083	1.109969	-0.121359	-2.261857	0.524980	0.247998	0.771679	0.909412	-0.689281	-0.327642	-0.139097	-0.055353	-0.059752	378.66	0
0.178228	0.507757	-0.287924	-0.631418	-1.059647	-0.684093	1.965775	-1.232622	-0.208038	-0.108300	0.005274	-0.190321	-1.175575	0.647376	-0.221929	0.062723	0.061458	123.50	0
0.538196	1.345852	-1.119670	0.175121	-0.451449	-0.237033	-0.038195	0.803487	0.408542	-0.009431	0.798278	-0.137458	0.141267	-0.206010	0.502292	0.219422	0.215153	69.99	0

```
#loading the data
df=pd.read_csv('/content/drive/MyDrive/NM-Project/creditcard_new.csv') # Changed the file path
df.head()
```

V12	V13	V14	V15	V16	V17	V18	V19	V20	V21	V22	V23	V24	V25	V26	V27	V28	Amount	Class
-0.617801	-0.991390	-0.311169	1.468177	-0.470401	0.207971	0.025791	0.403993	0.251412	-0.018307	0.277838	-0.110474	0.066928	0.128539	-0.189115	0.133558	-0.021053	149.62	0
1.065235	0.489095	-0.143772	0.635558	0.463917	-0.114805	-0.183361	-0.145783	-0.069083	-0.225775	-0.638672	0.101288	-0.339846	0.167170	0.125895	-0.008983	0.014724	2.69	0
0.066084	0.717293	-0.165946	2.345865	-2.890083	1.109969	-0.121359	-2.261857	0.524980	0.247998	0.771679	0.909412	-0.689281	-0.327642	-0.139097	-0.055353	-0.059752	378.66	0
0.178228	0.507757	-0.287924	-0.631418	-1.059647	-0.684093	1.965775	-1.232622	-0.208038	-0.108300	0.005274	-0.190321	-1.175575	0.647376	-0.221929	0.062723	0.061458	123.50	0
0.538196	1.345852	-1.119670	0.175121	-0.451449	-0.237033	-0.038195	0.803487	0.408542	-0.009431	0.798278	-0.137458	0.141267	-0.206010	0.502292	0.219422	0.215153	69.99	0

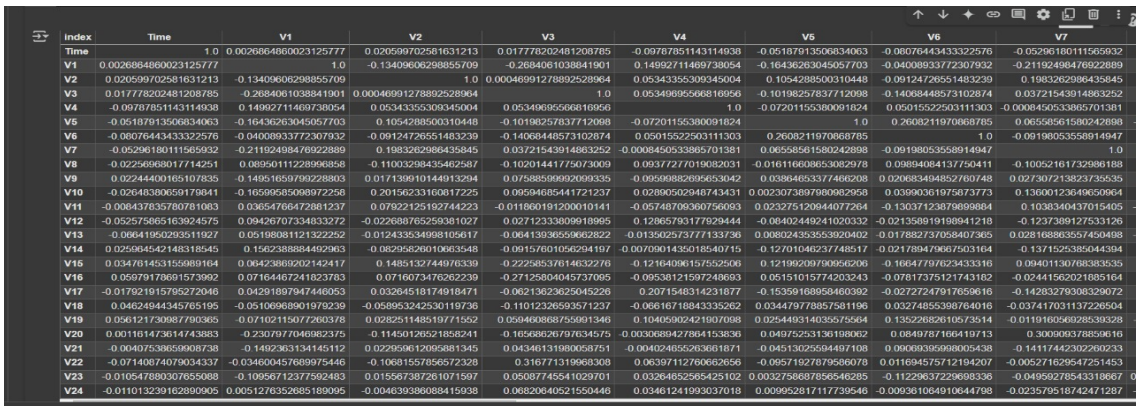
Df.head() of Fraud dataset.csv

```
df=pd.DataFrame(fraud)
df.head(100)
```

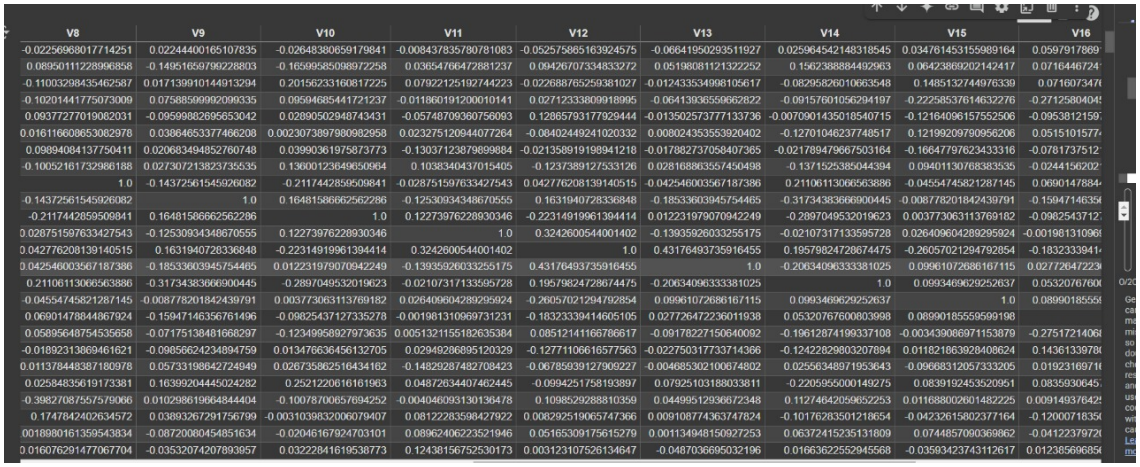
	step	customer	age	gender	zipcodeOri	merchant	zipMerchant	category	amount	fraud
0	0	'C1093826151'	'4'	'M'	'28007'	'M348934600'	'28007'	'es_transportation'	4.55	0
1	0	'C352968107'	'2'	'M'	'28007'	'M348934600'	'28007'	'es_transportation'	39.68	0
2	0	'C2054744914'	'4'	'F'	'28007'	'M1823072687'	'28007'	'es_transportation'	26.89	0
3	0	'C1760612790'	'3'	'M'	'28007'	'M348934600'	'28007'	'es_transportation'	17.25	0
4	0	'C757503768'	'5'	'M'	'28007'	'M348934600'	'28007'	'es_transportation'	35.72	0
...	...	...	...	...	...	...	...	...	...	...
95	0	'C1697851479'	'3'	'M'	'28007'	'M348934600'	'28007'	'es_transportation'	20.73	0
96	0	'C1255236689'	'1'	'F'	'28007'	'M348934600'	'28007'	'es_transportation'	68.17	0
97	0	'C603081336'	'3'	'F'	'28007'	'M348934600'	'28007'	'es_transportation'	34.75	0
98	0	'C274486575'	'2'	'F'	'28007'	'M692898500'	'28007'	'es_health'	171.07	0
99	0	'C1569939854'	'6'	'F'	'28007'	'M348934600'	'28007'	'es_transportation'	50.31	0

100 rows × 10 columns

Correlation



index	Time	V1	V2	V3	V4	V5	V6	V7
Time	1.0	0.002686486002325777	0.020599702581631213	0.017778202481208785	-0.09787851143114938	-0.05187913506834063	-0.08076443433322576	-0.05296180111565932
V1	0.002686486002325777	1.0	-0.13409606298855709	-0.26840610388419001	0.14992711469738054	-0.16436263045057703	-0.04089337723079332	-0.21192498476922889
V2	0.020599702581631213	-0.13409606298855709	1.0	0.0004699127889252896	0.05343355309345004	0.10542885003104	-0.09124726551483239	0.19832629864358545
V3	0.017778202481208785	-0.26840610388419001	0.0004699127889252896	1.0	0.05349695566816956	-0.10198257837712098	-0.14068448573102874	0.037215439144863252
V4	-0.09787851143114938	0.14992711469738054	0.05343355309345004	0.05349695566816956	1.0	-0.07201155380091824	0.05015522503111303	-0.0008450533865701381
V5	-0.05187913506834063	-0.16436263045057703	0.10542885003104	-0.10198257837712098	-0.07201155380091824	1.0	0.2608211970868785	0.06558561580242898
V6	-0.08076443433322576	-0.04089337723079332	-0.09124726551483239	-0.14068448573102874	0.05015522503111303	0.2608211970868785	1.0	-0.09198053558914947
V7	-0.05296180111565932	-0.21192498476922889	0.19832629864358545	0.037215439144863252	-0.0008450533865701381	0.06558561580242898	-0.09198053558914947	1.0
V8	-0.02256968017714251	0.02244400165107835	-0.02648380659179841	-0.008437835780781083	-0.052575885163924575	-0.06641950293511927	0.025964542148318545	0.034761453155989164
V9	0.08950111228996858	-0.14951659979228803	-0.16599585098972258	0.03654786472881237	0.09426707334833272	0.05198081121322252	0.1562388884492963	0.06423869202142417
V10	-0.11003298435462587	0.017139910144913294	0.20156233160817225	0.07922125192744223	-0.022688765259381027	-0.012433534998105617	-0.08295826010663548	0.14851327449763391
V11	-0.10201441775073009	0.07588599902099335	0.09594685441721237	-0.011860191200010141	0.027123338099181995	-0.06413936559662822	-0.09157601056294197	-0.22258537614632276
V12	0.09377277019082031	-0.09599882695653042	0.028905029487434331	-0.05747093607560093	0.12865793177929444	-0.013502573777133736	-0.007090143501854071	-0.12164096157552506
V13	0.016116608653082978	0.038646533774662088	0.002307389798098295	0.023275120944077264	-0.08402449241020332	0.008024353553920402	-0.12701046237748517	0.12199209790956206
V14	0.09894084137750411	0.020683494852760748	0.03990361975873773	-0.13037123879899884	-0.021358919198941218	-0.017882737058407365	-0.021789479667503164	-0.16647797623433316
V15	-0.10052161732986188	0.027307213823735535	0.13600123649650964	0.10383404370154054	-0.12373891275331276	0.028168863557450498	-0.13715253850443994	0.09401130768383535
V16	1.0	-0.14372561545926082	-0.2117442859509841	-0.028751597633427543	0.042776208139140515	-0.042546003567187386	0.21106113066563886	-0.04554745821287145
V17	-0.14372561545926082	1.0	0.16481586662562286	-0.12530934348670555	0.16319407283368486	-0.18533603945754465	-0.31734383666900445	-0.008778201842439791
V18	-0.2117442859509841	0.16481586662562286	1.0	0.12273976228930346	-0.22314919961394414	0.012231979070942249	-0.2897049532019623	0.003773063113769182
V19	0.028751597633427543	-0.12530934348670555	0.12273976228930346	1.0	0.32426005440014002	-0.13935926033255175	-0.021073171335957228	0.026409604289259524
V20	0.042776208139140515	0.16319407283368486	-0.22314919961394414	0.32426005440014002	1.0	0.43176493735916455	0.19579824728674475	-0.26057021294792854
V21	0.042546003567187386	-0.18533603945754465	0.012231979070942249	-0.13935926033255175	0.43176493735916455	1.0	-0.20634096333381025	0.09961072686167115
V22	0.21106113066563886	-0.31734383666900445	-0.2897049532019623	-0.021073171335957228	0.19579824728674475	-0.20634096333381025	1.0	0.09934696292526374
V23	-0.04554745821287145	-0.008778201842439791	0.003773063113769182	0.026409604289259524	-0.26057021294792854	0.09961072686167115	0.09934696292526374	1.0
V24	0.06901478844867924	-0.15947146356761496	-0.09825437127335278	-0.001981310969731231	-0.18323339414605105	0.027726472236011938	0.05320767600803998	0.08990185559599198
V25	0.05895648754535658	-0.07175138481668297	-0.12349958927973635	0.005132115518263538	0.08512141166786617	-0.09178227150640092	-0.19612874199337108	-0.003439086971153879
V26	-0.01892313869461621	-0.09856624234894759	0.013476636456132705	0.02949286895120329	-0.12771106616577563	-0.022750317733714366	-0.12422829803207894	0.011821863928408624
V27	0.011378448387180978	0.057331986427249	0.026735862516434162	-0.14829287482708423	-0.06785939127909227	-0.004685302100674802	0.025563489719536843	-0.09668312057333205
V28	0.025848356191973381	0.16399204445024282	0.25212208161161963	0.04872634407462445	-0.09942517578193897	0.07925103188033811	-0.2205955000149275	0.08391924535209514
V29	-0.39827087557579066	0.010298619664844404	-0.10078700857694252	-0.004046093130136478	0.10985292888103599	0.04499512936672348	0.11274642059652253	0.011688002601482225
V30	0.17478424026345724	0.038932672917567699	-0.003103983200679407	0.08122283598427922	0.008292519065747366	0.009108774363747824	-0.10176283501218654	-0.04232615802377164
V31	0.0018980161359543834	-0.08720080454851634	-0.020461679247031017	0.08962406223521946	0.051653091756152795	0.001134948150927253	0.06372415235131809	0.07448570903698862
V32	0.016076291477067704	-0.03532074207893957	0.03222841619538773	0.12438156752530173	0.003123107526134647	-0.04870366950321965	0.016636225529455568	-0.03593423743112617

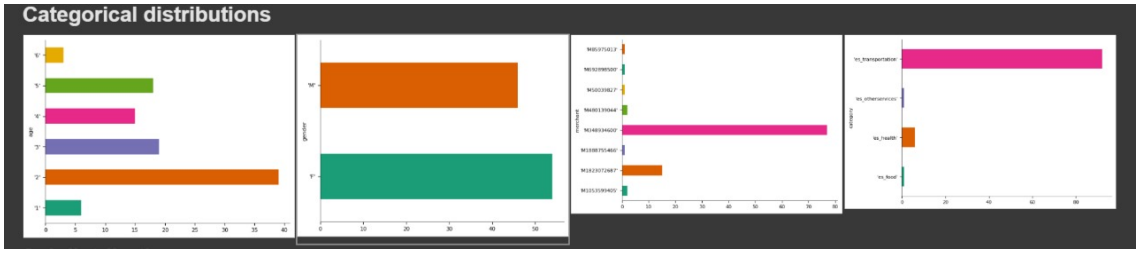


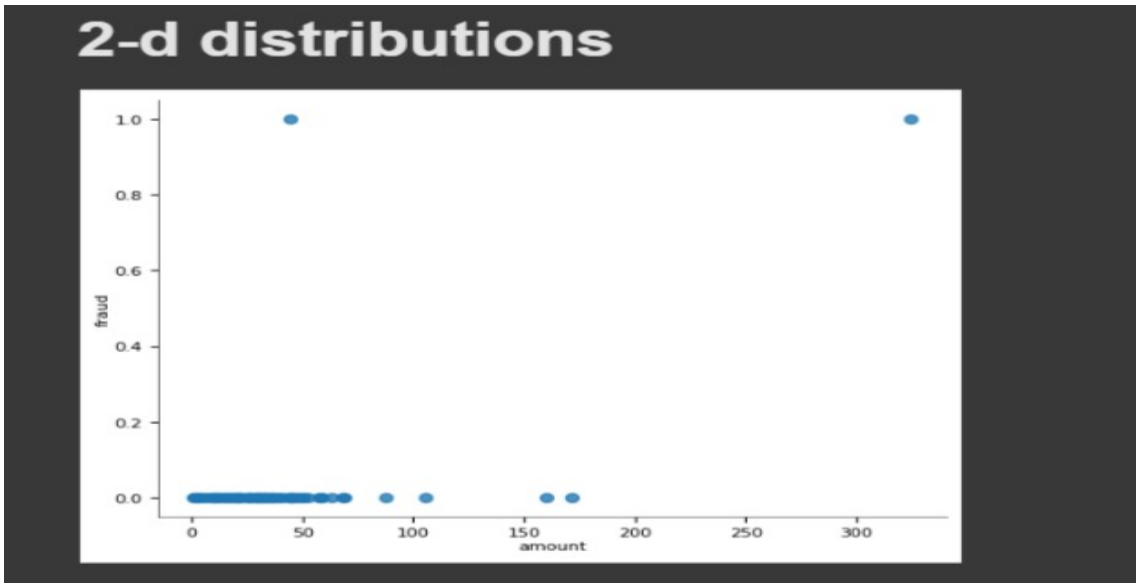
V8	V9	V10	V11	V12	V13	V14	V15	V16
-0.02256968017714251	0.02244400165107835	-0.02648380659179841	-0.008437835780781083	-0.052575885163924575	-0.06641950293511927	0.025964542148318545	0.034761453155989164	0.0597917869
0.08950111228996858	-0.14951659979228803	-0.16599585098972258	0.03654786472881237	0.09426707334833272	0.05198081121322252	0.1562388884492963	0.06423869202142417	0.0716446724
-0.11003298435462587	0.017139910144913294	0.20156233160817225	0.07922125192744223	-0.022688765259381027	-0.012433534998105617	-0.08295826010663548	0.14851327449763391	0.071607347
-0.10201441775073009	0.07588599902099335	0.09594685441721237	-0.011860191200010141	0.027123338099181995	-0.06413936559662822	-0.09157601056294197	-0.22258537614632276	-0.2712580404
0.09377277019082031	-0.09599882695653042	0.028905029487434331	-0.05747093607560093	0.12865793177929444	-0.013502573777133736	-0.007090143501854071	-0.12164096157552506	-0.09538121597
0.016116608653082978	0.038646533774662088	0.002307389798098295	0.023275120944077264	-0.08402449241020332	0.008024353553920402	-0.12701046237748517	0.12199209790956206	0.0515101577
0.09894084137750411	0.020683494852760748	0.03990361975873773	-0.13037123879899884	-0.021358919198941218	-0.017882737058407365	-0.021789479667503164	-0.16647797623433316	-0.0781737512
-0.10052161732986188	0.027307213823735535	0.13600123649650964	0.10383404370154054	-0.12373891275331276	0.028168863557450498	-0.13715253850443994	0.09401130768383535	-0.0244156202
1.0	-0.14372561545926082	-0.2117442859509841	-0.028751597633427543	0.042776208139140515	-0.042546003567187386	0.21106113066563886	-0.04554745821287145	0.0690147884
-0.14372561545926082	1.0	0.16481586662562286	-0.12530934348670555	0.16319407283368486	-0.18533603945754465	-0.31734383666900445	-0.008778201842439791	-0.1594714635
-0.2117442859509841	0.16481586662562286	1.0	0.12273976228930346	-0.22314919961394414	0.012231979070942249	-0.2897049532019623	0.003773063113769182	-0.0982543712
0.028751597633427543	-0.12530934348670555	0.12273976228930346	1.0	0.32426005440014002	-0.13935926033255175	-0.021073171335957228	0.026409604289259524	-0.0019813109
0.042776208139140515	0.16319407283368486	-0.22314919961394414	0.32426005440014002	1.0	0.43176493735916455	0.19579824728674475	-0.26057021294792854	-0.1832339341
0.042546003567187386	-0.18533603945754465	0.012231979070942249	-0.13935926033255175	0.43176493735916455	1.0	-0.20634096333381025	0.09961072686167115	0.027726472239
0.21106113066563886	-0.31734383666900445	-0.2897049532019623	-0.021073171335957228	0.19579824728674475	-0.20634096333381025	1.0	0.09934696292526374	0.0532076760
-0.04554745821287145	-0.008778201842439791	0.003773063113769182	0.026409604289259524	-0.26057021294792854	0.09961072686167115	0.09934696292526374	1.0	0.0899018555
0.06901478844867924	-0.15947146356761496	-0.09825437127335278	-0.001981310969731231	-0.18323339414605105	0.027726472236011938	0.05320767600803998	0.08990185559599198	
0.05895648754535658	-0.07175138481668297	-0.12349958927973635	0.005132115518263538	0.08512141166786617	-0.09178227150640092	-0.19612874199337108	-0.003439086971153879	-0.2751721406
-0.01892313869461621	-0.09856624234894759	0.013476636456132705	0.02949286895120329	-0.12771106616577563	-0.022750317733714366	-0.12422829803207894	0.011821863928408624	0.1436133978
0.011378448387180978	0.057331986427249	0.026735862516434162	-0.14829287482708423	-0.06785939127909227	-0.004685302100674802	0.025563489719536843	-0.09668312057333205	0.0192316971
0.025848356191973381	0.16399204445024282	0.25212208161161963	0.04872634407462445	-0.09942517578193897	0.07925103188033811	-0.2205955000149275	0.08391924535209514	0.0835930645
-0.39827087557579066	0.010298619664844404	-0.10078700857694252	-0.004046093130136478	0.10985292888103599	0.04499512936672348	0.11274642059652253	0.011688002601482225	0.0091493764
0.17478424026345724	0.038932672917567699	-0.003103983200679407	0.08122283598427922	0.008292519065747366	0.009108774363747824	-0.10176283501218654	-0.04232615802377164	-0.1200071835
0.0018980161359543834	-0.08720080454851634	-0.020461679247031017	0.08962406223521946	0.051653091756152795	0.001134948150927253	0.06372415235131809	0.07448570903698862	-0.0412237972
0.016076291477067704	-0.03532074207893957	0.03222841619538773	0.12438156752530173	0.003123107526134647	-0.04870366950321965	0.016636225529455568	-0.03593423743112617	0.0123856968

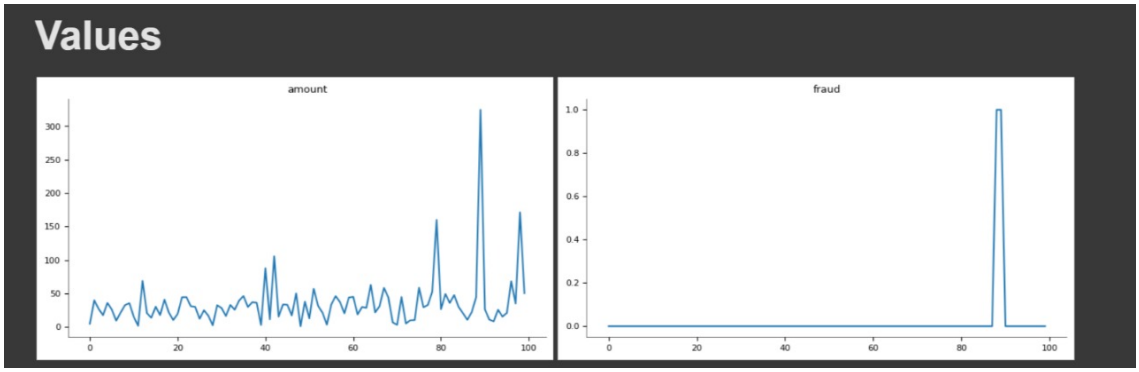
V16	V17	V18	V19
0.05979178691573992	-0.017921915795272046	0.04624944345765195	0.056121730987790365
0.07164467241823783	0.04291897947446053	-0.05106968901979239	-0.07102115077260378
0.0716073476262239	0.03264518174918471	-0.058953242530119736	0.028251148519771552
-0.27125804045737095	-0.06213623625045226	-0.11012326593571237	0.059460868755991346
-0.09538121597248693	0.2071548314231877	-0.06616718843335262	0.10405902421907098
0.05151015774203243	-0.15359168958460392	0.034479778857581196	0.025449314035575564
-0.07817375121743182	-0.02727247917659616	0.03274855398764016	0.13522682610573514
-0.02441562021885164	-0.14283279308329072	-0.037417031137226504	-0.011916056928539328
0.06901478844867924	0.05895648754535658	-0.01892313869461621	-0.011378448387180978
-0.15947146356761496	-0.07175138481668297	-0.09856624234894759	0.05733198642724949
-0.09825437127335278	-0.12349958927973635	0.013476636456132705	0.026735862516434162
-0.001981310969731231	0.005132115518263538	0.02949286895120329	-0.14829287482708423
-0.18323339414605105	0.08512141166786617	-0.12771106616577563	-0.06785939127909227
0.027726472236011938	-0.09178227150640092	-0.022750317733714366	-0.004685302100674802
0.05320767600803998	-0.19612874199337108	-0.12422829803207894	0.02556348971953643
0.08990185559599198	-0.003439086971153879	0.011821863928408624	-0.09668312057333205
1.0	-0.27517214068823315	0.14361339780325927	0.01923169716774418
-0.27517214068823315	1.0	-0.20602705683296488	-0.04705955701502714
0.14361339780325927	-0.20602705683296488	1.0	0.15056876014802886
0.01923169716774418	-0.04705955701502714	0.15056876014802886	1.0
0.08359306457102018	-0.07203765496993027	0.013479424330907985	0.08103091383564011
0.009149376425033964	-0.004137089200848911	-0.017434694453420725	0.06035899484759624
-0.12000718350134588	0.1269671133375839	-0.140445499562902	-0.0020743274059004738
-0.04122379720659809	0.08376189212560853	-0.06752937275321542	-0.08151385522587036
0.012385696856879238	-0.031317577985082111	-0.019848411408168704	-0.005217081524483134

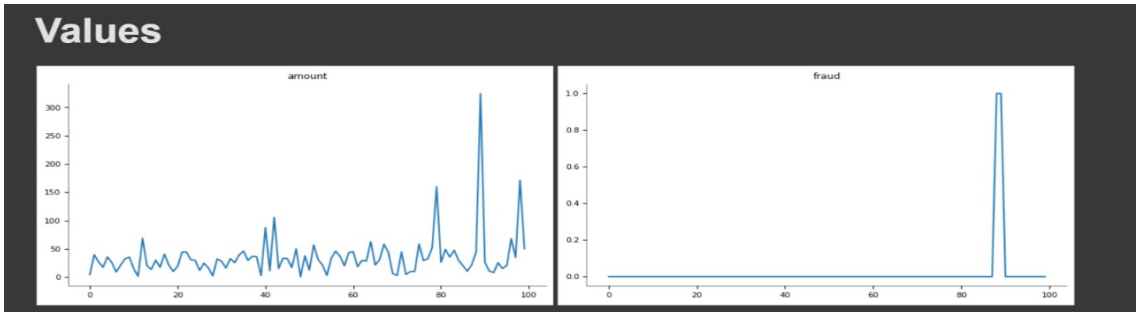
Visualization

Categorical Distribution

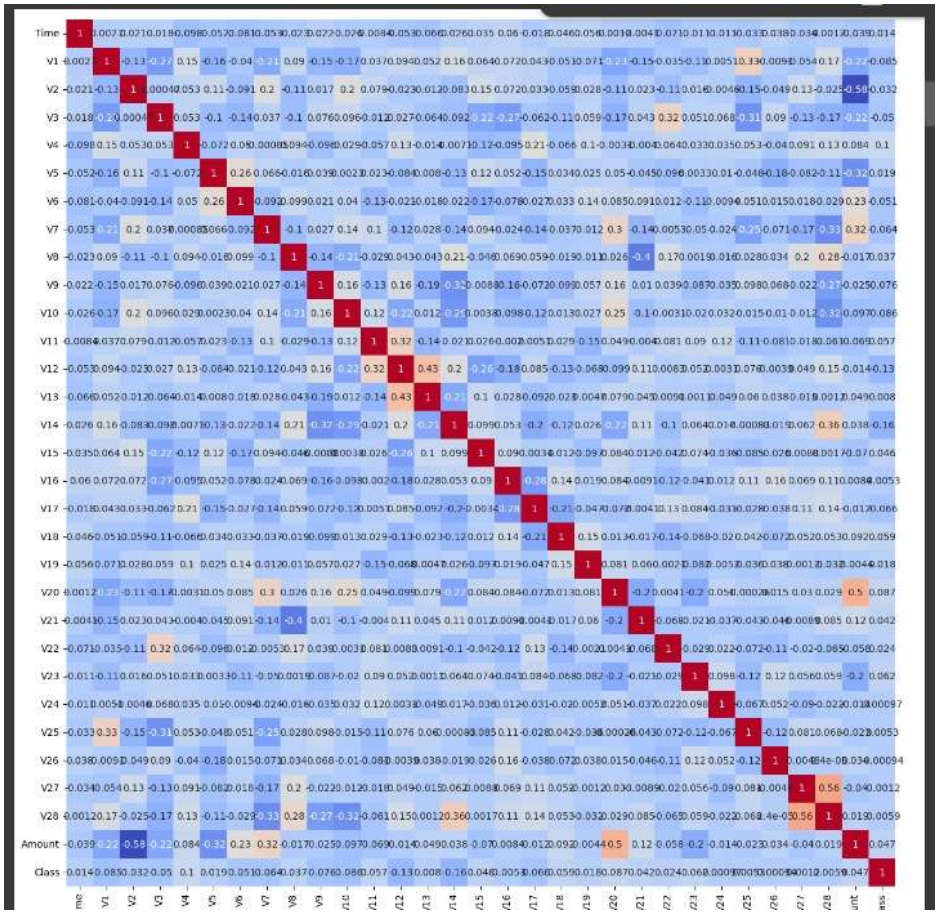




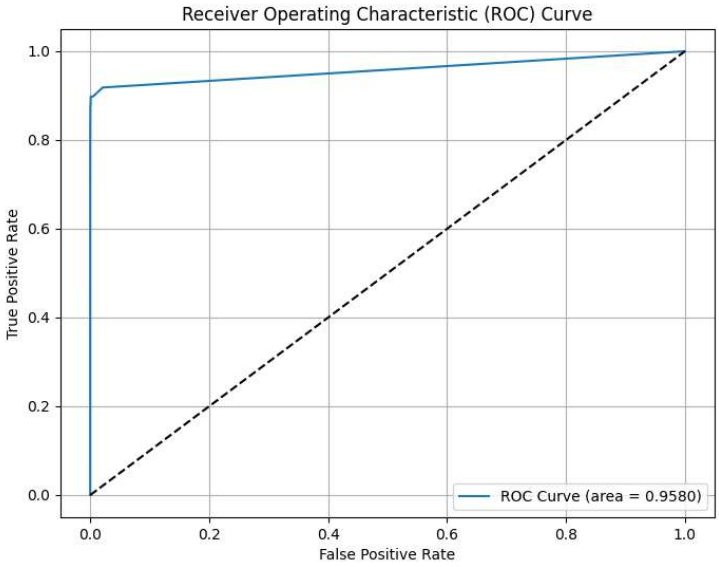




Heat map



ROC Curve



Result

```
Customer Group 0: 1.0 not fraud
Customer Group 1: 0.9791281589923939 not fraud | 0.02087184100760612 fraud
Customer Group 2: 0.9748987854251012 not fraud | 0.025101214574898785 fraud
Customer Group 3: 0.2097902097902098 not fraud | 0.7902097902097902 fraud
Customer Group 4: 1.0 not fraud
```

Naive Bayes

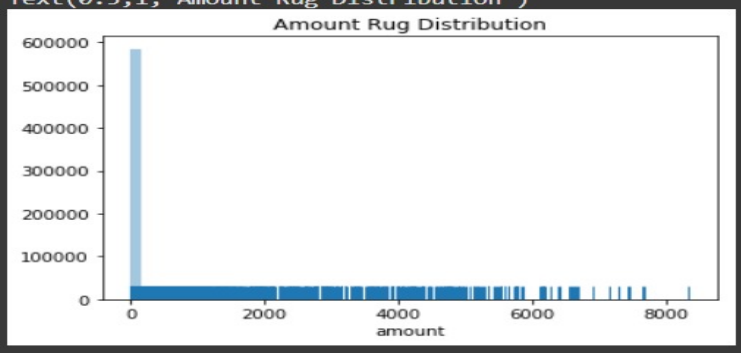
```
gnb = GaussianNB()
nb = cross_val_score(gnb, X_train, y_train, cv = 10)
print("Train Data:", numpy.mean(nb))

gnb = GaussianNB()
nb = cross_val_score(gnb, X_test, y_test, cv = 10)
print("Test Data:", numpy.mean(nb))
```

```
Train Data: 0.9507042088251954
Test Data: 0.9501341129450445
```

```
sns.distplot(fraud["amount"], kde=False, rug=True)
title("Amount Rug Distribution")
```

```
Text(0.5,1,'Amount Rug Distribution')
```



Distributions