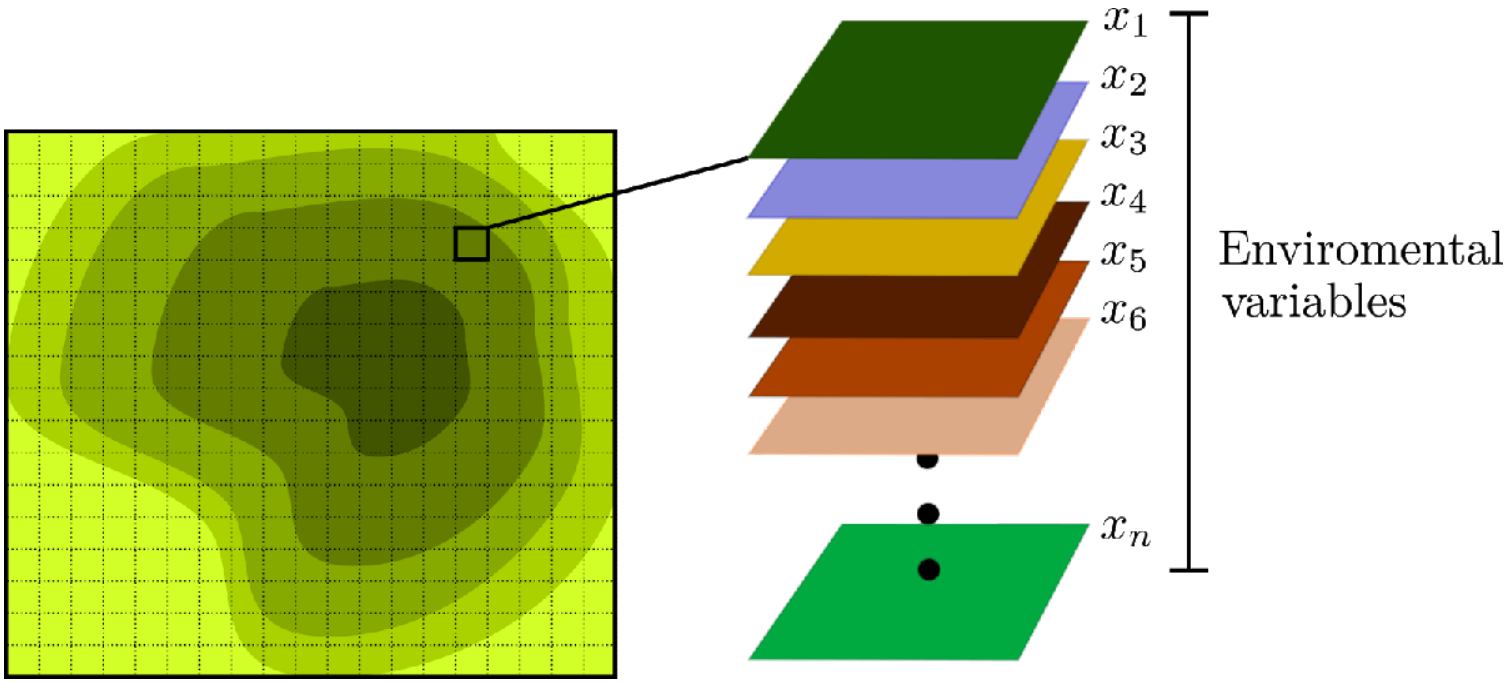
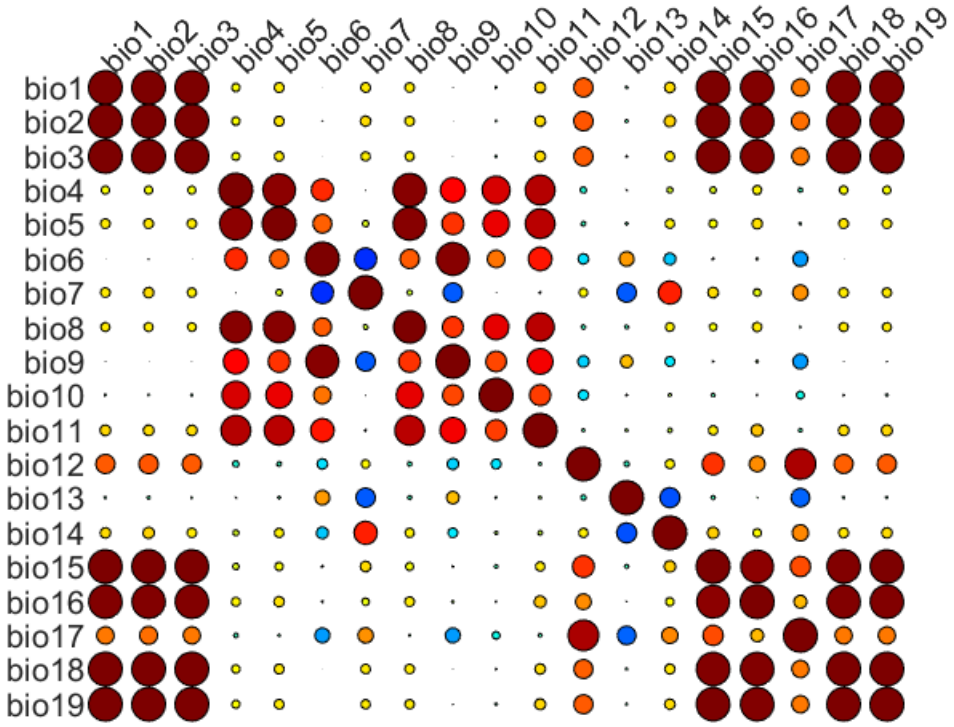
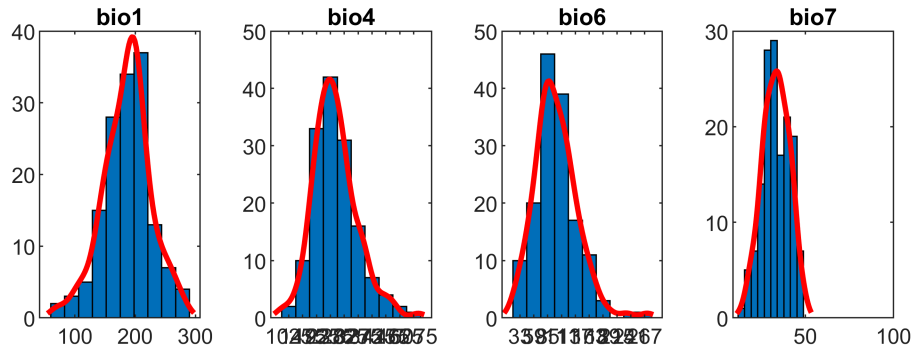
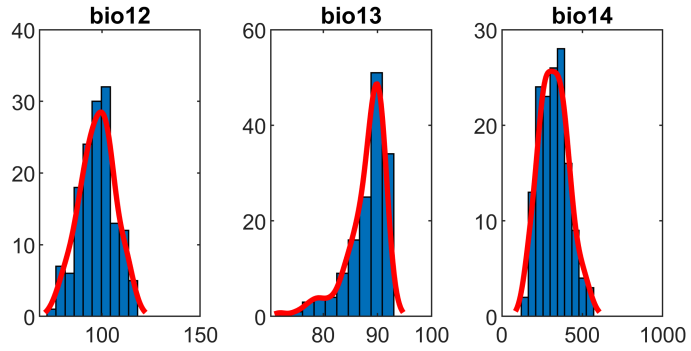
Tutorial toolbox modelamiento de nicho

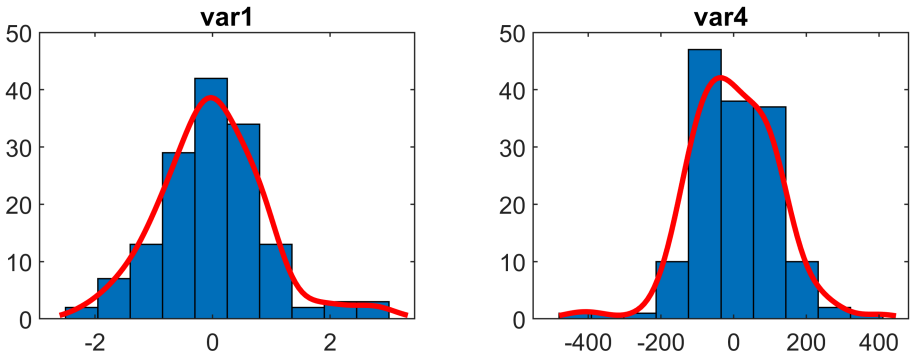


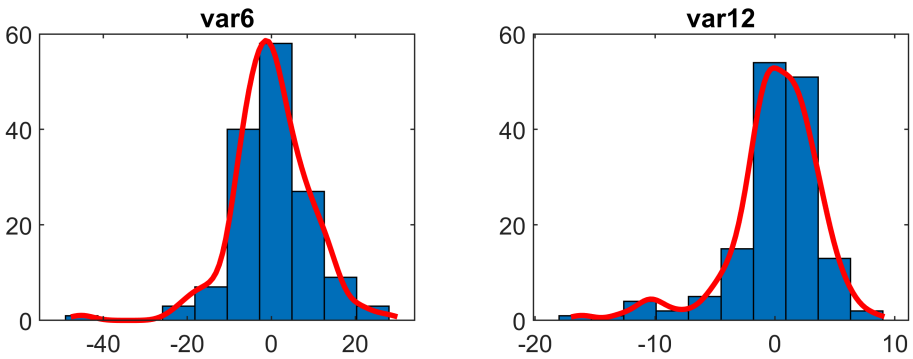

```
doc='../data/records/final_dataset.csv';%Ruta al documento de texto con los registros
layerfolder='../data/layers/';%route to folder with ambiental data
show=true;%para mostrar todas las figuras
data = bnm_prep(doc,layerfolder,show)
```







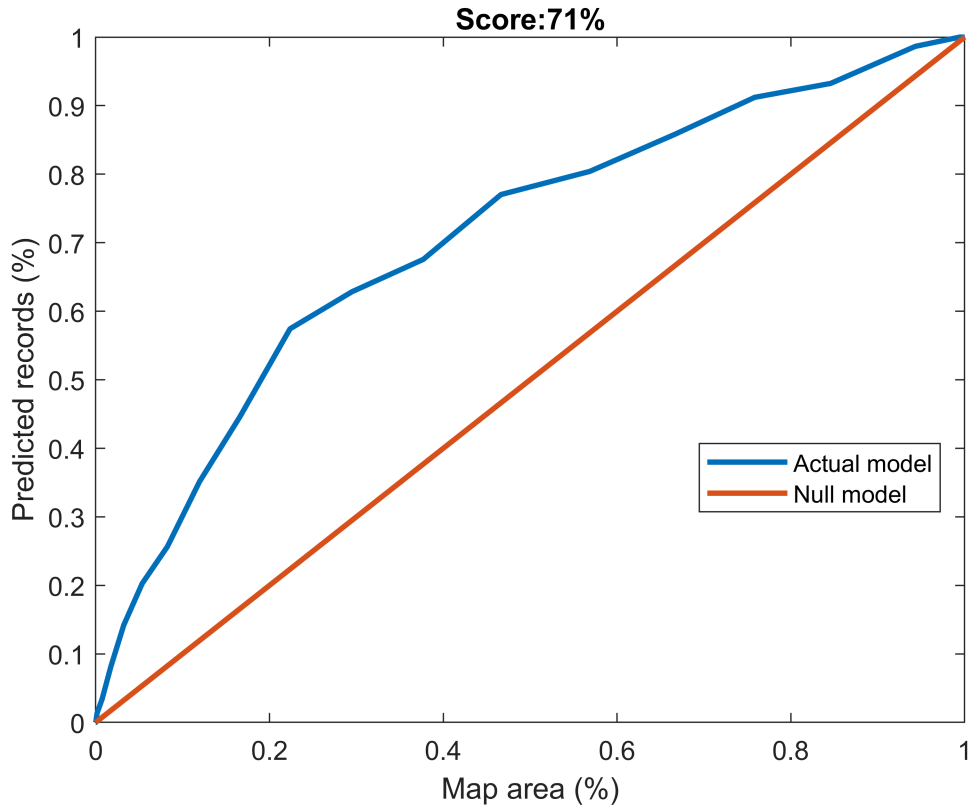


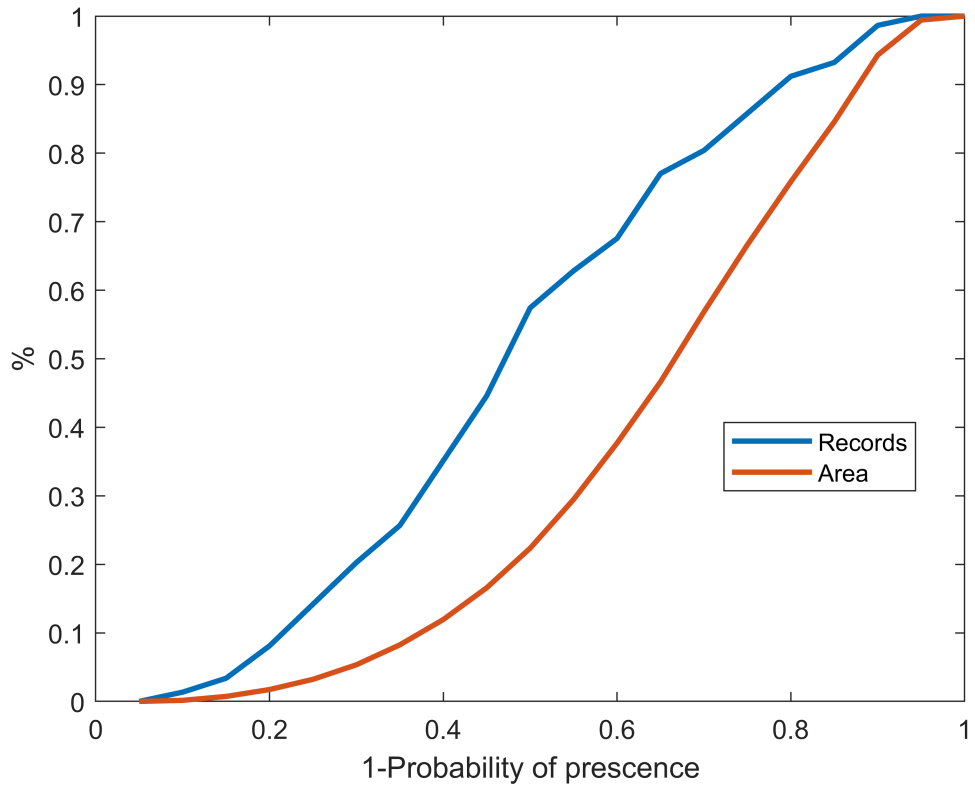


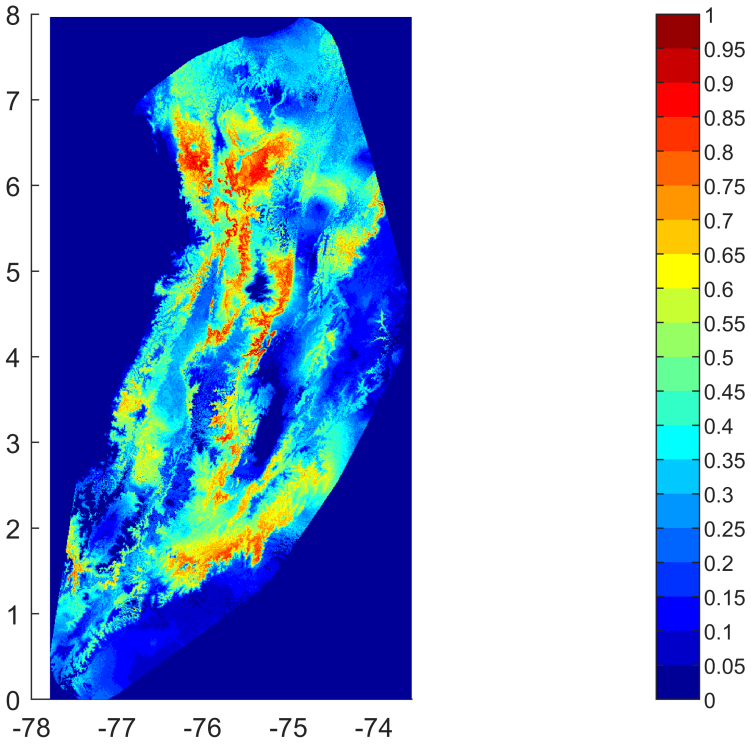

```
data = struct with fields:
         Tdata: [100×11 table]
    Indicators: [1 4 6 7 12 13 14]
          Vars: [1 4 6 12]
            T2: [148×22 table]
             Z: [956×507×19 double]
```

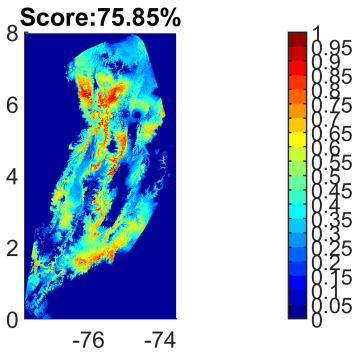
```
R: [3×2 double]
```

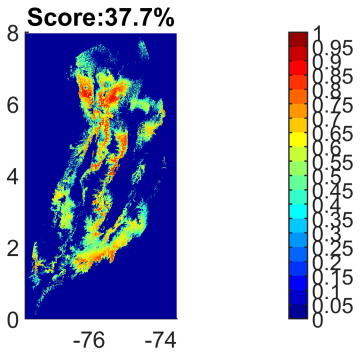
```
data = bnm_modeling(data,show)
```

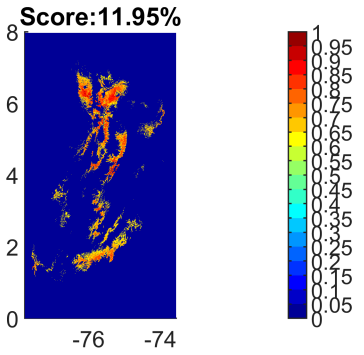


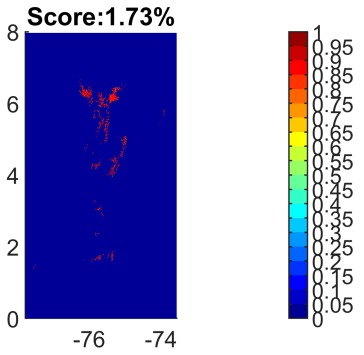










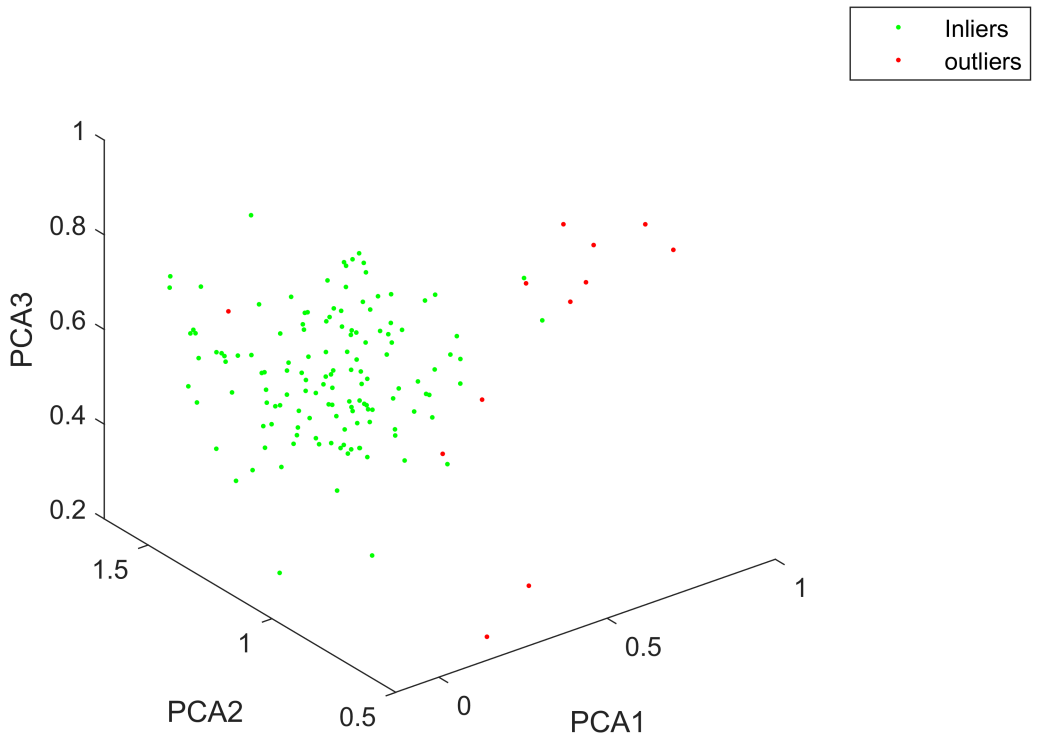



```
data = struct with fields:
         Tdata: [100×11 table]
    Indicators: [1 4 6 7 12 13 14]
          Vars: [1 4 6 12]
            T2: [148×22 table]
             Z: [956×507×19 double]
```

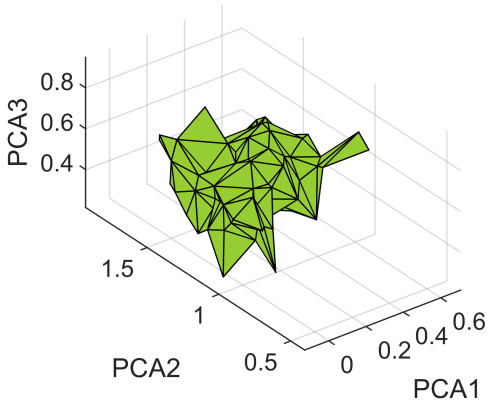
```
          R: [3×2 double]
        Map: [956×507 double]
   Response: [484692×11 double]
   Minimize: 0.8475
     Method: 4
```

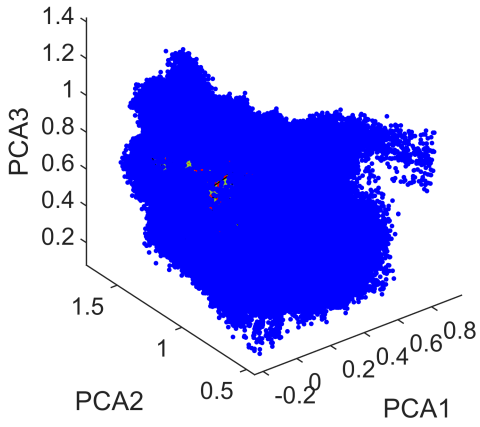
```
close all
show=true;%show graphics
outlier=false;%remove outliers before PCA with method in https://github.com/AntonSemechko/Multi
outlier2=true;%remove outliers after PCA with method in https://github.com/AntonSemechko/Multiv
data = bnm_modeling2(data,show,outlier,outlier2)
```

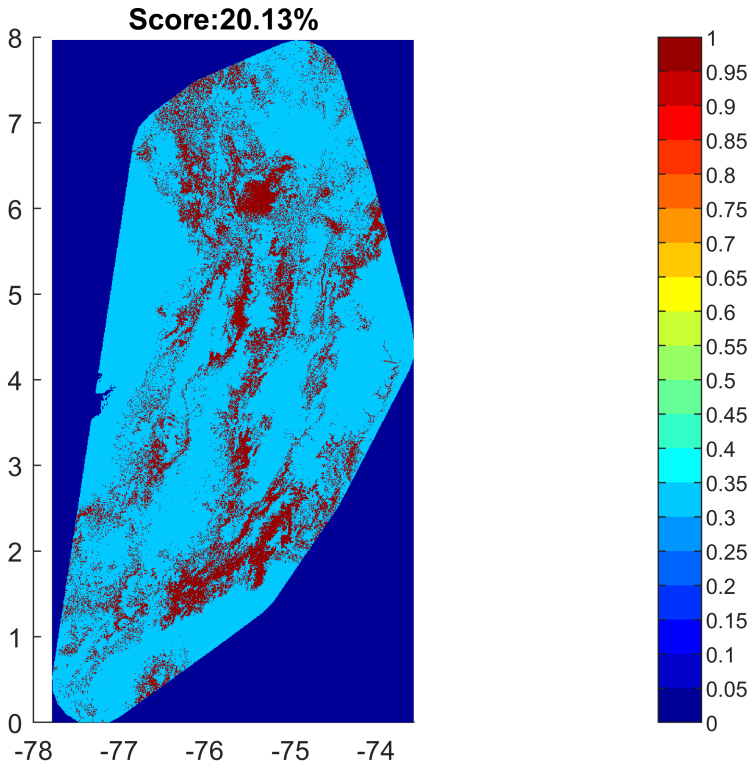
```
Warning: Duplicate data points have been detected and removed.
```



76% explained







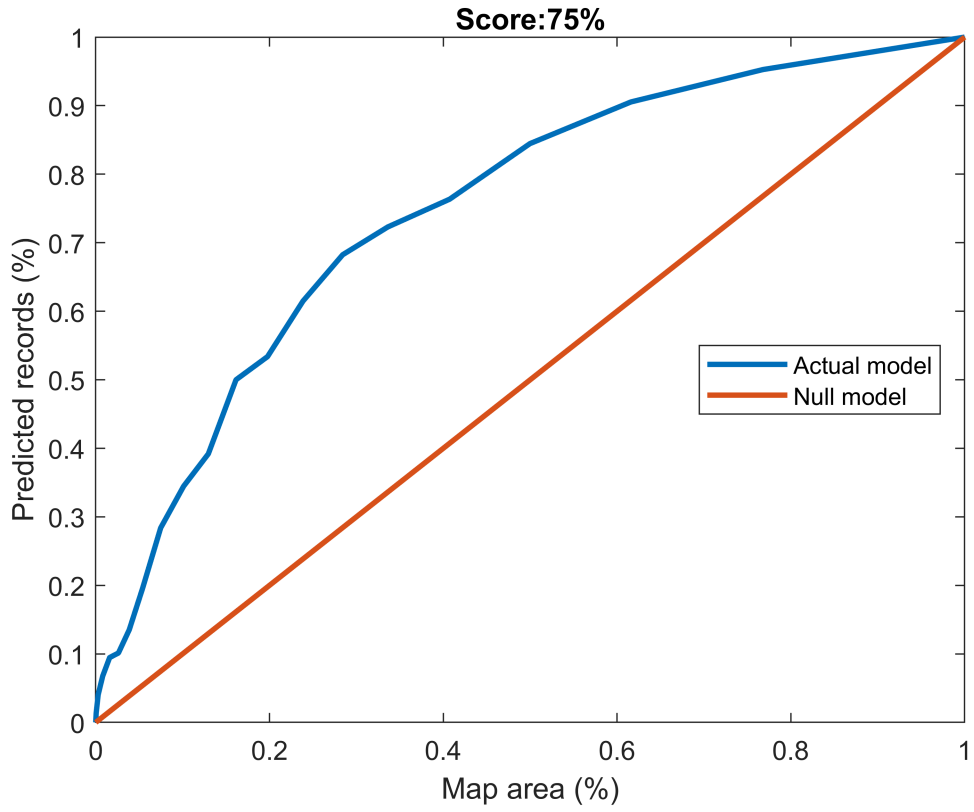

```
data = struct with fields:
         Tdata: [100×11 table]
    Indicators: [1 4 6 7 12 13 14]
          Vars: [1 4 6 12]
            T2: [148×22 table]
             Z: [956×507×19 double]
```

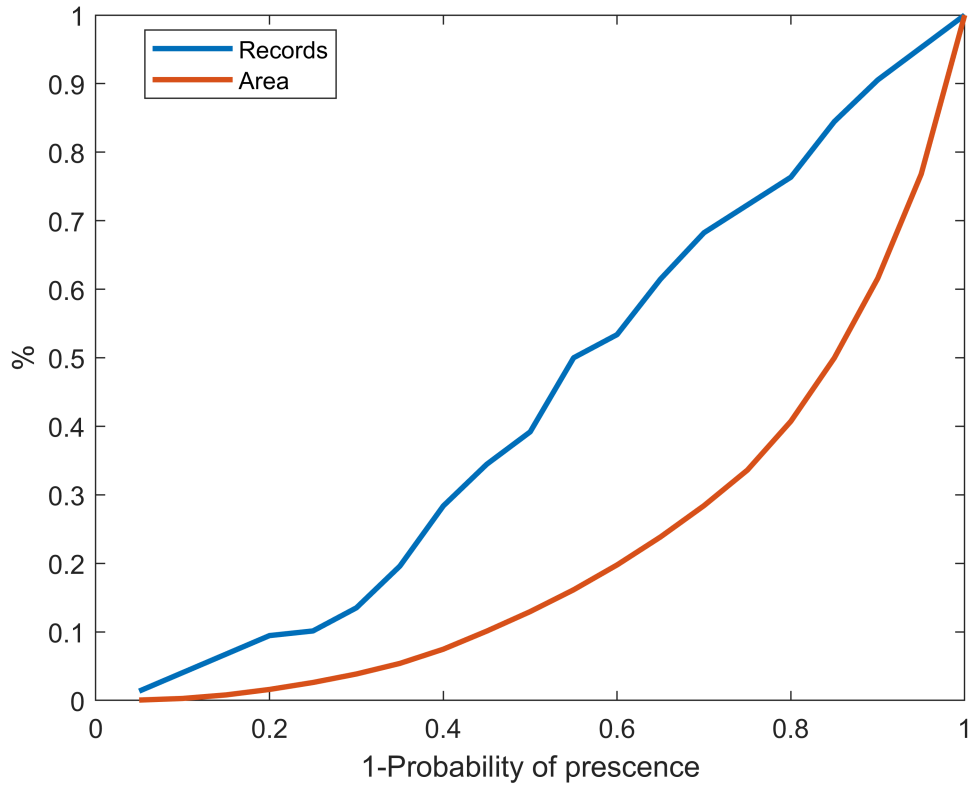
```
          R: [3×2 double]
        Map: [956×507 double]
   Response: [484692×11 double]
   Minimize: 0.8475
     Method: 4
     MapPca: [956×507 double]
   ScorePca: 20.1345
```

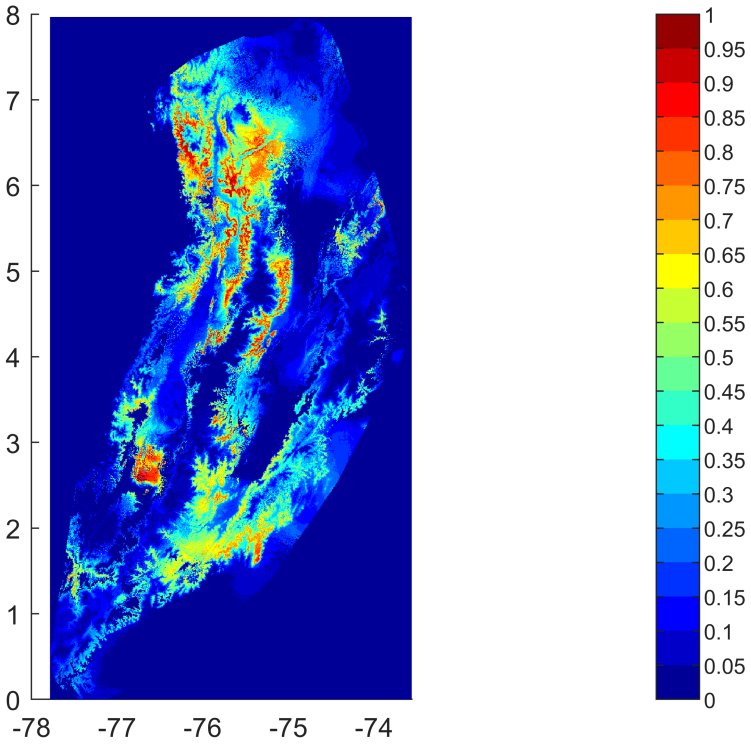
```
data.Method=5;%método para la función a optimizar
parallel=true;%uso del paralelo
solver=2;%1 --> fmincon, otherwise --> particleswarm
data = bnm_optim(data,show,parallel,solver)
```

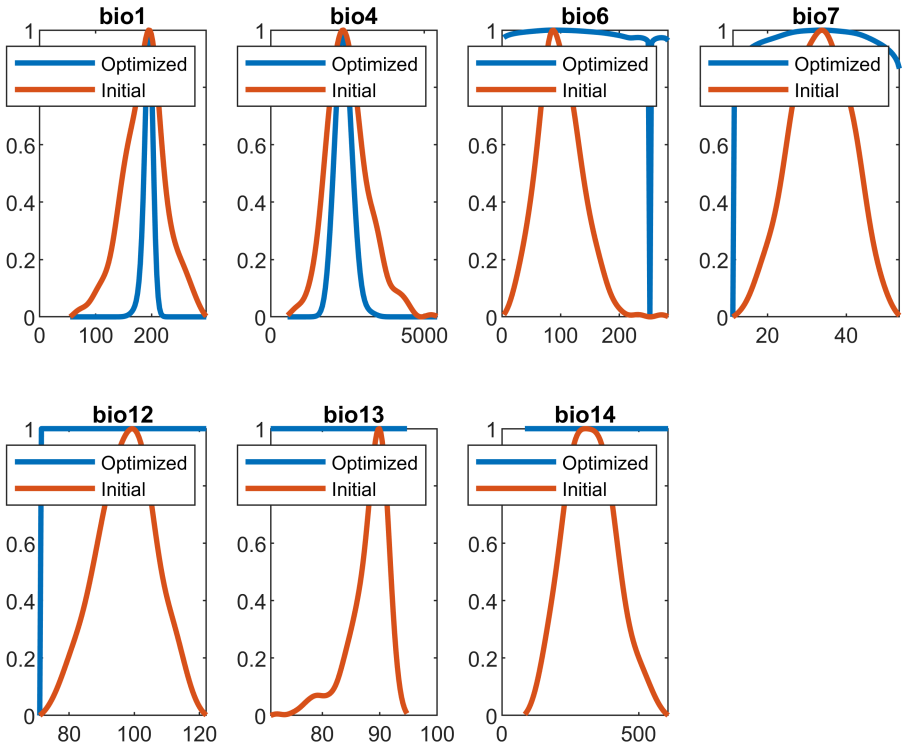
```
                              Best           Mean     Stall
Iteration     f-count          f(x)           f(x)    Iterations
    0             100          0.2823         0.3074       0
    1             200          0.2676         0.3106       0
    2             300           0.264         0.2862       0
    3             400          0.2595         0.2776       0
    4             500          0.2565         0.2693       0
    5             600          0.2548         0.2643       0
    6             700          0.2547         0.2625       0
    7             800          0.2547         0.2625       1
    8             900          0.2547         0.2612       2
    9            1000          0.2547         0.2615       3
   10            1100          0.2545         0.2603       0
   11            1200          0.2529         0.2612       0
   12            1300          0.2529         0.2631       1
   13            1400          0.2529         0.2606       2
   14            1500          0.2529         0.2612       3
   15            1600          0.2529         0.2613       4
   16            1700          0.2529         0.2619       5
   17            1800          0.2529         0.2587       6
   18            1900          0.2529         0.2574       7
   19            2000          0.2529         0.2567       8
   20            2100          0.2524          0.256       0
   21            2200          0.2524         0.2555       1
   22            2300          0.2517          0.255       0
   23            2400          0.2517         0.2549       1
   24            2500          0.2517         0.2542       2
   25            2600          0.2515          0.254       0
   26            2700          0.2515         0.2535       1
   27            2800          0.2513         0.2533       0
   28            2900          0.2513         0.2531       1
   29            3000          0.2513         0.2528       2
   30            3100          0.2512         0.2527       0

                              Best           Mean     Stall
Iteration     f-count          f(x)           f(x)    Iterations
   31            3200          0.2512         0.2526       1
   32            3300          0.2512         0.2524       2
   33            3400          0.2512         0.2524       3
   34            3500          0.2512         0.2522       0
   35            3600          0.2511         0.2522       0
   36            3700          0.2511          0.252       0
   37            3800          0.2511          0.252       0
   38            3900          0.2511          0.252       1
   39            4000          0.2511         0.2519       0
   40            4100          0.2511         0.2519       1
   41            4200          0.2511         0.2518       2
   42            4300          0.2511         0.2519       0
   43            4400          0.2511         0.2517       0
   44            4500          0.2511         0.2518       1
```

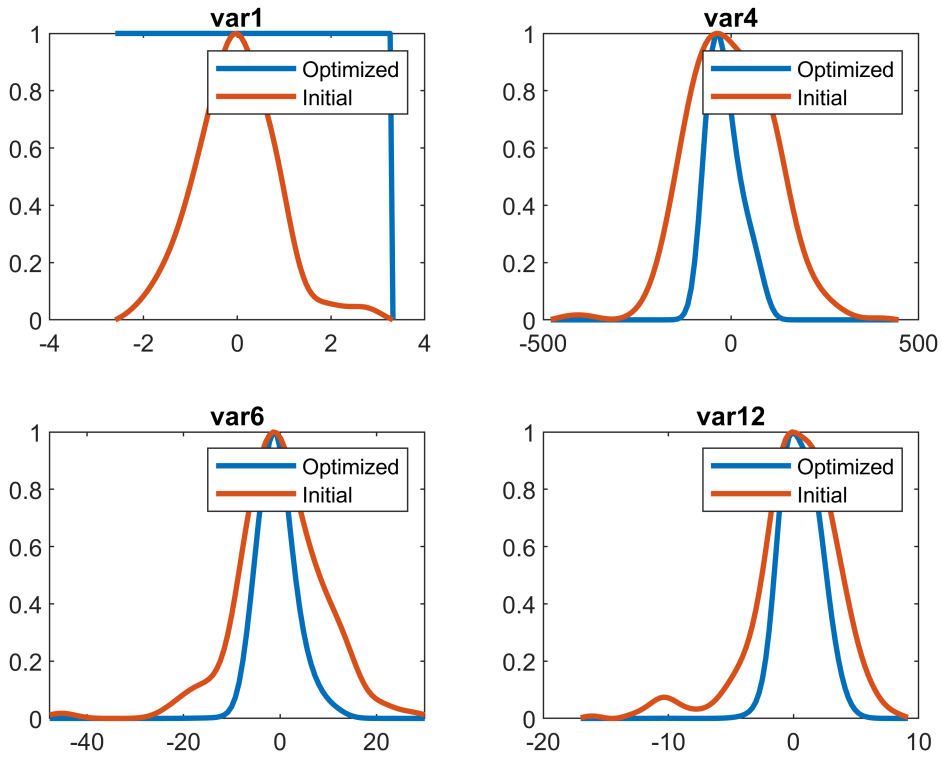
```
   45           4600          0.2511          0.2517        2
   46           4700          0.2511          0.2517        3
   47           4800          0.2511          0.2517        0
   48           4900          0.2511          0.2517        0
   49           5000          0.2511          0.2517        1
   50           5100          0.2511          0.2517        0
   51           5200          0.2511          0.2517        0
   52           5300          0.2511          0.2516        0
   53           5400          0.2511          0.2516        0
   54           5500          0.2511          0.2515        0
   55           5600          0.2511          0.2515        1
   56           5700          0.2511          0.2515        0
   57           5800          0.2511          0.2515        1
   58           5900          0.2511          0.2516        0
   59           6000          0.2511          0.2515        1
   60           6100          0.2511          0.2515        2

                               Best            Mean     Stall
Iteration     f-count           f(x)            f(x)    Iterations
   61           6200          0.2511          0.2516        0
   62           6300          0.2511          0.2515        1
   63           6400          0.2511          0.2515        0
   64           6500          0.2511          0.2515        0
   65           6600          0.2511          0.2515        0
   66           6700          0.2511          0.2515        1
   67           6800          0.2511          0.2515        0
   68           6900          0.2511          0.2514        1
   69           7000          0.2511          0.2515        2
   70           7100          0.2511          0.2515        3
   71           7200          0.2511          0.2515        4
   72           7300          0.2511          0.2514        0
   73           7400          0.2511          0.2514        0
   74           7500          0.2511          0.2514        0
   75           7600          0.2511          0.2515        1
   76           7700          0.2511          0.2514        2
   77           7800          0.2511          0.2514        3
   78           7900          0.2511          0.2513        4
   79           8000          0.2511          0.2513        5
   80           8100          0.2511          0.2514        6
   81           8200          0.2511          0.2513        7
   82           8300          0.2511          0.2514        8
Optimization ended: relative change in the objective value
over the last OPTIONS.MaxStallIterations iterations is less than OPTIONS.FunctionTolerance.
```


Score:75%
Predicted records (%)
Map area (%)
Actual model
Null model
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
0
0.2
0.4
0.6
0.8
1


%
1-Probability of prescence
Records
Area
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
0
0.2
0.4
0.6
0.8
1


8
7
6
5
4
3
2
1
0
-78
-77
-76
-75
-74
1
0.95
0.9
0.85
0.8
0.75
0.7
0.65
0.6
0.55
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0


bio1
bio4
bio6
bio7
bio12
bio13
bio14
Optimized
Initial




```
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          Vars: [1 4 6 12]
            T2: [148×22 table]
             Z: [956×507×19 double]
             R: [3×2 double]
           Map: [956×507 double]
      Response: [484692×11 double]
      Minimize: 0.8475
        Method: 5
         Coeff: [9.9756 4.2731 0.0054 0.0265 1.3289e-07 0 0 2.3140e-06 10.0000 3.1296 2.9408]
         Optim: 0.2511
```