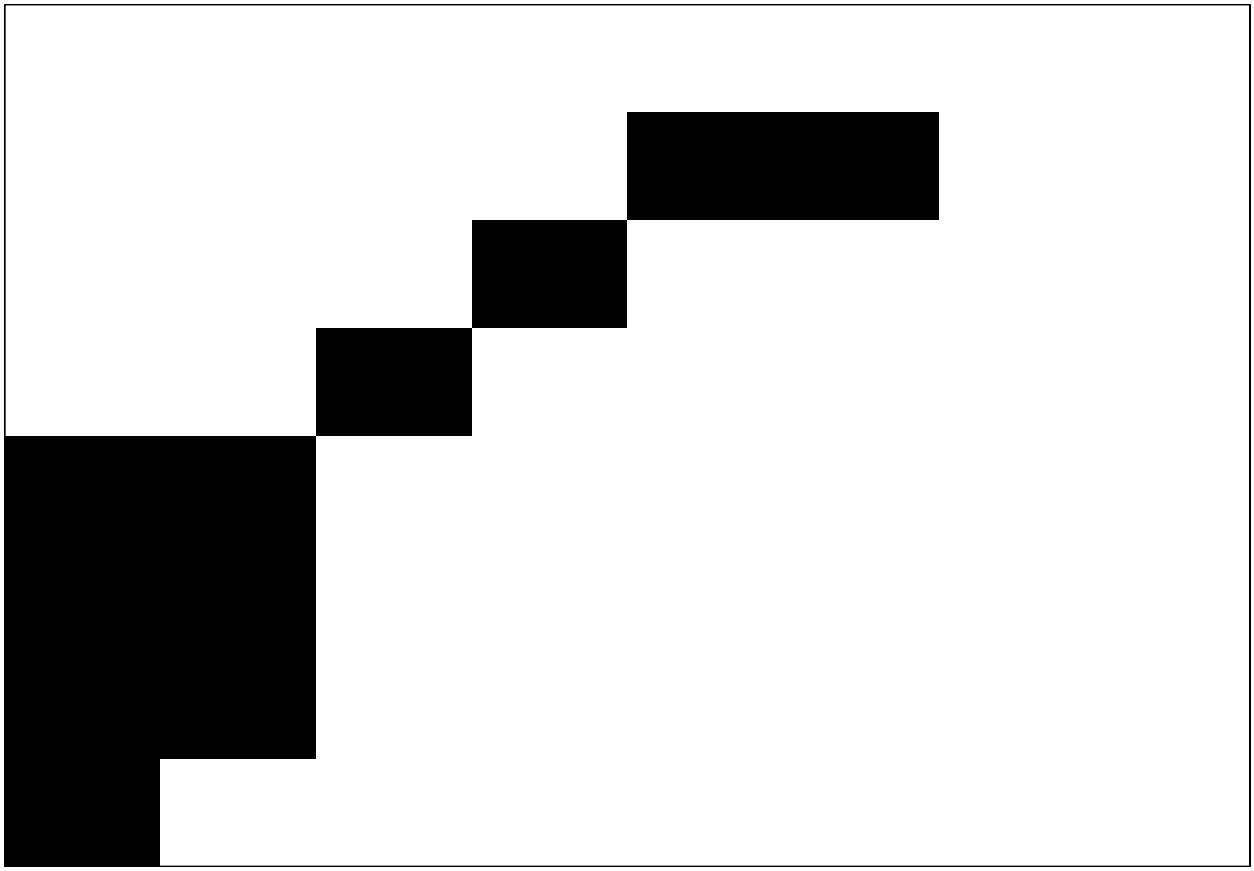
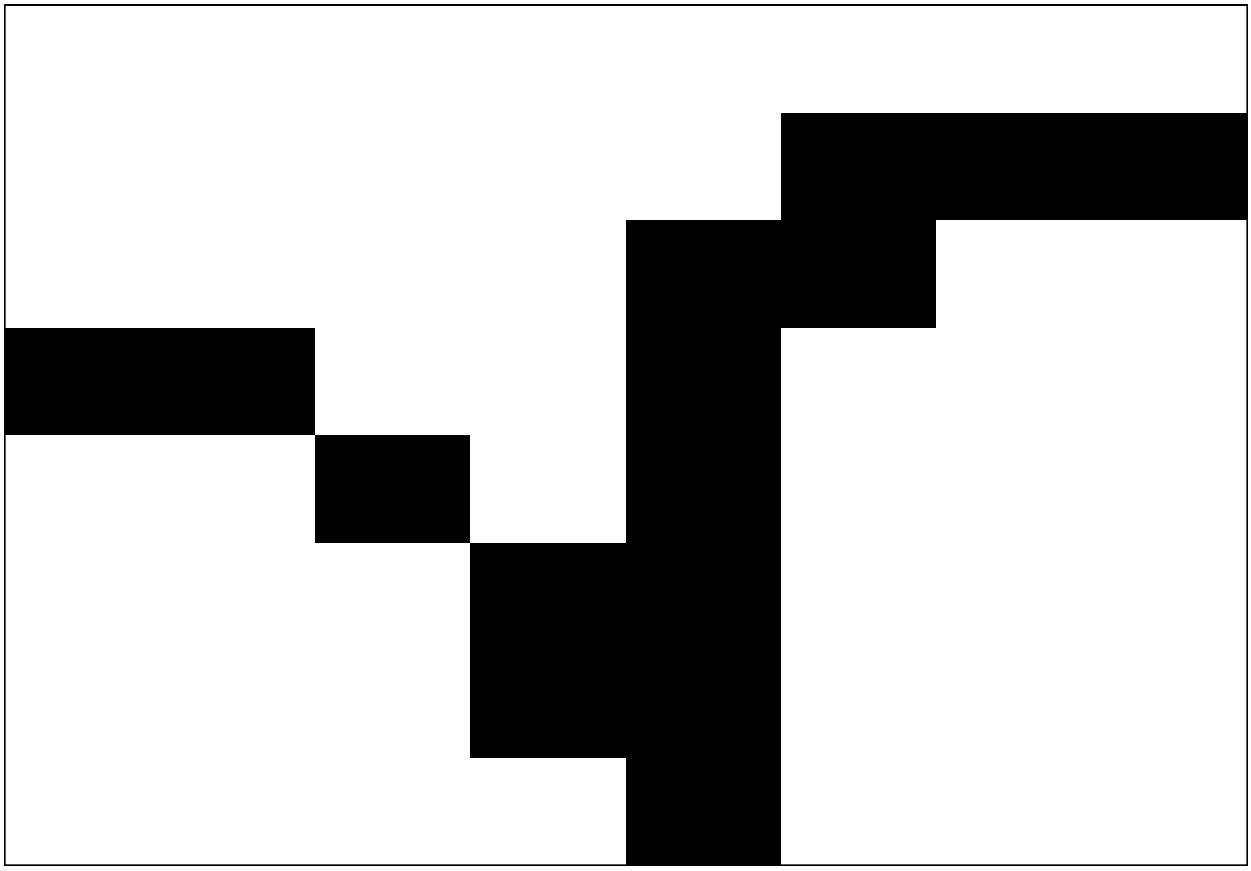
Lab 9

Alice Chang

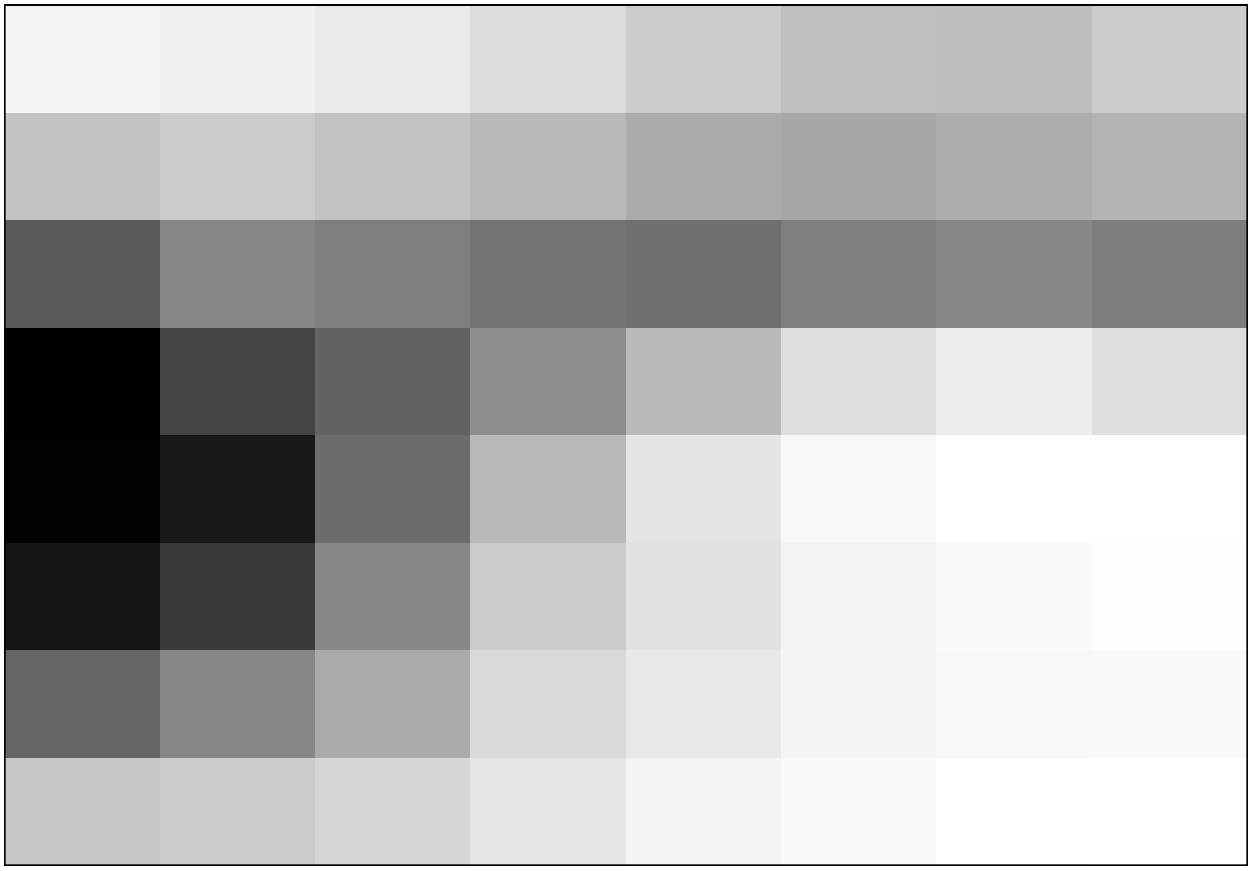
The Letter "R""

```
##
## Attaching package: 'dplyr'
## The following objects are masked from 'package:stats':
##
##     filter, lag
## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```





```
##          V7          V8          V9         V10         V11         V12
## 0.034044145 0.043771044 0.059857838 0.094276094 0.135428358 0.168350168
##         V13         V14         V23         V24         V25         V26
## 0.173213618 0.133183689 0.155256266 0.136924804 0.161242050 0.185185185
##         V27         V28         V29         V30         V39         V40
## 0.218481107 0.227459783 0.213617658 0.195286195 0.421623644 0.312383090
##         V41         V42         V43         V44         V45         V46
## 0.332585110 0.359895249 0.366255144 0.328469884 0.306771418 0.334829779
##         V55         V56         V57         V58         V59         V60
## 0.651328096 0.477740367 0.401421624 0.292181070 0.179199401 0.091283202
##         V61         V62         V71         V72         V73         V74
## 0.049382716 0.089786756 0.647586981 0.589973812 0.377104377 0.182192293
##         V75         V76         V77         V78         V87         V88
## 0.072577628 0.023943135 0.008978676 0.008978676 0.597081930 0.505050505
##         V89         V90         V91         V92         V93         V94
## 0.307145529 0.137673027 0.079685746 0.037411149 0.019453797 0.010101010
##        V103        V104        V105        V106        V107        V108
## 0.395061728 0.309764310 0.220351665 0.102506547 0.062850730 0.030677142
##        V109        V110        V119        V120        V121        V122
## 0.024691358 0.022072578 0.148522260 0.136924804 0.109240554 0.069210625
##        V123        V124        V125        V126
## 0.034418257 0.018331463 0.007482230 0.004863449
```



```
## [1] "sdev"     "rotation" "center"   "scale"    "x"
```

```
##                PC1          PC2          PC3          PC4          PC5
## V7   -0.1056118612  0.012692407 -0.034314841  0.009785277 -0.109912006
## V8   -0.1620147320  0.014496341 -0.074901391  0.112184367 -0.130018026
## V9   -0.2191983024 -0.026777965 -0.088971383  0.208349736 -0.117994180
## V10  -0.2667543422 -0.035092936 -0.103947142  0.218278677 -0.041799884
## V11  -0.2954818630 -0.056533345 -0.113924591  0.190083197  0.041664513
## V12  -0.3051091418 -0.065125185 -0.137349954  0.115955520  0.127347341
## V13  -0.2886983419 -0.071447199 -0.140089047  0.058941714  0.154902572
## V14  -0.2242279619 -0.061286367 -0.072995414  0.027244949  0.121064130
## V23  -0.1509629571 -0.020766913  0.038341286 -0.031203260 -0.077634488
## V24  -0.1762429421 -0.009158515  0.075748955  0.046536978 -0.076589998
## V25  -0.1669283397 -0.068625776  0.143700441  0.004900718  0.055801387
## V26  -0.1362956981 -0.100404831  0.157094793 -0.169226528  0.105256193
## V27  -0.0891224194 -0.071889380  0.174915606 -0.302792472  0.036003112
## V28  -0.0437924363 -0.055175387  0.209052561 -0.346216761 -0.100556500
## V29  -0.0339914893 -0.036521485  0.203161248 -0.323289948 -0.180649670
## V30  -0.0462228744 -0.051168650  0.156205520 -0.258904905 -0.196406688
## V39  -0.0731970574 -0.067086840  0.103569546  0.015465468 -0.067669766
## V40  -0.0960508840 -0.048337003  0.107559201  0.053300302  0.067522167
## V41  -0.0024794119 -0.069522104  0.038448728 -0.058880121  0.057622986
## V42   0.1140581808 -0.027963925 -0.081936192 -0.097849190  0.028105784
## V43   0.1777074956  0.065208294 -0.124245369  0.024808483  0.010696977
## V44   0.1897839422  0.109757948 -0.093905353  0.130863114 -0.011204286
## V45   0.1974678493  0.089508434 -0.089334139  0.168203378 -0.037140013
## V46   0.1873921954  0.025242414 -0.072578200  0.104021558 -0.079871150
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## V55   0.0522984593 -0.116622079  0.122892816  0.101755366 -0.052817434
## V56  -0.0061880309 -0.022099609 -0.012220000 -0.017515817  0.085282607
## V57   0.0715409567  0.030899392 -0.120245214 -0.086449840  0.059828508
## V58   0.0650326606  0.141852674 -0.077868791 -0.053353441  0.093773805
## V59   0.0289664791  0.210243920  0.062207367  0.024199968  0.088969907
## V60   0.0006084481  0.191282707  0.150298519  0.088726374  0.053326027
## V61   0.0178905690  0.102483416  0.085390662  0.091831266  0.001647301
## V62   0.0745715522  0.046711551  0.007942121  0.095444498 -0.008891433
## V71   0.0843774707 -0.211831721  0.194963120  0.169406480 -0.055473087
## V72   0.0489252623  0.009925284 -0.105305676 -0.078026564  0.218182453
## V73   0.0008694379  0.173248251 -0.110853625 -0.143757380  0.151258339
## V74  -0.0489718871  0.252286299  0.034752309 -0.042184259  0.028273090
## V75  -0.0430032784  0.226938830  0.105788120  0.013826704 -0.029307590
## V76  -0.0230140459  0.145048054  0.125078667  0.053374311  0.057063628
## V77  -0.0021856762  0.087384414  0.077100857  0.041683346  0.069748797
## V78   0.0171087258  0.050153165  0.047442646  0.045296479  0.077905704
## V87   0.0830344414 -0.231084196  0.211027690  0.171823975 -0.049389957
## V88   0.0065817050 -0.037242322 -0.085804529 -0.124285501  0.226025774
## V89  -0.0497069373  0.169583891 -0.161481353 -0.182994568  0.092601887
## V90  -0.0772915161  0.250316623  0.040838418 -0.043618929 -0.084448397
## V91  -0.0658551814  0.246255445  0.177234867  0.040475723 -0.020499674
## V92  -0.0250557545  0.166146576  0.194857955  0.080849800  0.229147455
## V93  -0.0021085724  0.122459484  0.135339732  0.042078664  0.304652421
## V94   0.0131156625  0.077797012  0.076260525  0.009658874  0.276418420
## V103 -0.0156310355 -0.215958898  0.227127844  0.056113583 -0.038953089
## V104 -0.1032902626 -0.100931156 -0.007181127 -0.144216984  0.172264860
## V105 -0.1234258742  0.077666373 -0.148182964 -0.233166840  0.039725167
## V106 -0.1027663221  0.179363882 -0.067137689 -0.128634088 -0.204754437
## V107 -0.1105492758  0.231222871  0.063915617  0.012154812 -0.260162072
## V108 -0.0766911436  0.168484711  0.201593524  0.089610583 -0.033456403
## V109 -0.0435243041  0.128780900  0.260233451  0.070900579  0.164804282
## V110 -0.0248104422  0.109733283  0.241265320  0.046823530  0.203610540
## V119 -0.1211253607 -0.150135238  0.142613495  0.051310841  0.036710955
## V120 -0.1733243857 -0.092892600 -0.028758725 -0.027196769  0.170629191
## V121 -0.1792013981  0.022850667 -0.136215182 -0.099566208  0.058837467
## V122 -0.1529881874  0.112176727 -0.111836840 -0.082854085 -0.127710628
## V123 -0.1251572524  0.159693642 -0.025490104  0.010776232 -0.223430994
## V124 -0.1058884450  0.146088555  0.040032434  0.077078540 -0.177300568
## V125 -0.0734336186  0.102794012  0.060367315  0.096435570 -0.090204341
## V126 -0.0532808184  0.062066270  0.099701995  0.085957600  0.053637529
##                PC6          PC7           PC8           PC9         PC10
## V7    0.0078822725 -0.099878989  0.1425828618 -0.0994003294  0.176761490
## V8   -0.0104335163 -0.128495567  0.1318034847 -0.2227961034  0.026044152
## V9    0.0001858966 -0.101632007  0.0813436681 -0.2218236118 -0.019556860
## V10  -0.0310662904 -0.052432934  0.0041214586 -0.1352636404 -0.080667315
## V11  -0.0508694978  0.019923307 -0.0511953372 -0.0450557777 -0.046069501
## V12  -0.0622613389  0.088958127 -0.0943528803  0.0285311596  0.047017965
## V13  -0.0359912230  0.110751483 -0.0937574446  0.0756931698  0.127156518
## V14  -0.0045873552  0.090771590 -0.0379009626  0.0673270619  0.257859098
## V23   0.0739014312 -0.203206521  0.1736437266 -0.0221601032  0.166918500
## V24   0.0446984429 -0.170800257 -0.0276494970  0.0089067872 -0.109769610
## V25  -0.0134562796 -0.046861589 -0.1270508750  0.1868040678 -0.100038275
## V26  -0.0637271575  0.056954361 -0.1106854871  0.2057772811 -0.042787171
## V27  -0.0950517986  0.088079314 -0.0889074578  0.0234814965  0.051917572
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## V28  -0.0405591280 -0.037427675 -0.0256781925 -0.1218654706  0.050931569
## V29  -0.0021290530 -0.078650519  0.0443257407 -0.1759458247 -0.032988244
## V30   0.0108566639 -0.032288028  0.0727690562 -0.1824049554 -0.032516163
## V39   0.0879662623 -0.305782531  0.1935762777  0.0937862097  0.141845186
## V40  -0.1049163851 -0.060788142  0.0135915444  0.2662422832 -0.178975783
## V41  -0.3123833426  0.125649466  0.0896479487  0.1629686169 -0.143618204
## V42  -0.3343275078  0.048373060  0.1051591790 -0.0563829752  0.066895010
## V43  -0.2412766792 -0.102436740  0.0004800191 -0.0681454673  0.207530613
## V44  -0.1612618337 -0.233031136 -0.0566994824  0.0658405318  0.103772266
## V45  -0.1323935042 -0.248952320 -0.0722437817  0.1356597289  0.026352772
## V46  -0.1310177804 -0.195062476 -0.0585365665  0.0879215207 -0.018122318
## V55   0.1083871008 -0.220840406  0.2198619545  0.0988511572  0.110469193
## V56  -0.1444299543  0.080193726  0.0358470859  0.1661242179 -0.302853297
## V57  -0.1476364230  0.132206265 -0.0584428817 -0.2544464593  0.027075587
## V58   0.1388636706  0.053607939 -0.2212262532 -0.2213488751  0.245416136
## V59   0.2859928156 -0.025918268 -0.1533324995  0.0222951540  0.106367736
## V60   0.2847158259  0.033090159 -0.0431570228  0.0261641255 -0.141031653
## V61   0.3220751533  0.175076294  0.0400463465 -0.0239070971 -0.185512606
## V62   0.2666232256  0.171063340 -0.0084103096 -0.0616069309 -0.164423772
## V71   0.0465105040 -0.063088500  0.0943508744  0.0288636481  0.106041645
## V72   0.0067499133 -0.051847873  0.0182016169 -0.1407334251 -0.289821391
## V73   0.0012539606 -0.006436084 -0.1761691409 -0.2095227224  0.141919655
## V74   0.0883412055 -0.028800446 -0.1149430884  0.0788866905  0.170053270
## V75   0.0348041806  0.034150229  0.1243873709  0.1069344654  0.066933484
## V76  -0.0155501827  0.085120216  0.2979292775 -0.0793266962  0.010586792
## V77   0.0056998735  0.126249146  0.3122337335 -0.1046827366  0.014323825
## V78   0.0465029816  0.133877032  0.2928375421 -0.0481859210  0.034747776
## V87  -0.0103329244  0.073620733 -0.0848347920 -0.0456490243  0.152642073
## V88   0.0327489317 -0.249611052  0.0385970210 -0.1661773197 -0.218747711
## V89   0.0292771647 -0.097722371 -0.0021803872  0.0237222785  0.063549821
## V90  -0.0033941401 -0.012182096 -0.0826332810  0.1591501807  0.085674289
## V91  -0.0883936935 -0.023674994 -0.0272340907  0.0775432807  0.025943610
## V92  -0.1227636271  0.016896746  0.1331572418 -0.0327144085  0.072005999
## V93  -0.1291552943  0.095551026  0.2456563216 -0.0226727987  0.101269420
## V94  -0.0848351868  0.100482060  0.2462659240 -0.0005974935  0.133045847
## V103 -0.0547322394  0.108007876 -0.1399668588 -0.0884612537  0.187304307
## V104  0.0536404112 -0.248186178  0.0555495204 -0.0919196807 -0.117520237
## V105  0.0374473218 -0.144560029  0.1175842850  0.1044061510 -0.002600991
## V106 -0.0048385422  0.021146264  0.0197043281  0.1789883352  0.030141859
## V107 -0.1206881957  0.077368529 -0.0320610014  0.0164554950 -0.050273577
## V108 -0.1361488981 -0.104202313 -0.1498538257 -0.1358041254 -0.127975803
## V109 -0.0918028556 -0.223627238 -0.1885455114 -0.0512953787 -0.041480929
## V110 -0.0673523132 -0.213149428 -0.1379958168  0.0226200280  0.005097237
## V119 -0.0256371717  0.107531718 -0.1666307977 -0.0502062761  0.203689289
## V120  0.0680014412 -0.122702145 -0.0101224604 -0.0610742601  0.029069255
## V121  0.0524601573 -0.092206124  0.1019877948  0.0833617635  0.020727736
## V122 -0.0109384838  0.033106982  0.0760326773  0.1685757619  0.047220593
## V123 -0.1219052672  0.117826926  0.0453609375  0.0438356186  0.006043308
## V124 -0.2023087726  0.096498443 -0.0285309966 -0.1578525988 -0.122640793
## V125 -0.1475086213  0.009668640 -0.0281344652 -0.2395514468 -0.139876832
## V126 -0.0930575980 -0.090744641 -0.0501282940 -0.1713963713 -0.092786400
##             PC11          PC12          PC13          PC14         PC15
## V7   -0.033961134  0.2675561332 -0.1370731772  0.1783695622 -0.293534550
## V8   -0.203007379  0.0324261625 -0.1025205009  0.2045958238 -0.191814070
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## V9   -0.192274190 -0.0854084208  0.0098038493  0.1236193457 -0.028444229
## V10  -0.132520319 -0.1277743735  0.0261193461  0.0513066653  0.073654063
## V11  -0.062064367 -0.0835194137  0.0155024969  0.0010737818  0.079303829
## V12   0.053277825  0.0158408577 -0.0086417668 -0.0278433103  0.091522786
## V13   0.108196406  0.0787681159 -0.0746903973 -0.0376011173  0.059497775
## V14   0.196922376  0.1846970916 -0.0993808532 -0.0655229590 -0.005407509
## V23   0.123186711  0.2282797535 -0.0615217598  0.1034283455 -0.251642480
## V24  -0.099182226 -0.1648742444 -0.0875636194  0.0401842781  0.001444175
## V25  -0.005309169 -0.1611748542  0.0976463154 -0.0550158581 -0.005106025
## V26   0.103169175  0.0229744149  0.0648174501 -0.0669961364 -0.141781346
## V27   0.103842885  0.1003607840  0.0252912748 -0.0007056047 -0.115728132
## V28  -0.048201592  0.0000614784 -0.0415103422  0.0291679909  0.015736514
## V29  -0.161052141 -0.1048401540 -0.1095290874  0.0171820734  0.070369719
## V30  -0.155493475 -0.1231245040 -0.0911841751 -0.0107170385  0.052230769
## V39   0.168734144  0.1374226251  0.1877943644 -0.0266570149 -0.131385507
## V40  -0.109440144 -0.2076859158 -0.0633552896  0.0224722696 -0.105556787
## V41   0.023313305  0.0755832372 -0.0067458193  0.1176438320 -0.122883303
## V42   0.080338326  0.1856983420 -0.0525999542  0.1134155588  0.077994920
## V43   0.006242108 -0.0091637079 -0.1059736637 -0.0205274613  0.098965011
## V44  -0.004222830 -0.0652452274 -0.1990088286 -0.0664190556 -0.013565912
## V45   0.027592603 -0.0068275474 -0.1342948871 -0.0375681622 -0.105841320
## V46   0.046365745 -0.0446284019 -0.0645901475 -0.0567307862 -0.165923054
## V55   0.140278854  0.1038614913  0.2849942583 -0.0517595063  0.063757188
## V56  -0.061856175  0.0203652337 -0.2403443157  0.1844923493 -0.280040663
## V57   0.083253350  0.2097817420  0.0532473079  0.1540326816  0.121216488
## V58  -0.003536333 -0.1061955009 -0.0332618061 -0.0476858978  0.042363057
## V59  -0.132508003 -0.0488407327 -0.0961776418 -0.0844752796 -0.130576608
## V60  -0.025884156  0.1874566101 -0.0653871446  0.0176761556 -0.023218004
## V61   0.078162454  0.1911636005  0.0225464055  0.1108498250 -0.044501082
## V62   0.061748742  0.1699735399  0.0183445762  0.1302061973 -0.011642711
## V71   0.041818591  0.0164454785  0.1178954887 -0.0649449074  0.172180621
## V72   0.009251053  0.1546327697 -0.1510580299  0.0155606303 -0.107418949
## V73   0.048792008 -0.1061648275  0.1391296587  0.1124824142 -0.108495164
## V74  -0.047252330 -0.1260930987 -0.0526094216 -0.1063414287 -0.133840030
## V75  -0.053381627  0.0682389277 -0.2403898741 -0.1674160241  0.061012372
## V76   0.123520350 -0.0598653631 -0.1975375555 -0.0269921106  0.094086581
## V77   0.367006031 -0.3503055615 -0.1322044171  0.0416315517 -0.031553564
## V78   0.332312673 -0.3420461779 -0.1857648445  0.1060519667  0.010507830
## V87  -0.027379486 -0.0255634239 -0.0755774133  0.0062048658  0.099718079
## V88   0.036302667  0.0779636495 -0.1536595740 -0.2705148319  0.095564816
## V89   0.078333063 -0.1806512399  0.2284943557  0.1296749977 -0.201060511
## V90   0.051549208 -0.0493477204 -0.0259945455 -0.0224698990 -0.060454182
## V91  -0.050903553  0.1537444693 -0.1302434531 -0.0100300712  0.183359691
## V92  -0.215216545  0.0931272969  0.0781334112 -0.0191014210  0.094540107
## V93  -0.284589326  0.0114890045  0.1783279795 -0.0907823968 -0.090810191
## V94  -0.331686061  0.0124857327  0.1520299025 -0.1315720177 -0.116881746
## V103 -0.031129317 -0.0714569106 -0.1570839369  0.0168444575 -0.074178934
## V104  0.058583822  0.0574437426 -0.1565819224 -0.3145619487  0.123227714
## V105  0.034029113 -0.0972631467  0.2022658250  0.1149403171  0.082855784
## V106  0.015517897 -0.0153969845 -0.0025891480 -0.0449340506  0.035513544
## V107  0.065261571  0.1269322737 -0.0495167380 -0.1569823305 -0.002444308
## V108  0.169585585  0.0335214768  0.0630008883  0.0401737439 -0.017204125
## V109  0.129624454  0.0076461622  0.0291528670  0.3007949101  0.146591416
## V110  0.039325335  0.0423379174 -0.0153429900  0.3467003846  0.231972773
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## V119  0.028105743 -0.0347337015 -0.1402080422  0.0118802032 -0.249567123
## V120  0.077518770  0.0834359574 -0.2013537968 -0.2269094988 -0.018070409
## V121 -0.009604220 -0.0127385782 -0.0002495758  0.1313955282  0.196836643
## V122 -0.045070441  0.0333698898 -0.0403229619  0.1056467361  0.217899243
## V123 -0.005766919  0.1154856724 -0.0329108966 -0.0744938857  0.140816420
## V124  0.103344471  0.0281654610  0.1904072139 -0.2311931870 -0.035013829
## V125  0.165790033 -0.0395310609  0.2315074423 -0.2463807687 -0.165734808
## V126  0.115162239 -0.0101710478  0.1250920971 -0.0786134449 -0.129900081
##              PC16        PC17          PC18         PC19         PC20
## V7    0.1700468900 -0.23722302  1.809073e-01  0.041346553 -0.105785623
## V8    0.0014841912 -0.21806934  1.698928e-01  0.092019930 -0.070664532
## V9   -0.0764171323  0.02256539  9.066058e-03  0.003559746  0.059076046
## V10  -0.0573167478  0.12612002 -8.823458e-02 -0.058676231  0.076025659
## V11   0.0130867389  0.08864413 -1.086808e-01 -0.105500737  0.069304834
## V12  -0.0193810117  0.03215718 -7.416800e-02 -0.052481080  0.021177368
## V13  -0.0757309887  0.02563058 -4.054796e-02 -0.002254580 -0.034226623
## V14  -0.1034488379  0.01733939 -3.217071e-02  0.029522089 -0.080129799
## V23   0.0734869869  0.13823583 -3.188486e-02 -0.048745733  0.023351960
## V24   0.1861372528  0.10022322  8.490748e-05  0.344713430  0.155199579
## V25   0.3715622883  0.01459346 -1.329737e-01  0.104651800  0.028322220
## V26   0.2623614041 -0.05531050  1.545917e-02  0.053815466 -0.119714180
## V27   0.0368439770 -0.07448251  7.395155e-02  0.153484101 -0.136452526
## V28  -0.1141990722  0.01479953 -4.873700e-02  0.114225922 -0.042812437
## V29  -0.0676890844  0.03512825 -1.783540e-01 -0.053431922  0.019868672
## V30   0.0032463584  0.06655868 -1.834784e-01 -0.149945112  0.059394631
## V39   0.0781107523  0.21901668 -2.432787e-02 -0.044678035  0.102671774
## V40   0.0172986162 -0.11727368  8.990833e-02  0.254294765  0.076183871
## V41  -0.1761821045 -0.21817444 -6.088341e-02 -0.162802290  0.135687634
## V42  -0.2461052792 -0.03007062 -3.951920e-02  0.182283692  0.213892897
## V43  -0.0961291570  0.01381185 -7.305117e-02  0.308584331  0.113550865
## V44   0.0196408725  0.01011058 -1.241625e-01  0.122768316 -0.075004747
## V45   0.1317981015 -0.05578380 -2.183754e-01  0.020577072 -0.101365885
## V46   0.1631451607 -0.03484257 -2.593124e-01 -0.030877922 -0.072355616
## V55  -0.0749615107  0.14815410  6.815336e-02 -0.044863764  0.081670990
## V56  -0.1799383430  0.14598201  6.259787e-02 -0.027076758 -0.127755372
## V57   0.2661133371  0.12613817 -1.868365e-01 -0.040735117  0.096547669
## V58   0.1080807430  0.03518142  1.699736e-01  0.178124969 -0.140842804
## V59  -0.1303154305 -0.09181821  9.924445e-02 -0.144431459 -0.134385593
## V60  -0.0864120625 -0.09732937 -1.977442e-01 -0.086762749 -0.082816568
## V61  -0.0254343898 -0.05804526 -2.540991e-01  0.271300270  0.102106447
## V62  -0.0008423685 -0.02473916 -1.354631e-01  0.398051423  0.193664847
## V71  -0.1011032212 -0.06533783  7.331935e-02  0.102801571 -0.128783008
## V72   0.0810606027  0.41163780  1.857892e-01 -0.046013392 -0.138792682
## V73   0.1735936983 -0.02528470 -1.035199e-01 -0.033343417  0.090665578
## V74  -0.2321563012 -0.03744158  1.346198e-01  0.015383815  0.119754255
## V75  -0.0237694149  0.00554346 -2.167538e-01 -0.156044813 -0.013870429
## V76   0.1006984356 -0.05978948 -1.468085e-01 -0.010474313 -0.155438745
## V77   0.0474100153  0.01930403  3.740200e-02 -0.029784607 -0.021587032
## V78   0.0731053646  0.01226517  1.197719e-01  0.005661850  0.073469016
## V87  -0.0321724805 -0.06640931 -1.324413e-02  0.099566627 -0.156778115
## V88   0.0278762607  0.07906471  1.405943e-01  0.075691237 -0.031610748
## V89  -0.0189342175 -0.07948247 -1.300693e-01 -0.053404208  0.082617297
## V90  -0.1957175359  0.18920111  1.124234e-01  0.060987908  0.260019499
## V91   0.1118345378 -0.03592405  2.170626e-02 -0.184930138  0.176597092
```

```
## V92   0.0732512039 -0.02585784  6.835632e-03 -0.041059075  0.014452849
## V93   0.0361601095  0.08750586 -2.273499e-02  0.091922641 -0.044230807
## V94   0.0470332959  0.08223785 -5.240885e-02  0.165061519  0.028034184
## V103 -0.0047910139  0.08226608 -9.467075e-02  0.016240662 -0.019426544
## V104 -0.0378094028 -0.16676080  2.893545e-02  0.085847620  0.125219117
## V105 -0.0683195219 -0.17259113 -1.586756e-01  0.023550373 -0.102302397
## V106 -0.1355386513  0.30069550  2.984840e-02  0.208840186 -0.004366360
## V107  0.1388107663  0.02382008 -1.351581e-02 -0.005676663  0.092776219
## V108 -0.0146581241 -0.10760898  6.153697e-02  0.060890214  0.015883069
## V109 -0.0790961735  0.03457586  7.975508e-02 -0.016445029 -0.053723409
## V110 -0.0252935774  0.02067070  1.149441e-01 -0.049707522  0.014934734
## V119 -0.0272155853  0.13573801 -1.367920e-01  0.014916021  0.082712043
## V120 -0.0653819849 -0.19260385 -9.691136e-02  0.027577417  0.201791104
## V121 -0.0437450285 -0.25259039 -1.457365e-01  0.083437989 -0.217393087
## V122 -0.0155782898  0.15847308 -9.405916e-03  0.183323250 -0.402918141
## V123  0.2058531525  0.01821994  1.367434e-01  0.014271006 -0.097345641
## V124  0.0457602587 -0.17780015  1.769890e-01  0.023456153  0.002731667
## V125 -0.2002755322 -0.06078479 -1.396877e-02  0.064788790 -0.186188987
## V126 -0.2412832240  0.17675532 -3.147722e-01  0.044482973 -0.308903679
##              PC21         PC22          PC23         PC24         PC25
## V7   -0.025995928  0.229743156 -0.1700891466 -0.057157273 -0.041190925
## V8   -0.155016580 -0.027543255 -0.1157199488  0.130642151  0.100866566
## V9   -0.202470840 -0.111697710  0.0402007761  0.071805241  0.088602260
## V10  -0.154740901  0.050416832  0.0299593786 -0.030595300  0.003958687
## V11  -0.136050531  0.109941830  0.0101158266 -0.097531100 -0.061783274
## V12  -0.074592956 -0.019531975 -0.0077227086 -0.057552107 -0.083083618
## V13   0.001138077 -0.124992797 -0.0192344337 -0.019942110 -0.082940360
## V14   0.090229227 -0.201196122 -0.0198859886 -0.073735407 -0.144267512
## V23   0.141340758  0.133664916  0.2252383938 -0.053171284 -0.144225652
## V24   0.132586948 -0.254837244  0.0988042037  0.114437050  0.154161316
## V25   0.027407348  0.180823977 -0.0277063143  0.034455484 -0.061166506
## V26  -0.230430217  0.187908992 -0.0856865002  0.083606907 -0.095364622
## V27  -0.260358586 -0.198511036 -0.0189282810  0.179279365  0.146976643
## V28  -0.119079135 -0.164658960 -0.0002665824  0.044948345  0.141679034
## V29  -0.001660680  0.018887925 -0.0176313643 -0.074720866 -0.167883628
## V30   0.054543853  0.117952648 -0.0281499748 -0.189110657 -0.338470194
## V39   0.149913877  0.046345746  0.1288660466 -0.031827721 -0.001155228
## V40   0.241725214  0.019081796 -0.1432796961 -0.198549798  0.154366113
## V41  -0.197411334  0.196106031  0.0820527870 -0.268404208 -0.028568929
## V42  -0.074172962 -0.097458953  0.0110362968 -0.038202280  0.051391006
## V43   0.198841741  0.047008319 -0.0903654869 -0.103270067 -0.044619702
## V44   0.049186924  0.098299539 -0.0245837948 -0.085109899 -0.119043084
## V45  -0.182858023 -0.085975147  0.0851404976  0.017846693 -0.117069578
## V46  -0.333561494 -0.175249519  0.1304448445  0.062639068 -0.025453985
## V55  -0.078151509 -0.090540441 -0.1945800415 -0.087977049  0.112096291
## V56   0.247402845  0.043158055  0.0911267780  0.007518840  0.044948225
## V57  -0.014831599  0.176563113  0.2248638045  0.190629858  0.198195508
## V58   0.057774372  0.120377828 -0.0455215114 -0.049502976 -0.068625629
## V59  -0.035405547  0.041857632  0.2141772447 -0.202521829  0.142897831
## V60  -0.035379215 -0.152759489 -0.0156468459 -0.065028189 -0.052268232
## V61  -0.085652646 -0.056495922  0.0291745078 -0.146626998 -0.079050513
## V62  -0.065179717  0.168458442  0.0103806905 -0.057202856 -0.073619044
## V71  -0.081954930  0.041169577  0.0789590587 -0.127490115  0.111346695
## V72   0.059731023 -0.082624414  0.0865878397  0.010570913  0.014960277
```

```
## V73   0.023973905  0.056252426 -0.0768526738 -0.230498244  0.177266800
## V74  -0.159409474  0.098943327  0.0854421401  0.054249862 -0.101261682
## V75   0.021024717 -0.017244289  0.0907150831  0.118633463  0.339088785
## V76   0.066546677 -0.216001650 -0.2903123090  0.135275949 -0.222499493
## V77  -0.100292142  0.021142901  0.1140984639 -0.018339631 -0.026581544
## V78  -0.103415594  0.110289658  0.0505653656 -0.034677594  0.147609630
## V87  -0.003379109  0.135555539  0.2506889399 -0.058265793  0.079795224
## V88  -0.175061319 -0.053363482  0.0401564294 -0.281405974 -0.014328165
## V89   0.040685946 -0.229694543 -0.0884574788 -0.170079668  0.081397856
## V90  -0.119636898  0.177677243 -0.0146115495  0.243886623 -0.081535408
## V91   0.105978340  0.043012043 -0.0274304470  0.067397080  0.166755168
## V92   0.080962692  0.034915661 -0.2175424377  0.111486353 -0.079470833
## V93  -0.066527931  0.016690281  0.1265333108 -0.030461773 -0.081903639
## V94  -0.077581286 -0.060397792  0.2045076214 -0.040799492 -0.017774385
## V103  0.087211575 -0.001381272  0.1840557573 -0.082772910  0.068901127
## V104 -0.114549390  0.114709931  0.0347313732 -0.014559763  0.065454402
## V105  0.125527323 -0.043136804  0.1934299622 -0.067015449  0.049553827
## V106 -0.155029957  0.091542962  0.0229930790  0.045092718 -0.045464437
## V107  0.024522171 -0.026274625  0.0207211884 -0.175097108  0.190238849
## V108  0.076174329 -0.073425212  0.0814654408  0.018285903 -0.169878886
## V109 -0.054309428 -0.012804958  0.0653718135 -0.038899013 -0.062391985
## V110 -0.074356913 -0.044936230  0.0188649111 -0.049235698 -0.041688567
## V119  0.062303265 -0.230316422 -0.0699984814 -0.109843179  0.022072648
## V120  0.085727003  0.128308846 -0.0516628154  0.140392537  0.060133642
## V121  0.187234848  0.095984978  0.2597734099  0.162421360  0.050807425
## V122 -0.090956718  0.072109073 -0.0049915466 -0.077186730 -0.066728041
## V123 -0.042864788 -0.069839832 -0.0375034072 -0.422240190  0.165181622
## V124  0.114849237 -0.082349319  0.2025549791 -0.016325753 -0.197909107
## V125  0.151792324  0.012826353  0.1277998599  0.120192721 -0.001091390
## V126 -0.002560288  0.312150996 -0.3595445179 -0.008951219  0.291075832
##               PC26         PC27         PC28         PC29         PC30
## V7   -0.0095448634 -0.215091909  0.043582152  0.117835489  0.105149723
## V8   -0.0009759434 -0.045848254  0.013516759 -0.054984443 -0.057474465
## V9   -0.0307177060  0.052332578 -0.037862968 -0.074643519 -0.189485929
## V10  -0.0285469313 -0.001091173 -0.054160990  0.045242052 -0.063237992
## V11  -0.0955127807 -0.030662081 -0.035314033  0.002479454 -0.036064395
## V12  -0.1356314555  0.013987844 -0.003911528  0.051493556 -0.025223108
## V13  -0.1114492752  0.044611156 -0.011301553  0.099012760 -0.033751387
## V14  -0.0541306973  0.085117972 -0.029677874  0.128615359 -0.073243622
## V23   0.0079461357  0.097978778  0.062397948 -0.152308694  0.106701604
## V24   0.0813138096 -0.086167124  0.056189230  0.042103722  0.154577042
## V25  -0.0782335021 -0.311547452  0.013188334  0.108208448  0.043385383
## V26  -0.0999356574 -0.046906393 -0.083925926 -0.089966827 -0.057645377
## V27  -0.1782698683  0.092302584 -0.018286284 -0.038793182 -0.130664092
## V28  -0.1703242072  0.050710966 -0.100732844  0.144891546 -0.056028027
## V29  -0.1033058748  0.065702915 -0.102417150  0.102468922 -0.050486770
## V30  -0.0963875898  0.043835362  0.030884157  0.023839111 -0.076432610
## V39  -0.0328939268  0.222622867  0.118989240 -0.007072739 -0.079874487
## V40   0.0285406348  0.218597654  0.289207337 -0.020491023 -0.128763009
## V41   0.1295866515 -0.153953732  0.051776563 -0.120177615 -0.179209998
## V42   0.0197616886 -0.037640327  0.244638086  0.087314868  0.117343178
## V43  -0.2170536647 -0.101438176 -0.047467361  0.036954593 -0.034804688
## V44  -0.1520989502 -0.138834280 -0.166418383 -0.067600940 -0.100389436
## V45  -0.0356815315  0.105141731 -0.029508984  0.032718527 -0.100208111
```

```
## V46  -0.0065896181  0.209120415  0.097838407  0.140665027 -0.026703216
## V55  -0.0819910414 -0.174030000 -0.151673523  0.092322825 -0.246385867
## V56  -0.0313199171  0.127004978 -0.366244328  0.037333057 -0.164788687
## V57   0.1163896036 -0.062571134  0.016864966  0.068406723 -0.037120077
## V58  -0.0021942483  0.152531991 -0.070259991 -0.056781219 -0.279541893
## V59  -0.1103794431 -0.060793662  0.004370699  0.042993560 -0.003138911
## V60   0.1566556833 -0.004782203  0.222839018  0.126896352 -0.047259774
## V61  -0.0122043029  0.066848661  0.022934910  0.034070986 -0.172316706
## V62  -0.3007116960 -0.026100750 -0.134987003 -0.111281573  0.089497093
## V71   0.0878728736 -0.142974506 -0.166347525  0.058522456 -0.172354769
## V72  -0.0286935487 -0.228988440  0.013753702  0.191412831 -0.136157828
## V73   0.1922001287  0.075137047  0.072809526 -0.134439924 -0.213699086
## V74  -0.0123019868 -0.130559974  0.070526803  0.221077262  0.147417307
## V75  -0.2147917257 -0.234209438 -0.005327722 -0.265784969  0.067942992
## V76   0.2902008087 -0.164306431 -0.121121702 -0.139311502 -0.031332242
## V77  -0.0716699000  0.115769529  0.019174808 -0.017223574  0.176294440
## V78  -0.1094472602 -0.004530337  0.069339856  0.178351774 -0.188070470
## V87   0.1850577212 -0.024761446 -0.019046026  0.063327819 -0.075174931
## V88  -0.0228469382 -0.186252937  0.218669894 -0.028257917 -0.017758624
## V89   0.0753385075 -0.101273679 -0.180719849 -0.031919296 -0.021829406
## V90   0.1170372991 -0.022346535 -0.010746319  0.188741718 -0.027111372
## V91  -0.1472078554  0.024971376  0.068363720 -0.049808164 -0.302092137
## V92  -0.0935084151  0.073974157  0.238298950  0.178925203 -0.147602487
## V93  -0.0294777567  0.193065678  0.014600483  0.032977227  0.152076408
## V94   0.1346125627 -0.065870920 -0.267136609 -0.044178948 -0.002702225
## V103  0.1603444027 -0.095109345  0.143387617  0.024772499  0.003427603
## V104  0.1617966365  0.144720040 -0.033459762 -0.082376618  0.044959019
## V105 -0.0297737916 -0.239962646 -0.003784517  0.084573239  0.027167442
## V106  0.2670572785 -0.067981795  0.056233570 -0.252337128 -0.126337913
## V107  0.1026650319  0.070698761 -0.167452851  0.123872231 -0.049184668
## V108  0.2400225286 -0.070680403 -0.123705581  0.266264777 -0.064614176
## V109  0.0056643558  0.059900557 -0.095279156 -0.124379559  0.143264711
## V110 -0.0720225377  0.019781795 -0.064889234 -0.252575282  0.156762392
## V119 -0.0077477166 -0.223642742  0.113155682 -0.142333004  0.043139113
## V120  0.2149140986  0.142592741 -0.262469770 -0.081144188  0.007577710
## V121 -0.0446007978  0.024650657  0.034760706  0.197598330 -0.076977417
## V122  0.1506976774  0.018710148  0.182034771 -0.142522921 -0.074190790
## V123 -0.0319273312  0.181673357 -0.180922608  0.108603701  0.308472609
## V124 -0.0580256007 -0.137635265  0.023637566 -0.030465741 -0.030702756
## V125 -0.2024083635  0.019740436  0.143015840 -0.295488524 -0.098338503
## V126  0.0461298887  0.034668888  0.017612731  0.177089228  0.222251133
##              PC31         PC32         PC33          PC34          PC35
## V7   -0.2746087926 -0.050687576 -0.004769182 -2.073297e-01  1.942926e-01
## V8   -0.0838280230 -0.033214361  0.084665087  1.638154e-01 -1.461675e-01
## V9    0.0762635464  0.030838640  0.031970733  1.266838e-01 -2.399060e-02
## V10   0.0682798597  0.088891251  0.002790190  1.701588e-02  1.540490e-01
## V11  -0.0007213390  0.064241692  0.118573025 -4.961117e-02  8.989842e-02
## V12   0.0066612381 -0.011622500  0.107789016 -7.898893e-02 -4.645238e-02
## V13  -0.0278967150 -0.109669313  0.021695736 -3.515047e-02 -7.432084e-02
## V14  -0.1494240371 -0.135329203 -0.188233011  1.288916e-02 -1.060952e-02
## V23   0.3109671218 -0.023934331 -0.049409116 -1.708161e-01 -1.353410e-01
## V24   0.1814932633  0.046488518 -0.112441142 -2.930789e-01 -3.171147e-01
## V25  -0.1255541495  0.171633721  0.035755942 -1.079903e-01  2.029708e-01
## V26   0.0399172412  0.070872367  0.259690853  8.310848e-02 -2.049699e-01
```

```
## V27   0.1495967621  0.005851354  0.087438925  7.624643e-02 -1.228710e-01
## V28  -0.0173881010  0.017657993 -0.165417560  7.751283e-02  2.611746e-01
## V29  -0.0969354571 -0.031728987 -0.042849169 -5.550289e-03  8.008276e-02
## V30  -0.0912528666 -0.093310342  0.125116562 -8.578727e-02 -2.789338e-01
## V39   0.0851786100  0.181561611  0.138771853  2.610924e-01  1.391873e-01
## V40  -0.1025007258 -0.262512270  0.095283353  1.655479e-01  1.112767e-01
## V41   0.2816424089 -0.100846806 -0.200749762 -3.007116e-02  2.197902e-03
## V42   0.0294513834  0.186712707  0.250015848 -2.189335e-01  4.129138e-02
## V43  -0.0556904132  0.112467402  0.234348127  2.417949e-02 -6.638301e-03
## V44   0.0014503391 -0.053865213 -0.003636266  3.030278e-01 -2.157946e-01
## V45   0.0040254743 -0.012188253 -0.121174357  6.843613e-02 -8.232272e-02
## V46  -0.0740573788  0.024836552 -0.103673956 -2.636677e-01  2.323208e-01
## V55  -0.0163355379 -0.018598987  0.050146414 -1.331145e-02  7.424965e-02
## V56  -0.0160351866  0.374696234  0.043346431 -1.224472e-01 -1.407685e-03
## V57  -0.1460039103  0.020306796  0.005984384  2.052966e-01 -2.050797e-01
## V58   0.2461343888  0.003929709  0.052670441 -3.179622e-01  1.047063e-01
## V59   0.0153401876  0.036150599 -0.039380746  2.188455e-02 -6.189637e-02
## V60  -0.1229754173  0.097925312  0.238918634  8.715157e-02 -1.756202e-01
## V61  -0.1109016134  0.127719328  0.168340893 -1.047585e-01 -1.924034e-03
## V62   0.1379815103 -0.090895161 -0.324844843  1.713328e-01  1.364861e-01
## V71  -0.0846967425  0.041178356 -0.039306087 -1.753849e-01 -2.006040e-01
## V72  -0.0871123108 -0.089060768 -0.031442615  7.322094e-02  1.134324e-01
## V73   0.0162948845  0.052389487  0.050417892  3.046759e-02  1.064992e-01
## V74   0.1852954253  0.251387500  0.100032119  8.703200e-02  5.788966e-02
## V75  -0.0269824510 -0.076320081  0.134723926 -7.728967e-02  1.103765e-01
## V76   0.2667233209  0.111885001  0.072286925  1.121316e-01  1.733854e-01
## V77  -0.1487277798 -0.107005127  0.012119496 -3.130240e-02  7.347126e-02
## V78  -0.0163188073  0.067747347 -0.068214868  6.154629e-03 -1.881370e-01
## V87  -0.0717565291  0.093919009 -0.038409730  4.433882e-03 -1.274267e-05
## V88   0.0715465952 -0.068023775 -0.008302697 -1.601126e-03 -5.484873e-03
## V89  -0.1617696546  0.158882283 -0.119448655  1.821823e-02 -5.964293e-02
## V90  -0.0916092549 -0.123413295 -0.012657061  1.154969e-01 -2.717525e-02
## V91   0.0086303486 -0.041555491 -0.104145899 -1.761062e-01 -3.758283e-03
## V92   0.0310418350  0.255350214 -0.356719952  1.442247e-02 -1.042597e-01
## V93  -0.1565834672 -0.068113888 -0.076986943  3.693528e-05 -7.209718e-02
## V94   0.0408204652 -0.203588938  0.173423306 -4.083558e-02  7.899457e-02
## V103 -0.0206306634  0.108484644  0.001151800  2.103605e-01  1.886693e-01
## V104 -0.0064131041  0.181329411 -0.047697970  9.100778e-02  1.641824e-02
## V105 -0.0348750322 -0.003961997 -0.126206666 -2.925068e-02 -1.025858e-01
## V106 -0.2000017872 -0.013577162 -0.088577224 -8.955434e-02 -1.197349e-02
## V107  0.0530410454 -0.189121002  0.050164213 -2.027711e-02  4.873840e-02
## V108  0.0836387638 -0.264081061  0.056241383  2.277282e-02 -8.816321e-03
## V109 -0.1124181063 -0.083078680  0.057287184 -3.912269e-02  3.481875e-02
## V110 -0.0648054085  0.068209597 -0.006017836  3.276303e-03  5.969987e-02
## V119  0.0177818793 -0.033606158 -0.157408822  7.904950e-02 -6.424028e-02
## V120 -0.2490246709  0.069644153 -0.138221732 -3.482987e-02 -1.320494e-02
## V121  0.1930086411 -0.140483366  0.108613945  9.412300e-02  1.574085e-01
## V122 -0.0752179165  0.116450486 -0.153166558  6.605842e-02  4.055960e-02
## V123  0.0200540428  0.179535616  0.022988487  1.462223e-01 -7.396895e-02
## V124 -0.0008866239  0.228062194 -0.157226297  7.634004e-02  6.195763e-02
## V125 -0.1956663763  0.009020405  0.067795995 -7.031205e-02 -9.791453e-03
## V126  0.1814603487 -0.057678326 -0.072996808 -7.448221e-02 -8.388919e-02
##               PC36          PC37         PC38          PC39        PC40
## V7    0.1067360205  0.0171652671  0.075371678  0.0046266849 -0.04994694
```

```
## V8   -0.1402037060 -0.1292366297  0.018042067 -0.1133291219 -0.04575783
## V9   -0.0004086202  0.0194221737 -0.004539568 -0.0161242648  0.08230702
## V10   0.1100461604  0.0407618629 -0.020593973  0.0418637293  0.11537479
## V11   0.0531651360  0.0028603332  0.003285419  0.1090534567  0.01874245
## V12   0.0762813120 -0.0091661762  0.068546651  0.1140537618 -0.06615334
## V13   0.1065839996  0.0409731252  0.100736037 -0.0007150422 -0.08189556
## V14   0.1102632361  0.0753291562  0.092331063 -0.1369288998 -0.07604360
## V23   0.1559628743  0.0450835497 -0.059355039  0.1728680938  0.21349171
## V24  -0.0181826562  0.2334420193 -0.051114839 -0.0347804925 -0.28830054
## V25  -0.0152472350  0.1596107208 -0.021526399 -0.2369263596  0.05958580
## V26  -0.1392625819 -0.0290144041 -0.009187211  0.1526052378  0.06795073
## V27   0.0470905650  0.0572028502  0.038094014  0.0983554219  0.02717090
## V28   0.2600578677  0.1213664350 -0.119700259 -0.1313765963  0.09806020
## V29   0.0529937754  0.0960661729 -0.059722003 -0.0036638128 -0.04511143
## V30  -0.0843352496 -0.0941400291  0.105315405  0.1299953267 -0.21864932
## V39   0.0305683895  0.0175923000  0.067687686 -0.1549767102 -0.03565111
## V40   0.3409686987 -0.1481040415 -0.056269388  0.2198770161 -0.14573470
## V41  -0.0090043863  0.1171729518 -0.252001095 -0.1471382811 -0.17302161
## V42  -0.1101870012  0.1497612429  0.044749051  0.1764569622 -0.02007625
## V43  -0.0429702942  0.0483206830 -0.054083401 -0.0973754326  0.16998593
## V44   0.0522151012  0.1307962438 -0.075888582 -0.0346944627  0.02722349
## V45   0.0385674491 -0.0172157054 -0.019778037  0.0497660541 -0.08392869
## V46  -0.0497829607 -0.1464477960  0.002801439  0.1081300010 -0.04309051
## V55  -0.1363580689  0.0313054305 -0.146840134  0.0323210109 -0.34314239
## V56   0.0141896448 -0.0983405953  0.231347106 -0.1953843862 -0.10055254
## V57   0.2881162356 -0.1470884518 -0.043691153 -0.1139494660 -0.31516575
## V58   0.0551924676 -0.2334083379 -0.209469161 -0.0190774169 -0.10878753
## V59   0.0010929380  0.2851026143 -0.027407435 -0.0135958295 -0.07834253
## V60   0.0880657727  0.1476144021 -0.094862440 -0.0314999932  0.07797288
## V61  -0.0087592435 -0.1795639657 -0.205085152 -0.1352058648  0.04769811
## V62  -0.0851102038  0.0314705182  0.259212115  0.2186626912 -0.08926685
## V71   0.1284006193 -0.1269429722  0.143501947  0.0593638167 -0.06742088
## V72  -0.1115761271  0.0128734449 -0.191948962  0.3608532249 -0.02975817
## V73  -0.0063497269  0.2590431556  0.197838151 -0.0146057498 -0.08732294
## V74   0.0726970932 -0.1778303754  0.013004757  0.0724756024 -0.25489120
## V75   0.1841494219 -0.0235057128  0.107938121  0.0519900735 -0.05435152
## V76   0.1198315331 -0.0383307162  0.024671813  0.1208552853 -0.10520479
## V77  -0.0796281463 -0.0109953050  0.050899950 -0.1281679671 -0.21436868
## V78   0.0273136516  0.1031318734 -0.089926511  0.0281454910  0.31864810
## V87   0.0435633021  0.0005376807  0.131561045  0.1749884397  0.03500535
## V88   0.0028728177 -0.1260089142  0.128905716 -0.2072114408  0.06140934
## V89  -0.0919176150 -0.0576986343  0.137983984  0.2241263431  0.03851151
## V90  -0.0568832426 -0.0615067037  0.019707682  0.0306174422 -0.07987520
## V91  -0.2319826340 -0.0730320979  0.116051946  0.0554142544  0.04439806
## V92  -0.0006144439 -0.0419369793  0.065483781  0.0640757249  0.07389623
## V93  -0.1259303814 -0.0321776445 -0.048701834 -0.1031394827  0.01725922
## V94   0.0404590962  0.0692705554  0.027958657  0.0186443784  0.04825283
## V103 -0.2253911428 -0.0735888765  0.017304837  0.2184940235  0.04604435
## V104 -0.0571453816 -0.1215268523  0.264718011 -0.0598855352 -0.01612888
## V105  0.0847935735 -0.3137418408  0.006811485  0.1311167118  0.14386034
## V106  0.1020037708 -0.0892663493 -0.051392692 -0.0241795682  0.21281647
## V107 -0.1589625889 -0.1069181337  0.082310159 -0.0892237933  0.12116434
## V108 -0.0217513068  0.1220607395  0.228514052 -0.0199996400  0.13638903
## V109 -0.0375087328 -0.0076095242 -0.033594219 -0.0349007633 -0.02079588
```

```
## V110  0.0649106839 -0.1200032596 -0.125645333  0.0197517915  0.01677203
## V119 -0.2343448685 -0.3185735416 -0.100123616 -0.2434819831  0.02129410
## V120 -0.1117883755  0.1427072381 -0.402559898  0.1657984511 -0.01174205
## V121 -0.3290992914 -0.0866495206 -0.154179475 -0.0840513709 -0.04714969
## V122 -0.1907946546  0.2352816229  0.082164181 -0.0324786688 -0.16153044
## V123 -0.0694573701 -0.0629678097 -0.198075125  0.1274357613 -0.04757661
## V124  0.1781375271 -0.0400208598 -0.155202915 -0.0184435647 -0.04108185
## V125 -0.1230186207  0.0815807012 -0.019411304  0.0976741765 -0.09871016
## V126  0.0371964716 -0.0624471235 -0.040244397 -0.0236615099  0.02753561
##               PC41         PC42         PC43          PC44         PC45
## V7   -0.1369876639 -0.024104276 -0.031091024  0.0541955651  0.281580326
## V8    0.1543521654  0.124049638  0.092856567  0.1301279285 -0.217998193
## V9    0.0923607355 -0.042204063 -0.079265190 -0.0919550770 -0.083858621
## V10  -0.0481347902 -0.012476549 -0.055848753 -0.1128635966 -0.018711726
## V11  -0.0567191077  0.008975474  0.039252315 -0.0372750823  0.008172012
## V12  -0.0131188665  0.057482522  0.055006003  0.0759390982  0.123268901
## V13   0.0444980625  0.027432369 -0.018131835  0.1224905035  0.053868880
## V14   0.1380918845 -0.058937007 -0.036838779  0.1417716341 -0.141059069
## V23   0.0132740824 -0.291229830 -0.119455132 -0.2275843020 -0.200005636
## V24   0.0428335908  0.020603659 -0.095185806  0.1712973284  0.137197513
## V25   0.0813806074 -0.097989399  0.102862783  0.0141112626 -0.216308960
## V26   0.1051871191  0.062465195 -0.011816882 -0.0754348470 -0.157725220
## V27  -0.0050251495  0.031384157 -0.116232589 -0.0577186151  0.200935820
## V28   0.0060613643 -0.111628592  0.035648313 -0.0004961807 -0.069051954
## V29  -0.0451554318 -0.038736984  0.104755716  0.0057616898 -0.090613657
## V30   0.0244658575  0.103258826  0.009288997  0.0433737478  0.138148886
## V39   0.0094141530  0.321038318  0.172956215  0.2837701857  0.042918750
## V40  -0.0504573065 -0.019483592  0.039370087 -0.1144509203 -0.122154686
## V41   0.0505265311  0.060290705 -0.142131705  0.2027451433 -0.056450270
## V42   0.0029792380  0.074168777  0.280236413 -0.1140238103 -0.138946474
## V43   0.0861161263  0.037010868 -0.249580997  0.0197151110 -0.154253631
## V44   0.0003497374 -0.075826663 -0.067798121 -0.0275095965  0.106598851
## V45  -0.0846087607 -0.012589898  0.147619647  0.0060441837  0.110635196
## V46   0.0307308361  0.030971520 -0.002895055 -0.0164084882 -0.063454510
## V55  -0.0258800984  0.019426984 -0.054391514 -0.2509550671  0.065160584
## V56   0.0253856891 -0.011573981  0.088140320 -0.1545380483  0.114759317
## V57  -0.0702334403  0.009059694  0.075296248 -0.0337512898 -0.126317986
## V58  -0.1082658297  0.182765243  0.040529302 -0.0200591236 -0.088268996
## V59   0.0778096456  0.154100307  0.096504265  0.0568784644 -0.240091933
## V60  -0.0225544844 -0.084715187  0.149787408 -0.1761946479  0.034315631
## V61  -0.0605376319 -0.042586488 -0.342554544  0.1631475960  0.017301171
## V62   0.0726988659  0.076780388  0.216834493 -0.0629829598  0.013315716
## V71   0.1109698350 -0.176898590  0.071660967 -0.0799271566 -0.083300465
## V72   0.0704663570 -0.001262425 -0.118922201  0.1007350821 -0.163150005
## V73   0.2134208221 -0.204387709 -0.011828657 -0.1654466696  0.181586921
## V74   0.0694083551 -0.032014791  0.047986330  0.0367456760 -0.026864497
## V75  -0.0307661347  0.205593880 -0.226011450 -0.1345135997  0.069549326
## V76   0.1228379758 -0.116978514  0.138314573  0.1639365795 -0.090562237
## V77   0.1937025577  0.041043421 -0.155512571 -0.2087808807 -0.121846222
## V78  -0.2651135486  0.024967229  0.187602904  0.1328043433  0.155027212
## V87   0.1274352261 -0.086986413 -0.001905849  0.0901221247 -0.042905003
## V88   0.1422635656 -0.094010635  0.137793176 -0.0528086789  0.211929058
## V89  -0.0761242464 -0.031671811 -0.127067807  0.0979745613 -0.045591895
## V90  -0.1139218846 -0.357994533 -0.079379341  0.0213076738  0.043981229
```

```
## V91  -0.0727295670 -0.071822732  0.104724157  0.0605615888 -0.093211061
## V92   0.1250749167  0.049141284 -0.105275323 -0.0780333589  0.035115848
## V93   0.1575852673  0.028119360 -0.074811909 -0.0830105885  0.012008983
## V94  -0.3074369186 -0.045287312  0.168413891  0.1194789681  0.078946161
## V103  0.0464631445  0.098481459 -0.209574195  0.1024439192  0.237469113
## V104 -0.2854499703 -0.067430485 -0.236530952  0.0519628274 -0.157578293
## V105  0.0210278687  0.142908623  0.072800939  0.0285737006 -0.094902698
## V106  0.3265559915  0.186144545  0.110729413 -0.0470688353  0.147200209
## V107  0.1651790428 -0.066112659  0.057970680  0.1880746333 -0.068515149
## V108 -0.1216045328  0.368593775 -0.093708267 -0.2509751531 -0.076084972
## V109 -0.0372031756 -0.002242545  0.035776659  0.0441242179  0.020723352
## V110  0.0209174469 -0.049686848  0.011727594  0.1407336691  0.100665595
## V119 -0.2438216911 -0.034998922  0.212463895 -0.2586728193 -0.084703869
## V120  0.0798187814  0.174136262  0.152008446 -0.1288589527  0.059027433
## V121  0.1117340550 -0.188318264  0.052208687 -0.1342235407  0.224804825
## V122 -0.3700217051  0.082841845 -0.079501818 -0.0799421440 -0.139988597
## V123 -0.0162403960 -0.090512826  0.057152832 -0.0686134344  0.019574255
## V124 -0.0626146668  0.072241392 -0.055151614 -0.1494860277  0.168729224
## V125 -0.0630204055 -0.254450167  0.135611906  0.1996057741 -0.042386773
## V126 -0.0226870540  0.065502549 -0.009520313  0.0863374187  0.055219738
##               PC46         PC47          PC48         PC49          PC50
## V7    0.0086130397  0.229654058 -0.0422806700 -0.150133306 -0.1005666865
## V8   -0.0862788718 -0.298984966  0.0587849921  0.257686695  0.0865369119
## V9   -0.0194165132  0.075990015 -0.1503419248 -0.078888946  0.0300082165
## V10   0.0200043282  0.153058584 -0.0993493815 -0.105765889  0.0665708750
## V11   0.0250985669  0.076777292  0.0773272382 -0.070090469 -0.0924519219
## V12  -0.0246944733  0.026732724  0.1111522633 -0.008824719 -0.1259924769
## V13  -0.0698685334 -0.056383806  0.0752976624  0.064859978 -0.0383825542
## V14   0.0487509774 -0.161336821 -0.1501609300  0.170545311  0.1559906967
## V23   0.1088467008 -0.141079563  0.0932346149  0.052078878  0.0451520943
## V24  -0.0436616515  0.024764987 -0.0446976824 -0.058484564 -0.0584268530
## V25  -0.0264947486 -0.030986234 -0.0769661774  0.174594723  0.0720741683
## V26   0.0067539265 -0.065274741 -0.0098453863 -0.027390021 -0.0198310728
## V27  -0.0100518308  0.169726657 -0.0042644459 -0.144147407  0.0198623026
## V28   0.0121829134  0.049483200 -0.0374436294  0.003110992 -0.0220863111
## V29   0.0417107531 -0.113130194  0.0440614129 -0.026523980 -0.0579368733
## V30  -0.0219982148  0.019014267  0.0022091880  0.142305172  0.0153765726
## V39  -0.1476469233  0.092371977 -0.1161248452 -0.109402398 -0.1192541216
## V40   0.0972260324 -0.011492483  0.0551750256  0.010485736 -0.0157346815
## V41  -0.1231281901 -0.045277166 -0.1351968381 -0.089482785 -0.1291933778
## V42   0.0036613873  0.203912209 -0.0291558768  0.247863408  0.1040557889
## V43  -0.0775359353 -0.194732577  0.0415153052 -0.245179403 -0.2345138143
## V44   0.0450023395  0.241317478 -0.0464711966  0.052322437  0.1328756825
## V45   0.0795808812  0.159289210 -0.1132035494  0.158747828  0.0797142123
## V46  -0.1417635758 -0.249394608  0.1978973875 -0.071509091 -0.1112721872
## V55   0.0350438167 -0.089189084  0.1429315943  0.103612826  0.1320294474
## V56  -0.0554223587 -0.064672591  0.0498437357 -0.025926812  0.0626420961
## V57   0.1475716013 -0.051213860  0.1252477145 -0.110351599 -0.0883828095
## V58  -0.1550028062 -0.001907928 -0.2589158023  0.037406209 -0.0428347850
## V59  -0.0415748217  0.206249162  0.4329705494  0.058063145 -0.1561263039
## V60  -0.1386271784 -0.113175166 -0.3945131946 -0.074562978 -0.1790592607
## V61   0.0907455075  0.132428211  0.2262130160  0.048370405  0.2023451717
## V62  -0.0622975318 -0.097174586 -0.0844768587 -0.008446552 -0.0866223749
## V71   0.0394608476  0.024551018 -0.0906628403 -0.038149267 -0.2241806896
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## V72  -0.0309475716  0.129797081 -0.1284582327  0.116116177 -0.0738264202
## V73  -0.1577373711 -0.009651453  0.0693064954  0.129613155  0.1767856506
## V74   0.3957949665 -0.084323216 -0.1118262578 -0.136982108  0.1806385024
## V75  -0.1048475587 -0.158430278 -0.1031109215  0.121976975  0.0094743171
## V76  -0.0860970591  0.086356605  0.1518261543 -0.057077305 -0.0429409823
## V77   0.0007208197  0.187767523 -0.1076050155 -0.120245644 -0.0203007329
## V78   0.0567829531 -0.182218690  0.0490345433  0.125987371  0.0167775639
## V87  -0.1156263281  0.035171256 -0.0586014466 -0.033424552  0.0761452699
## V88   0.0258654661 -0.229887269  0.0642273901 -0.247733917  0.0945624490
## V89   0.2371609120 -0.104963264 -0.1730573657 -0.012614861 -0.3158198072
## V90  -0.4803459382 -0.044088347  0.0646949394 -0.017223460 -0.0252387987
## V91   0.0755845205  0.029743773 -0.1502407151 -0.061547871  0.0613909215
## V92  -0.0014602790  0.060949508  0.1952200809 -0.082812109 -0.0681827177
## V93  -0.0093409972  0.068167141 -0.1643449656  0.045811614  0.0329528231
## V94   0.0251271991 -0.112505735  0.0684963186  0.021613037  0.0243801345
## V103  0.0228402199 -0.156624434 -0.0004510756  0.024182147  0.0890618479
## V104 -0.0583359623  0.183149894 -0.0151737143  0.287513704 -0.1514974510
## V105 -0.3441088883  0.142791913 -0.0032345344 -0.149572874  0.3871794097
## V106  0.0980437672  0.095332630  0.0970682557  0.153824518 -0.2348133957
## V107  0.2479142554  0.125607671 -0.0302800639 -0.057802812  0.1054986376
## V108  0.0177751783 -0.030439013  0.1372980852 -0.087363774 -0.0192673163
## V109 -0.0208796143 -0.017045149 -0.0912948066  0.025266137  0.0171570013
## V110  0.0651734204 -0.051706357  0.1181678383  0.075345589  0.0001223564
## V119 -0.0467082065  0.180580698  0.0773252036 -0.030238122 -0.1240931858
## V120  0.0362586986 -0.067351480  0.0123386251 -0.205701257  0.1466441203
## V121  0.1210159584  0.019633597  0.0567402944  0.142014552 -0.2893400069
## V122  0.1229480787 -0.119647617 -0.0039434059 -0.159622803  0.1471286784
## V123 -0.2369317024 -0.048507411  0.0426699499 -0.024593992 -0.0593060365
## V124 -0.0215850879 -0.104135402 -0.0489256355  0.315666408 -0.0309175093
## V125 -0.0061702951  0.016881394  0.0837040106 -0.183615311  0.0065463070
## V126  0.0271374866 -0.049104103 -0.0315155485  0.143887951  0.0107354725
##              PC51         PC52         PC53          PC54          PC55
## V7   -0.077454326  0.010605744  0.002497030  0.1233428888  0.0347436372
## V8    0.050173392 -0.129529100 -0.078252206 -0.2231463681  0.0167657947
## V9    0.039353855  0.286551336  0.124253819  0.2118845436 -0.0271157019
## V10   0.059763026  0.027157980 -0.010432300  0.0907559065  0.0147751795
## V11  -0.056492686 -0.211505090 -0.131993276 -0.0441753500  0.0119662371
## V12  -0.043402827 -0.069292043 -0.054901450 -0.1340883938  0.0501913515
## V13  -0.041166110  0.009394529 -0.040475374 -0.0578910985  0.0009578322
## V14  -0.002430967  0.042623640  0.076682396  0.1564279978  0.0269907519
## V23   0.004957750  0.068297941 -0.090563817 -0.0963578504  0.0415673769
## V24  -0.101705288 -0.155050153 -0.035926679  0.1097149143  0.0325715657
## V25   0.100085566  0.350313853 -0.019083278 -0.2282500887 -0.0282905857
## V26  -0.036136608 -0.298408923 -0.060027143  0.3516473175 -0.0053991779
## V27   0.104531330  0.269141987  0.132997057 -0.1245725453  0.0699143709
## V28  -0.023182753 -0.086423019 -0.130860064 -0.0919951516  0.0125555243
## V29  -0.064959502 -0.355481588 -0.076486133  0.0595239321  0.0240257782
## V30   0.071364151  0.336349003  0.194435521  0.0008052701 -0.0864672849
## V39   0.153536232 -0.118516778  0.089569079 -0.0285004934 -0.1138303821
## V40   0.038817531  0.055202716  0.001697531  0.0565095292  0.0123300453
## V41  -0.070304729  0.028699091 -0.011539852 -0.0966224230 -0.0334034710
## V42   0.166946921 -0.003301389 -0.156495304  0.0867148668 -0.1134854970
## V43  -0.118448876  0.097989425  0.231036085  0.0669617479  0.1656850071
## V44   0.021863515 -0.121488372 -0.166315762 -0.0060784105 -0.0904427294
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## V45   0.042217339  0.015712581 -0.057438069 -0.1657255477  0.1189626456
## V46  -0.084170839  0.039891456  0.144882618  0.1324368361 -0.0696161244
## V55  -0.266966251  0.111115443 -0.175746700  0.0762605195  0.1445117751
## V56  -0.042864674  0.050813387 -0.070212565  0.0405180662  0.0236924995
## V57  -0.022329872  0.115656891 -0.106936614  0.0570074539  0.0671424680
## V58   0.003901241  0.072963063 -0.266943590 -0.0011238105 -0.0954320950
## V59   0.124243099  0.152078946 -0.053587500  0.1973471430  0.1144380205
## V60  -0.207190241  0.063449844 -0.085280316  0.0749999616  0.0888572296
## V61   0.189137243 -0.141756696  0.031978863 -0.1087493049 -0.0148627761
## V62  -0.071936023  0.064097378  0.006322655  0.0366573315 -0.0035451517
## V71   0.201189066 -0.111264265  0.169610615 -0.1138530456 -0.2157712960
## V72  -0.041077711 -0.079316233  0.232995450 -0.0887852569 -0.0906425882
## V73  -0.117183819 -0.197144999  0.271660389 -0.0557602424 -0.0665194150
## V74  -0.174588714 -0.050688878  0.228283779 -0.1620406100 -0.0187028134
## V75   0.028134260 -0.061520002 -0.012174644 -0.0818422084 -0.3103115802
## V76   0.009425894  0.079770746 -0.012119095  0.0630352420  0.0599531839
## V77   0.138772236 -0.085289731 -0.040432628 -0.0289889519  0.1829156451
## V78  -0.171935218  0.057039461  0.058449454  0.0375287679 -0.1154602365
## V87  -0.008310003 -0.076398720  0.039111727  0.0339821256  0.0214283269
## V88   0.258211009  0.014048568 -0.182121998  0.0388919889  0.0164391145
## V89   0.260068759  0.047038468 -0.230953564 -0.0066332388 -0.0401812812
## V90   0.247962429  0.020305243 -0.119995517  0.0911697300 -0.0974477076
## V91   0.173143040 -0.116988695  0.110591021 -0.0258305065  0.5097364226
## V92  -0.045125345 -0.021797355 -0.115248853 -0.1125038007 -0.2264816199
## V93  -0.111705916  0.019302416 -0.097886920  0.0622262049 -0.0307373843
## V94   0.064992395 -0.009590934  0.127005182 -0.0089315653  0.1367234739
## V103  0.002118040  0.101472059 -0.318171907  0.0034852760  0.1777179778
## V104 -0.296226723  0.060086009  0.002570659  0.0024514813  0.0778330707
## V105 -0.166459172 -0.003367295  0.004074115  0.0652953842  0.1001204232
## V106 -0.160931982  0.019237429  0.001502498 -0.1105609009  0.1974299419
## V107 -0.167771808  0.098813421 -0.107680979  0.2504224614 -0.3173788108
## V108 -0.012510430 -0.014492436 -0.020538988 -0.1990025119 -0.0485111516
## V109 -0.088034141  0.011980850  0.008872246 -0.0996870592 -0.0043935444
## V110  0.006321911  0.085710563  0.072699438  0.2228666347 -0.1199192729
## V119 -0.061918322 -0.079174776  0.182869556  0.0012755248 -0.1101005000
## V120  0.148001217  0.057894379  0.102451115 -0.0364363467 -0.1046119283
## V121  0.036779360 -0.012878156  0.042571834  0.0130090514 -0.0673169152
## V122  0.083737174  0.001846703  0.080278323  0.0646000862 -0.1235873131
## V123 -0.003628867  0.035706244  0.023975661 -0.2735198806  0.0615192614
## V124  0.180195703 -0.096580028  0.153329797  0.2914124195  0.0935341536
## V125 -0.194394782  0.060065620 -0.124926185 -0.1537124283 -0.0782462605
## V126  0.142918353 -0.003021420  0.110647252  0.1085371971  0.1579468662
##              PC56         PC57          PC58         PC59          PC60
## V7   -0.0949928851 -0.016439239 -0.0211323890 -0.023878996  0.0248103606
## V8    0.2347816081  0.026384208  0.0449584110  0.027541789 -0.0644479826
## V9   -0.3157618442 -0.080255388 -0.1188034735  0.075459592  0.1610773583
## V10  -0.0543037076  0.044706679  0.1204145112 -0.067388563 -0.2558881368
## V11   0.1304060780  0.079484932  0.0589846000 -0.118908900 -0.0058528948
## V12   0.2399501387 -0.036330891 -0.1573889763  0.078489800  0.0938715616
## V13   0.1260807390 -0.073216293 -0.0590390751  0.031145225  0.2092400121
## V14  -0.3428742760  0.006135287  0.1270960947  0.003067475 -0.2072907105
## V23   0.1187054162  0.003387239 -0.0319515234  0.013748827  0.0095801197
## V24  -0.0403838718  0.016914219  0.0569599260 -0.041508404 -0.0124359115
## V25   0.0069784610 -0.049621738 -0.0878755995  0.109841421  0.0215035503
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## V26  -0.2101483555  0.067673541  0.1533921499 -0.159727560 -0.0164632145
## V27   0.1554685806 -0.028677290 -0.2008380315  0.198307907 -0.1552860912
## V28   0.1392829979  0.057795209  0.3610473128 -0.306533725  0.2402771407
## V29  -0.1334215289 -0.061649119 -0.4778951980  0.276255681 -0.1457367221
## V30   0.0385480860  0.071950543  0.2519542318 -0.101997426  0.0578512377
## V39  -0.0051919889 -0.019091956  0.0022547437  0.025137269  0.0336329698
## V40  -0.0085441864 -0.008166496 -0.0363357119  0.007628557 -0.0012083394
## V41  -0.0272677884  0.010994355  0.0103631804  0.013140634  0.0003058284
## V42  -0.0735159602 -0.046011396  0.0088144631  0.038237501 -0.0017648426
## V43   0.1226521498  0.172830044 -0.0809537226 -0.136085131 -0.1013336347
## V44   0.0389245410 -0.383483443  0.1869612807  0.285208779  0.1517212630
## V45  -0.0333779763  0.427297490 -0.2070959106 -0.327078257 -0.1723789464
## V46   0.0278488162 -0.257449308  0.1288756354  0.131847105  0.0786073822
## V55   0.0350997536  0.110951039 -0.0123876517  0.079905425  0.0433182805
## V56   0.0039498748 -0.007812572  0.0044014868 -0.012142784  0.0035303623
## V57  -0.0629205839 -0.037525373 -0.0098589600 -0.005571611  0.0010181161
## V58  -0.0218403183 -0.013495043  0.0063657495  0.046320731 -0.0015922515
## V59  -0.0054268614 -0.013215367 -0.0605914176 -0.077087955 -0.0725220790
## V60   0.1902531614 -0.033857991  0.1051267082  0.070842466 -0.0457620515
## V61  -0.0967596139  0.001638708 -0.0286016436 -0.005731927  0.0441481299
## V62   0.0307992717 -0.032159993  0.0022803977 -0.006169712 -0.0109656166
## V71   0.0689266353 -0.311823656 -0.0822353132 -0.276364666 -0.1330317753
## V72   0.0527967725  0.013545741 -0.0197041548  0.005071048 -0.0026804448
## V73   0.0277148916 -0.023426312 -0.0254686395 -0.094967372 -0.0059024587
## V74  -0.0515979567 -0.043471134  0.0091211134  0.018489461  0.0751873382
## V75  -0.1395720029  0.106725135 -0.0560306145 -0.014131271 -0.0011642551
## V76  -0.0241224739 -0.041330561 -0.1133096747 -0.114013242  0.0824066466
## V77   0.1587252007  0.043249471  0.1632957148  0.127706197 -0.1207014443
## V78  -0.0737780951 -0.017719085 -0.0720744522 -0.061063970  0.0527965217
## V87   0.0102061516  0.489170368  0.0241204141  0.391962078  0.2726380242
## V88  -0.0776276501  0.100972870 -0.0296083125  0.019716234  0.0405160732
## V89  -0.0293998697  0.111417351  0.0014755341  0.116145392  0.1027329441
## V90   0.0303549395  0.062733284 -0.0659855670 -0.057845379 -0.0212005932
## V91  -0.0104749304 -0.129519563  0.0345296355 -0.016392014  0.1759477041
## V92  -0.0332017489  0.093943371  0.1782217138  0.154239673 -0.2638059342
## V93   0.0293976948 -0.071882018 -0.3338870712 -0.226484598  0.3417271527
## V94   0.0228317681  0.010013010  0.2568422729  0.157088550 -0.1981107944
## V103  0.0045051753 -0.265616392 -0.0205368190 -0.202630242 -0.1628670576
## V104  0.0076390042 -0.051831116  0.0118327827  0.025373353 -0.0204518236
## V105  0.0637035620 -0.060286755 -0.0212272099 -0.039319525 -0.0714841510
## V106 -0.1113759881 -0.009142194  0.0519432438  0.078314333 -0.0183585550
## V107  0.3218344409  0.068587676 -0.0561765790  0.036095742 -0.1519102884
## V108 -0.1710743306  0.014090133  0.0175640302 -0.074806397  0.2042673473
## V109 -0.0620618326 -0.074368657 -0.0632396584  0.050837383 -0.3089323872
## V110  0.0930046249  0.073139870  0.0672816645 -0.009737199  0.1704027245
## V119 -0.0007905984  0.072309268 -0.0070961384  0.041030715  0.0323445957
## V120  0.0833078425  0.006125480  0.0002109813 -0.027096806  0.0083535275
## V121 -0.1014277254  0.044391642  0.0519773229  0.023114688 -0.0079522063
## V122  0.1755249901 -0.001473981 -0.0291778795 -0.055460084  0.0432244674
## V123 -0.2794731389 -0.017328216  0.0661321476  0.029422489  0.0342987438
## V124  0.1998951457 -0.001316445 -0.0618998180  0.039352575 -0.0282630067
## V125 -0.1575526908  0.011699800  0.0709953105 -0.045750581  0.0216535771
## V126  0.0214376079 -0.006313417 -0.0096852039  0.044482405  0.0301473148
##               PC61         PC62          PC63          PC64
```
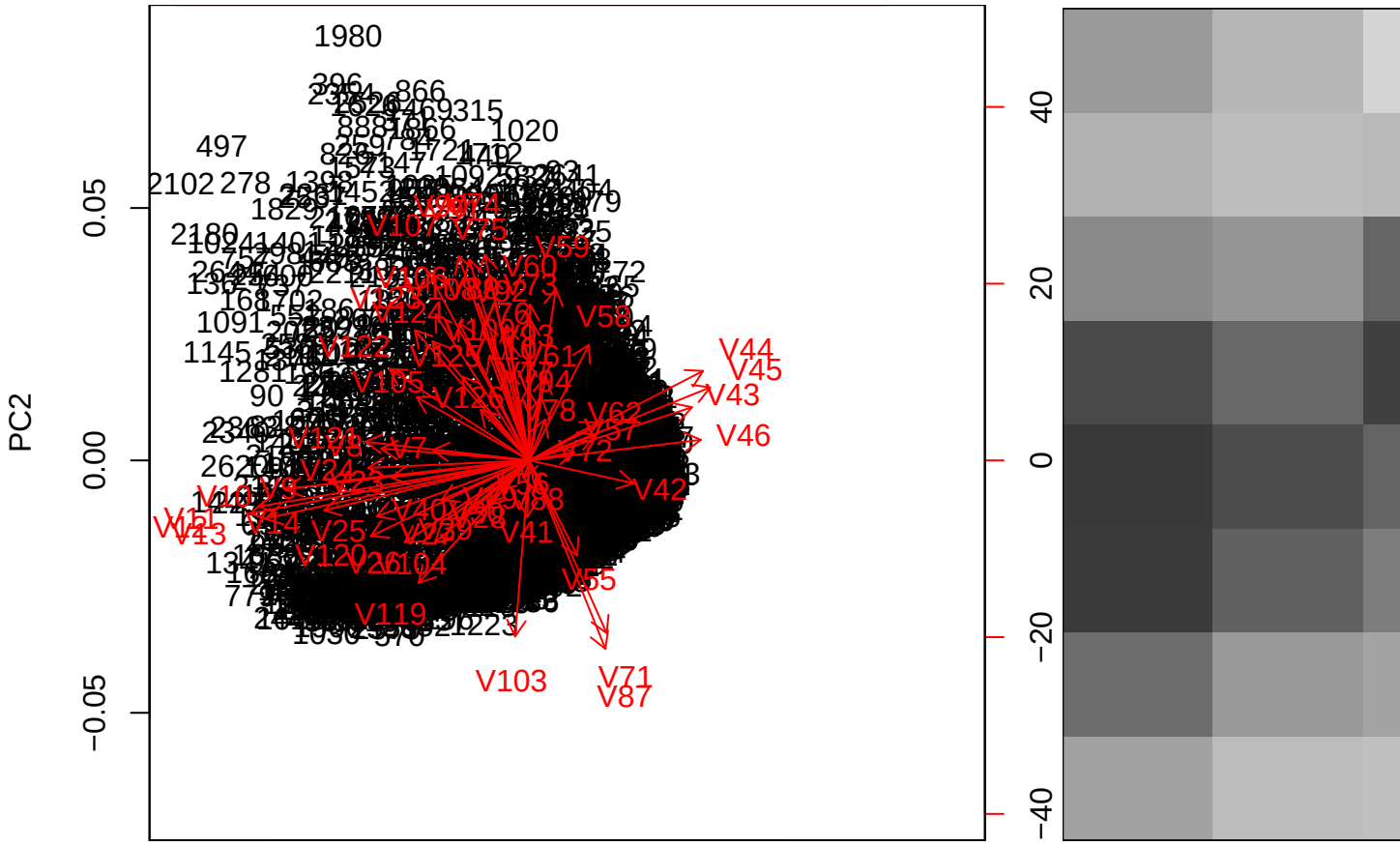
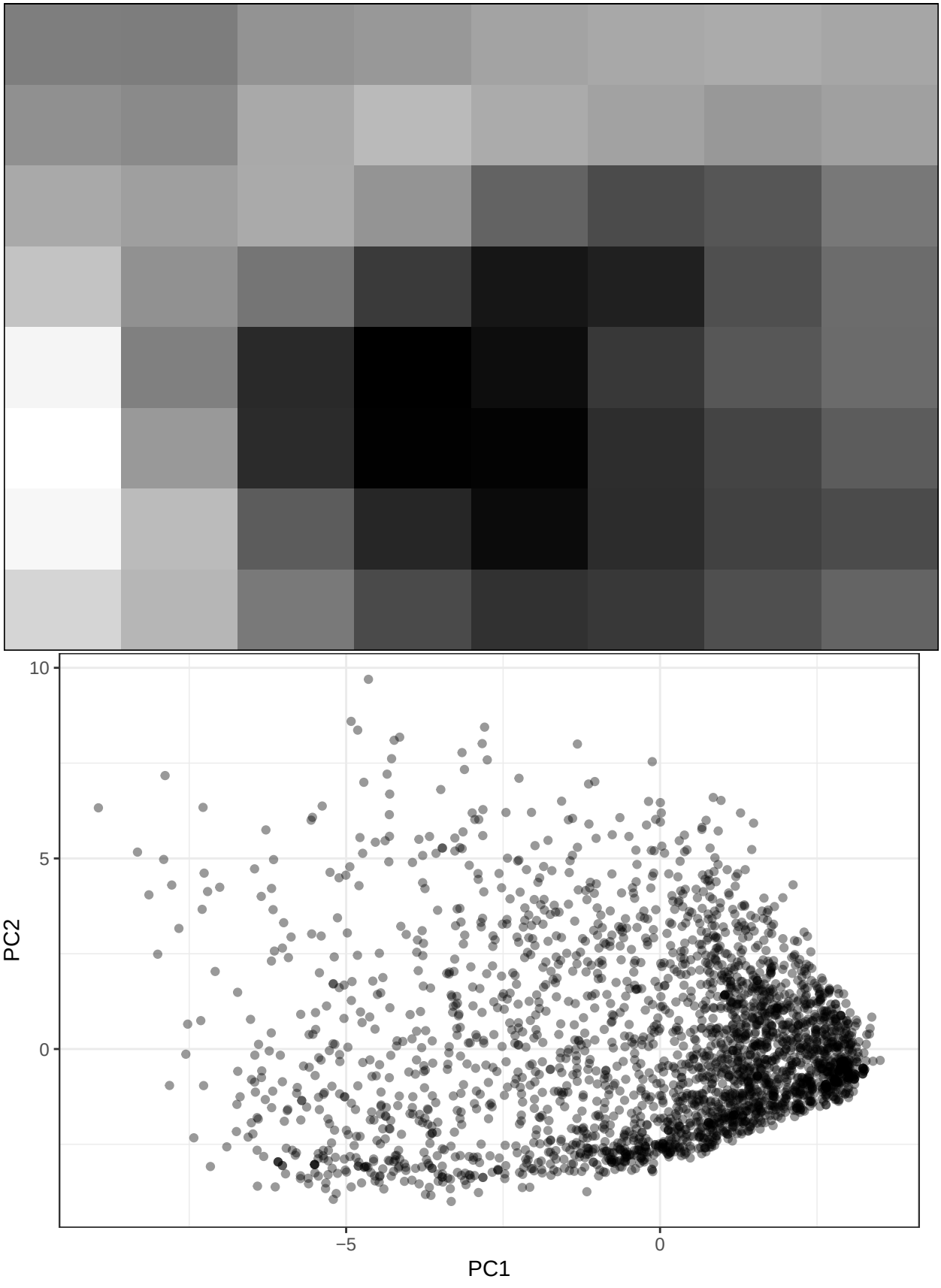
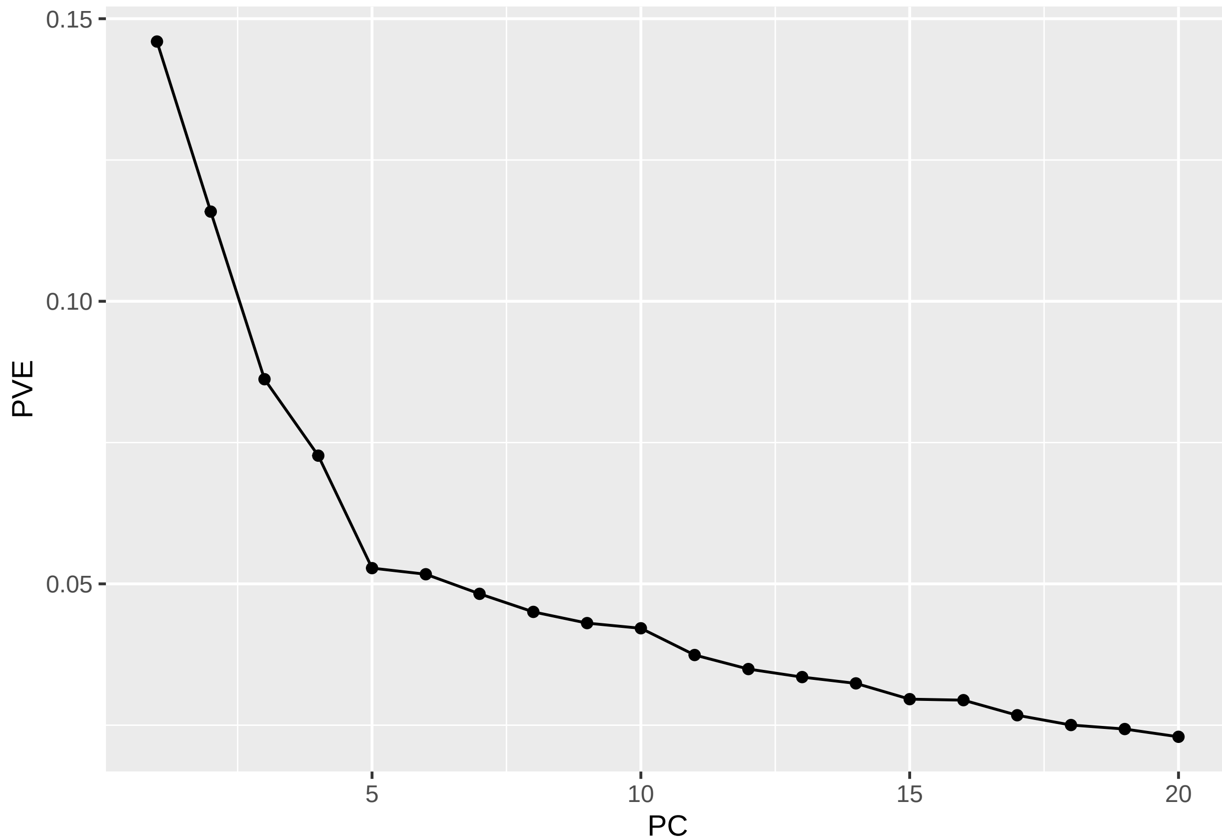

```
## V7    0.0103183697 -0.022215523  2.181837e-02 -0.0028390817
## V8   -0.0427094084  0.125375012  3.262104e-02  0.0185245546
## V9    0.0520322766 -0.451007439 -1.761053e-01 -0.0285845757
## V10  -0.0366042821  0.423053346  5.262245e-01  0.1688366685
## V11  -0.0474492681  0.200537408 -5.475366e-01 -0.4608166743
## V12   0.0352745493 -0.176750871 -1.306947e-01  0.6972783722
## V13   0.1008568104 -0.250002545  5.163405e-01 -0.4774308978
## V14  -0.1363377637  0.209232777 -2.352306e-01  0.0838022478
## V23   0.0263682141 -0.017017138  5.126720e-03  0.0064395183
## V24  -0.0107904237  0.042944913 -2.242474e-02  0.0049671947
## V25  -0.0693306169 -0.040997234 -7.131506e-03 -0.0158166432
## V26   0.0740488915 -0.113693750  1.046647e-01  0.0626709069
## V27  -0.1013742969  0.262872587 -8.966889e-02 -0.1054895314
## V28   0.1586298981 -0.111309646 -3.820945e-02  0.0945916568
## V29  -0.1795447011 -0.057641990  7.584339e-02 -0.0427508975
## V30   0.0898457989  0.066571321 -8.721622e-03  0.0022573872
## V39  -0.0008281702  0.018763615  7.997458e-03 -0.0115402702
## V40   0.0410937108  0.024292348 -6.488675e-03  0.0036469671
## V41  -0.0288858425  0.003116077  1.414886e-02  0.0057123092
## V42  -0.0088616362 -0.013367321  4.285336e-03 -0.0146815205
## V43   0.0165875691 -0.001544450  4.999797e-03 -0.0038178897
## V44   0.0129221920  0.094076920 -2.940296e-02  0.0170836840
## V45  -0.0980657922 -0.192605212  4.345807e-02 -0.0220784217
## V46   0.0576606377  0.108251048 -4.440507e-03  0.0040006997
## V55   0.0272406699  0.034698081  2.511129e-02  0.0070994211
## V56  -0.0117891122 -0.002895633 -1.676555e-02  0.0098561154
## V57   0.0240027148  0.045055602  1.375982e-02 -0.0007431937
## V58  -0.0647561147 -0.007841562  3.121346e-04 -0.0061992159
## V59   0.0578443396  0.044220679 -1.354732e-03  0.0088911427
## V60  -0.1120882322 -0.020162506  3.902341e-03 -0.0085445655
## V61   0.0552946381 -0.014606997  7.110821e-03  0.0074007998
## V62  -0.0017747848  0.010745742  7.017493e-03 -0.0131889935
## V71  -0.0933802246 -0.042008872  2.267253e-02 -0.0149862084
## V72  -0.0373715009 -0.030488024 -3.970186e-05 -0.0001016224
## V73  -0.0349733425 -0.022130977  2.394710e-02  0.0112889822
## V74   0.0086313638 -0.006121028  1.463885e-02 -0.0145790195
## V75   0.0306655555  0.014645254  1.307668e-04  0.0233585767
## V76   0.1173973252  0.122131522 -1.119281e-02  0.0074246389
## V77  -0.1412178842 -0.187117338  1.183619e-02 -0.0110344548
## V78   0.0527161074  0.075955452 -3.369083e-04  0.0024465502
## V87   0.1312627460  0.111399136  8.220839e-03  0.0084720868
## V88   0.0680278359  0.021680618 -3.615983e-03  0.0033263068
## V89   0.0697531735  0.069557979  2.295735e-02 -0.0026317620
## V90  -0.0162956284  0.015128029 -4.383257e-02  0.0194598767
## V91   0.0160681654  0.059212201  3.008648e-02 -0.0094946247
## V92   0.0070111051 -0.181610907 -4.217480e-03 -0.0247893989
## V93   0.0694618265  0.269175369  5.271970e-03  0.0337464000
## V94  -0.0683438660 -0.179417450  3.507681e-03 -0.0218147802
## V103 -0.0868494895 -0.117518500 -1.156774e-03 -0.0055034436
## V104 -0.0428310240 -0.004477661  3.480066e-03  0.0030128561
## V105 -0.0452053331 -0.059665235 -3.567078e-02 -0.0175899987
## V106 -0.0189991032  0.006084968  2.180591e-02 -0.0134851967
## V107  0.0223097174 -0.070482685 -3.177087e-03 -0.0052030311
## V108 -0.1685286740  0.039034685 -4.233345e-03  0.0280987826
```

```
## V109  0.6304568974 -0.004177545 -4.947581e-02 -0.0319009476
## V110 -0.5257205326 -0.024754774  5.137701e-02  0.0074750467
## V119  0.0255465611  0.028456507  3.280505e-02  0.0102345846
## V120  0.0253954079 -0.026512873 -6.291921e-03 -0.0074736795
## V121  0.0086699779  0.055808014  5.721768e-03  0.0008529752
## V122  0.0328560243 -0.041471291 -1.792796e-02  0.0177499413
## V123 -0.0554780102 -0.004528222  2.924178e-02 -0.0066278805
## V124  0.1177656625 -0.025885570 -1.857777e-02 -0.0336410211
## V125 -0.1149092469  0.012480483  6.851531e-02  0.0157470676
## V126 -0.0389429784 -0.054139719 -3.480831e-02 -0.0220864833
```




10
5
0
PC2
−5
0
PC1




```
## Warning in matrix(a, nrow = 8, byrow = TRUE): data length [63] is not a
## sub-multiple or multiple of the number of rows [8]

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```
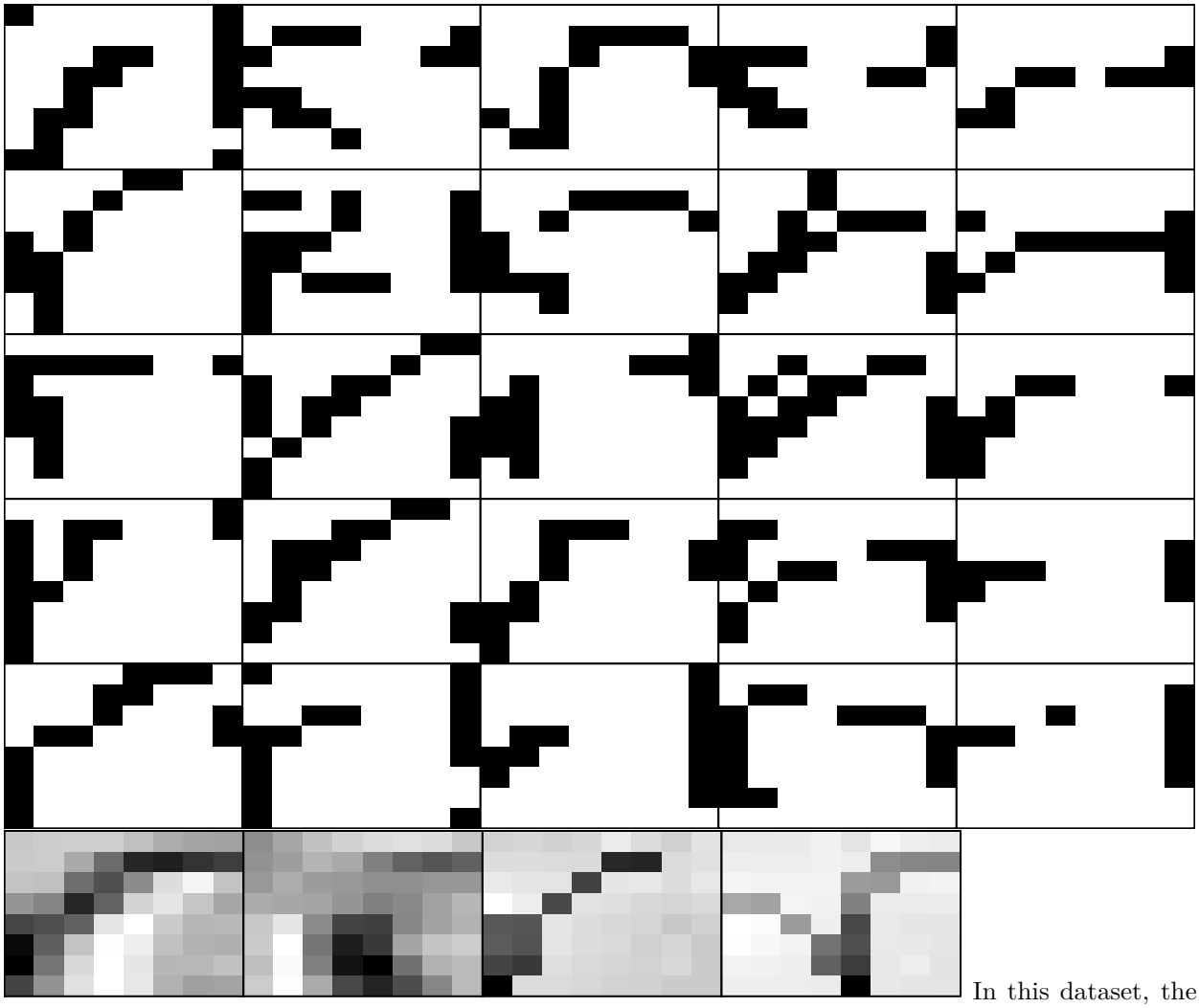



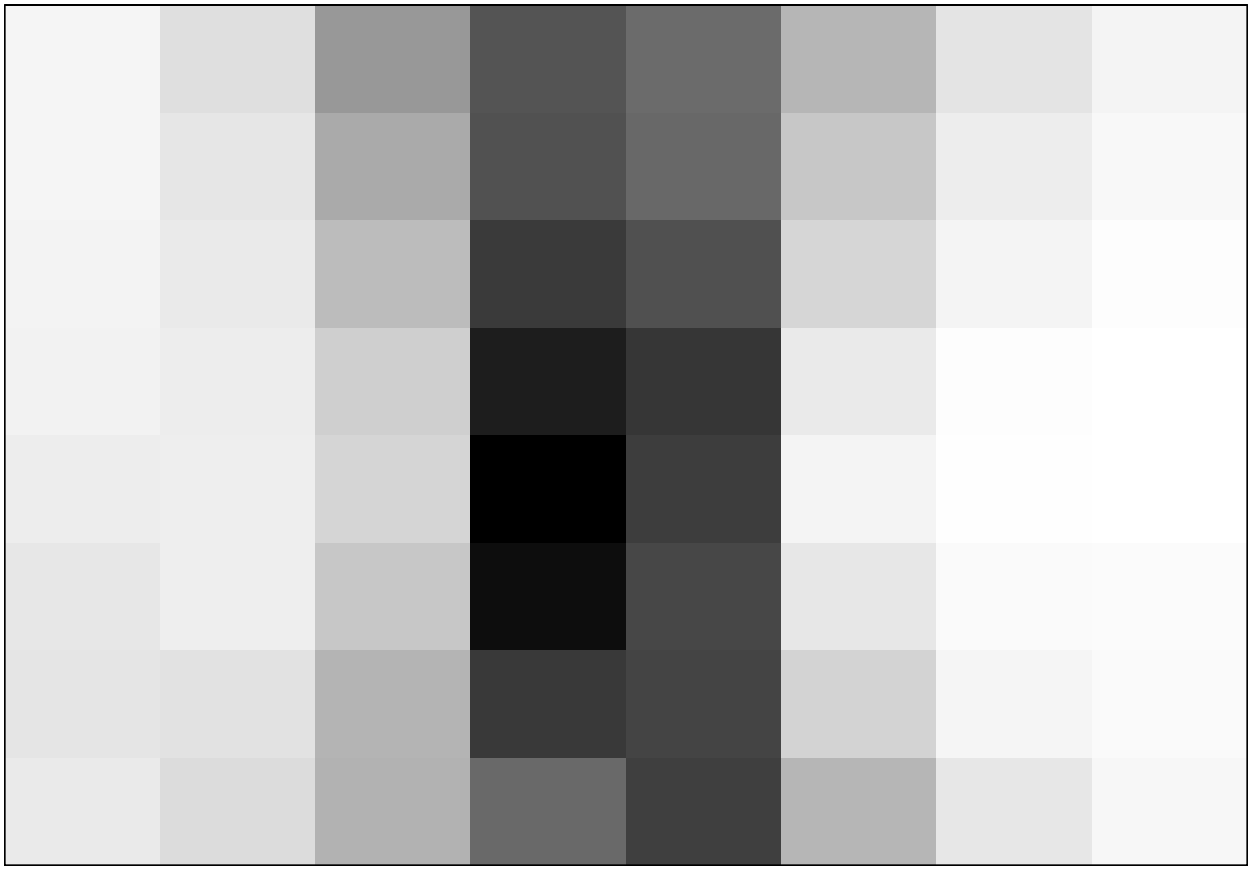
In this dataset, the rows seem to represent the letter classification of each image, and the columns represent each of the pixels in the image.

Exploring the letter grid, PC1 (horizontal axis) seems to be encoding for how left-aligned the letters are (or how much the letters ascend upwards diagonally from left to right) in the image. PC2(vertical axis) could be encoding for the width of the image that is filled by the letter.

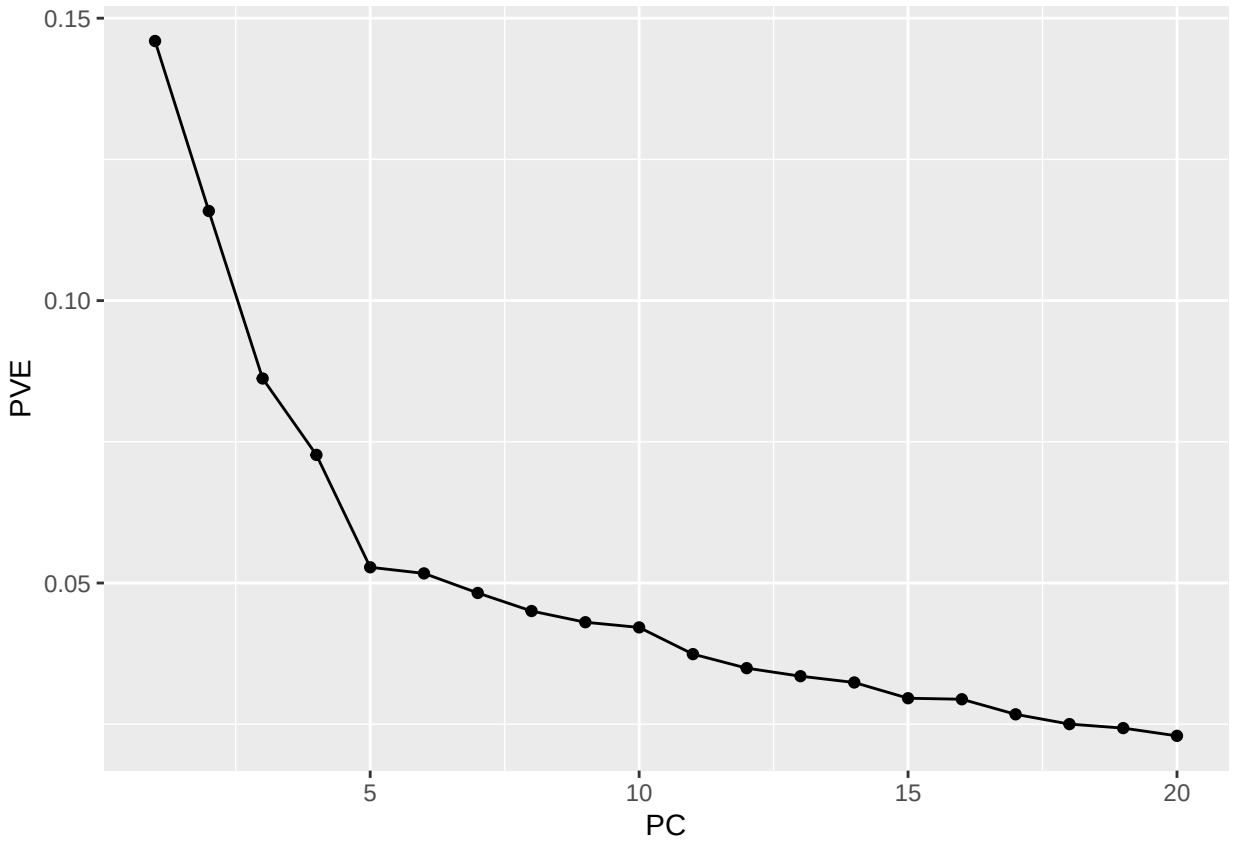
The fuller image construction, yields the more accurate letter result.

The Letter "L"

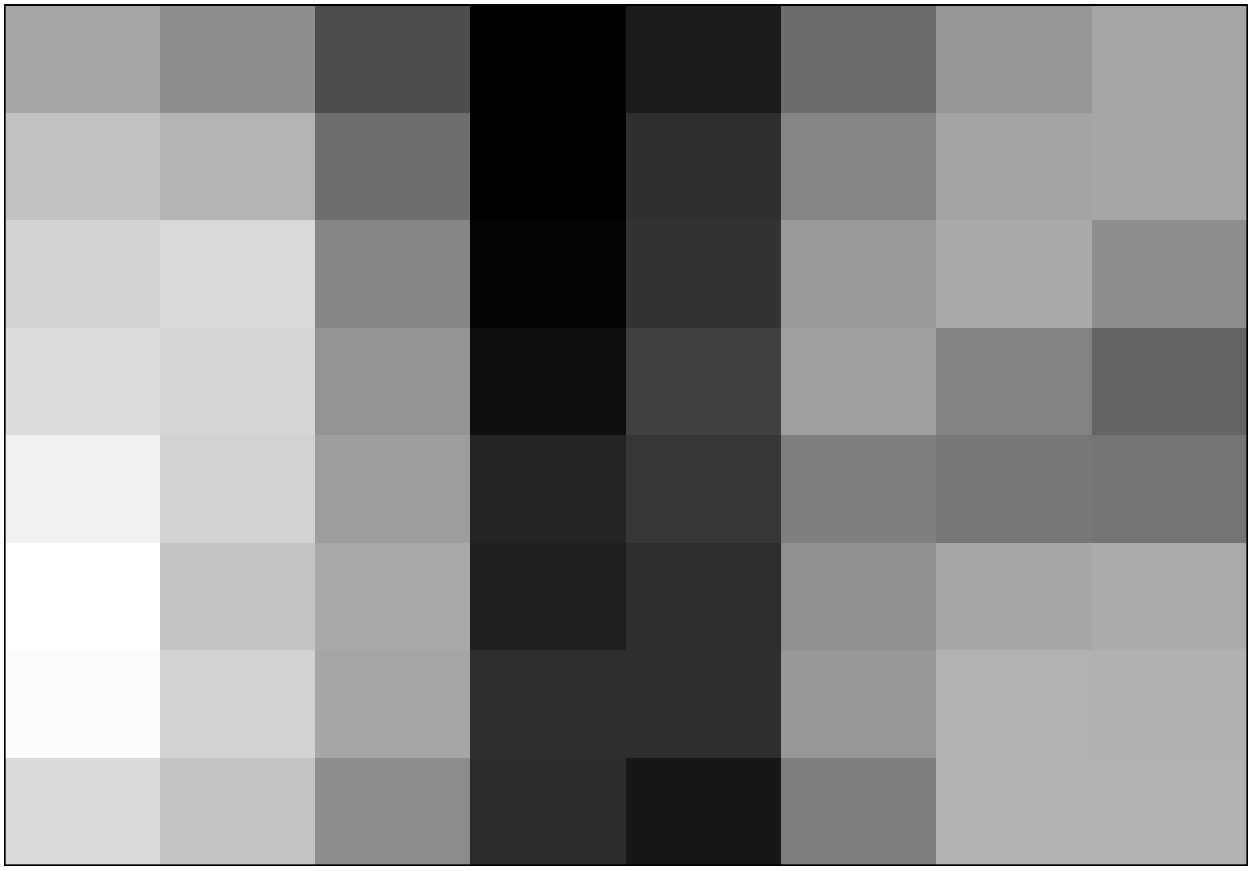
```
l_data <- d %>%
  filter(letter == "l")


#Compute/visualize mean image for "l"
l_data <- l_data[, -1]
mean_l <- colMeans(l_data)
plot_letter(mean_l, hasletter = FALSE)
```



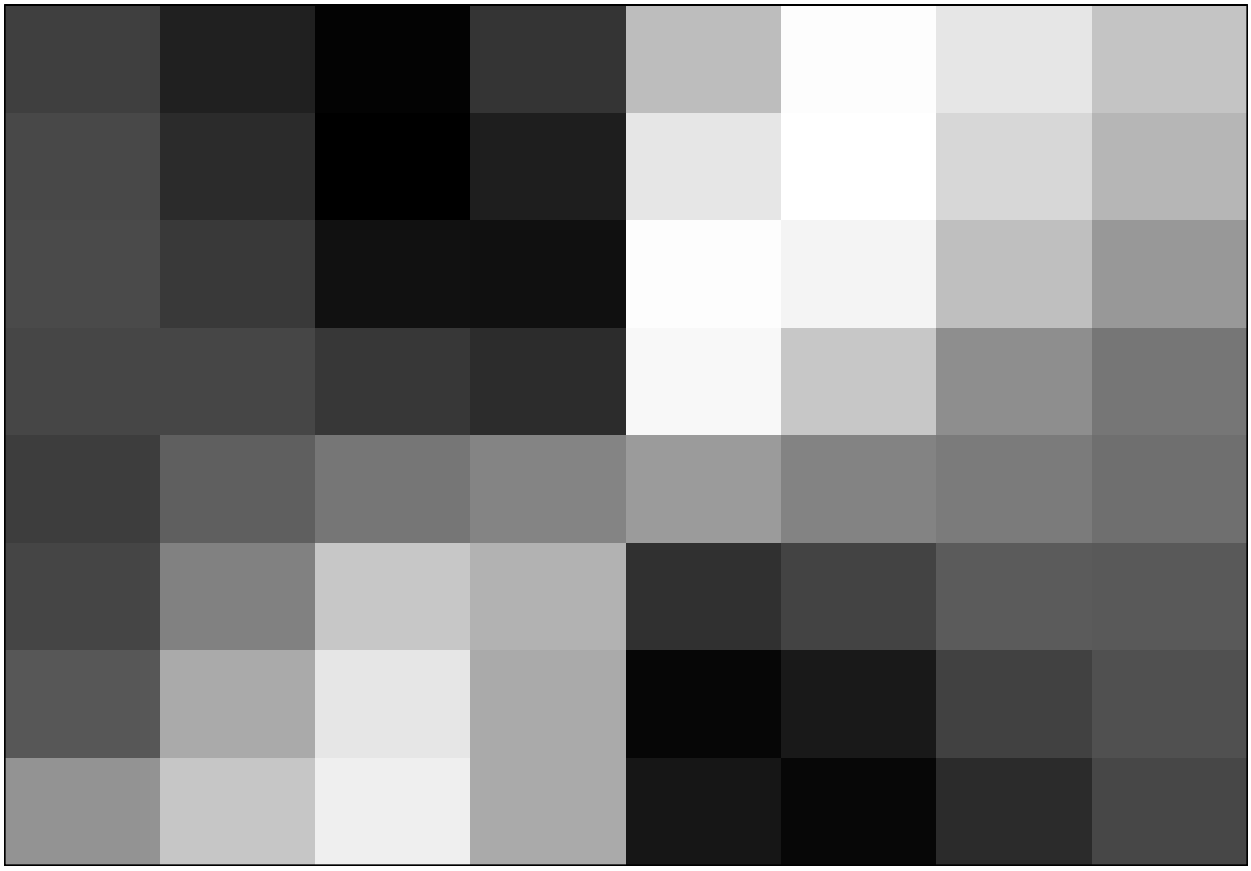
```r
#Perform PCA
pca2 <- prcomp(l_data, scale = TRUE)

#Construct Scree Plot
frame_l <- data.frame(PC = 1:20,
                      PVE = pca1$sdev[1:20]^2 /
                        sum(pca1$sdev[1:20]^2))
ggplot(frame_l, aes(x = PC, y = PVE)) +
  geom_line() +
  geom_point()
```



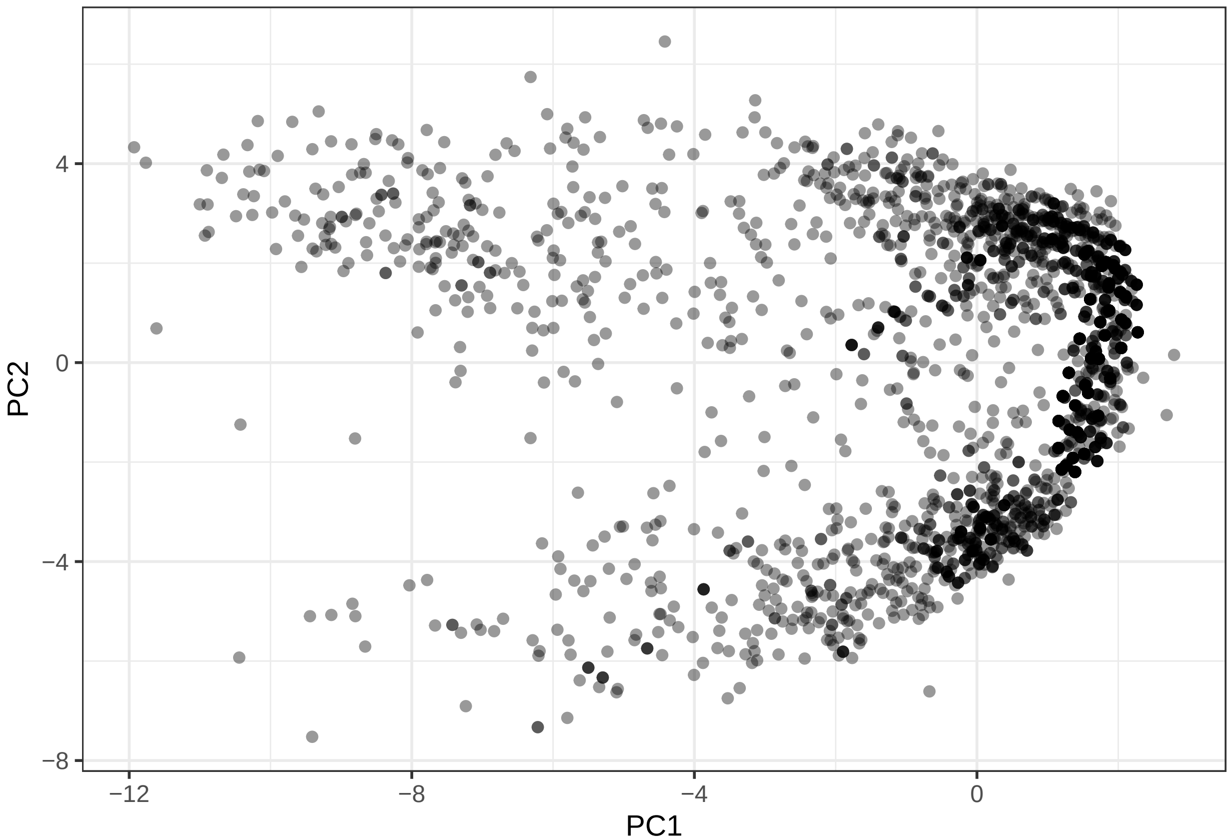

```
#Plot first several PCs
phi_l <- pca2$rotation
plot_letter(phi_l[,1], hasletter = FALSE)
```



```
plot_letter(phi_1[,2], hasletter = FALSE)
```



```
#Plot the PCs
d_3<- as.data.frame(pca2$x)
library(ggplot2)
p2 <- ggplot(d_3, aes(x = PC1, y = PC2)) + geom_point(alpha = .4) + theme_bw()
p2
```




```r
#Plot letter grid
pc_grid(pca2, l_data)
```

```
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```
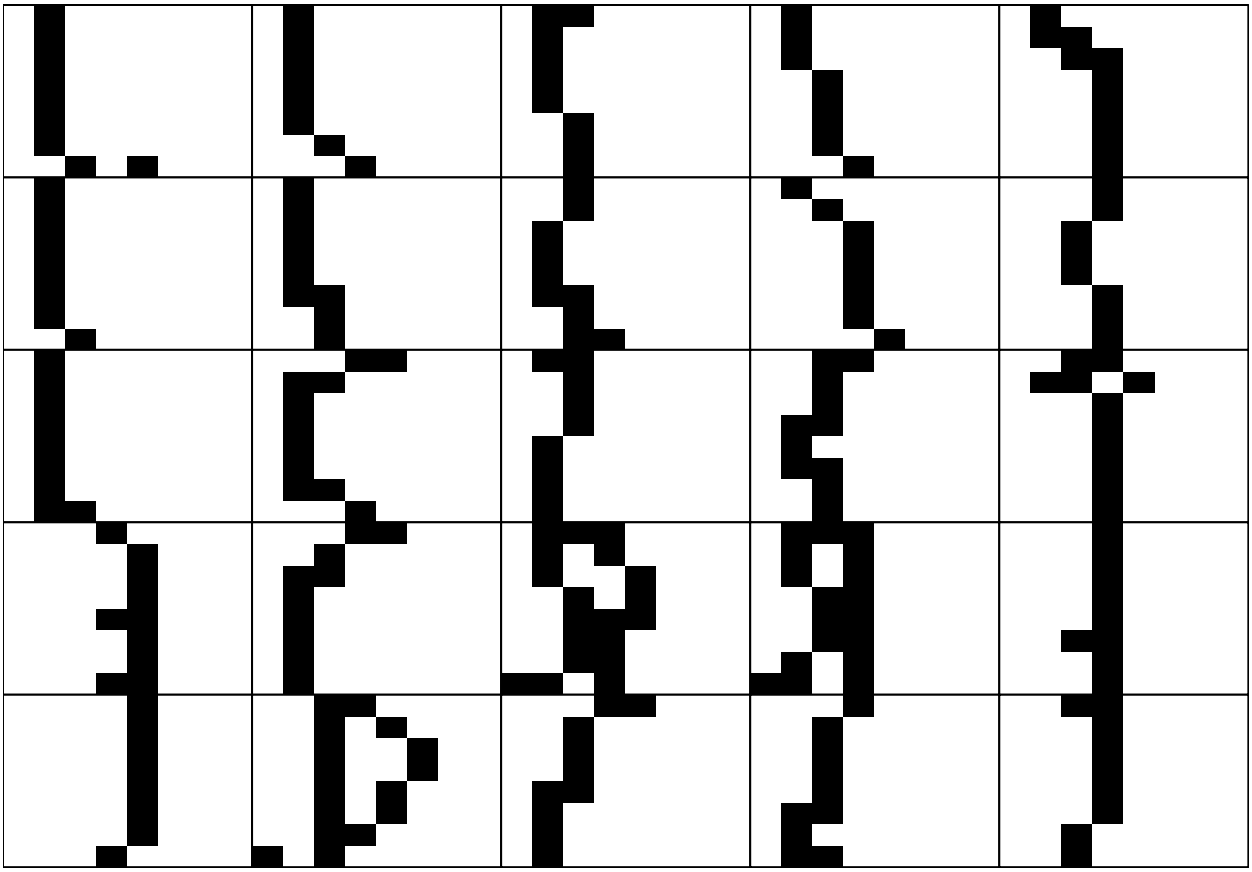
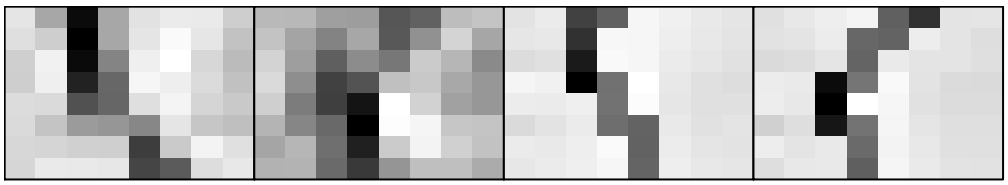



```
#Image construction
z_l <- pca2$x
z_l_tilda <- z_l[,1:10]
phi_l_tilda <- phi_l[,1:10]
image1_l <- t(mean_l) + z_l_tilda [1, ] %*% t(phi_l_tilda)
image2_l <- t(mean_l) + z_l_tilda [2, ] %*% t(phi_l_tilda)
plot_letter(image1_l, hasletter = FALSE)
plot_letter(image2_l, hasletter = FALSE)

#Fuller image construction
z_l_full <- z_l[,1:60]
phi_l_full <- phi_l[,1:60]
image1_l_full <- t(mean_l) + z_l_full [1, ] %*% t(phi_l_full)
image2_l_full <- t(mean_l) + z_l_full [2, ] %*% t(phi_l_full)
plot_letter(image1_l_full, hasletter = FALSE)
plot_letter(image2_l_full, hasletter = FALSE)
```



Examining the letter grid, PC1 (horizontal axis) seems to be encoding for how centered the letter is in the image. PC2(vertical axis) could be encoding for the straightness of the letter. As observed previously, a fuller image contstruction yields a more accurate result.