variogram

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```
library(geoR)
```

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## ----------------------------------------------------------
##  Analysis of Geostatistical Data
##  For an Introduction to geoR go to http://www.leg.ufpr.br/geoR
##  geoR version 1.7-5.2.1 (built on 2016-05-02) is now loaded
## ----------------------------------------------------------
```

```
library(tcltk)
data(s100)
s100
```

```
## $coords
##               [,1]       [,2]
##   [1,] 0.807126710 0.94544601
##   [2,] 0.549998072 0.68326492
##   [3,] 0.340805545 0.45850888
##   [4,] 0.137099310 0.47200832
##   [5,] 0.044185692 0.12232017
##   [6,] 0.027816360 0.80374588
##   [7,] 0.724385299 0.62332495
##   [8,] 0.246973875 0.14205770
##   [9,] 0.522983879 0.76201844
##  [10,] 0.249600428 0.58405976
##  [11,] 0.028991738 0.95606156
##  [12,] 0.143142421 0.95199657
##  [13,] 0.086238803 0.14106986
##  [14,] 0.983920544 0.71920011
##  [15,] 0.079471597 0.58686494
##  [16,] 0.478065402 0.43981990
##  [17,] 0.631426017 0.89451549
##  [18,] 0.820550200 0.48675112
##  [19,] 0.934560909 0.90151412
##  [20,] 0.094132199 0.55364481
##  [21,] 0.585577094 0.69763691
##  [22,] 0.642417917 0.76206592
##  [23,] 0.507945677 0.88213743
##  [24,] 0.363397676 0.62456433
##  [25,] 0.513764089 0.06826610
##  [26,] 0.263806508 0.35663249
##  [27,] 0.864579863 0.26637957
##  [28,] 0.005638006 0.76928547
##  [29,] 0.907257782 0.13576162
##  [30,] 0.177797950 0.05321294
##  [31,] 0.330195867 0.20887775
##  [32,] 0.094165342 0.77715519
##  [33,] 0.257783640 0.55595250
##  [34,] 0.226869478 0.59507909
```

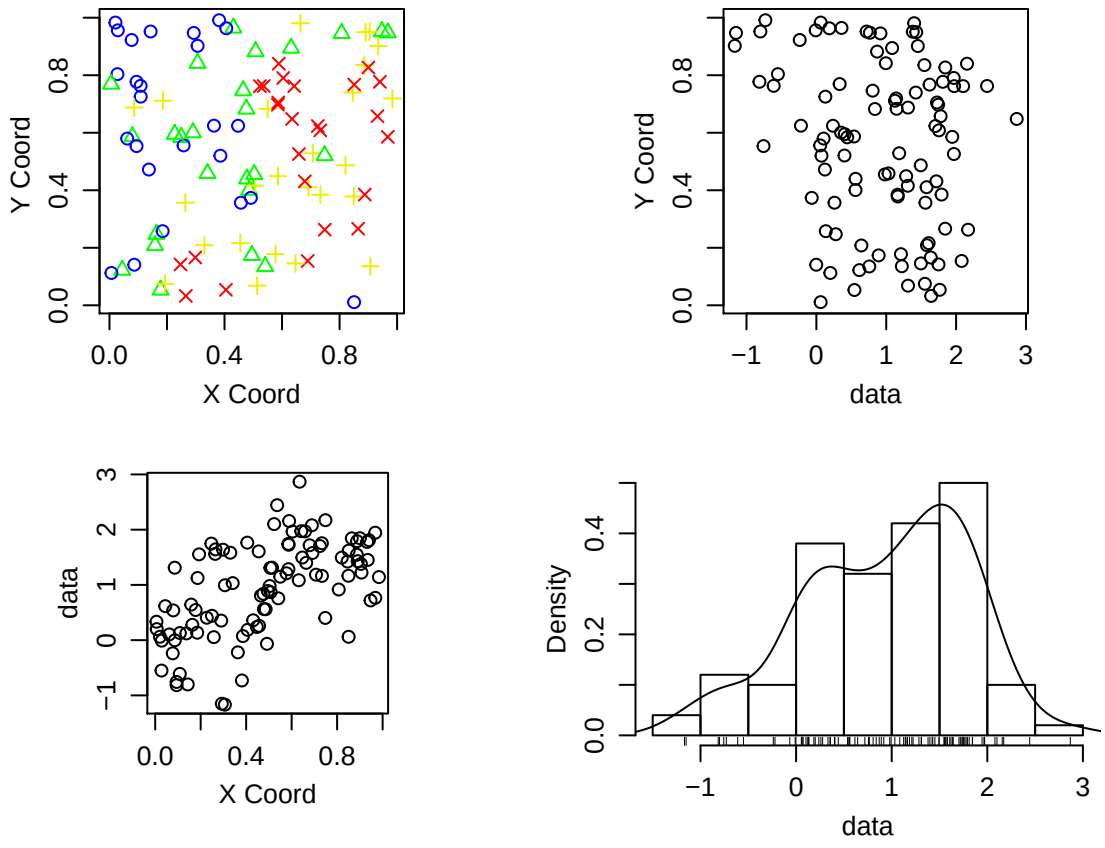
```
##  [35,] 0.846112244 0.73963968
##  [36,] 0.404958459 0.05382997
##  [37,] 0.707190327 0.52866792
##  [38,] 0.732988894 0.60828701
##  [39,] 0.293062207 0.94696340
##  [40,] 0.192971485 0.07482082
##  [41,] 0.849779000 0.37836289
##  [42,] 0.457026324 0.35670797
##  [43,] 0.691539921 0.41060066
##  [44,] 0.475881600 0.68247605
##  [45,] 0.265413690 0.03265305
##  [46,] 0.679222414 0.43100733
##  [47,] 0.306418876 0.84172254
##  [48,] 0.108589044 0.72541736
##  [49,] 0.464779988 0.74625289
##  [50,] 0.968033380 0.94756137
##  [51,] 0.061719681 0.57977207
##  [52,] 0.306426739 0.90216261
##  [53,] 0.947014188 0.95192688
##  [54,] 0.430859474 0.96433238
##  [55,] 0.931844109 0.65749259
##  [56,] 0.689199685 0.15415125
##  [57,] 0.634984260 0.64798717
##  [58,] 0.485696871 0.40060389
##  [59,] 0.163376110 0.24714981
##  [60,] 0.887798236 0.38501224
##  [61,] 0.006870312 0.11247721
##  [62,] 0.447166599 0.62429936
##  [63,] 0.506515568 0.41561616
##  [64,] 0.967556274 0.58564516
##  [65,] 0.747906145 0.52078144
##  [66,] 0.503182120 0.45504266
##  [67,] 0.077190299 0.92241133
##  [68,] 0.588881995 0.83999337
##  [69,] 0.108194098 0.76308847
##  [70,] 0.886685456 0.83523563
##  [71,] 0.647070315 0.14569712
##  [72,] 0.290393424 0.60043479
##  [73,] 0.658765058 0.52603477
##  [74,] 0.748581991 0.26287565
##  [75,] 0.604099556 0.79045207
##  [76,] 0.851071746 0.76730799
##  [77,] 0.298447147 0.16615725
##  [78,] 0.020767781 0.98308196
##  [79,] 0.940281073 0.77707861
##  [80,] 0.586882023 0.70516562
##  [81,] 0.850595354 0.01091027
##  [82,] 0.381382126 0.99124979
##  [83,] 0.577533818 0.17780001
##  [84,] 0.158356967 0.20805035
##  [85,] 0.491523982 0.37358486
##  [86,] 0.733346733 0.38444906
##  [87,] 0.536329847 0.76250096
##  [88,] 0.900223871 0.82685943
```

```
##  [89,] 0.186263138 0.71121034
##  [90,] 0.904586329 0.95129012
##  [91,] 0.664045752 0.98082406
##  [92,] 0.085919891 0.68740117
##  [93,] 0.455045202 0.21624276
##  [94,] 0.890554640 0.94962814
##  [95,] 0.184807496 0.25771587
##  [96,] 0.585834014 0.44893034
##  [97,] 0.541334383 0.13499379
##  [98,] 0.406253994 0.96311050
##  [99,] 0.495317768 0.17356993
## [100,] 0.385663031 0.52014266
##
## $data
##   [1]  0.917188752  1.148323354  1.032756300  0.121954767  0.615298778
##   [6] -0.550606543  1.703814887  1.747901020  2.100869073  0.441224609
##  [11] -0.009536357 -0.801448333 -0.001930896  1.141943813  0.538675515
##  [16]  0.561124760  1.084342606  1.494224867  1.451773709 -0.756622437
##  [21]  1.742536841  1.972069943  0.869030503 -0.220931922  1.311725186
##  [26]  1.561038129  1.843500850  0.333177663  1.223030476  0.545023824
##  [31]  1.582932912 -0.814958051  0.054556702  0.405697418  1.422665584
##  [36]  1.765298993  1.185470638  1.754435368 -1.150624846  1.553357086
##  [41]  1.164951011  0.259479909  1.577426439  0.837983077  1.643087465
##  [46]  1.717231426  0.993917554  0.128603062  0.805666518  0.765777025
##  [51]  0.103290499 -1.167695474  0.719148783  0.359709271  1.778422657
##  [56]  2.079565424  2.867896903  0.560021276  0.277490957  1.792041134
##  [61]  0.200109632  0.237756326  1.308548621  1.944901149  0.402131870
##  [66]  0.979640487 -0.238509435  2.156120583 -0.610998066  1.546203174
##  [71]  1.496030375  0.353898003  1.968717419  2.171577664  1.965981722
##  [76]  1.620228489  1.637205070  0.061662135  1.810161014  1.726308891
##  [81]  0.060908554 -0.729824032  1.210333642  0.643947930 -0.066323182
##  [86]  1.162695117  2.443485524  1.845180798  1.124844572  1.380025167
##  [91]  1.399538798  1.311149175  1.606818085  1.429380087  0.134733580
##  [96]  1.284822319  0.757246091  0.186184896  0.891084676  0.073563986
##
## $cov.model
## [1] "exponential"
##
## $nugget
## [1] 0
##
## $cov.pars
## [1] 1.0 0.3
##
## $kappa
## [1] 0.5
##
## $lambda
## [1] 1
##
## attr(,"class")
## [1] "geodata"
```

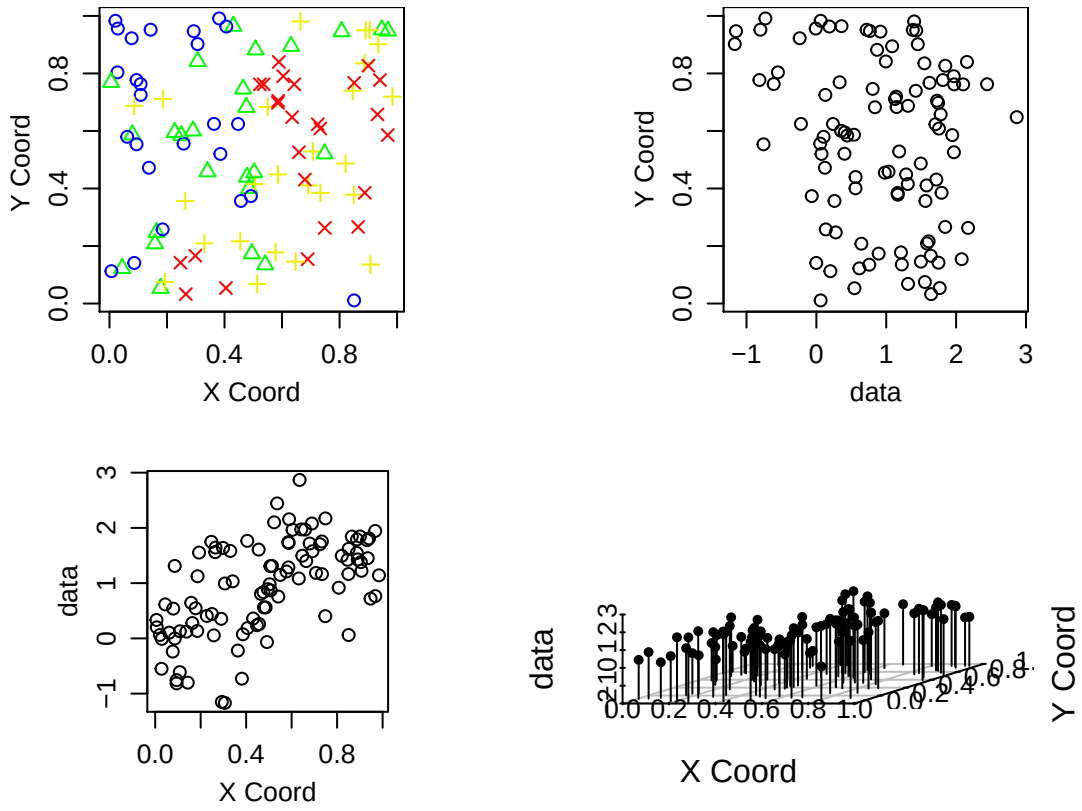
```
s100$coords[,1]
```

```
##   [1] 0.807126710 0.549998072 0.340805545 0.137099310 0.044185692
##   [6] 0.027816360 0.724385299 0.246973875 0.522983879 0.249600428
##  [11] 0.028991738 0.143142421 0.086238803 0.983920544 0.079471597
##  [16] 0.478065402 0.631426017 0.820550200 0.934560909 0.094132199
##  [21] 0.585577094 0.642417917 0.507945677 0.363397676 0.513764089
##  [26] 0.263806508 0.864579863 0.005638006 0.907257782 0.177797950
##  [31] 0.330195867 0.094165342 0.257783640 0.226869478 0.846112244
##  [36] 0.404958459 0.707190327 0.732988894 0.293062207 0.192971485
##  [41] 0.849779000 0.457026324 0.691539921 0.475881600 0.265413690
##  [46] 0.679222414 0.306418876 0.108589044 0.464779988 0.968033380
##  [51] 0.061719681 0.306426739 0.947014188 0.430859474 0.931844109
##  [56] 0.689199685 0.634984260 0.485696871 0.163376110 0.887798236
##  [61] 0.006870312 0.447166599 0.506515568 0.967556274 0.747906145
##  [66] 0.503182120 0.077190299 0.588881995 0.108194098 0.886685456
##  [71] 0.647070315 0.290393424 0.658765058 0.748581991 0.604099556
##  [76] 0.851071746 0.298447147 0.020767781 0.940281073 0.586882023
##  [81] 0.850595354 0.381382126 0.577533818 0.158356967 0.491523982
##  [86] 0.733346733 0.536329847 0.900223871 0.186263138 0.904586329
##  [91] 0.664045752 0.085919891 0.455045202 0.890554640 0.184807496
##  [96] 0.585834014 0.541334383 0.406253994 0.495317768 0.385663031
```

```
plot.geodata(s100)
```




```
# install.packages('scatterplot3d')
plot.geodata(s100,scatter3d=TRUE)
```




```
library(akima)
int.s100<-interp.new(s100$coords[,1],s100$coords[,2],s100$data,extrap=TRUE)
```

```
## Warning in interp.new(s100$coords[, 1], s100$coords[, 2], s100$data, extrap
## = TRUE): interp.new() is deprecated, use interp()
```

```
int.s100
```

```
## $x
##  [1] 0.005638006 0.030722174 0.055806341 0.080890509 0.105974677
##  [6] 0.131058844 0.156143012 0.181227180 0.206311347 0.231395515
## [11] 0.256479682 0.281563850 0.306648018 0.331732185 0.356816353
## [16] 0.381900521 0.406984688 0.432068856 0.457153024 0.482237191
## [21] 0.507321359 0.532405526 0.557489694 0.582573862 0.607658029
## [26] 0.632742197 0.657826365 0.682910532 0.707994700 0.733078868
## [31] 0.758163035 0.783247203 0.808331370 0.833415538 0.858499706
## [36] 0.883583873 0.908668041 0.933752209 0.958836376 0.983920544
##
## $y
##  [1] 0.01091027 0.03604718 0.06118409 0.08632100 0.11145791 0.13659482
##  [7] 0.16173173 0.18686864 0.21200555 0.23714247 0.26227938 0.28741629
## [13] 0.31255320 0.33769011 0.36282702 0.38796393 0.41310084 0.43823775
## [19] 0.46337466 0.48851157 0.51364848 0.53878540 0.56392231 0.58905922
## [25] 0.61419613 0.63933304 0.66446995 0.68960686 0.71474377 0.73988068
## [31] 0.76501759 0.79015450 0.81529141 0.84042833 0.86556524 0.89070215
## [37] 0.91583906 0.94097597 0.96611288 0.99124979
```

```
##
## $z
##               [,1]        [,2]        [,3]        [,4]        [,5]
##  [1,] -11.26262397 -7.62570703 -4.54347774 -2.00264747  0.01781835
##  [2,]  -8.74112477 -5.21094390 -2.24578949  0.15013046  1.01611941
##  [3,]  -7.15972526 -3.78480726 -0.94874177  1.33394047 -1.60947415
##  [4,]  -6.15931712 -3.05343058 -0.44435703  1.65022388 -2.38531685
##  [5,]  -5.30770002 -2.59043032 -0.33271581 -2.13185058 -0.50027374
##  [6,]  -4.27061303 -2.00793742 -0.19298811 -0.51886323  0.79499735
##  [7,]  -2.98276610 -1.12762872  0.23298487  0.95866887  1.34849233
##  [8,]  -1.68343318 -0.13586941  0.93357752  1.53044951  1.71763801
##  [9,]  -0.49983659  0.69990419  1.51129148  1.91497156  1.91153718
## [10,]   0.39867397  1.30401065  1.88157127  2.11046372  2.03243482
## [11,]   0.92228499  1.64389359  2.04265923  2.18113830  2.10375230
## [12,]   1.18548845  1.81808971  2.13781494  2.20634722  2.10085096
## [13,]   1.38770326  1.91117088  2.15399555  2.17420276  2.04790616
## [14,]   1.53583689  1.93787535  2.09596773  2.06555456  1.92503905
## [15,]   1.63897355  1.91591083  1.98886971  1.91144389  1.78183895
## [16,]   1.70678549  1.86304386  1.85800798  1.76095863  1.72833741
## [17,]   1.74606438  1.79363288  1.72492739  1.58633654  1.46464790
## [18,]   1.78763995  1.73377750  1.59758266  1.39271471  1.21894373
## [19,]   1.88248605  1.71051561  1.49112967  1.23797628  1.00367538
## [20,]   2.02661138  1.72998404  1.42430383  1.12646957  0.88379358
## [21,]   2.24514513  1.79126316  1.40917329  1.07823621  0.83715507
## [22,]   2.27191483  1.83677549  1.43934523  1.07400842  0.76980279
## [23,]   2.23335129  1.85086774  1.48580529  1.11402742  0.80836380
## [24,]   2.13946202  1.83220181  1.51895768  1.14430035  0.94373018
## [25,]   1.99157736  1.77553865  1.52191991  1.17778194  1.01840399
## [26,]   1.79993224  1.68510696  1.49491095  1.21721402  1.13715950
## [27,]   1.58036588  1.57130293  1.44856118  1.27183012  1.30448802
## [28,]   1.35102153  1.44738989  1.39907489  1.35251801  1.51550573
## [29,]   1.12904618  1.32596142  1.36339285  1.46698223  1.76739503
## [30,]   0.92729028  1.21025320  1.35435486  1.61490665  2.06582403
## [31,]   0.75100743  1.10625833  1.37586222  1.83115680  2.23396225
## [32,]   0.59455413  1.01464248  1.43294993  1.90217330  2.21698657
## [33,]   0.43808949  0.92137764  1.41235150  1.78062418  2.04973791
## [34,]   0.24427492  0.77526711  1.20547446  1.53023764  1.78593761
## [35,]  -0.04449721  0.48059428  0.88786041  1.20640391  1.47915819
## [36,]  -0.47069030  0.06750671  0.49276077  0.84328722  1.16411553
## [37,]  -1.02436242 -0.45691486  0.01500092  0.43523906  0.83841706
## [38,]  -1.68783395 -1.07127697 -0.52858163 -0.01633936  0.48612621
## [39,]  -2.44128959 -1.75306889 -1.11554876 -0.49187817  0.11856610
## [40,]  -3.26334615 -2.47946558 -1.72440165 -0.97397282 -0.27714263
##             [,6]      [,7]      [,8]      [,9]      [,10]     [,11]
##  [1,]  1.5257769 2.4721367 2.8356168 2.6387426 1.94076388 0.8305755
##  [2,]  3.1321329 4.0267644 4.4929271 4.2264813 3.36816303 2.0962009
##  [3,]  1.6391726 4.1533824 4.4889182 4.9013292 4.98665648 4.4253039
##  [4,] -0.2614469 2.0888751 3.4744534 3.4077103 3.62507874 3.8341784
##  [5,]  0.4966932 0.7225254 1.6816920 2.0397076 1.84269164 1.9335650
##  [6,]  1.0448360 1.0639994 0.9276648 0.9398550 0.83061599 0.7512126
##  [7,]  1.4082141 1.2421826 0.9381169 0.6080308 0.38268033 0.3513719
##  [8,]  1.5967861 1.2738492 0.8678094 0.4512004 0.16557194 0.1742556
##  [9,]  1.6583080 1.2867025 0.8314701 0.3317373 0.09084146 0.1101093
## [10,]  1.7430528 1.3793674 0.9286936 0.5436214 0.20717393 0.2252398
```

```
## [11,]  1.8573026 1.5430981 1.2273956 0.8477711 0.50282618 0.5104679
## [12,]  1.8970494 1.6633502 1.4403995 1.0784677 0.89849227 0.8781913
## [13,]  1.8514345 1.6592531 1.5231798 1.3442661 1.26159718 1.2113907
## [14,]  1.7573943 1.7178408 1.6759019 1.5862193 1.54293330 1.5302408
## [15,]  1.8248915 1.8375538 1.7968096 1.7618262 1.81618499 1.8689229
## [16,]  1.7062468 1.7155565 1.7567374 1.8252955 1.98708763 2.1520965
## [17,]  1.4164178 1.4631003 1.5955927 1.7787799 2.02112405 2.2503789
## [18,]  1.1575448 1.2059733 1.3940270 1.6671341 1.96276814 2.1877218
## [19,]  0.8763662 0.9616627 1.2128023 1.5406018 1.83464937 2.0105627
## [20,]  0.7607210 0.8075515 1.0579300 1.4297403 1.57136301 1.3170736
## [21,]  0.7356611 0.8120533 1.0408172 1.3368075 1.24079999 0.7449004
## [22,]  0.7614844 0.8773535 1.1029194 1.2493800 0.96222656 0.4164034
## [23,]  0.7895763 0.9721500 1.1942973 1.2572704 1.09058728 0.7959970
## [24,]  0.8924282 1.1024896 1.3175869 1.4935319 1.51281760 1.3656078
## [25,]  1.0655546 1.2776306 1.4876077 1.6587086 1.74672835 1.7692290
## [26,]  1.2769207 1.5008530 1.7127465 1.8961466 1.93780842 1.8564275
## [27,]  1.5205108 1.7723600 1.9800568 2.1108375 2.20428584 2.1055126
## [28,]  1.8123551 2.0721830 2.2539966 2.3196398 2.37107304 2.3185004
## [29,]  2.1290006 2.3795342 2.4835123 2.4756862 2.41218668 2.3686077
## [30,]  2.3912332 2.6103475 2.6205400 2.5112490 2.38102840 2.2692795
## [31,]  2.5033412 2.6924559 2.6256865 2.4444881 2.26694504 2.1190345
## [32,]  2.4558108 2.6161109 2.5030451 2.3081501 2.15331232 1.9917218
## [33,]  2.2788394 2.4167404 2.3051867 2.1752117 2.06186298 1.8950257
## [34,]  2.0235524 2.1564617 2.1146719 2.0878558 1.98680856 1.8423633
## [35,]  1.7432961 1.9055939 1.9922734 2.0037088 1.94796094 1.8489079
## [36,]  1.4749293 1.7161128 1.8717586 1.9469068 1.95409948 1.8957008
## [37,]  1.2201177 1.5351827 1.7684327 1.9233582 2.01355051 2.0589992
## [38,]  0.9441444 1.3114282 1.6113430 1.8617925 2.07617091 2.2638499
## [39,]  0.6317645 1.0307842 1.3535789 1.6189291 1.84117093 2.0306831
## [40,]  0.2764211 0.6895759 1.0179649 1.2812542 1.49473044 1.6697881
##            [,12]      [,13]       [,14]       [,15]      [,16]
##  [1,] -0.5803616 -2.1650998 -3.78828378 -5.31323009 -6.6090060
##  [2,]  0.5810311 -1.0179856 -2.58631441 -4.04148659 -5.2624295
##  [3,]  3.1983057  1.5683650 -0.21686035 -1.94194931 -3.4270010
##  [4,]  3.8078107  3.3785904  2.43298172  1.11222365 -0.2983850
##  [5,]  2.1134541  2.2335113  2.18954597  1.91665637  1.3835810
##  [6,]  0.8571933  1.0251200  1.16642413  1.22203816  1.1570272
##  [7,]  0.4740356  0.6706080  0.88471812  1.06945116  1.1567611
##  [8,]  0.3706903  0.6433757  0.93026308  1.18660825  1.3740879
##  [9,]  0.3444133  0.6865704  1.05763418  1.40143241  1.6588135
## [10,]  0.4197273  0.7538967  1.16808788  1.56583670  1.8648966
## [11,]  0.6386811  0.8888388  1.24642657  1.64593446  1.9181596
## [12,]  0.9303649  1.0724945  1.32682306  1.65878269  1.9856169
## [13,]  1.2020980  1.2756029  1.42224760  1.60103339  1.9851287
## [14,]  1.5281896  1.5281409  1.51227491  1.47022337  1.8203396
## [15,]  1.8632185  1.7652617  1.55773817  1.26532581  1.4940863
## [16,]  2.1345363  1.9266833  1.52463911  0.99049098  1.0126624
## [17,]  2.2732542  1.9665313  1.39336878  0.66426690  0.3968504
## [18,]  2.1854487  1.8480416  1.16792825  0.32881992 -0.2281703
## [19,]  1.9462190  1.5609447  0.87776366  0.06731450 -0.2881287
## [20,]  0.7815984  0.2383247 -0.06541150 -0.07575581  0.2170174
## [21,]  0.1063098 -0.3338389 -0.33912120 -0.04345029  0.1805669
## [22,] -0.0244925 -0.2040276 -0.09939958  0.23803505  0.5836163
## [23,]  0.4917288  0.3109478  0.35029753  0.62286207  1.0075662
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## [24,]  1.1304978  0.9274122  0.87056693  1.02143081  1.3416870
## [25,]  1.6441871  1.4613187  1.33635647  1.36309823  1.5663688
## [26,]  1.7831888  1.7290149  1.62761423  1.58682729  1.6785650
## [27,]  1.9018042  1.7081063  1.62285266  1.63183619  1.6765286
## [28,]  2.1172980  1.8565603  1.63491455  1.52793613  1.5555653
## [29,]  2.1996361  1.9408855  1.67159310  1.47398811  1.3894863
## [30,]  2.1118608  1.8435223  1.44753977  1.20370167  1.1658541
## [31,]  1.9356019  1.6289337  1.27533057  1.03990424  0.9976710
## [32,]  1.7796104  1.5208753  1.20099704  0.95857514  0.9039267
## [33,]  1.6792711  1.4052253  1.16100367  0.96060442  0.9057259
## [34,]  1.6547278  1.4090032  1.18052306  1.05190094  1.0256631
## [35,]  1.7121559  1.5258362  1.34821270  1.26012202  1.2842294
## [36,]  1.7942266  1.6881263  1.61974228  1.62326999  1.7217504
## [37,]  2.0826992  2.1072573  2.15149960  2.22707802  2.3350774
## [38,]  2.4306658  2.5794072  2.70978500  2.80248946  2.8623772
## [39,]  2.1943743  2.3361704  2.45750196  2.55779114  2.6349392
## [40,]  1.8144170  1.9336891  2.03024617  2.10478701  2.1565545
##              [,17]       [,18]       [,19]      [,20]        [,21]
##  [1,] -7.557509106 -8.06054607 -8.04691226 -7.4794708 -6.362231644
##  [2,] -6.141117044 -6.59026160 -6.55039330 -5.9969392 -4.947302663
##  [3,] -4.530918372 -5.15469173 -5.24468235 -4.7959060 -3.855316549
##  [4,] -1.564908235 -2.51009100 -3.01664321 -3.0305231 -2.564220692
##  [5,]  0.588003481 -0.27216478 -0.98201811 -1.4044930 -1.483651681
##  [6,]  0.955220395  0.61384250  0.13774162 -0.3817472 -0.625395367
##  [7,]  1.124085846  0.98314831  0.69717654  0.2777824 -0.158167407
##  [8,]  1.449668381  1.35323359  1.03736822  0.6207565  0.243849502
##  [9,]  1.754908792  1.56085268  1.13571413  0.6585038  0.296114453
## [10,]  1.889008494  1.57212440  1.04707617  0.5124997  0.155817793
## [11,]  1.862860370  1.47552196  0.89536560  0.3283214 -0.029988875
## [12,]  1.988690898  1.63137006  1.04458606  0.4280059 -0.026826440
## [13,]  2.102864452  1.79435983  1.20027154  0.5292877 -0.021800808
## [14,]  1.988989881  1.64494404  1.01629601  0.4282287 -0.029730177
## [15,]  1.639782039  1.29960244  0.71227157  0.2747485  0.006204199
## [16,]  1.007560278  0.75490881  0.38920730  0.1710404  0.069772141
## [17,]  0.207992580  0.31434172  0.12841105  0.1355113  0.194534747
## [18,] -0.130385292  0.09570026  0.05203726  0.2575669  0.295817961
## [19,]  0.005481253  0.21177514  0.23023290  0.4818051  0.303153790
## [20,]  0.620876584  0.65424835  0.74457832  0.5951287  0.360417803
## [21,]  1.311686160  1.15833952  0.95525115  0.8274504  0.631470179
## [22,]  1.063003844  1.23756454  1.12877298  1.1194298  1.000306680
## [23,]  1.081759265  1.25490750  1.22326408  1.4279911  1.423237334
## [24,]  1.357873570  1.27594225  1.28237467  1.6762647  1.807479199
## [25,]  1.572764123  1.37089854  1.40241526  1.6816366  2.052287120
## [26,]  1.712176275  1.61739796  1.64837735  1.7862516  2.090575585
## [27,]  1.740779076  1.79235119  1.82693039  1.8696004  1.938666284
## [28,]  1.643417815  1.70331472  1.64787244  1.5443923  1.555432207
## [29,]  1.442408366  1.36104381  1.14585848  0.9646816  1.034299568
## [30,]  1.103945492  0.84668170  0.52636940  0.3445679  0.462813226
## [31,]  1.026576153  0.86168752  0.49719236  0.2596295  0.315495696
## [32,]  0.945367610  1.01533961  0.97088397  0.7994399  0.794140927
## [33,]  0.958990480  1.08209171  1.22867192  1.3430059  1.500078790
## [34,]  1.102101461  1.27726223  1.49435370  1.6696223  1.794208540
## [35,]  1.420549964  1.63843189  1.85446037  2.0257061  2.131464737
## [36,]  1.888721075  2.08031671  2.25581381  2.3828058  2.443021105
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## [37,]  2.462622383  2.57949295  2.65720344  2.6925896  2.678904747
## [38,]  2.903671036  2.93122415  2.93712728  2.8973155  2.783592393
## [39,]  2.685813794  2.70673601  2.69396790  2.6441996  2.555036692
## [40,]  2.183823152  2.18438605  2.15604245  2.0970849  2.006786343
##             [,22]       [,23]       [,24]       [,25]      [,26]
##  [1,] -4.74743116 -2.83109598 -0.65211580  0.91893178  1.7947421
##  [2,] -3.46794219 -1.68145105  0.17805115  1.60263868  2.3877159
##  [3,] -2.52599912 -0.97112577  0.59670600  1.81740897  2.3771440
##  [4,] -1.70004169 -0.56850224  0.62621596  1.41041798  1.7609718
##  [5,] -0.85374511 -0.38309565  0.42363692  0.99264366  1.2253029
##  [6,] -0.54812519 -0.24811764  0.14544512  0.54676837  0.7039119
##  [7,] -0.31342066 -0.18067720 -0.01208990  0.25246928  0.3311874
##  [8,] -0.05679360 -0.08912335  0.02880131  0.17675143  0.4176572
##  [9,]  0.13332778  0.10799774  0.21108172  0.31298317  0.8246016
## [10,]  0.07622368  0.21601263  0.40560324  0.54761892  1.1381485
## [11,] -0.07126861  0.15896406  0.46493763  0.75202503  1.2963702
## [12,] -0.20721393 -0.03517199  0.28862512  0.63070823  0.9865274
## [13,] -0.28179336 -0.16460066  0.05890939  0.32637649  0.5980086
## [14,] -0.21412374 -0.18649334 -0.12927899  0.01667484  0.1791388
## [15,] -0.09112446 -0.16059954 -0.23761572 -0.20687972 -0.1147892
## [16,]  0.03080206 -0.06607701 -0.20362243 -0.26771293 -0.2861056
## [17,]  0.16979360  0.13936871  0.04155806 -0.02677335 -0.1022307
## [18,]  0.17260065  0.07172676  0.07887110  0.18073721  0.2715432
## [19,]  0.06400906 -0.10469700 -0.09348313  0.10599928  0.3644421
## [20,]  0.10798718 -0.09333301 -0.12911656  0.07320230  0.3219749
## [21,]  0.35938738  0.11460341  0.05701894  0.15497537  0.2848308
## [22,]  0.76366806  0.53258622  0.49639047  0.31214199  0.3033088
## [23,]  1.26477266  1.09858683  0.93075323  0.50255625  0.3961072
## [24,]  1.75022575  1.68047020  1.23947938  0.73342820  0.6324393
## [25,]  2.09309420  1.97819876  1.47854130  1.53225860  2.4557396
## [26,]  2.19366786  2.04819018  2.57108384  3.14448466  3.0274989
## [27,]  2.02756528  2.26492421  2.63667328  2.85675612  2.6857112
## [28,]  1.70517809  1.91366072  2.20076715  2.36907154  2.1824472
## [29,]  1.28362207  1.66941147  1.98352505  1.95470412  1.7301824
## [30,]  0.80866818  1.29555883  1.69377961  1.72928023  1.4673603
## [31,]  0.62428561  1.36436576  1.55229421  1.51372109  1.4109754
## [32,]  1.41480692  1.50107163  1.52028604  1.44713705  1.3150561
## [33,]  1.59594549  1.63591429  1.60732541  1.50199154  1.3311171
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## [35,]  2.15335056  2.09953670  1.98311839  1.81891190  1.6223673
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## [38,]  2.64356660  2.47966003  2.27475628  2.07696256  1.8974819
## [39,]  2.42738202  2.25762291  2.05266736  1.85501806  1.6935317
## [40,]  1.88588783  1.73708534  1.56658801  1.39732105  1.2634559
##             [,27]      [,28]     [,29]      [,30]      [,31]       [,32]
##  [1,]  2.0479866 1.84926675 1.4050857  0.8958181  0.4136816 -0.07999433
##  [2,]  2.5562298 2.24453142 1.6048477  0.9310533  0.2814194 -0.33682415
##  [3,]  2.3132005 1.86973958 1.2990075  0.6317467 -0.2198423 -0.72316007
##  [4,]  1.7222174 1.38006150 0.8513785  0.1930524 -0.6202789 -0.91505205
##  [5,]  1.1457466 0.87612041 0.3858931 -0.1598773 -0.6451986 -0.88822089
##  [6,]  0.6416039 0.69226566 0.2332642 -0.1266163 -0.4319871 -0.67726660
##  [7,]  0.6850744 0.92185144 0.5318204  0.2071197  0.1655337  0.08785888
##  [8,]  1.1262591 1.33151662 0.9860368  0.7231926  1.0344439  1.43214894
```

```
##  [9,]  1.4064004 1.69830490 1.4411095  1.4530355  1.9705274  2.79111227
## [10,]  1.7971883 1.85255234 2.0047544  2.5364230  3.0365880  3.70130362
## [11,]  1.6601135 1.86048583 2.6477623  3.6792292  4.3820044  4.37355711
## [12,]  1.3074816 1.93104111 3.2376515  4.5675826  5.2978337  5.01335200
## [13,]  0.9187426 1.99648293 3.5122148  4.8283032  5.3684132  4.78870340
## [14,]  0.6707286 1.77278759 3.0523719  3.9907522  4.2014863  3.56630636
## [15,]  0.2097368 0.89268946 1.7771640  2.5386516  2.8262846  2.40152313
## [16,] -0.1864436 0.23052810 0.8846517  1.5076926  1.7720655  1.42952174
## [17,] -0.1261335 0.02811733 0.4407933  0.8712162  1.0331596  0.74791343
## [18,]  0.2960871 0.30114715 0.4074321  0.6258140  0.6585015  0.59448565
## [19,]  0.5792034 0.73118780 0.7209779  0.7250928  0.7175356  0.80222851
## [20,]  0.6611998 0.94624416 1.0717687  1.0594270  1.0706132  1.15056110
## [21,]  0.6537751 1.07872829 1.4207055  1.6243047  1.6965594  1.75905725
## [22,]  0.6746192 1.18630039 1.6666903  2.1108297  2.4051877  2.38535393
## [23,]  0.7444374 1.33832433 1.8061742  2.2242187  2.4677558  2.39504323
## [24,]  1.4629016 1.74717577 1.7588409  2.0215281  2.1746853  2.14897088
## [25,]  2.4128260 1.92462042 1.7179362  1.8538988  1.9361595  1.94697172
## [26,]  2.5964047 2.14955944 1.8236239  1.7632689  1.9554648  2.19931192
## [27,]  2.2862399 1.92031866 1.7241775  1.8177940  2.1138372  2.39095673
## [28,]  1.8302412 1.59073647 1.6532267  1.9653872  2.3121846  2.47794846
## [29,]  1.4755628 1.43953891 1.6893640  2.1281066  2.4442795  2.51826734
## [30,]  1.2892336 1.36883715 1.7283678  2.2223618  2.4580454  2.44527438
## [31,]  1.2241232 1.33278450 1.7179069  2.2021221  2.3506026  2.26840133
## [32,]  1.2998818 1.31342172 1.6375012  2.0583426  2.1544273  2.03282447
## [33,]  1.2411693 1.31738797 1.4979481  1.8183902  1.9221429  1.80530953
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## [35,]  1.3992465 1.22582688 1.1969045  1.3391802  1.5812368  1.62581172
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##  [2,] -0.7579522 -0.9534877 -0.868058539 -0.58808970 -0.27376629
##  [3,] -0.9751033 -1.0461916 -0.888564237 -0.57815863 -0.29646043
##  [4,] -0.9878421 -0.9124227 -0.735380704 -0.51491684 -0.29312850
##  [5,] -0.9550405 -0.9178533 -0.781770082 -0.58818827 -0.39147855
##  [6,] -0.8373582 -0.8962737 -0.871329701 -0.78980781 -0.68654881
##  [7,] -0.2016388 -0.4349677 -0.612163703 -0.74566007 -0.85721444
##  [8,]  0.8861593  0.3618491 -0.120387036 -0.56308150 -0.97969459
##  [9,]  2.1807464  1.2353846  0.354424298 -0.46054269 -1.15848143
## [10,]  3.3439243  1.8859094  0.573727850 -0.59268088 -1.07767123
## [11,]  3.9097397  2.0773312  0.414589054 -0.72044843 -1.04078874
## [12,]  3.6785093  1.7417686  0.001864084 -0.81253500 -1.11635037
## [13,]  3.1490188  1.0840835 -0.369615969 -1.06394205 -1.18451894
## [14,]  2.1619897  0.5589769 -0.554919304 -1.09348641 -1.13477573
## [15,]  1.2906565  0.3391008 -0.447748792 -0.89536104 -0.86551927
## [16,]  0.7561793  0.3998936 -0.068052555 -0.46648417 -0.47719565
## [17,]  0.6148453  0.6520105  0.431745195  0.07958988  0.03032619
## [18,]  0.7564430  0.9777981  0.898812350  0.53935852  0.43060662
## [19,]  1.0431328  1.2677169  1.196346181  0.78436422  0.55477585
## [20,]  1.3458697  1.4567645  1.280000140  0.79124357  0.60090595
## [21,]  1.7676646  1.6185294  1.234359464  0.67639291  0.36935816
```

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## [22,]  2.1536894  1.7547843  1.271060843  0.63612949  0.36718910
## [23,]  2.1124006  1.8778590  1.555077735  0.67625899  0.47507451
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## [25,]  2.0110041  2.2218367  2.021755909  0.98867655  0.50484132
## [26,]  2.5054669  2.5707328  2.132536003  1.24330325  0.46703075
## [27,]  2.6720121  2.7421607  2.352448544  1.48944228  0.50003106
## [28,]  2.3856319  2.3204458  2.070044993  1.44347040  0.59901459
## [29,]  2.2548192  1.7328513  1.375760356  1.01713471  0.54038444
## [30,]  2.0866670  1.4763225  0.758942740  0.39009714  0.26699843
## [31,]  1.8636440  1.2491096  0.569805049  0.01591804 -0.01680923
## [32,]  1.6338735  1.0760190  0.495755229  0.06026547 -0.01962567
## [33,]  1.4677714  1.0210492  0.580424854  0.27737679  0.27253281
## [34,]  1.4438904  1.1567798  0.806681269  0.48936674  0.53462936
## [35,]  1.4442323  1.1050579  0.764081683  0.62218675  0.66730592
## [36,]  1.6812878  1.4317129  1.096704305  0.81419292  0.78478464
## [37,]  1.9934432  1.8727630  1.602003251  1.25292012  1.03891823
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## [39,]  2.0128400  2.0415011  1.921353531  1.66705620  1.31151324
## [40,]  1.3908477  1.2590408  1.044089660  0.78031214  0.50810984
##              [,38]        [,39]       [,40]
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##  [2,] -0.067091714  0.007513804  0.05518936
##  [3,] -0.109298500  0.002348485  0.09847908
##  [4,] -0.121405673 -0.019117204  0.06890289
##  [5,] -0.264881399 -0.206311329 -0.15518224
##  [6,] -0.607189788 -0.591217574 -0.63028977
##  [7,] -0.974836222 -1.106843878 -1.31603957
##  [8,] -1.268462645 -1.540853337 -1.83846865
##  [9,] -1.393041363 -1.801112763 -2.11171964
## [10,] -1.359637764 -1.865172355 -2.14472124
## [11,] -1.269974267 -1.679655277 -1.98402767
## [12,] -1.192501325 -1.349714205 -1.69945323
## [13,] -1.080002097 -1.030856058 -1.36970691
## [14,] -0.861761716 -0.758666857 -1.06802701
## [15,] -0.587140004 -0.472301291 -0.84781568
## [16,] -0.227728858 -0.161733612 -0.72827381
## [17,]  0.193515561  0.159267531 -0.70115914
## [18,]  0.486081478  0.313400525 -0.70865982
## [19,]  0.838855099  0.474759997 -0.39253817
## [20,]  0.714481548  0.792180714  0.29981439
## [21,]  0.729419355  1.297864395  1.34105998
## [22,]  0.874550550  1.886285105  2.54089579
## [23,]  1.043097646  2.377370533  3.63355155
## [24,]  1.094000669  2.579879019  4.34407512
## [25,]  0.914833373  2.354776594  4.45461819
## [26,]  0.501192033  1.678614017  3.87072183
## [27,] -0.008268669  0.700313538  2.68760225
## [28,] -0.411768719 -0.282752320  1.33435120
## [29,] -0.450309706 -0.659811651  0.76649680
## [30,] -0.164135263 -0.171421193  1.27121650
## [31,]  0.230749786  0.804389888  2.43831443
## [32,]  0.534850086  1.661153361  3.55920501
## [33,]  0.768619816  1.997031362  4.03160154
## [34,]  0.996085926  2.110519096  3.97066340
```
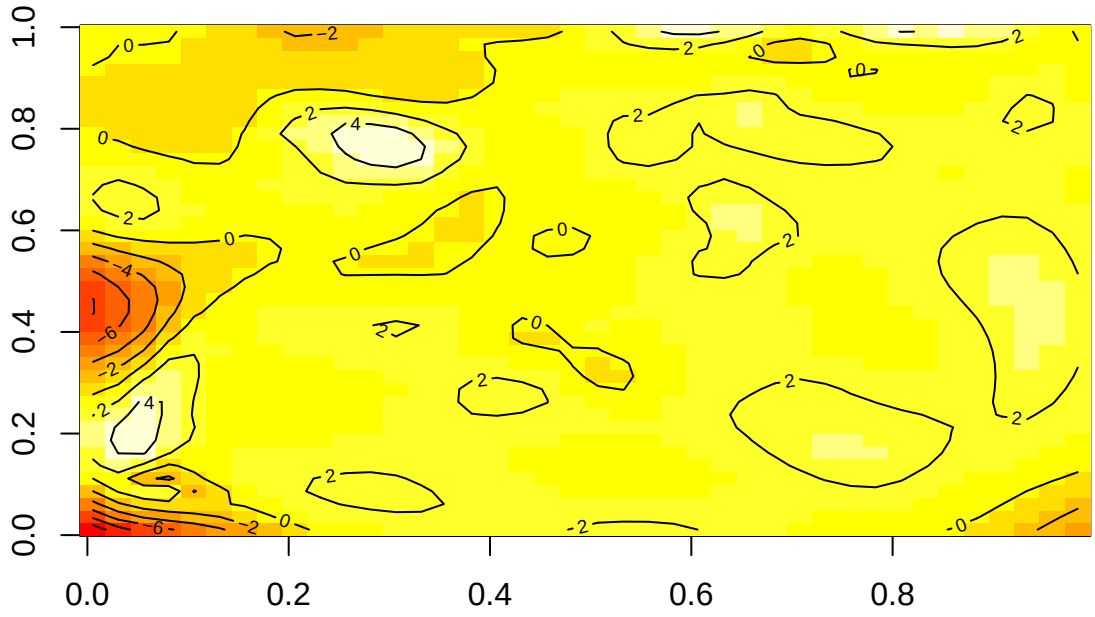
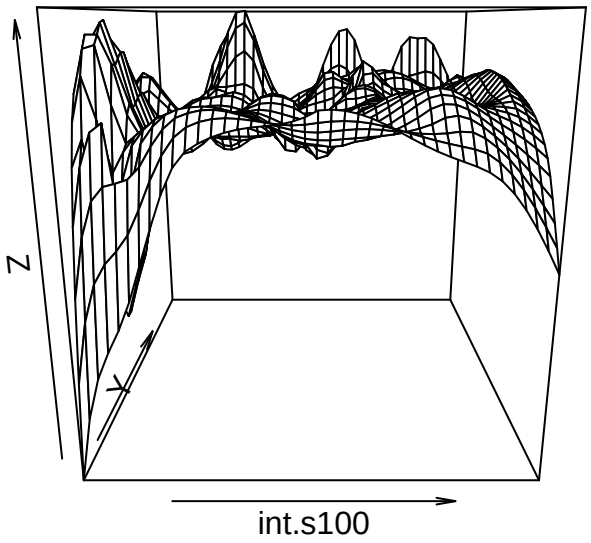

```
## [35,]  1.139911974  2.237266733  3.99560698
## [36,]  1.191495498  2.140048478  3.64157452
## [37,]  1.157539725  1.751276375  2.84747937
## [38,]  0.941232030  1.198159185  1.99723817
## [39,]  0.928188790  0.519809551  0.61971310
## [40,]  0.264710986  0.068175156 -0.14311140
```

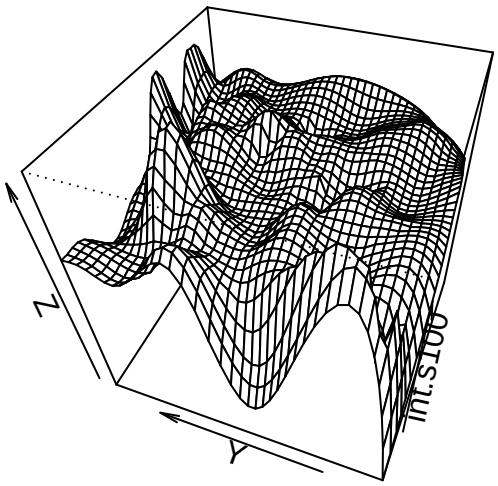
```
# Graphs
image(int.s100)
contour(int.s100, add=T)
```



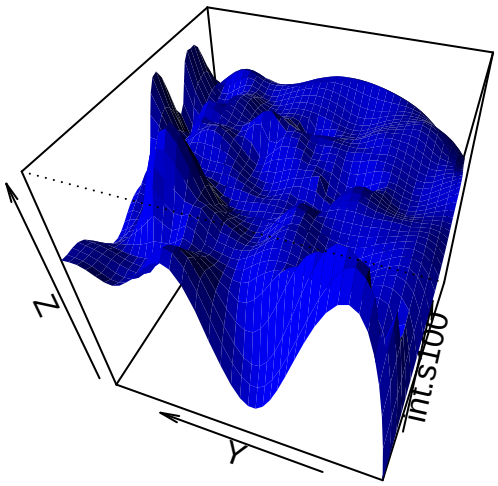

```
persp(int.s100)
```




```
persp(int.s100,theta = -70, phi = 45, d=1)
```



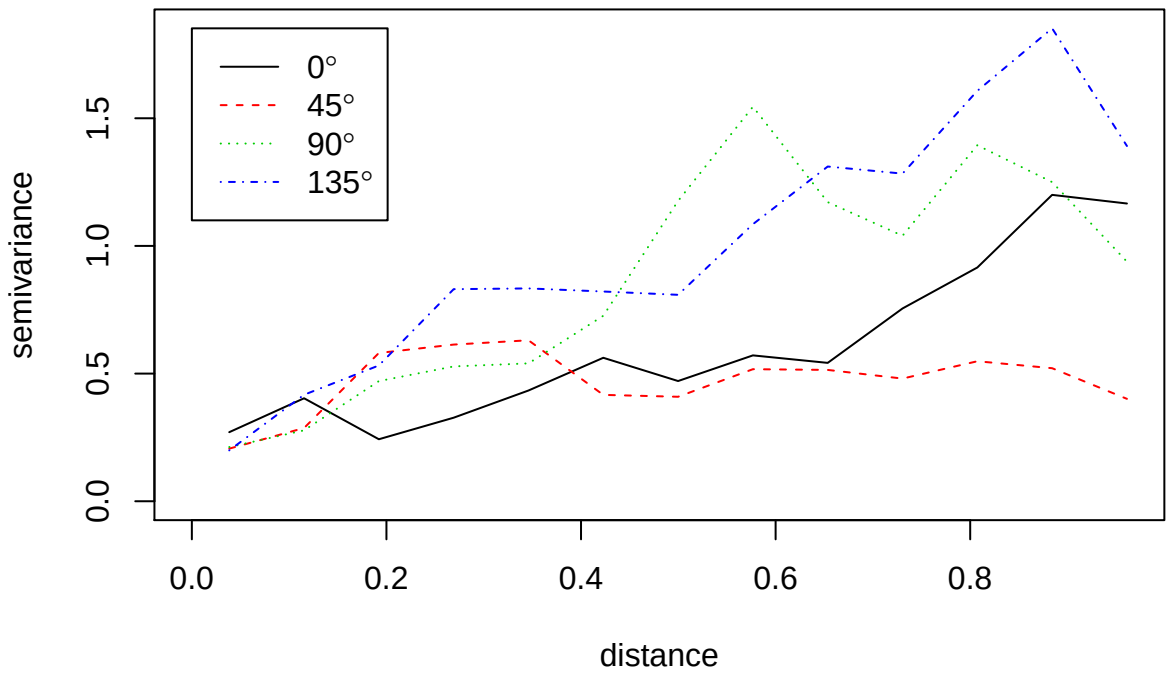

```
persp(int.s100,theta = -70, phi = 45, d=1,col="blue",shade=0.75,border=NA)
```




```
# variograms
var4<-variog4(s100,max.dist=1)
```

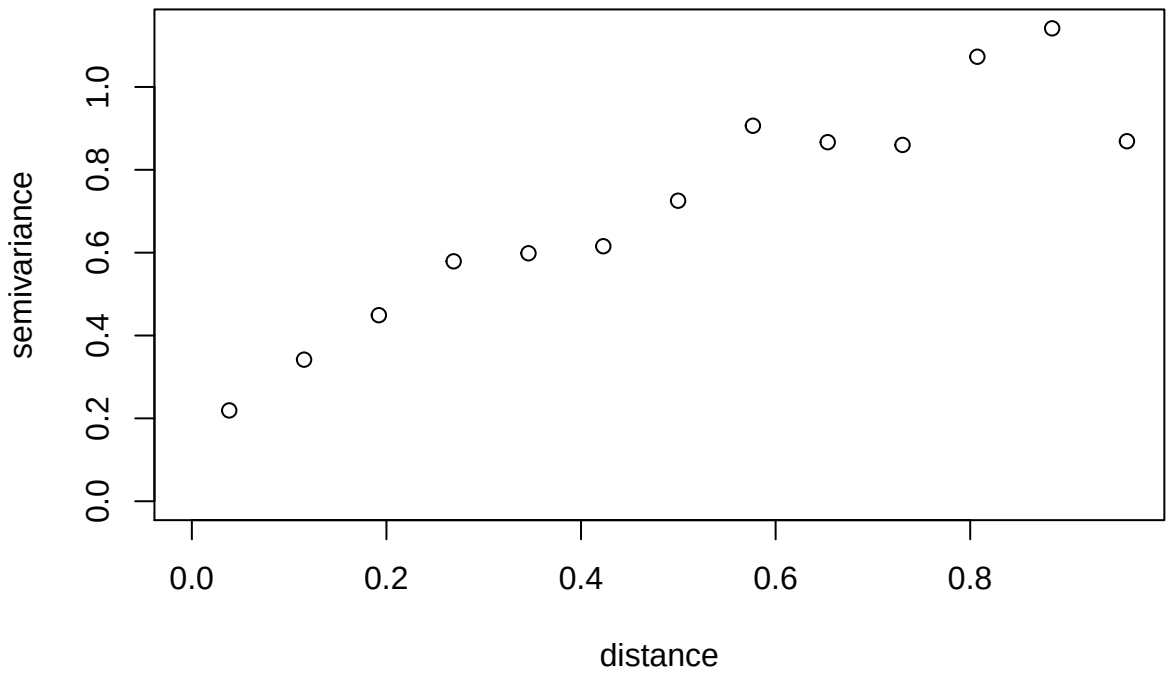
```
## variog: computing variogram for direction = 0 degrees (0 radians)
##         tolerance angle = 22.5 degrees (0.393 radians)
## variog: computing variogram for direction = 45 degrees (0.785 radians)
##         tolerance angle = 22.5 degrees (0.393 radians)
## variog: computing variogram for direction = 90 degrees (1.571 radians)
##         tolerance angle = 22.5 degrees (0.393 radians)
## variog: computing variogram for direction = 135 degrees (2.356 radians)
##         tolerance angle = 22.5 degrees (0.393 radians)
## variog: computing omnidirectional variogram
```

```
plot(var4)
```




```
var<-variog(s100,max.dist=1,estimator.type="classical")
```

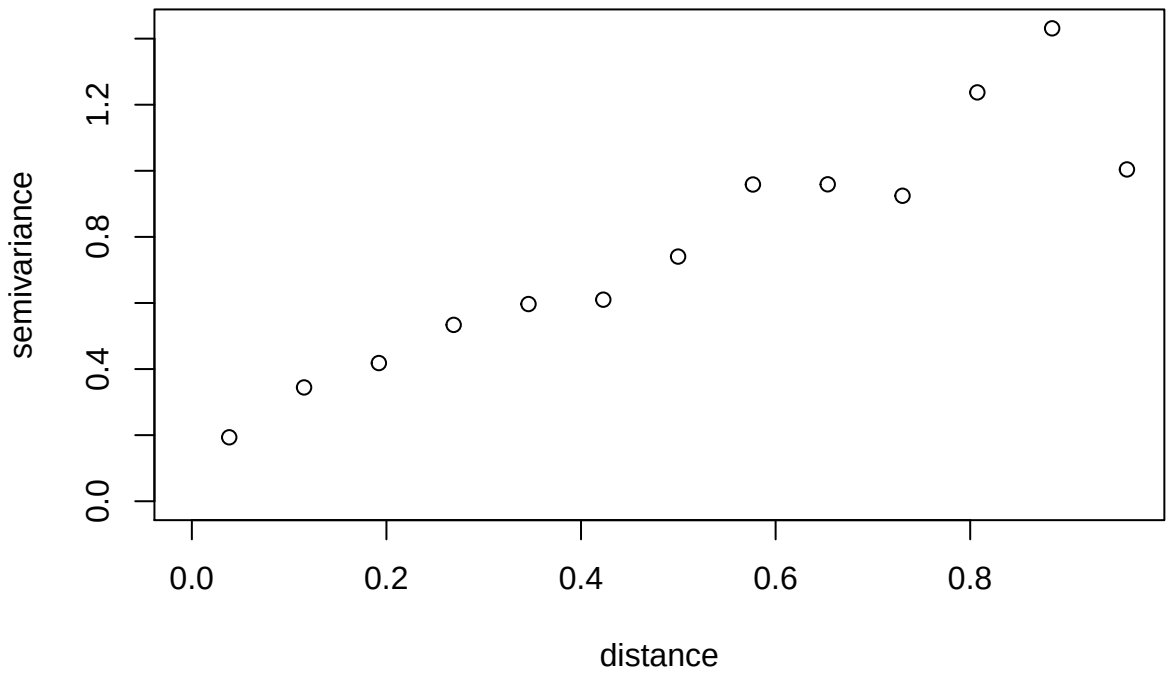
```
## variog: computing omnidirectional variogram
plot(var)
```




```
var<-variog(s100,max.dist=1,estimator.type="modulus")
```

```
## variog: computing omnidirectional variogram
```

```
plot(var)
```




```
#eyefit(var,silent=TRUE)
varf<-variofit(var,ini.cov.pars=c(0.91,0.59),cov.model="exponential",fix.nugget=FALSE, nugget=0.23)
```

```
## variofit: covariance model used is exponential
## variofit: weights used: npairs
## variofit: minimisation function used: optim
```

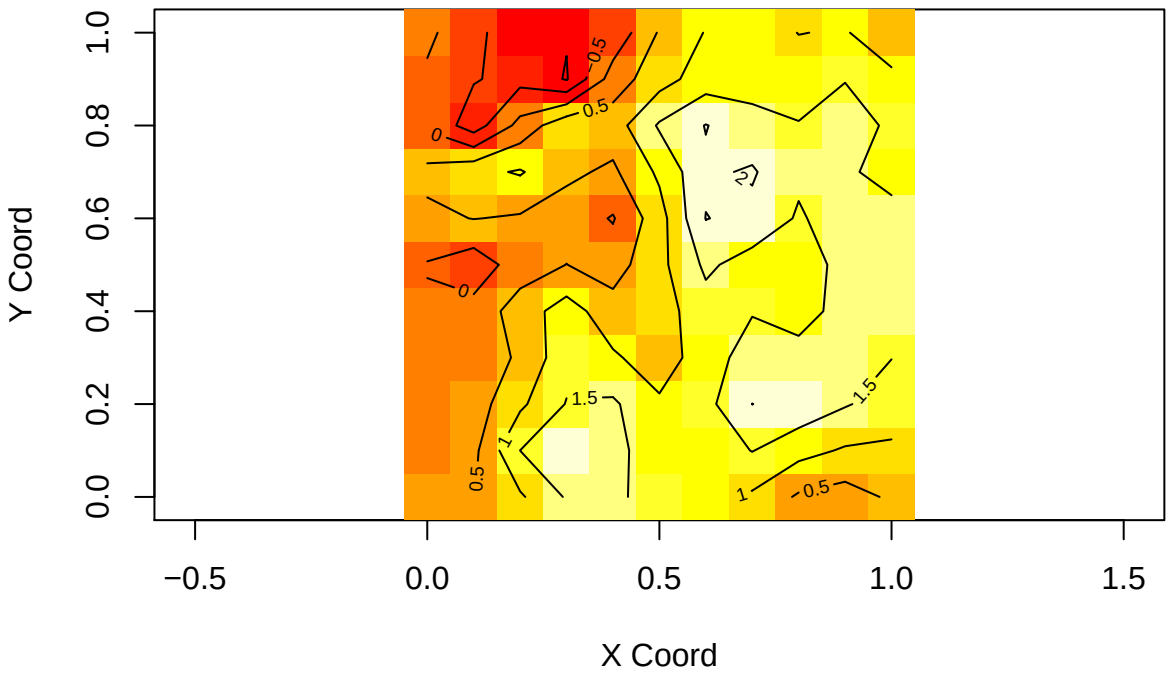
```
varf
```

```
## variofit: model parameters estimated by WLS (weighted least squares):
## covariance model is: exponential
## parameter estimates:
##   tausq sigmasq     phi
##  0.1751 13.0558 10.5626
## Practical Range with cor=0.05 for asymptotic range: 31.64268
##
## variofit: minimised weighted sum of squares = 44.6678
```

```
# Classical Kriging
loci<-expand.grid(seq(0,1,l=11),seq(0,1,l=11))
kc<-krige.conv(s100,loc=loci,krige=krige.control(cov.pars=c(1,.25)))
```

```
## krige.conv: model with constant mean
## krige.conv: Kriging performed using global neighbourhood
```

```
image(kc)
contour(kc,add=T)
```


Y Coord
0.0
0.2
0.4
0.6
0.8
1.0
−0.5
0.0
0.5
1.0
1.5
X Coord
0
0.5
1
1.5