Rmd_EsempioPartizioneFissa

Partizione fissa

```
library(GDFMM)
library(ACutils)
```

data generation

Genero i dati per 3 gruppi

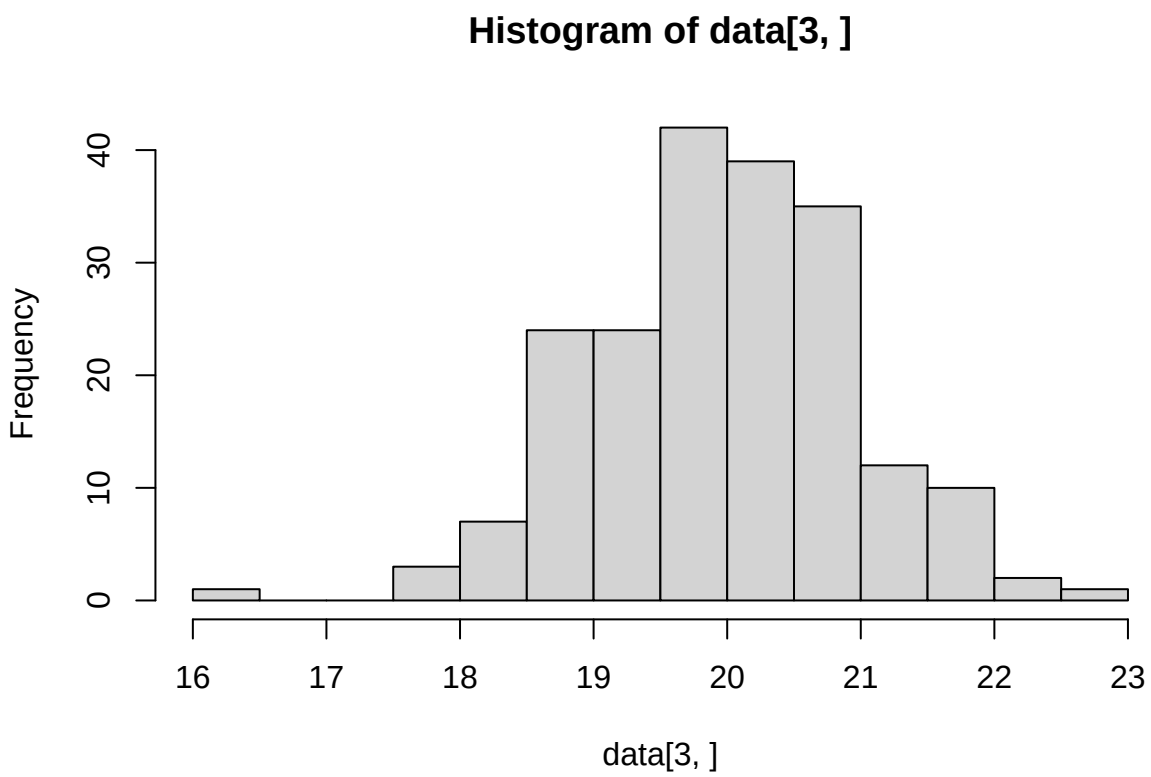
```
d = 3                # number of groups
K = 3                # number of global clusters
mu = c(-20,0,20)    # vectors of means
sd = c(1,1,1)       # vector of sd
n_j = rep(200, d)   # set cardinality of the groups
p = matrix(0, nrow = d, ncol = K) # matrix with components weights

set.seed(124123)
Kgruppo = c()
componenti_gruppo = NULL
data = matrix(NA, nrow = d, ncol = max(n_j))      # d x max(n_j) matrix
cluster = matrix(NA, nrow = d, ncol = max(n_j))   # d x max(n_j) matrix
real_partition = c()       # real_partition is a vector of length sum(n_j), it collects all the group me
                           # values are collected level by level, so first all the values in level 1, th
                           # cluster label must always start from 0!
for(j in 1:d){
  Kgruppo[j] = sample(1:K,1) # number of clusters in each level
  componenti_gruppo[[j]] = sample(1:K,Kgruppo[j], replace = F) # choose the components
  p[j,1:Kgruppo[j]] = rep(1/Kgruppo[j], Kgruppo[j]) # set the weights all equals
  appoggio = genera_mix_gas(n = n_j[j], pro = p[j,1:Kgruppo[j]], means = mu[ componenti_gruppo[[j]] ],
                            sds = sd[ componenti_gruppo[[j]] ] )

  data[j, 1:n_j[j]] = appoggio$y
  #cluster[j, 1:n_j[j]] = appoggio$clu, #errore, genera_mix_gas usa sempre indici che partono da 1!
  cluster[j, 1:n_j[j]] = unlist(lapply(1:n_j[j], function(h){componenti_gruppo[[j]][appoggio$clu[h]]}))
  real_partition = c(real_partition, cluster[j, 1:n_j[j]])
}
```

La partizione generata cosi non rispecchia i criteri del sampler. Serve che parta da 0 e che abbia valori contigui. Quindi deve essere 0,1,2,... e non cose tipo 1,2,3... oppure 0,1,3,5,6... Ho fatto una funzione per sistemare questa cosa, si chiama `arrange_partition`. Non la faccio vedere, viene chiamata automaticamente nel sampler.

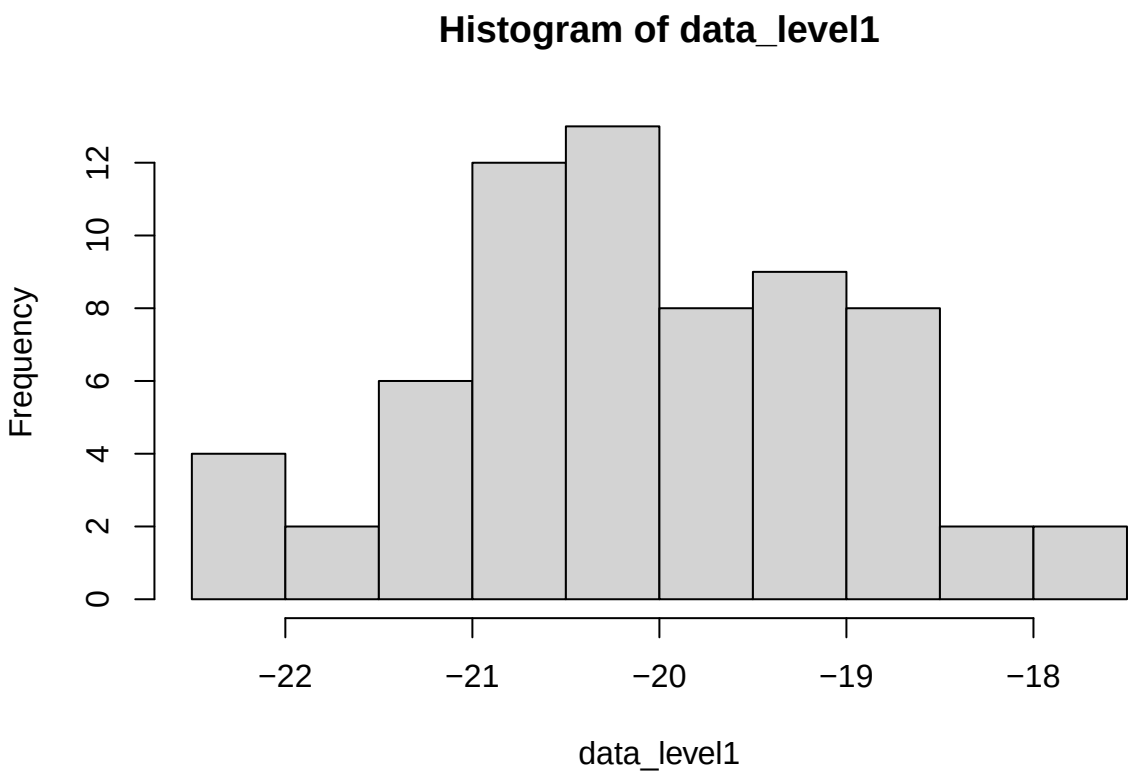
guardo i dati

Spero che sia il seed giusto, perché se non ci sono formati 3 cluster allocati, può essere che ci siano dei nan

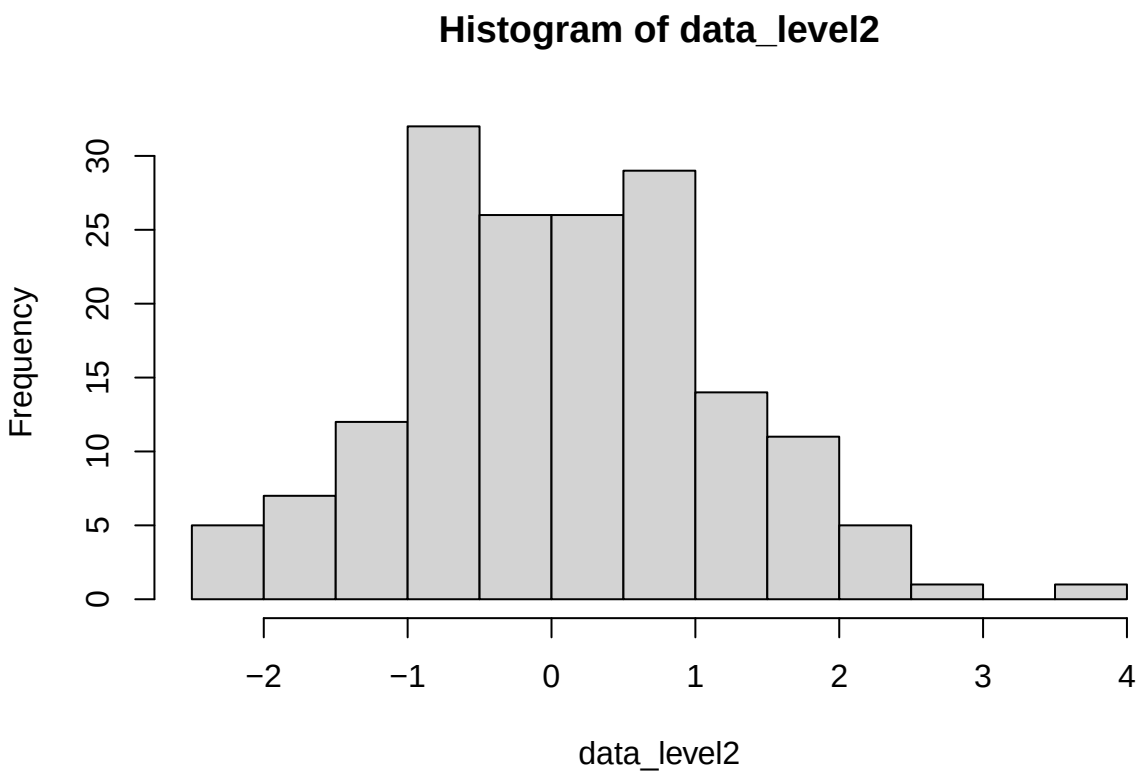
```
N_m = table(real_partition)

x11();hist(data[1,])
x11();hist(data[2,])
x11();hist(data[3,])


data_level1 = data[cluster==1]
```



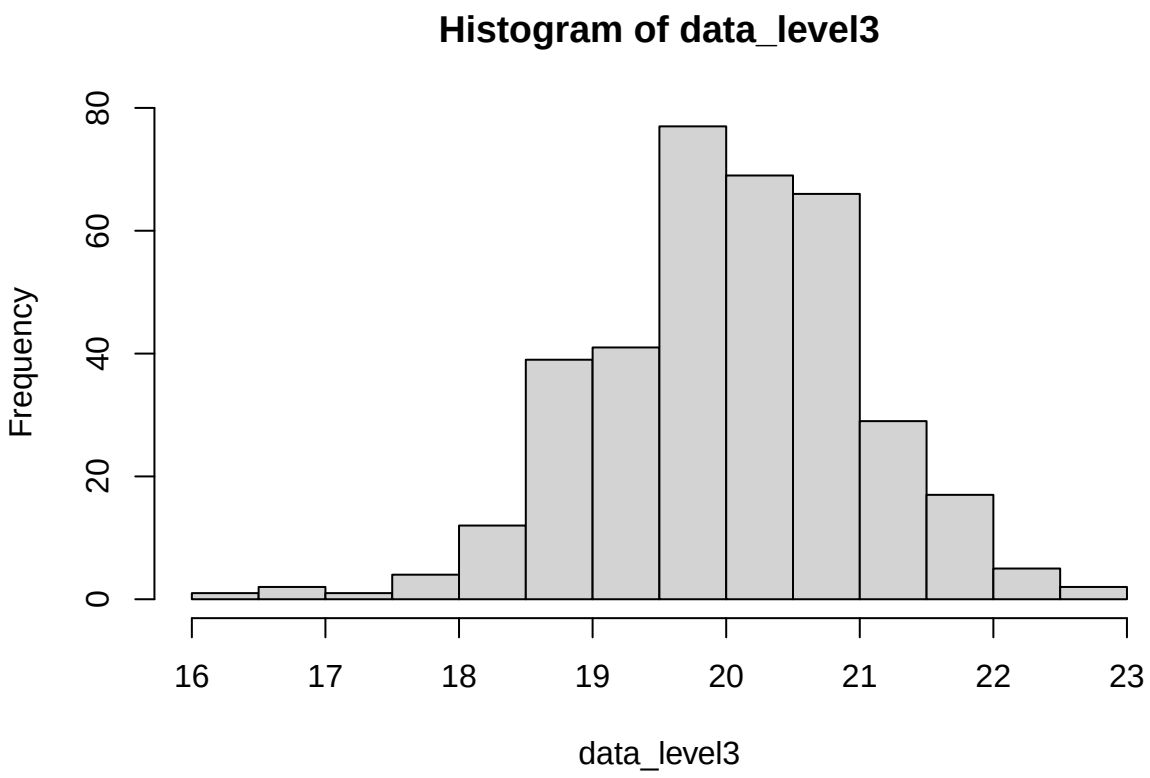

```
data_level2 = data[cluster==2]
data_level3 = data[cluster==3]

mean1 = mean(data_level1); var1 = var(data_level1); x11(); hist(data_level1); N_m1 = length(data_level1
mean2 = mean(data_level2); var2 = var(data_level2); x11(); hist(data_level2); N_m2 = length(data_level2
```




```
mean3 = mean(data_level3); var3 = var(data_level3); x11(); hist(data_level3); N_m3 = length(data_level3)
```


Histogram of data_level2
Frequency
0
5
10
15
20
25
30
−2
−1
0
1
2
3
4
data_level2

```
c(N_m1, N_m2, N_m3)
```




```
## [1]  66 169 365
```

```
c(mean1, mean2, mean3)
```

```
## [1] -20.07729349   0.08255401  20.02558109
```

```
c(var1, var2, var3)
```

```
## [1] 1.168506 1.160008 0.999889
```

Run

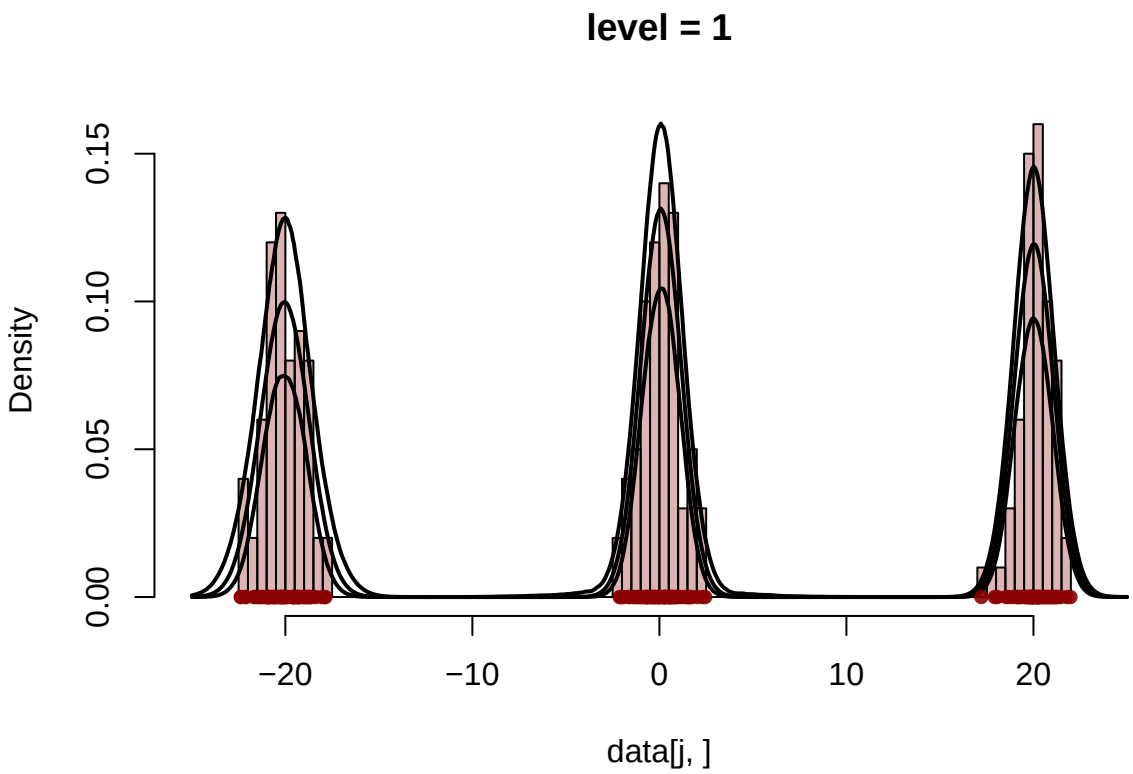
```
niter  <- 1000
burnin <- 1000
thin   <- 1

option<-list("Mstar0" = 3, "Lambda0" = 3, "mu0" = 0,"sigma0"= 1, "gamma0" = 1,
             "Adapt_MH_hyp1"= 0.7,"Adapt_MH_hyp2"= 0.234, "Adapt_MH_power_lim"=10, "Adapt_MH_var0"=1,
             "k0"= 1/10, "nu0"=10, "alpha_gamma"=1,
             "beta_gamma"=1, "alpha_lambda"=1, "beta_lambda"=1,
             "UpdateU" = T, "UpdateM" = F, "UpdateGamma" = T, "UpdateS" = T,
             "UpdateTau" = T, "UpdateLambda" = F, "partition" = real_partition
)

#GDFMM = GDFMM_sampler(data, niter, burnin, thin, seed = 123, option = option)
GDFMM = GDFMM_sampler(data, niter, burnin, thin, seed = 123, FixPartition = T, option = option)
```

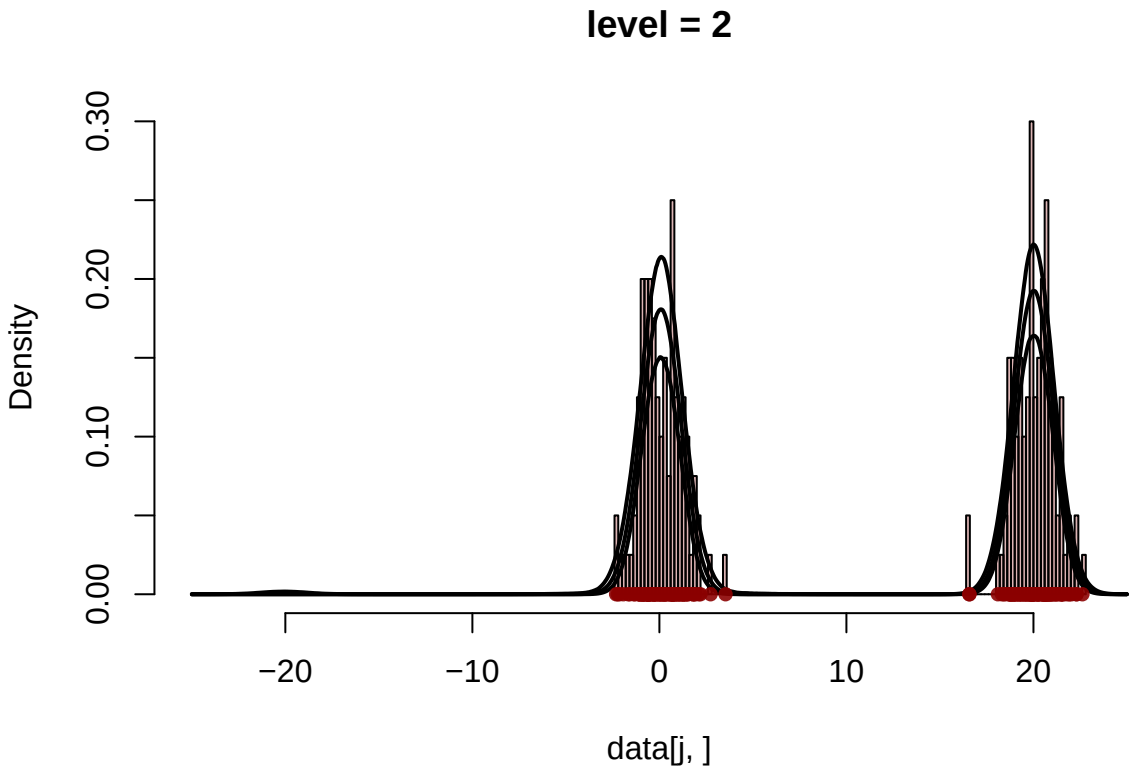
```
##
```

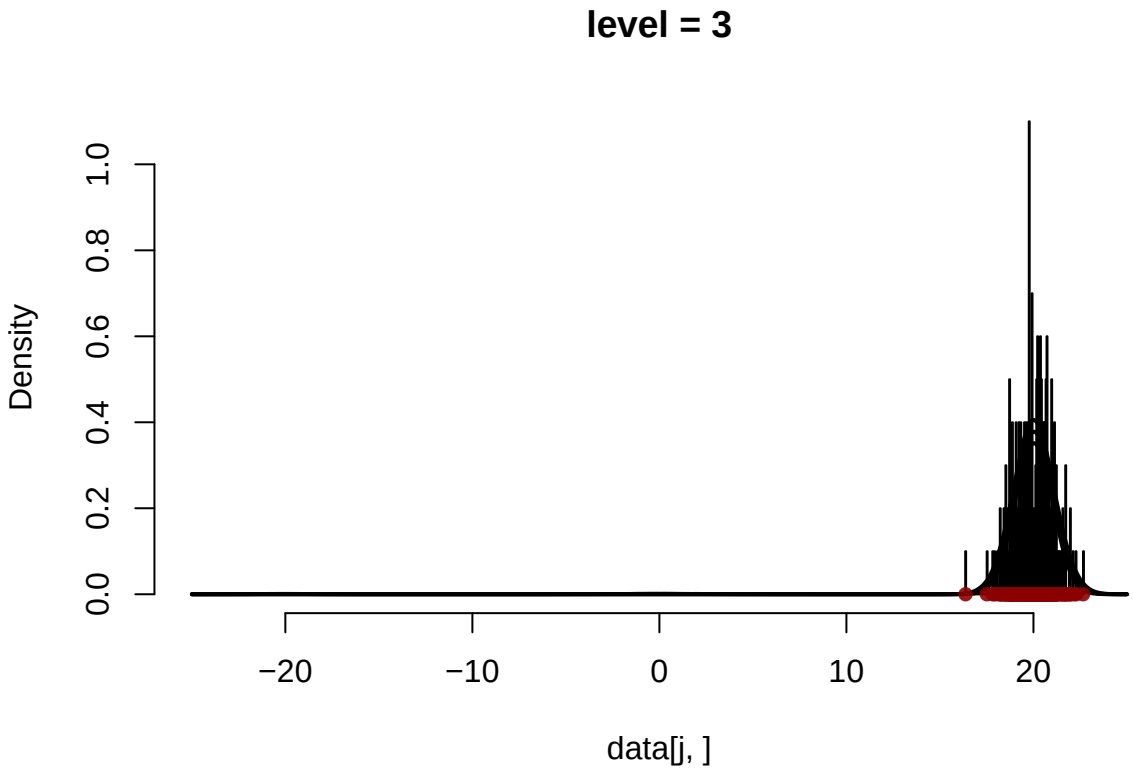
```
##  Check that provided partition is well formed. It must start from 0 and all values must be contiguous
## initialize_Partition with non empty partition_vec
## Watch out modification: Mstar is not set to zero but to Mstar0
##  (K, Mstar, M) = (3,3,3)
## Chiamato initialize_S con gs_engine, mette casuale!
```

Analisi output - Calcolo predittive

```
l_grid = 1000
grid = seq(-25,25,length.out = l_grid)

# Predictive in all groups
Pred_all = predictive_all_groups(grid = grid, fit = GDFMM)

for(j in 1:d){
  hist(data[j,], freq = F, breaks = l_grid/10, col = ACutils::t_col("darkred", 70), xlim = range(grid),
             main = paste0("level = ",j))
  matplot(x = grid, y = t(Pred_all[[j]]), type = 'l', col = 'black', lty = 1, lwd = 2, add = T)
  points(x = data[j,], y = rep(0, length(data[j,])), pch = 16, col = ACutils::t_col("darkred", 10))

}
```




level = 2
Density
0.00
0.10
0.20
0.30
−20
−10
0
10
20
data[j,]



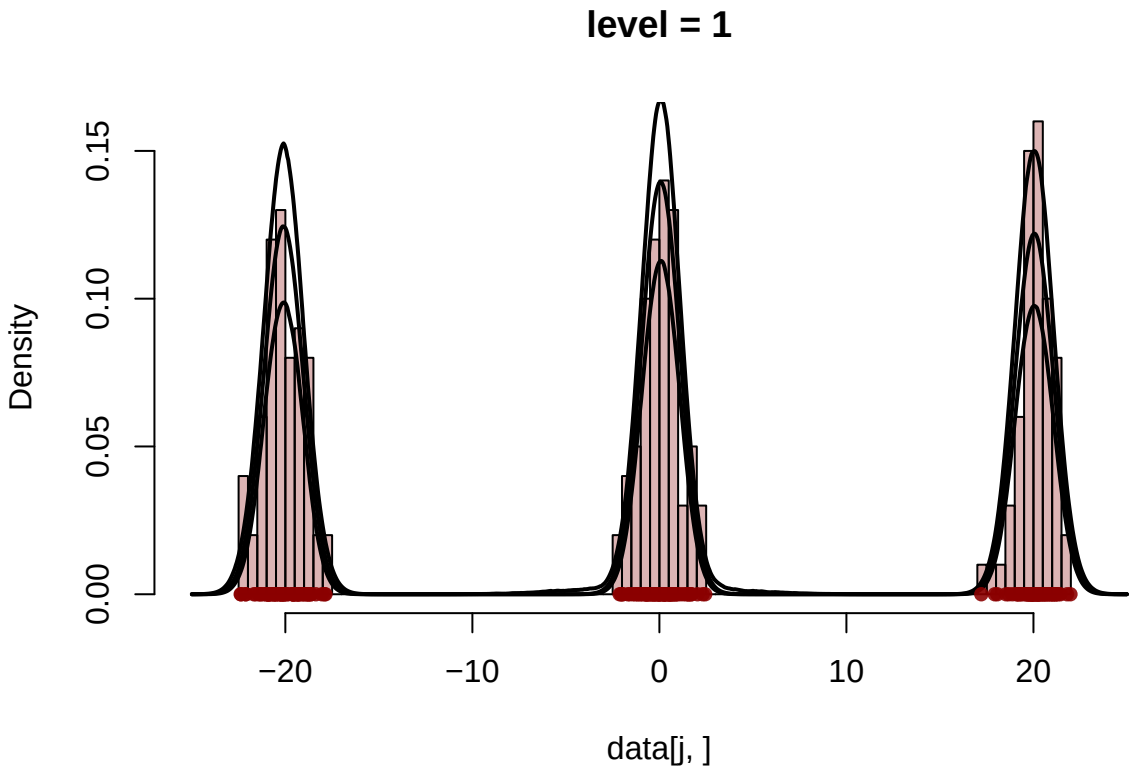
ripeto per d = 10

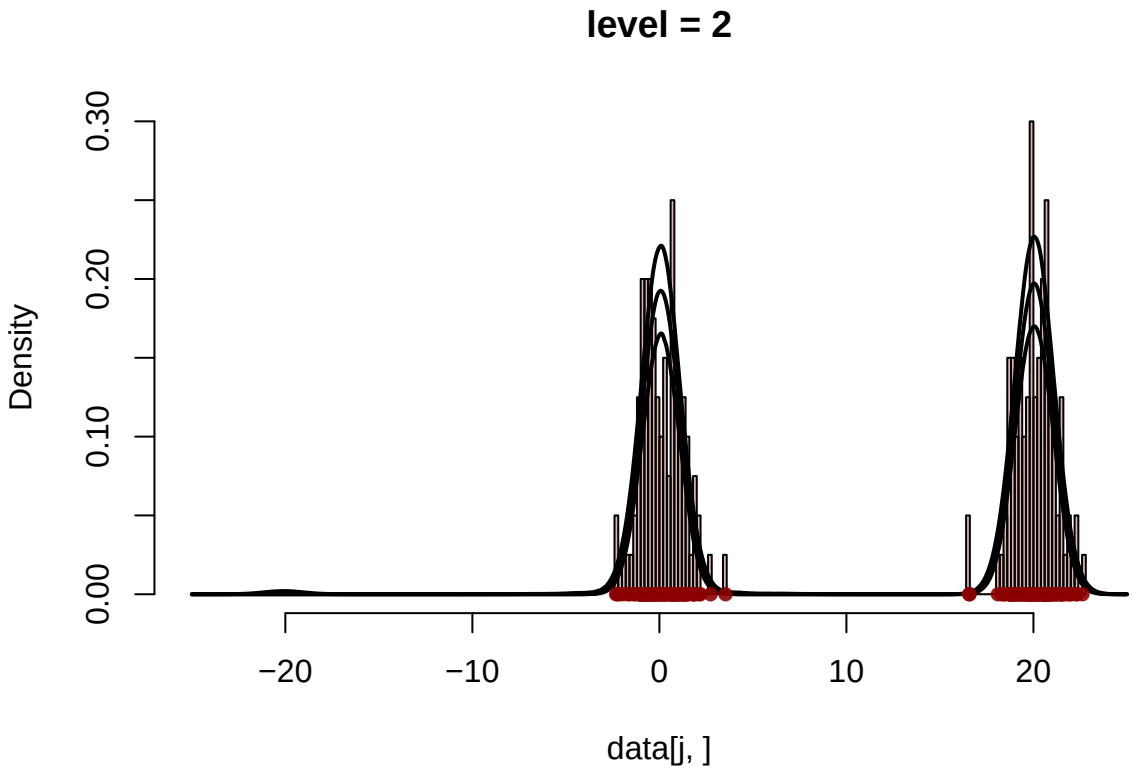
```
d = 10                # number of groups
K = 3                 # number of global clusters
mu = c(-20,0,20)    # vectors of means
sd = c(1,1,1)       # vector of sd
n_j = rep(200, d)   # set cardinality of the groups
p = matrix(0, nrow = d, ncol = K) # matrix with components weights

set.seed(124123)
Kgruppo = c()
componenti_gruppo = NULL
data = matrix(NA, nrow = d, ncol = max(n_j))      # d x max(n_j) matrix
cluster = matrix(NA, nrow = d, ncol = max(n_j))   # d x max(n_j) matrix
real_partition = c()       # real_partition is a vector of length sum(n_j), it collects all the group me
                           # values are collected level by level, so first all the values in level 1, th
                           # cluster label must always start from 0!
for(j in 1:d){
  Kgruppo[j] = sample(1:K,1) # number of clusters in each level
  componenti_gruppo[[j]] = sample(1:K,Kgruppo[j], replace = F) # choose the components
  p[j,1:Kgruppo[j]] = rep(1/Kgruppo[j], Kgruppo[j]) # set the weights all equals
  appoggio = genera_mix_gas(n = n_j[j], pro = p[j,1:Kgruppo[j]], means = mu[ componenti_gruppo[[j]] ],
                            sds = sd[ componenti_gruppo[[j]] ] )

  data[j, 1:n_j[j]] = appoggio$y
```

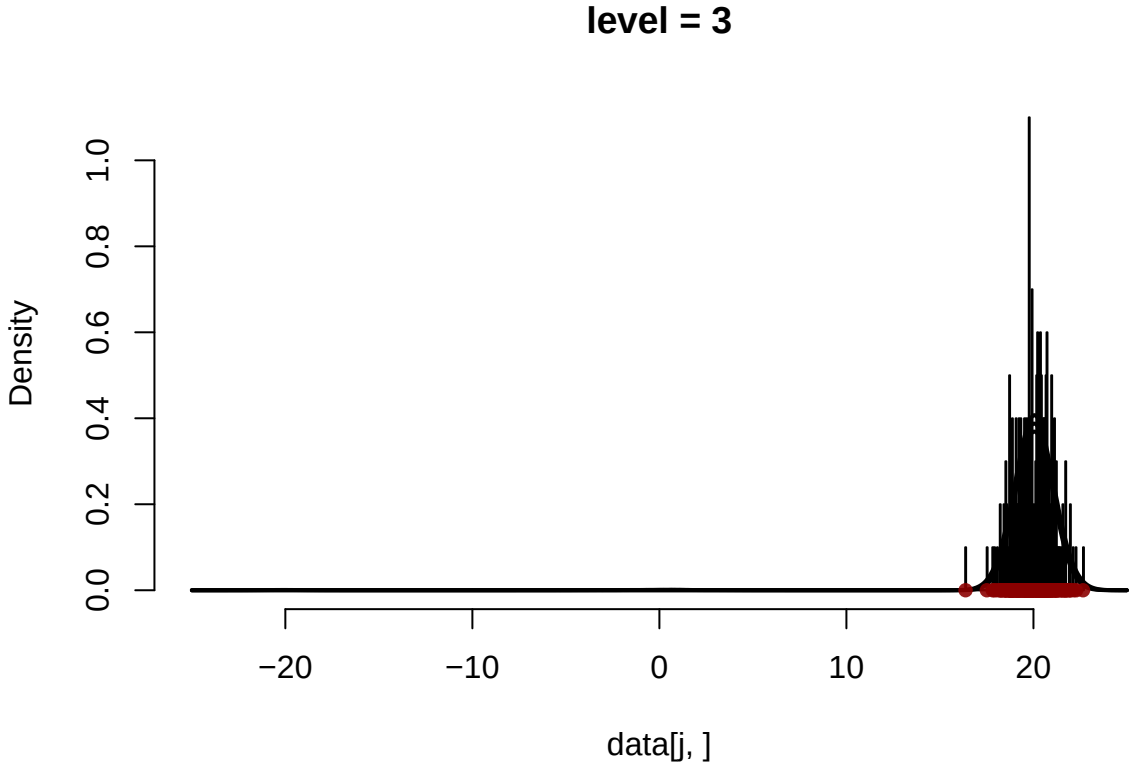
```
  #cluster[j, 1:n_j[j]] = appoggio$clu, #errore, genera_mix_gas usa sempre indici che partono da 1!
  cluster[j, 1:n_j[j]] = unlist(lapply(1:n_j[j], function(h){componenti_gruppo[[j]][appoggio$clu[h]]}))
  real_partition = c(real_partition, cluster[j, 1:n_j[j]])
}

niter  <- 1000
burnin <- 1000
thin   <- 1

option<-list("Mstar0" = 3, "Lambda0" = 3, "mu0" = 0,"sigma0"= 1, "gamma0" = 1,
             "Adapt_MH_hyp1"= 0.7,"Adapt_MH_hyp2"= 0.234, "Adapt_MH_power_lim"=10, "Adapt_MH_var0"=1,
             "k0"= 1/10, "nu0"=10, "alpha_gamma"=1,
             "beta_gamma"=1, "alpha_lambda"=1, "beta_lambda"=1,
             "UpdateU" = T, "UpdateM" = F, "UpdateGamma" = T, "UpdateS" = T,
             "UpdateTau" = T, "UpdateLambda" = F, "partition" = real_partition
)

#GDFMM = GDFMM_sampler(data, niter, burnin, thin, seed = 123, option = option)
GDFMM = GDFMM_sampler(data, niter, burnin, thin, seed = 123, FixPartition = T, option = option)
```

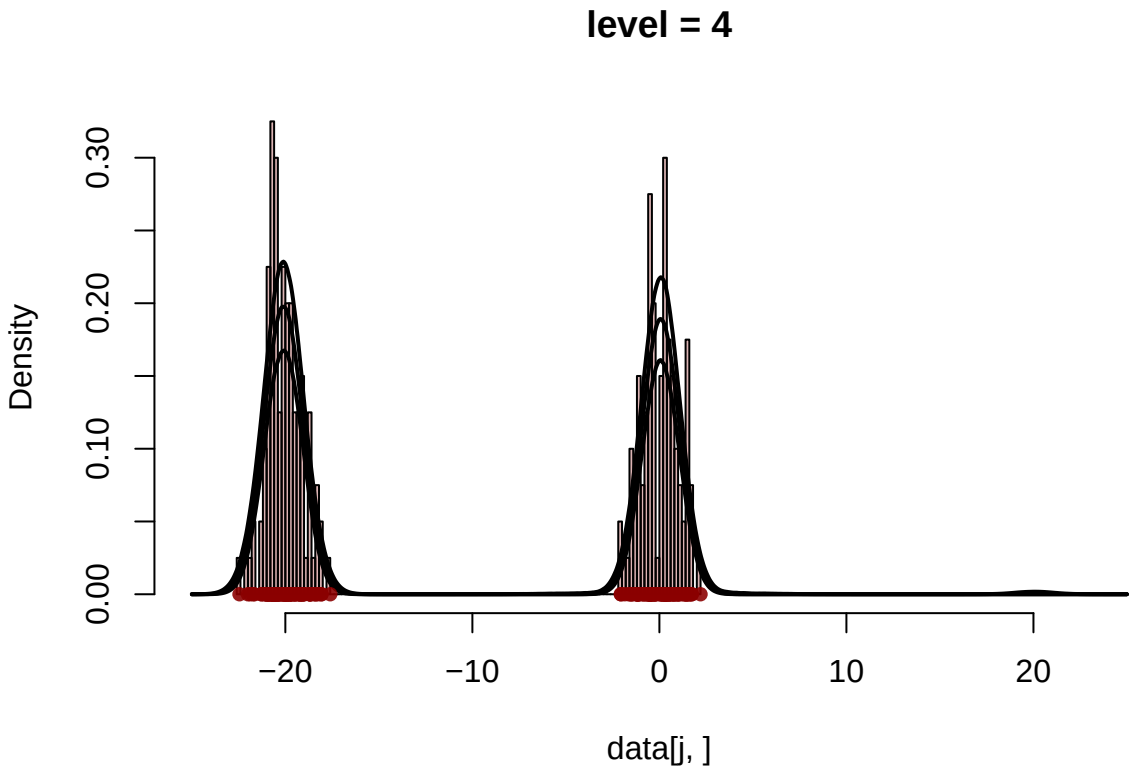
```
##
##  Check that provided partition is well formed. It must start from 0 and all values must be contiguous
## initialize_Partition with non empty partition_vec
## Watch out modification: Mstar is not set to zero but to Mstar0
##  (K, Mstar, M) = (3,3,3)
## Chiamato initialize_S con gs_engine, mette casuale!
```

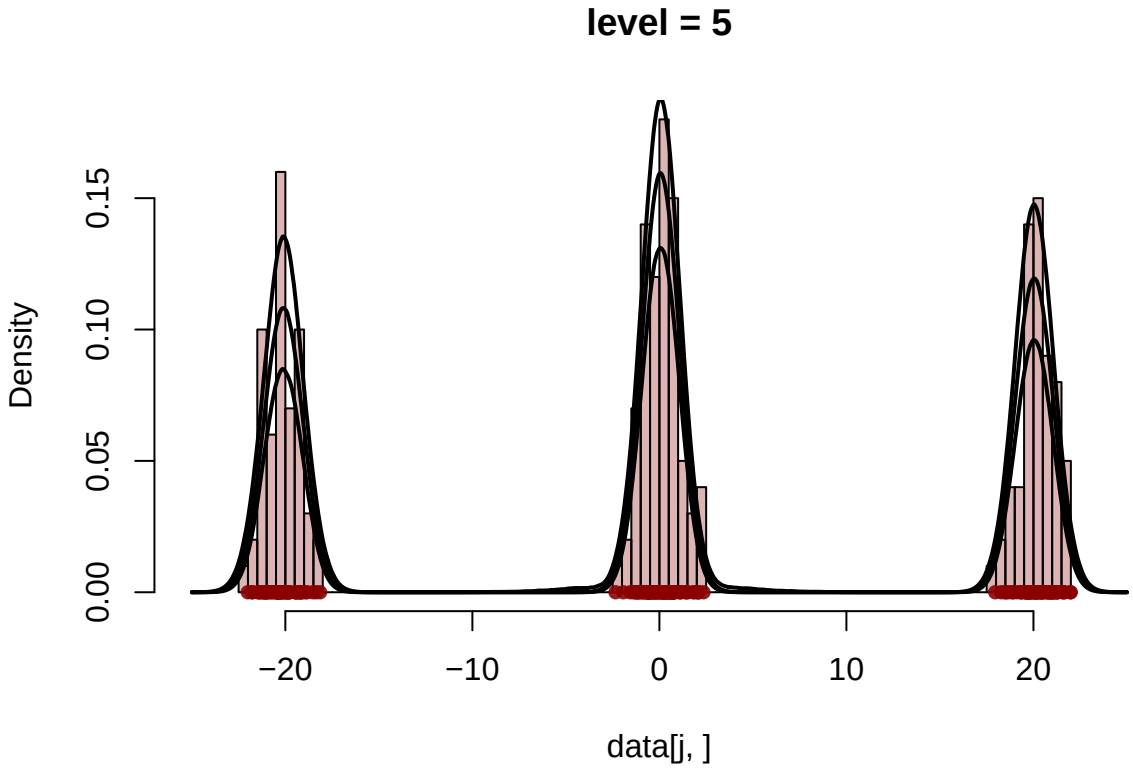
```
l_grid = 1000
grid = seq(-25,25,length.out = l_grid)

# Predictive in all groups
Pred_all = predictive_all_groups(grid = grid, fit = GDFMM)

for(j in 1:d){
  hist(data[j,], freq = F, breaks = l_grid/10, col = ACutils::t_col("darkred", 70), xlim = range(grid),
             main = paste0("level = ",j))
  matplot(x = grid, y = t(Pred_all[[j]]), type = 'l', col = 'black', lty = 1, lwd = 2, add = T)
  points(x = data[j,], y = rep(0, length(data[j,])), pch = 16, col = ACutils::t_col("darkred", 10))

}
```

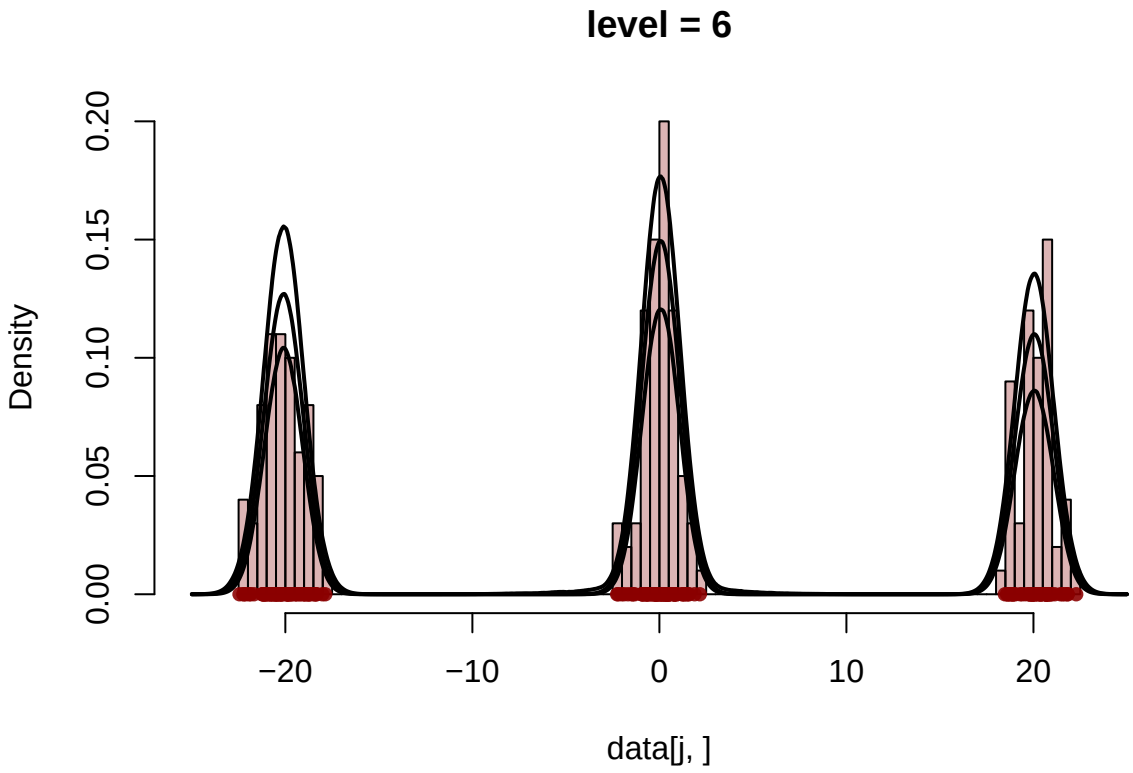

level = 1
Density
0.00
0.05
0.10
0.15
−20
−10
0
10
20
data[j,]

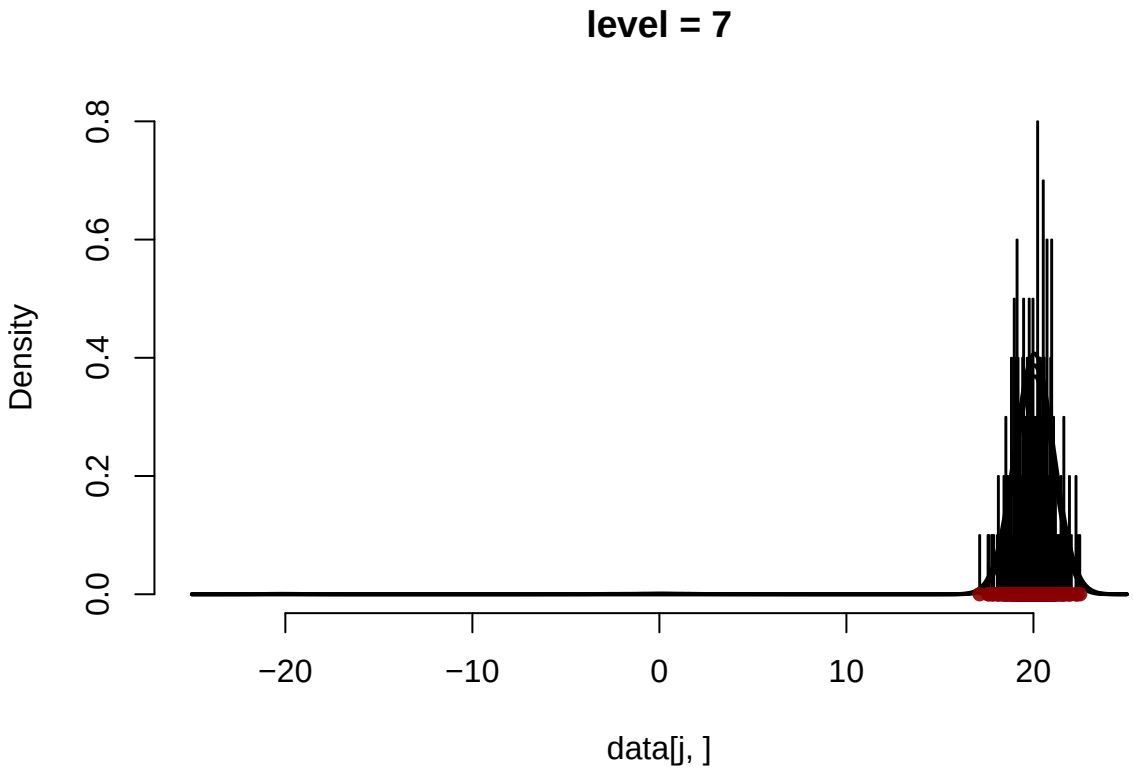

level = 2
Density
0.00
0.10
0.20
0.30
−20
−10
0
10
20
data[j,]

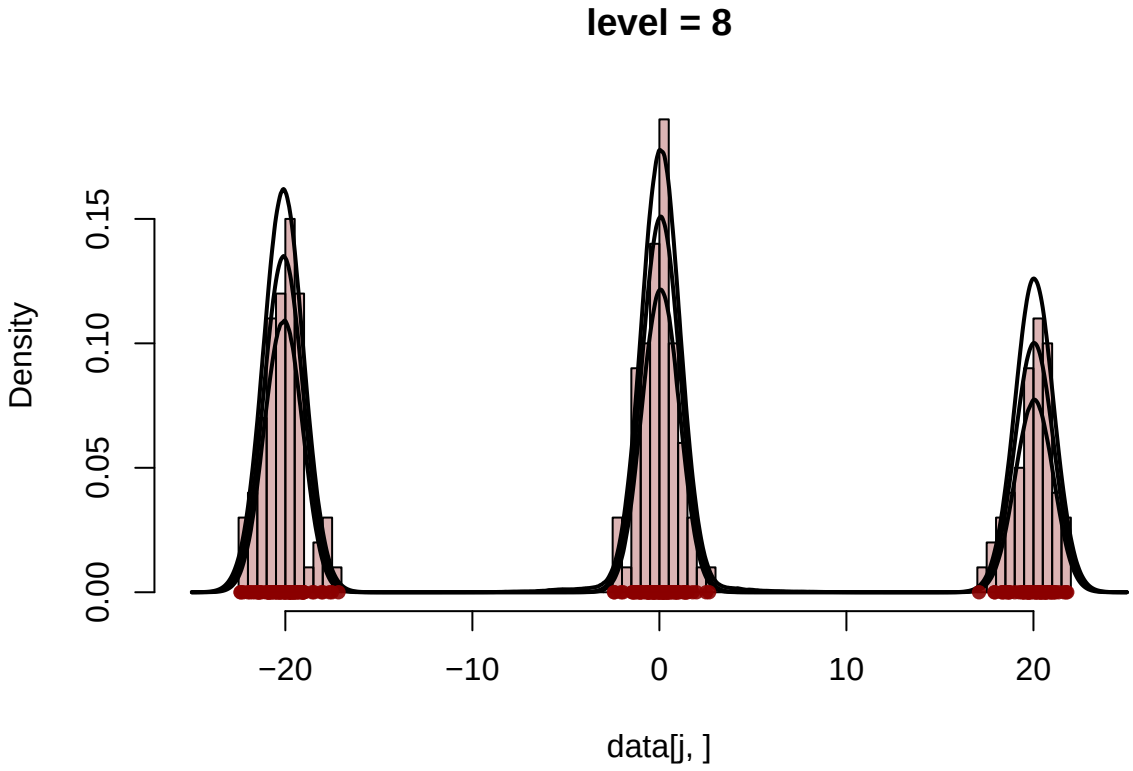

level = 3
Density
0.0
0.2
0.4
0.6
0.8
1.0
−20
−10
0
10
20
data[j,]

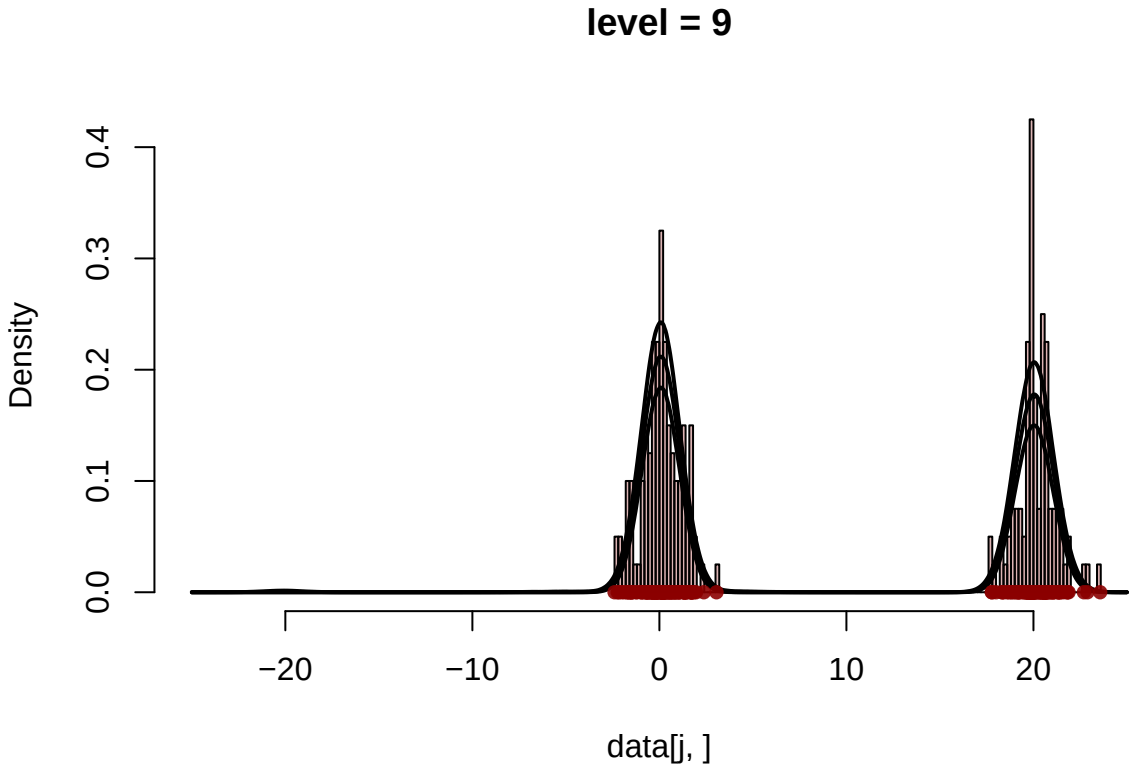

level = 4
Density
0.00
0.10
0.20
0.30
−20
−10
0
10
20
data[j,]

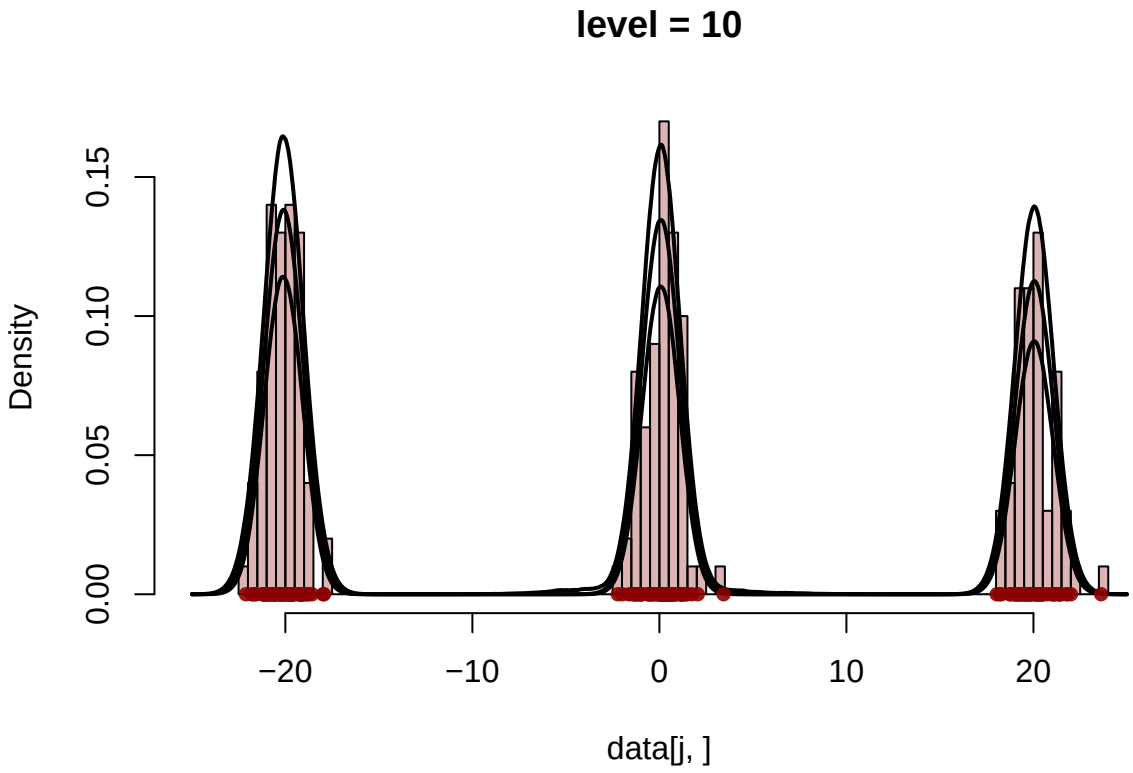

level = 5
Density
0.00
0.05
0.10
0.15
−20
−10
0
10
20
data[j,]


level = 6
Density
0.00
0.05
0.10
0.15
0.20
−20
−10
0
10
20
data[j,]


level = 7
Density
0.0
0.2
0.4
0.6
0.8
−20
−10
0
10
20
data[j,]


level = 8
Density
0.00
0.05
0.10
0.15
−20
−10
0
10
20
data[j,]


level = 9
Density
0.0
0.1
0.2
0.3
0.4
−20
−10
0
10
20
data[j,]

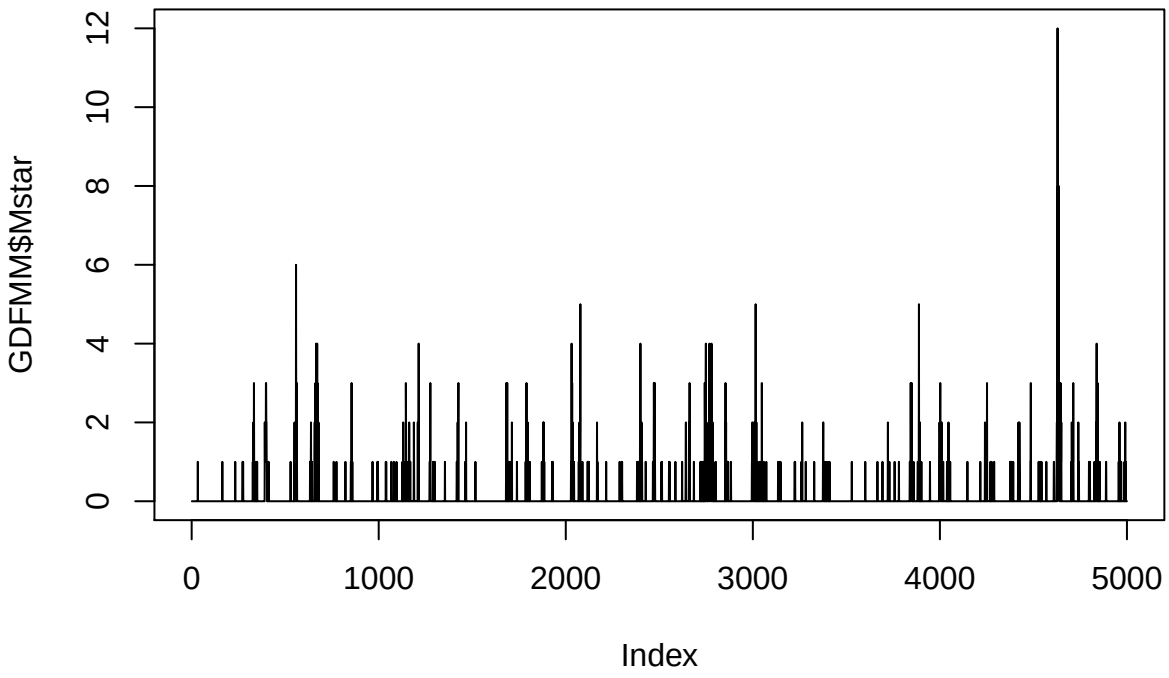


Esempio con partizione fissa e Mstar che si aggiorna In questa serie di esempi, seguo quello di prima, quindi la partizione è fissata, ma Mstar viene aggiornato.

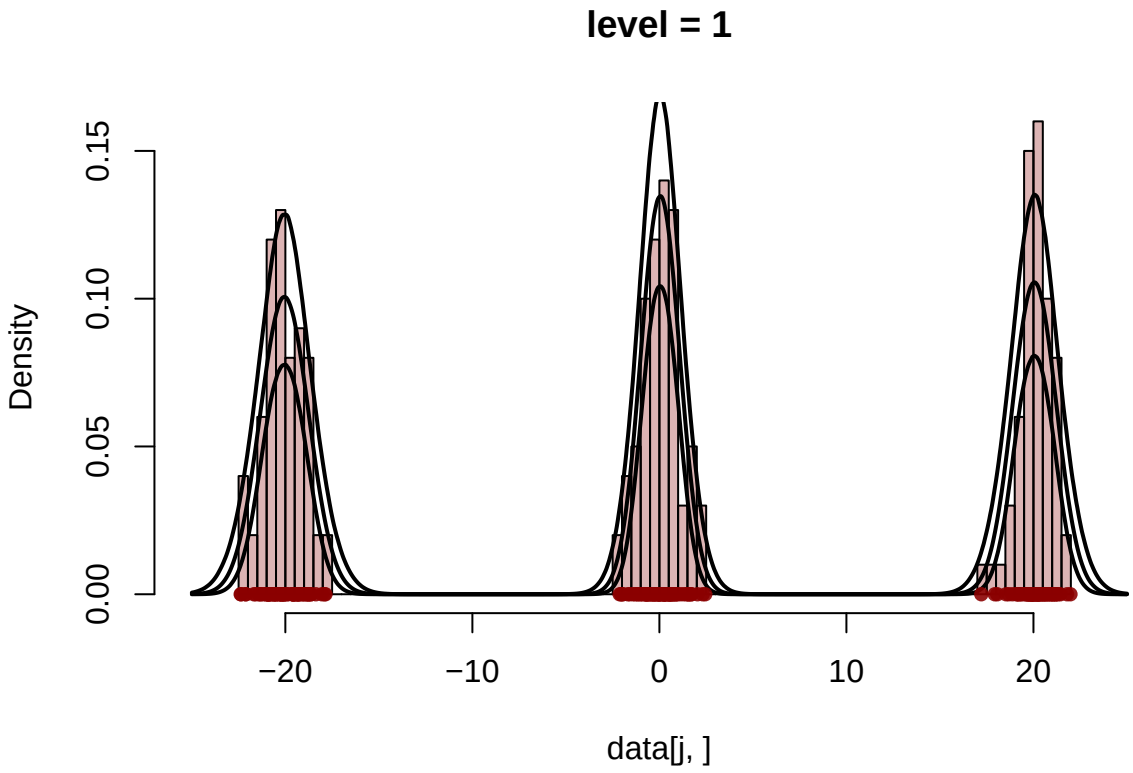
d=1

```
library(GDFMM)
library(ACutils)
# data generation

d = 1                # number of groups
K = 3                # number of global clusters
mu = c(-20,0,20)    # vectors of means
sd = c(1,1,1)       # vector of sd
n_j = rep(200, d)  # set cardinality of the groups
p = matrix(0, nrow = d, ncol = K) # matrix with components weights

set.seed(124123)
Kgruppo = c()
componenti_gruppo = NULL
data = matrix(NA, nrow = d, ncol = max(n_j))      # d x max(n_j) matrix
cluster = matrix(NA, nrow = d, ncol = max(n_j))  # d x max(n_j) matrix
real_partition = c()       # real_partition is a vector of length sum(n_j), it collects all the group me
                           # values are collected level by level, so first all the values in level 1, th
                           # cluster label must always start from 0!
for(j in 1:d){
  Kgruppo[j] = sample(1:K,1) # number of clusters in each level
```

```
  componenti_gruppo[[j]] = sample(1:K,Kgruppo[j], replace = F) # choose the components
  p[j,1:Kgruppo[j]] = rep(1/Kgruppo[j], Kgruppo[j]) # set the weights all equals
  appoggio = genera_mix_gas(n = n_j[j], pro = p[j,1:Kgruppo[j]], means = mu[ componenti_gruppo[[j]] ],
                            sds = sd[ componenti_gruppo[[j]] ] )

  data[j, 1:n_j[j]] = appoggio$y
  #cluster[j, 1:n_j[j]] = appoggio$clu, #errore, genera_mix_gas usa sempre indici che partono da 1!
  cluster[j, 1:n_j[j]] = unlist(lapply(1:n_j[j], function(h){componenti_gruppo[[j]][appoggio$clu[h]]}))
  real_partition = c(real_partition, cluster[j, 1:n_j[j]])
}
N_m = table(real_partition)

data_level1 = data[cluster==1]
data_level2 = data[cluster==2]
data_level3 = data[cluster==3]


# Run

niter  <- 5000
burnin <- 1000
thin   <- 1

option<-list("Mstar0" = 3, "Lambda0" = 3, "mu0" = 0,"sigma0"= 1, "gamma0" = 1,
             "Adapt_MH_hyp1"= 0.7,"Adapt_MH_hyp2"= 0.234, "Adapt_MH_power_lim"=10, "Adapt_MH_var0"=1,
             "k0"= 1/10, "nu0"=10, "alpha_gamma"=1,
             "beta_gamma"=1, "alpha_lambda"=1, "beta_lambda"=1,
             "UpdateU" = T, "UpdateM" = T, "UpdateGamma" = T, "UpdateS" = T,
             "UpdateTau" = T, "UpdateLambda" = T, "partition" = real_partition
)

GDFMM = GDFMM_sampler(data, niter, burnin, thin, seed = 123, FixPartition = T, option = option)

##
##  Check that provided partition is well formed. It must start from 0 and all values must be contiguous
## initialize_Partition with non empty partition_vec
## Watch out modification: Mstar is not set to zero but to Mstar0
##  (K, Mstar, M) = (3,3,3)
## Chiamato initialize_S con gs_engine, mette casuale!
#Mstar
summary(GDFMM$Mstar)

##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   0.000   0.000   0.000   0.133   0.000  12.000
plot(GDFMM$Mstar, type = 'l')
```




```
# Predictive

l_grid = 1000
grid = seq(-25,25,length.out = l_grid)

# Predictive in all groups
Pred_all = predictive_all_groups(grid = grid, fit = GDFMM)

for(j in 1:d){
  hist(data[j,], freq = F, breaks = l_grid/10, col = ACutils::t_col("darkred", 70), xlim = range(grid),
             main = paste0("level = ",j))
  matplot(x = grid, y = t(Pred_all[[j]]), type = 'l', col = 'black', lty = 1, lwd = 2, add = T)
  points(x = data[j,], y = rep(0, length(data[j,])), pch = 16, col = ACutils::t_col("darkred", 10))

}
```



d=3

```
library(GDFMM)
library(ACutils)
# data generation

d = 3                # number of groups
K = 3                # number of global clusters
mu = c(-20,0,20)    # vectors of means
sd = c(1,1,1)       # vector of sd
n_j = rep(200, d)   # set cardinality of the groups
p = matrix(0, nrow = d, ncol = K) # matrix with components weights

set.seed(124123)
Kgruppo = c()
componenti_gruppo = NULL
data = matrix(NA, nrow = d, ncol = max(n_j))      # d x max(n_j) matrix
cluster = matrix(NA, nrow = d, ncol = max(n_j))   # d x max(n_j) matrix
real_partition = c()       # real_partition is a vector of length sum(n_j), it collects all the group me
                           # values are collected level by level, so first all the values in level 1, th
                           # cluster label must always start from 0!
for(j in 1:d){
  Kgruppo[j] = sample(1:K,1) # number of clusters in each level
  componenti_gruppo[[j]] = sample(1:K,Kgruppo[j], replace = F) # choose the components
  p[j,1:Kgruppo[j]] = rep(1/Kgruppo[j], Kgruppo[j]) # set the weights all equals
```

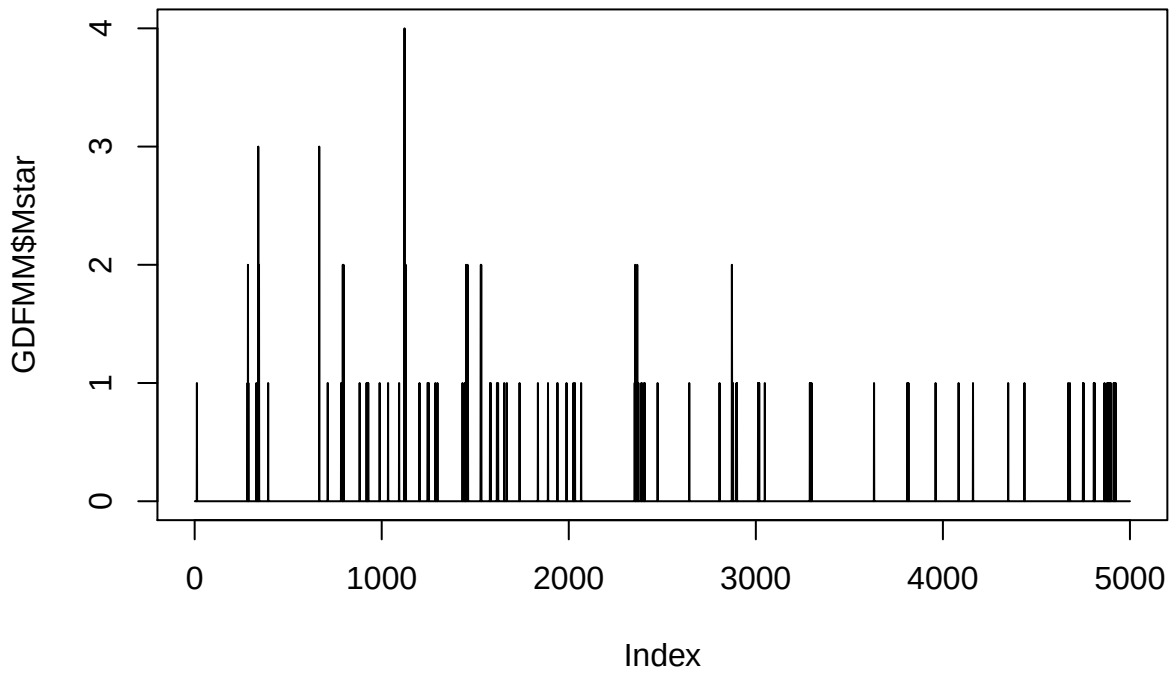
```
  appoggio = genera_mix_gas(n = n_j[j], pro = p[j,1:Kgruppo[j]], means = mu[ componenti_gruppo[[j]] ],
                            sds = sd[ componenti_gruppo[[j]] ] )

  data[j, 1:n_j[j]] = appoggio$y
  #cluster[j, 1:n_j[j]] = appoggio$clu, #errore, genera_mix_gas usa sempre indici che partono da 1!
  cluster[j, 1:n_j[j]] = unlist(lapply(1:n_j[j], function(h){componenti_gruppo[[j]][appoggio$clu[h]]}))
  real_partition = c(real_partition, cluster[j, 1:n_j[j]])
}
N_m = table(real_partition)

data_level1 = data[cluster==1]
data_level2 = data[cluster==2]
data_level3 = data[cluster==3]


# Run

niter  <- 5000
burnin <- 1000
thin   <- 1

option<-list("Mstar0" = 3, "Lambda0" = 3, "mu0" = 0,"sigma0"= 1, "gamma0" = 1,
             "Adapt_MH_hyp1"= 0.7,"Adapt_MH_hyp2"= 0.234, "Adapt_MH_power_lim"=10, "Adapt_MH_var0"=1,
             "k0"= 1/10, "nu0"=10, "alpha_gamma"=1,
             "beta_gamma"=1, "alpha_lambda"=1, "beta_lambda"=1,
             "UpdateU" = T, "UpdateM" = T, "UpdateGamma" = T, "UpdateS" = T,
             "UpdateTau" = T, "UpdateLambda" = T, "partition" = real_partition
)

GDFMM = GDFMM_sampler(data, niter, burnin, thin, seed = 123, FixPartition = T, option = option)
```

```
##
##  Check that provided partition is well formed. It must start from 0 and all values must be contiguous
## initialize_Partition with non empty partition_vec
## Watch out modification: Mstar is not set to zero but to Mstar0
##  (K, Mstar, M) = (3,3,3)
## Chiamato initialize_S con gs_engine, mette casuale!
```

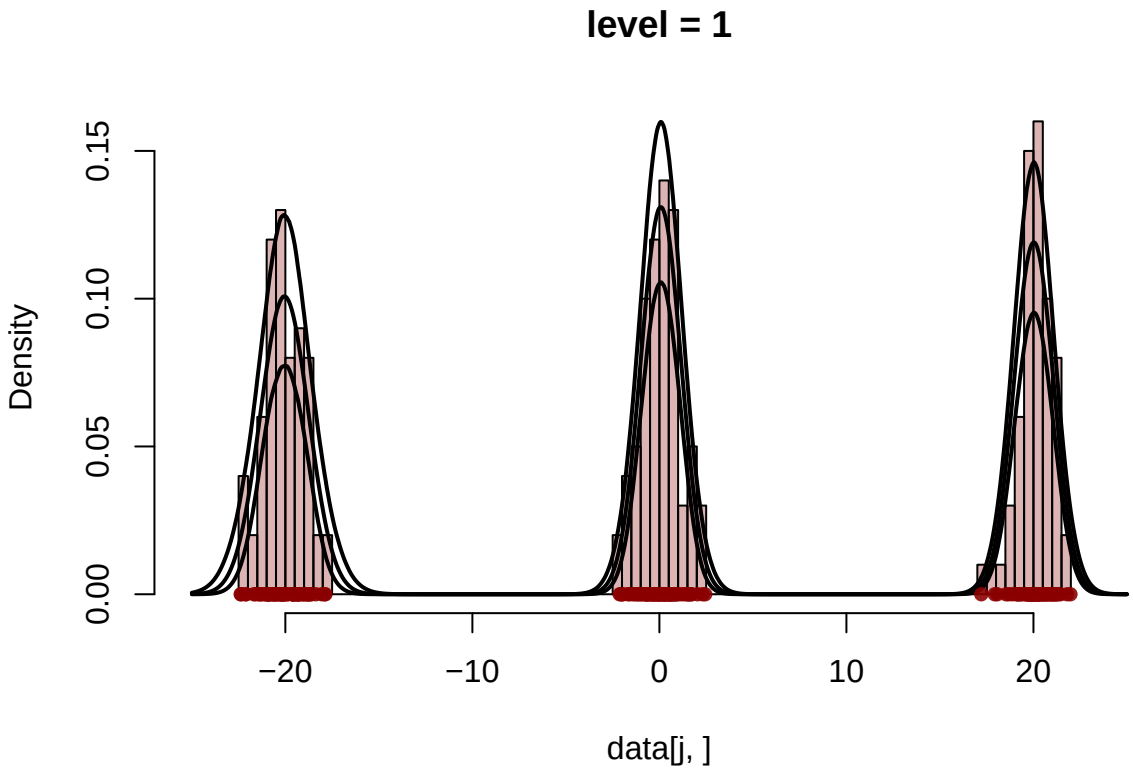
```
#Mstar
summary(GDFMM$Mstar)
```

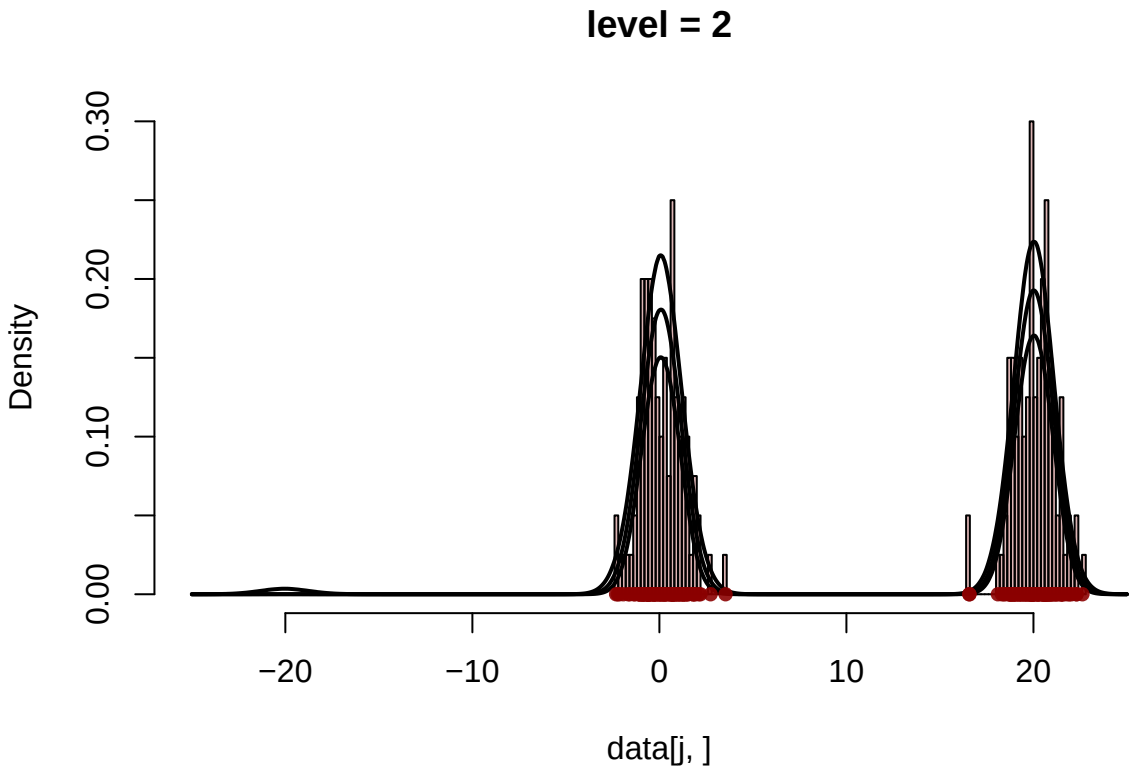
```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##  0.0000  0.0000  0.0000  0.0284  0.0000  4.0000
```

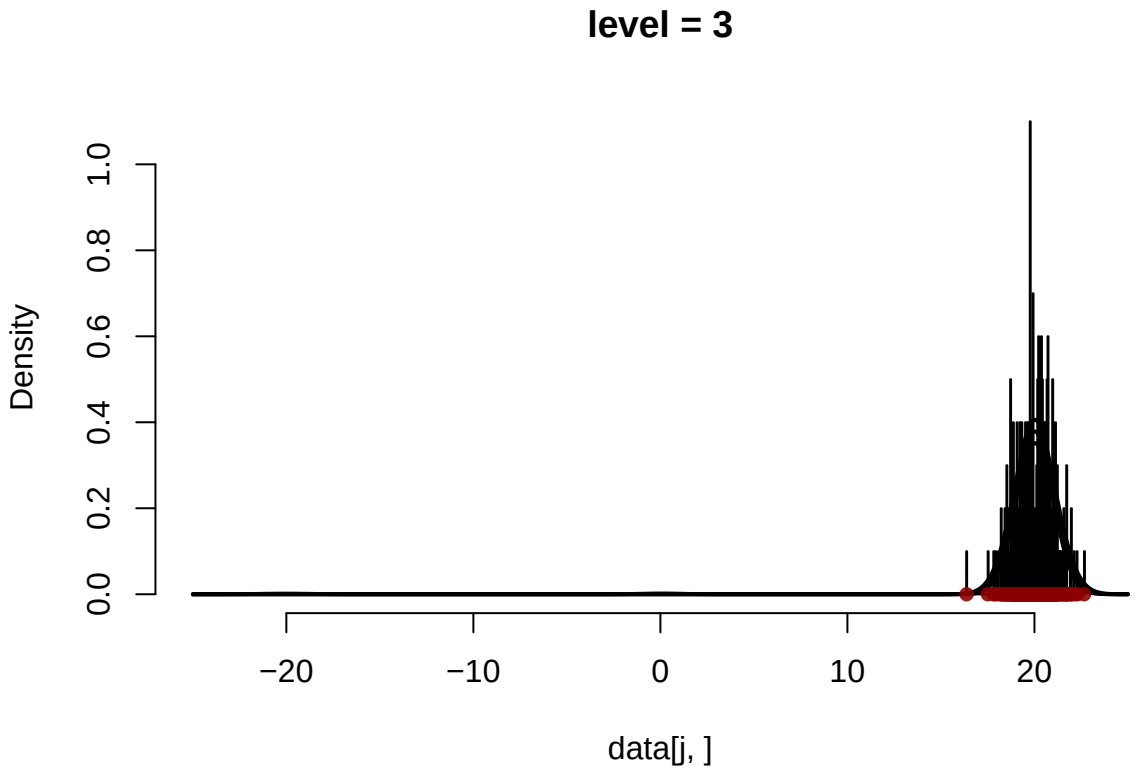
```
plot(GDFMM$Mstar, type = 'l')
```




```r
# Predictive

l_grid = 1000
grid = seq(-25,25,length.out = l_grid)

# Predictive in all groups
Pred_all = predictive_all_groups(grid = grid, fit = GDFMM)

for(j in 1:d){
  hist(data[j,], freq = F, breaks = l_grid/10, col = ACutils::t_col("darkred", 70), xlim = range(grid),
            main = paste0("level = ",j))
  matplot(x = grid, y = t(Pred_all[[j]]), type = 'l', col = 'black', lty = 1, lwd = 2, add = T)
  points(x = data[j,], y = rep(0, length(data[j,])), pch = 16, col = ACutils::t_col("darkred", 10))

}
```


level = 1
Density
0.00
0.05
0.10
0.15
−20
−10
0
10
20
data[j,]


level = 2
Density
0.00
0.10
0.20
0.30
−20
−10
0
10
20
data[j,]



Un aumento del valore a priori di `lambda` aiuta il mixing della catena di Mstar senza compromettere le predittive. Forse però, questo vale solo finché la partizione è fissata. A priori,

$$\Lambda \sim Gamma(a_\Lambda, b_\Lambda)$$

quindi provo ad aumentare il primo parametro e tenere il secondo fisso a 1. Ho notato che mettendolo sopra 2o o 25 il numero cresce anche molto (le predittive andava sempre bene però). Qua tengo 15.

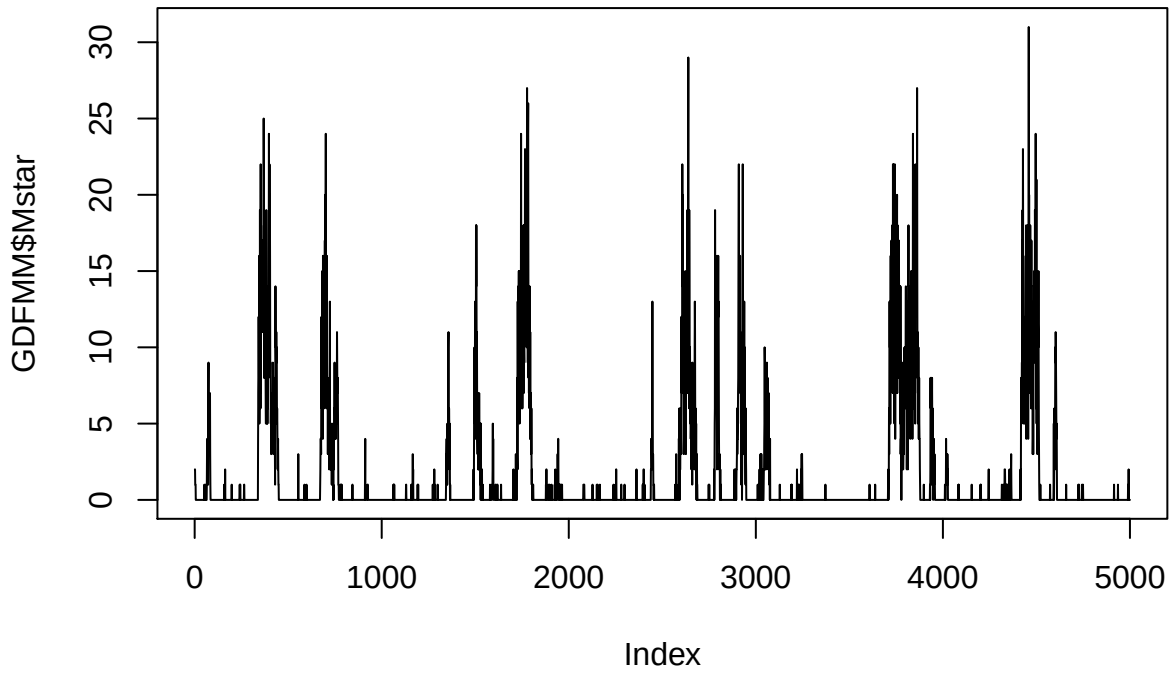
```
niter  <- 5000
burnin <- 1000
thin   <- 1

option<-list("Mstar0" = 3, "Lambda0" = 3, "mu0" = 0,"sigma0"= 1, "gamma0" = 1,
             "Adapt_MH_hyp1"= 0.7,"Adapt_MH_hyp2"= 0.234, "Adapt_MH_power_lim"=10, "Adapt_MH_var0"=1,
             "k0"= 1/10, "nu0"=10, "alpha_gamma"=1,
             "beta_gamma"=1, "alpha_lambda"=15, "beta_lambda"=1,
             "UpdateU" = T, "UpdateM" = T, "UpdateGamma" = T, "UpdateS" = T,
             "UpdateTau" = T, "UpdateLambda" = T, "partition" = real_partition
)

GDFMM = GDFMM_sampler(data, niter, burnin, thin, seed = 123, FixPartition = T, option = option)
```

```
##
##  Check that provided partition is well formed. It must start from 0 and all values must be contiguous
## initialize_Partition with non empty partition_vec
## Watch out modification: Mstar is not set to zero but to Mstar0
##  (K, Mstar, M) = (3,3,3)
## Chiamato initialize_S con gs_engine, mette casuale!
```

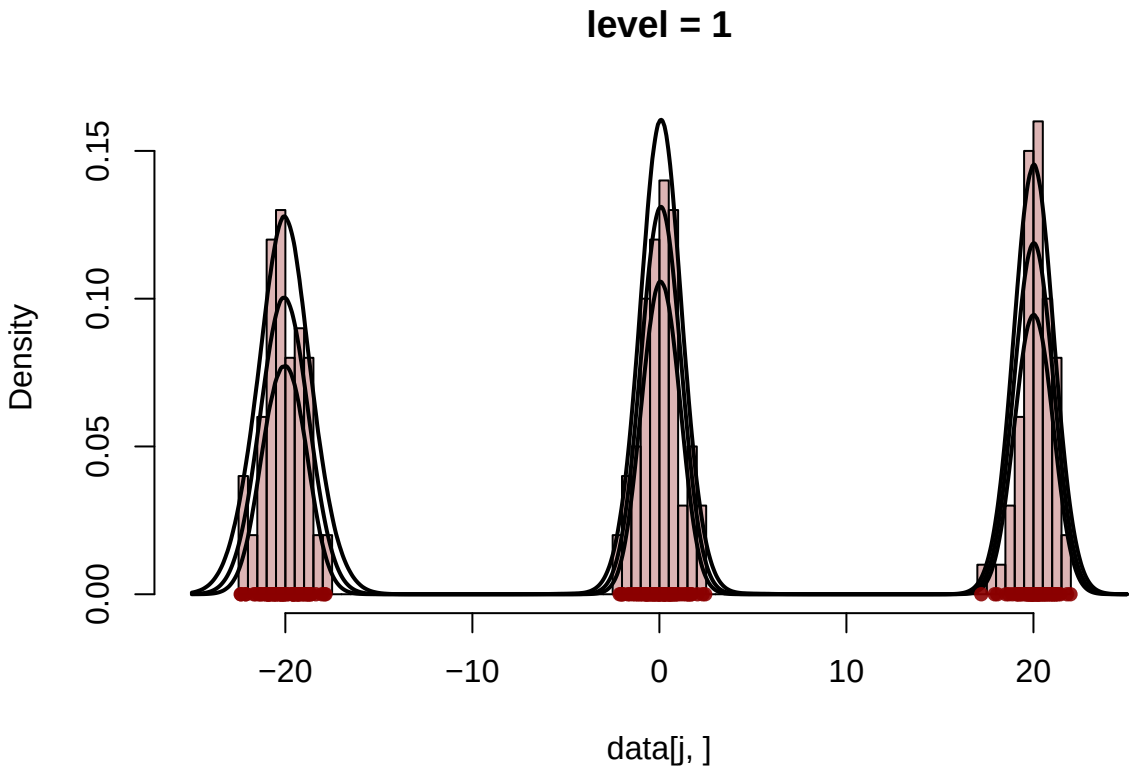
```r
#Mstar
summary(GDFMM$Mstar)
```

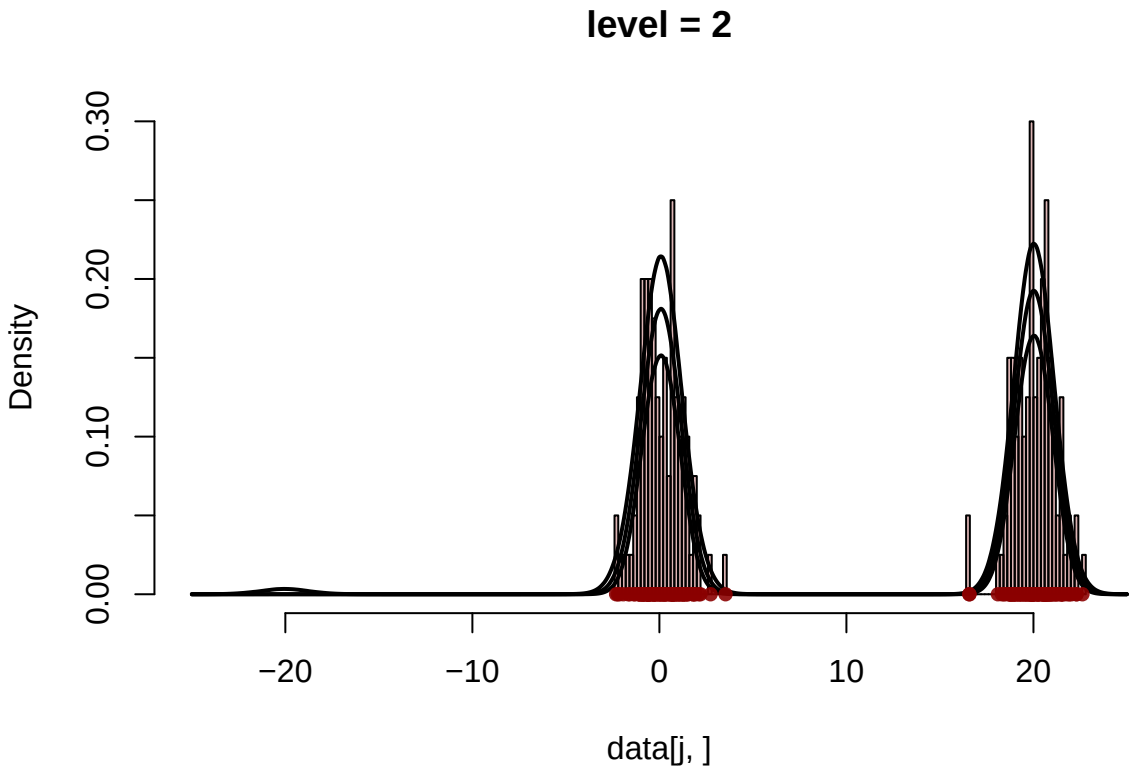
```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   0.000   0.000   0.000   1.611   0.000  31.000
```

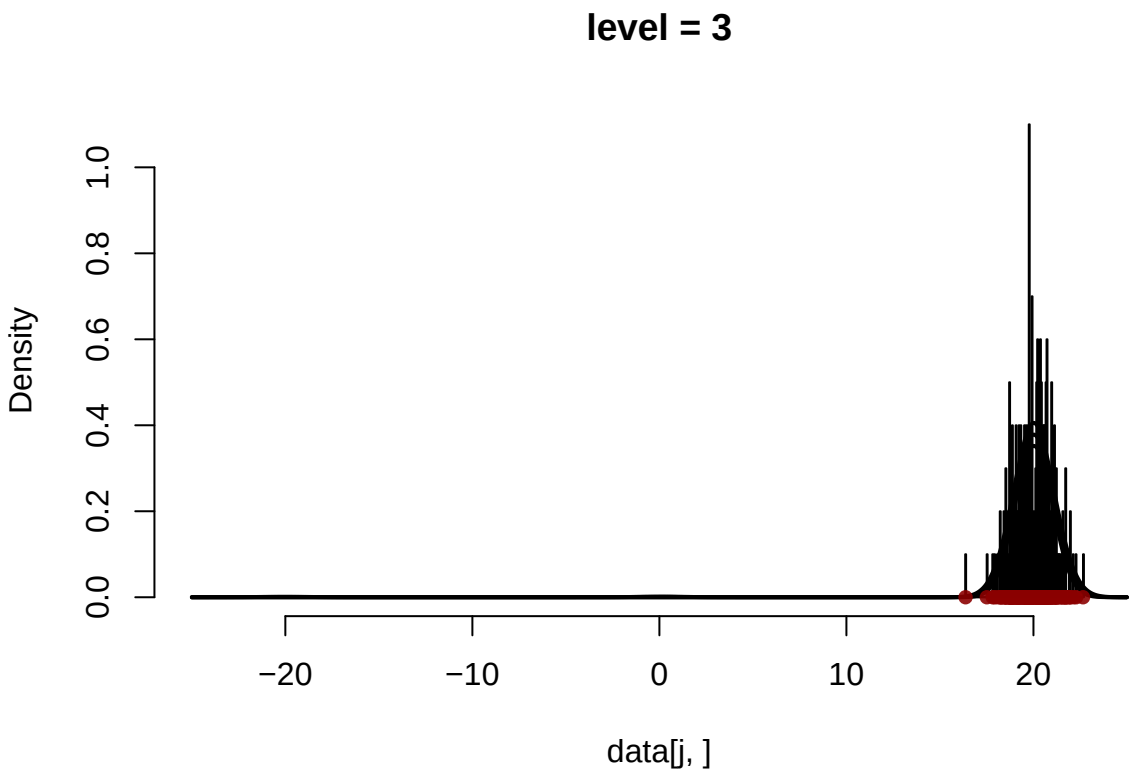
```r
plot(GDFMM$Mstar, type = 'l')
```




```r
# Predictive

l_grid = 1000
grid = seq(-25,25,length.out = l_grid)

# Predictive in all groups
Pred_all = predictive_all_groups(grid = grid, fit = GDFMM)

for(j in 1:d){
  hist(data[j,], freq = F, breaks = l_grid/10, col = ACutils::t_col("darkred", 70), xlim = range(grid),
             main = paste0("level = ",j))
  matplot(x = grid, y = t(Pred_all[[j]]), type = 'l', col = 'black', lty = 1, lwd = 2, add = T)
  points(x = data[j,], y = rep(0, length(data[j,])), pch = 16, col = ACutils::t_col("darkred", 10))

}
```


level = 1
Density
0.00
0.05
0.10
0.15
−20
−10
0
10
20
data[j,]


level = 2
Density
0.00
0.10
0.20
0.30
−20
−10
0
10
20
data[j,]



d=10

```
library(GDFMM)
library(ACutils)
# data generation

d = 10                # number of groups
K = 3                # number of global clusters
mu = c(-20,0,20)    # vectors of means
sd = c(1,1,1)       # vector of sd
n_j = rep(200, d)  # set cardinality of the groups
p = matrix(0, nrow = d, ncol = K) # matrix with components weights

set.seed(124123)
Kgruppo = c()
componenti_gruppo = NULL
data = matrix(NA, nrow = d, ncol = max(n_j))      # d x max(n_j) matrix
cluster = matrix(NA, nrow = d, ncol = max(n_j))  # d x max(n_j) matrix
real_partition = c()       # real_partition is a vector of length sum(n_j), it collects all the group me
                           # values are collected level by level, so first all the values in level 1, th
                           # cluster label must always start from 0!
for(j in 1:d){
  Kgruppo[j] = sample(1:K,1) # number of clusters in each level
  componenti_gruppo[[j]] = sample(1:K,Kgruppo[j], replace = F) # choose the components
  p[j,1:Kgruppo[j]] = rep(1/Kgruppo[j], Kgruppo[j]) # set the weights all equals
```

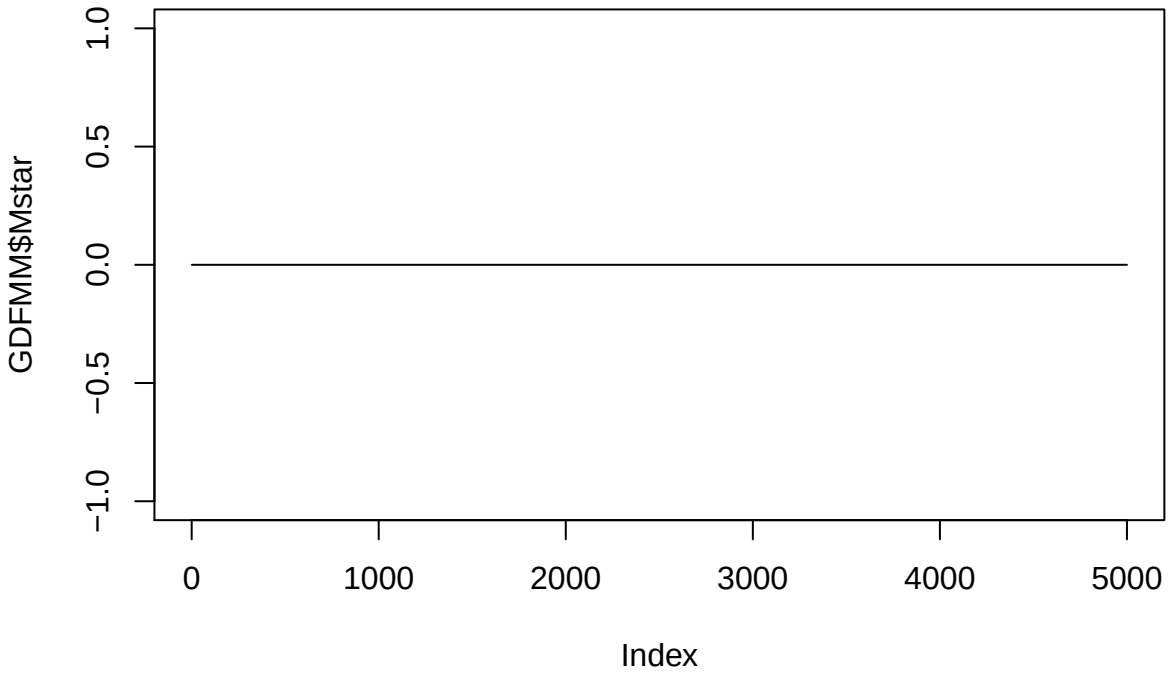
```
  appoggio = genera_mix_gas(n = n_j[j], pro = p[j,1:Kgruppo[j]], means = mu[ componenti_gruppo[[j]] ],
                            sds = sd[ componenti_gruppo[[j]] ] )

  data[j, 1:n_j[j]] = appoggio$y
  #cluster[j, 1:n_j[j]] = appoggio$clu, #errore, genera_mix_gas usa sempre indici che partono da 1!
  cluster[j, 1:n_j[j]] = unlist(lapply(1:n_j[j], function(h){componenti_gruppo[[j]][appoggio$clu[h]]}))
  real_partition = c(real_partition, cluster[j, 1:n_j[j]])
}
N_m = table(real_partition)

data_level1 = data[cluster==1]
data_level2 = data[cluster==2]
data_level3 = data[cluster==3]


# Run

niter  <- 5000
burnin <- 1000
thin   <- 1

option<-list("Mstar0" = 3, "Lambda0" = 3, "mu0" = 0,"sigma0"= 1, "gamma0" = 1,
             "Adapt_MH_hyp1"= 0.7,"Adapt_MH_hyp2"= 0.234, "Adapt_MH_power_lim"=10, "Adapt_MH_var0"=1,
             "k0"= 1/10, "nu0"=10, "alpha_gamma"=1,
             "beta_gamma"=1, "alpha_lambda"=1, "beta_lambda"=1,
             "UpdateU" = T, "UpdateM" = T, "UpdateGamma" = T, "UpdateS" = T,
             "UpdateTau" = T, "UpdateLambda" = T, "partition" = real_partition
)

GDFMM = GDFMM_sampler(data, niter, burnin, thin, seed = 123, FixPartition = T, option = option)
```

```
##
##  Check that provided partition is well formed. It must start from 0 and all values must be contiguous
## initialize_Partition with non empty partition_vec
## Watch out modification: Mstar is not set to zero but to Mstar0
##  (K, Mstar, M) = (3,3,3)
## Chiamato initialize_S con gs_engine, mette casuale!
```

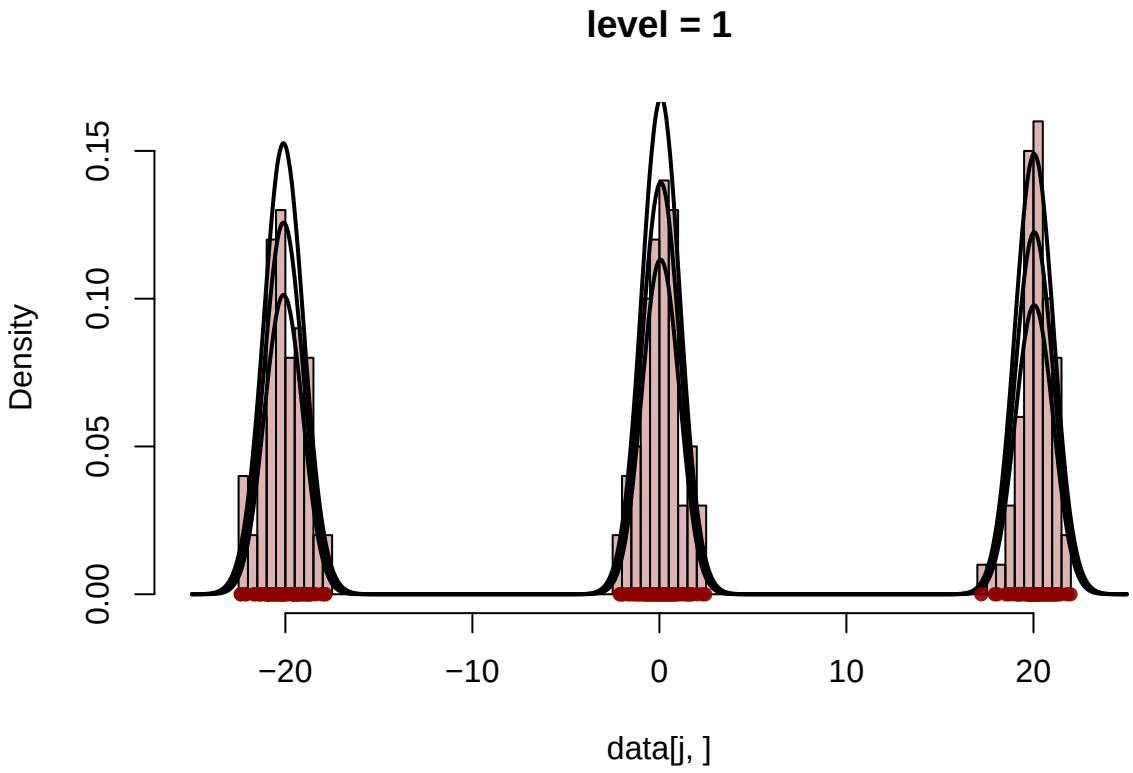
```
#Mstar
summary(GDFMM$Mstar)
```

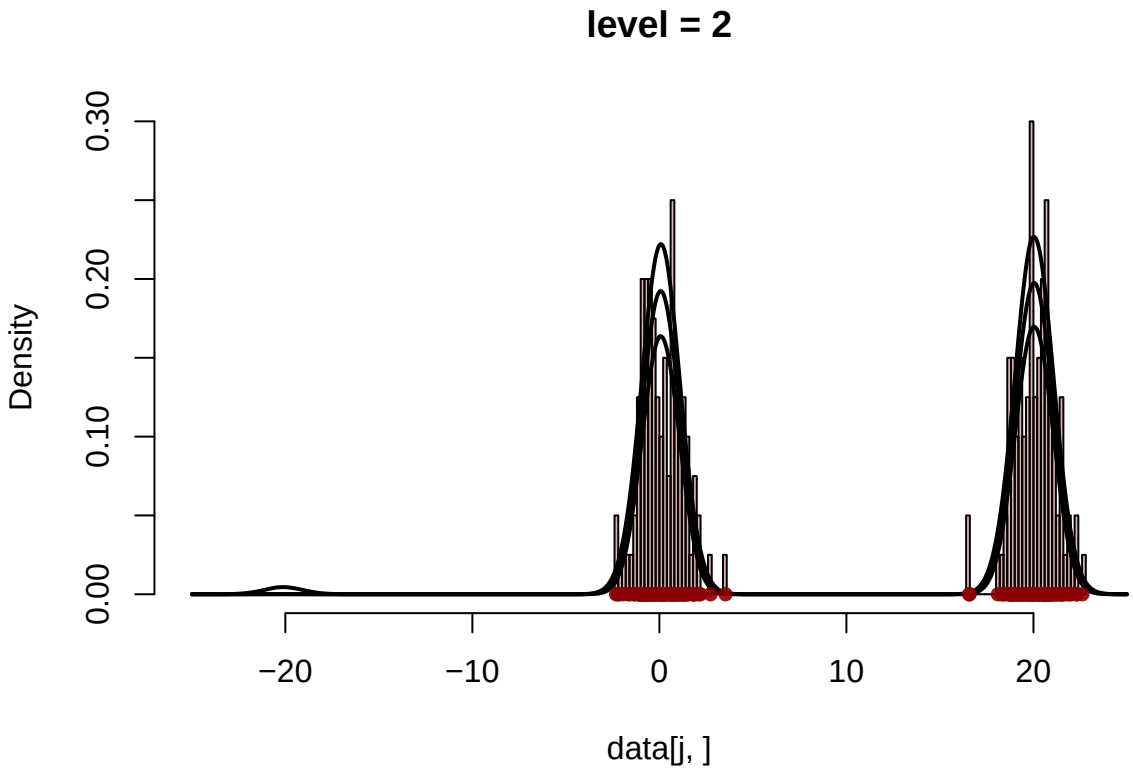
```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##       0       0       0       0       0       0
```

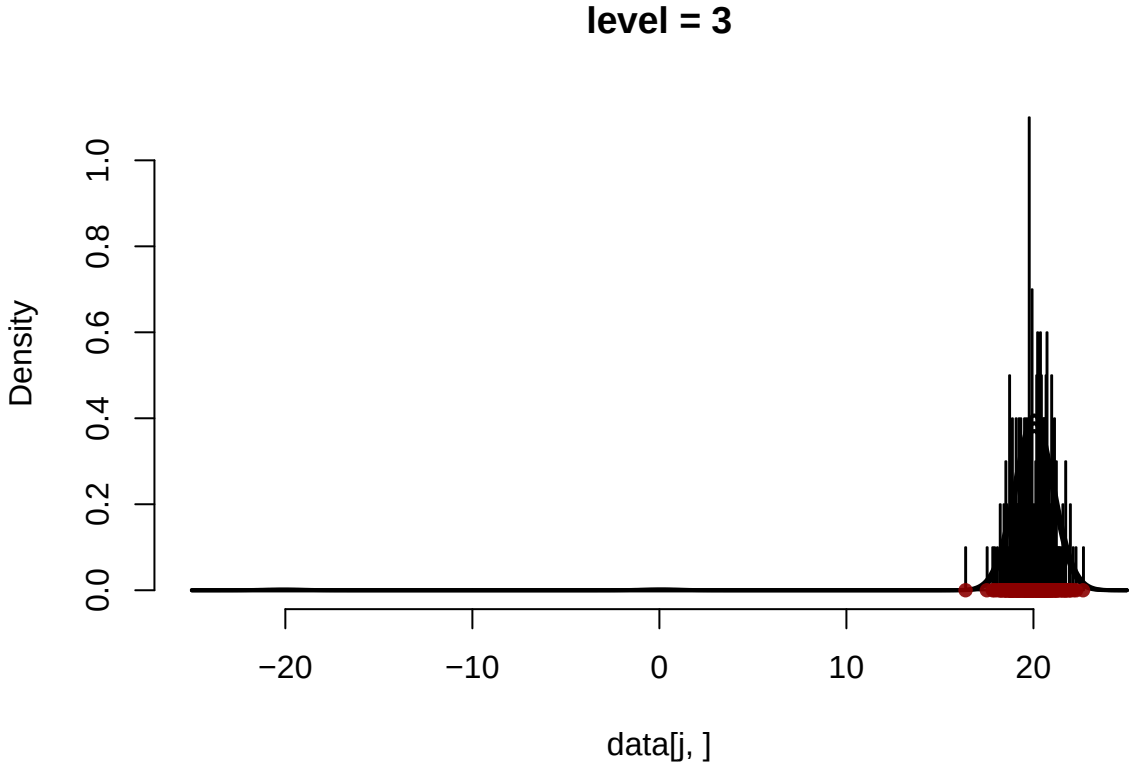
```
plot(GDFMM$Mstar, type = 'l')
```

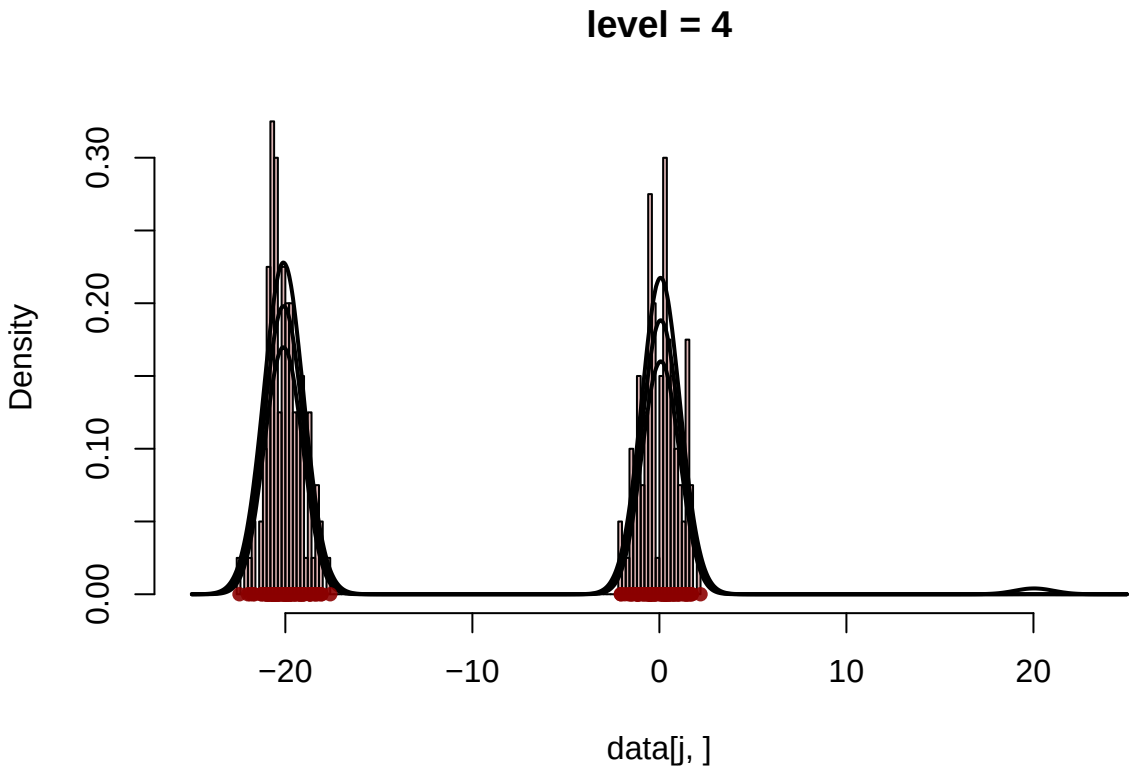


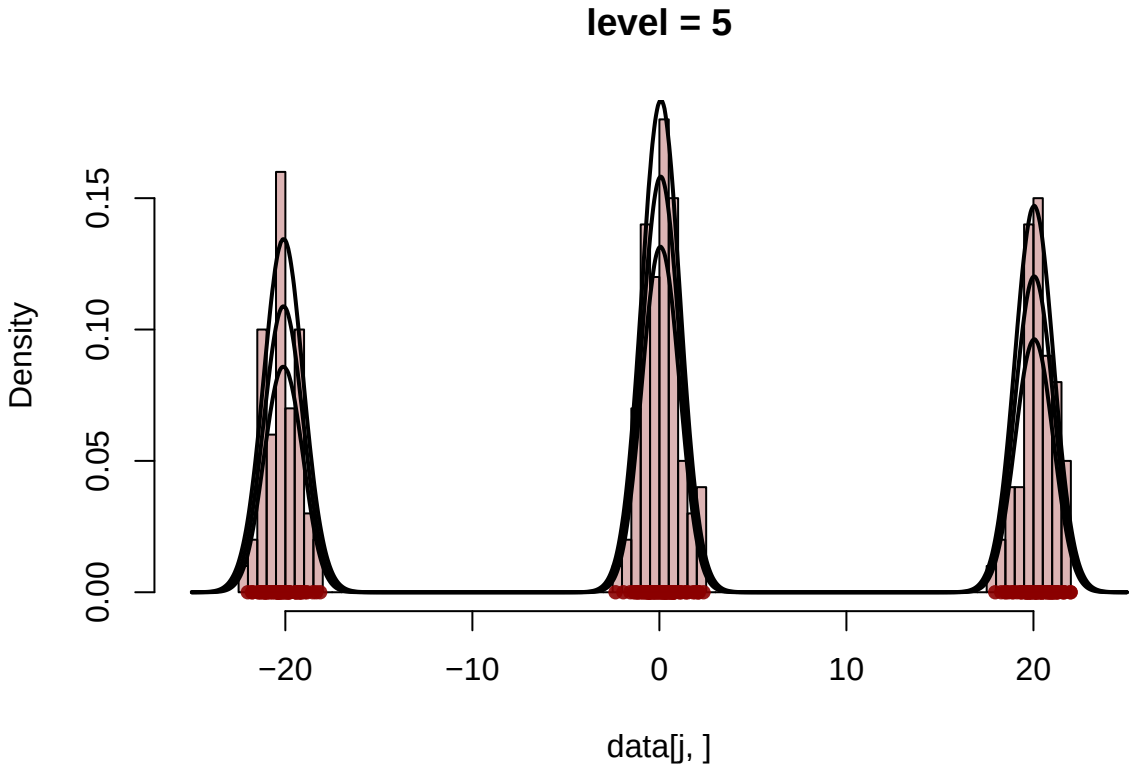

```
# Predictive

l_grid = 1000
grid = seq(-25,25,length.out = l_grid)

# Predictive in all groups
Pred_all = predictive_all_groups(grid = grid, fit = GDFMM)

for(j in 1:d){
  hist(data[j,], freq = F, breaks = l_grid/10, col = ACutils::t_col("darkred", 70), xlim = range(grid),
             main = paste0("level = ",j))
  matplot(x = grid, y = t(Pred_all[[j]]), type = 'l', col = 'black', lty = 1, lwd = 2, add = T)
  points(x = data[j,], y = rep(0, length(data[j,])), pch = 16, col = ACutils::t_col("darkred", 10))

}
```

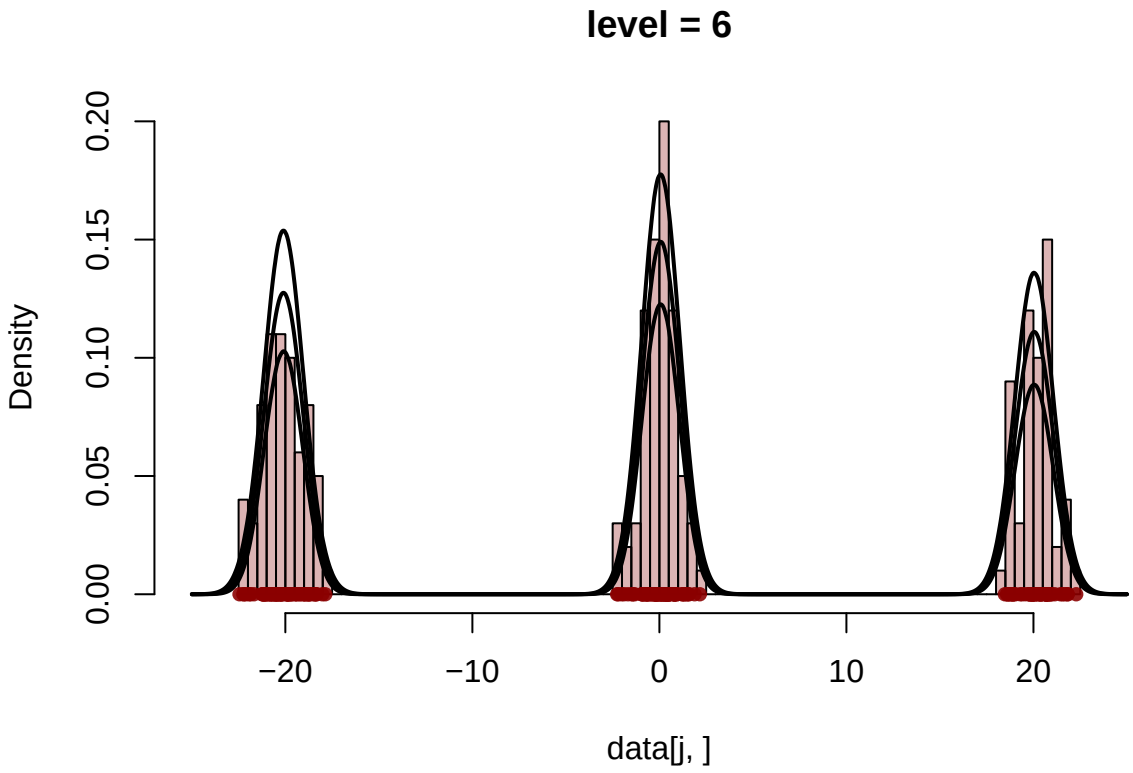

level = 1
Density
0.00
0.05
0.10
0.15
−20
−10
0
10
20
data[j,]

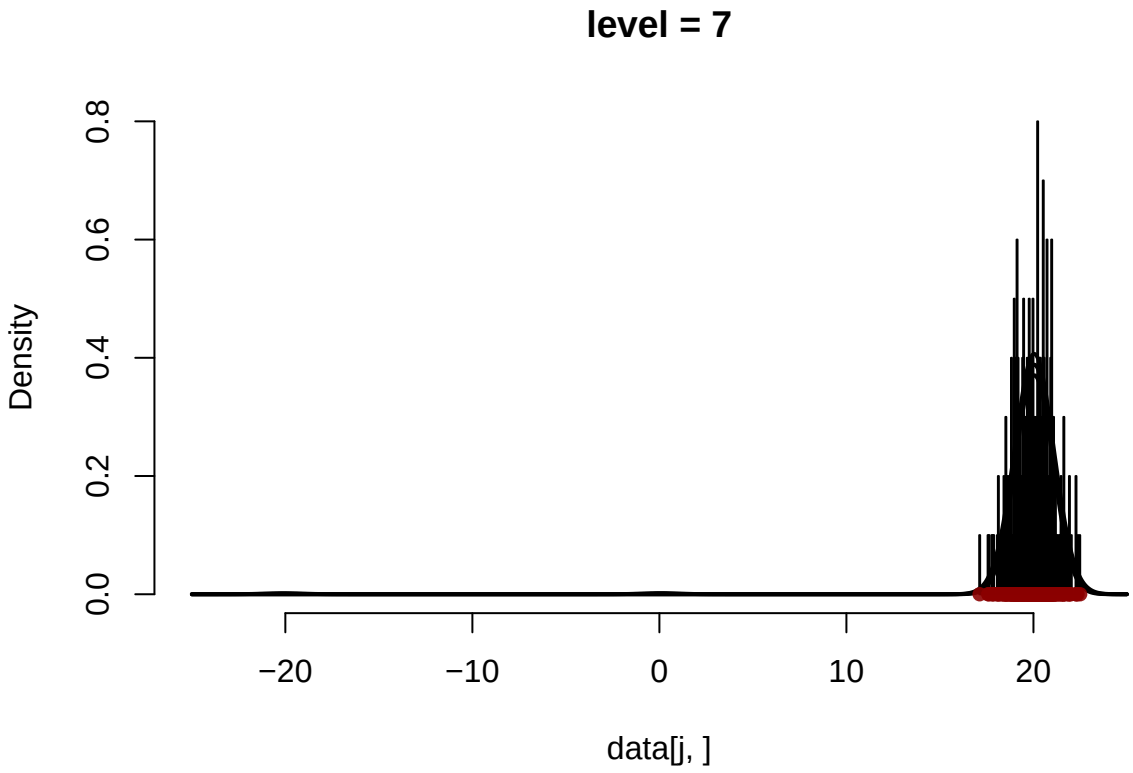

level = 2
Density
0.00
0.10
0.20
0.30
−20
−10
0
10
20
data[j,]

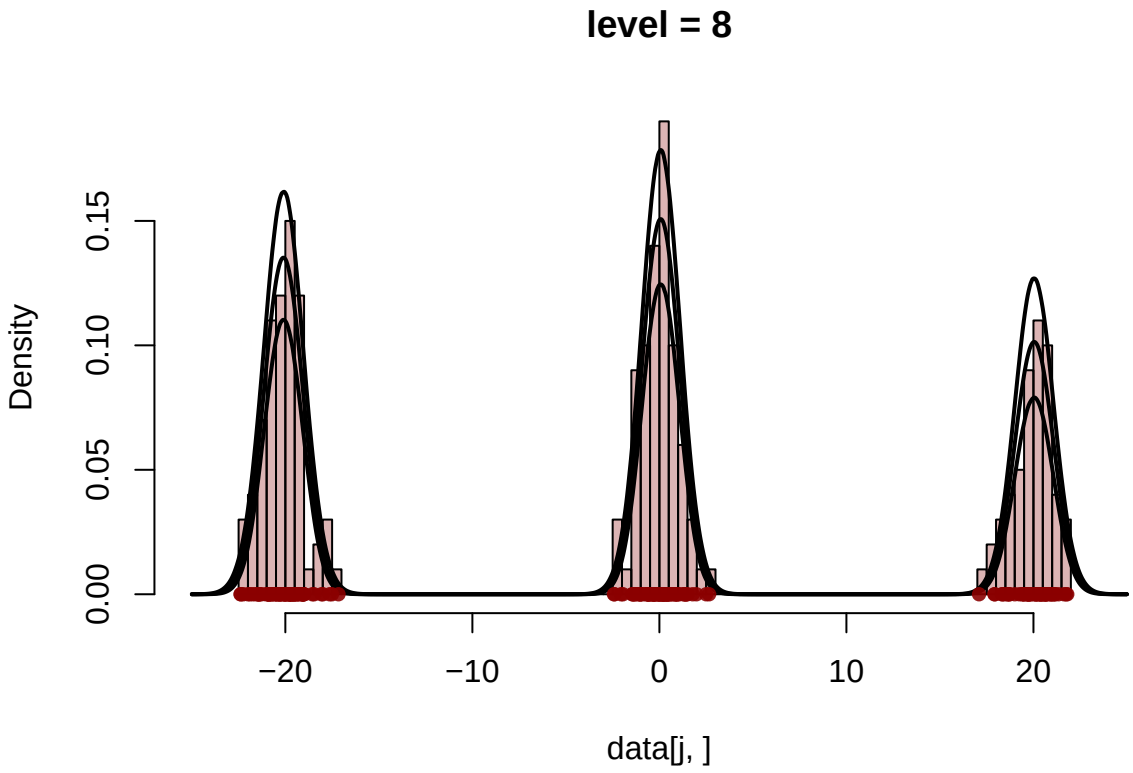

level = 3
Density
0.0
0.2
0.4
0.6
0.8
1.0
−20
−10
0
10
20
data[j,]

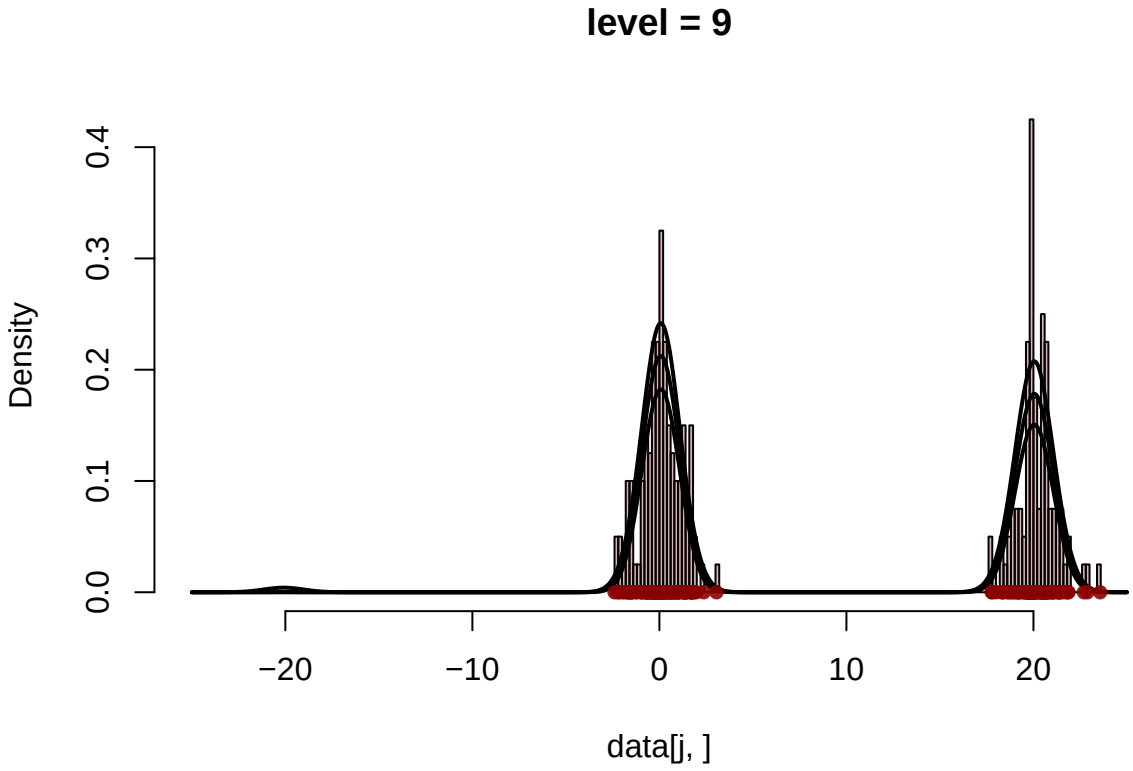

level = 4
Density
0.00
0.10
0.20
0.30
−20
−10
0
10
20
data[j,]

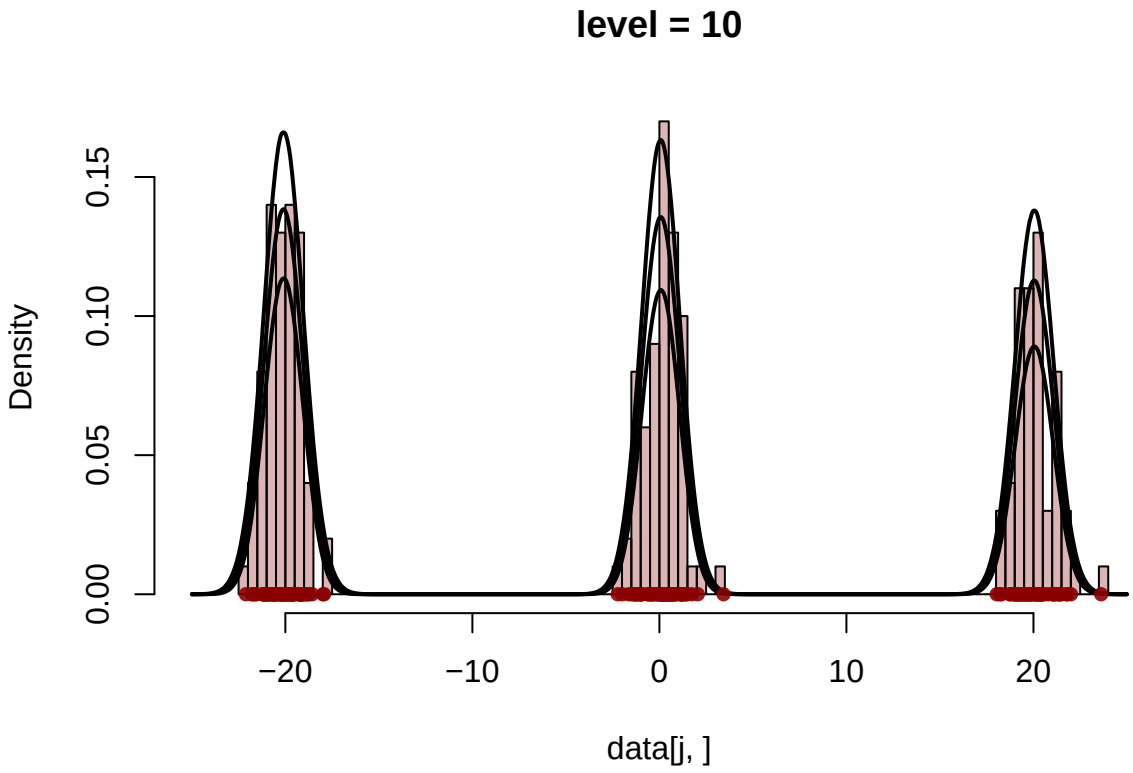

level = 5
Density
0.00
0.05
0.10
0.15
−20
−10
0
10
20
data[j,]


level = 6
Density
0.00
0.05
0.10
0.15
0.20
−20
−10
0
10
20
data[j,]


level = 7
Density
0.0
0.2
0.4
0.6
0.8
−20
−10
0
10
20
data[j,]


level = 8
Density
0.00
0.05
0.10
0.15
−20
−10
0
10
20
data[j,]


level = 9
Density
0.0
0.1
0.2
0.3
0.4
−20
−10
0
10
20
data[j,]



Aumentare Λ (sia tenendolo fissato a un valore grande, che modificare la prior) non serve già più a niente. Questo perché il pamatero della Poisson da cui si estrae `Mstar` è

$$\Lambda \prod_{j=1}^{d} \frac{1}{(1+U_j)^{\gamma_j}}$$

e quel prodotto può essere nell'ordine di grandezza di $\exp(-100)$ che è troppo piccolo per qualunque valore ottenibile di Λ.