Lab 11: Remote Sensing Machine Learning approaches in R

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Introduction

In this section of the course, we will be cover approaches to machine learning using remote sensing data. **Remote sensing** can be defined as the science of obtaining information about a place from a distance, commonly from unmanned autonomous vehicles (drones), aircraft or satellites.

These data can be important for emergency response, where immediate data is needed over a wide area, and for a wide range of topics.

Figure 1: AirborneImage

Figure 1. The NEON observational platform is an example of a remote sensing operation, based on a fixed wing airplane.

Figure 2. Another type of remotely sensed data is data sourced from orbit. This is the European Space Agency's Sentinel 2 platform.

Both of these platforms are collecting the energy reflected from objects across the electromagnetic spectrum in order to "sense" those objects remotely.

Our data

In this walk through, we will be working with Sentinel-2 imagery. Remotely sensed data normally is made up of **bands** of data, as layers in a single image. These bands are sections of intensity within a certain range of wavelengths.

Example of bands For example, a single digital image can be composed of red, green and blue color bands. For example:

Figure 3. The three layers that make up a RGB color image. Copyright NEON 2020.

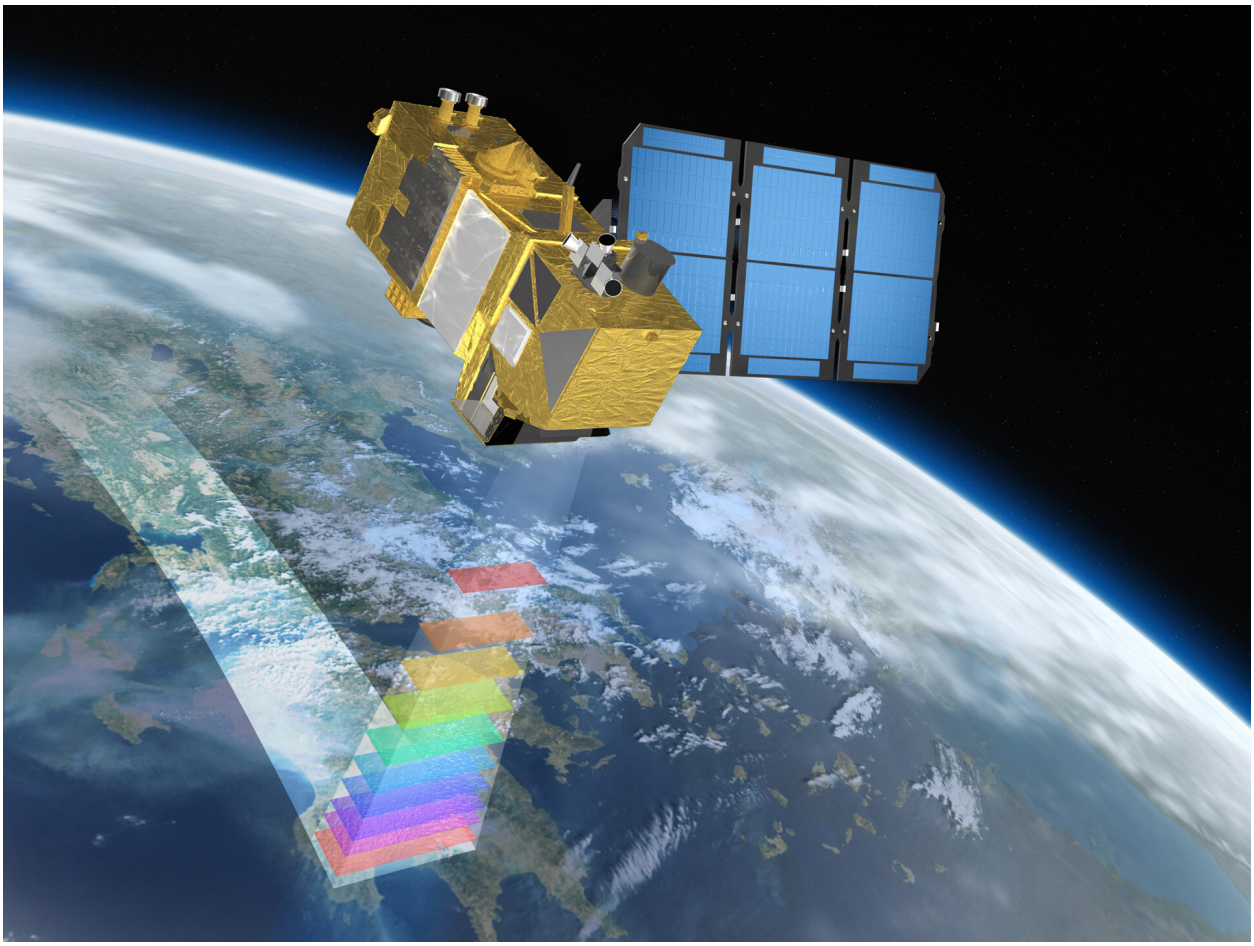


Figure 2: SentinelImage

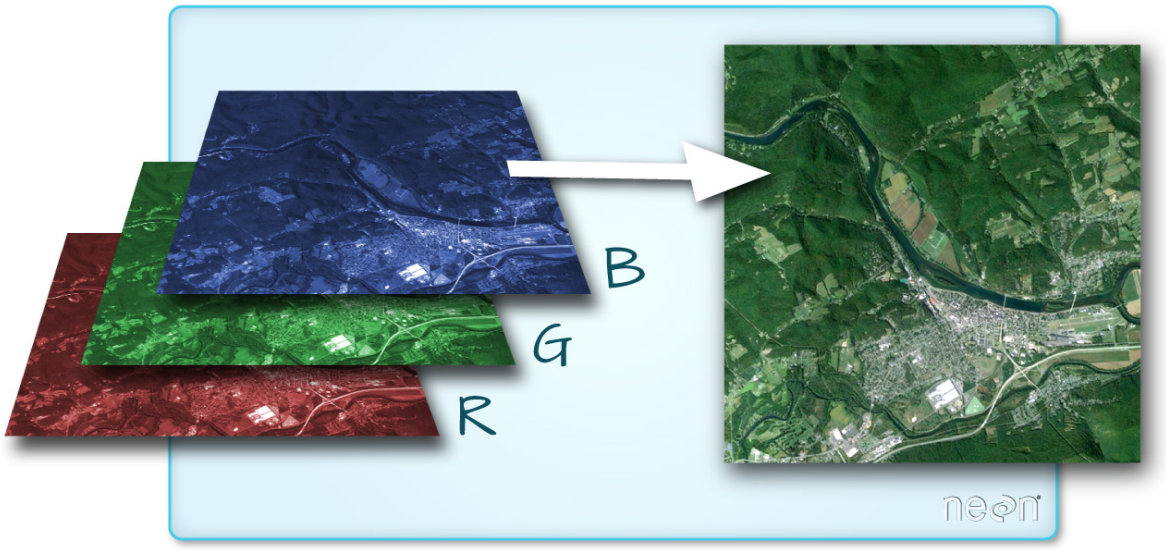


Figure 3: RasterExample

Bands in Sentinel imagery

In our case, Sentinel imagery is called **multi-spectral** as it detects 13 separate bands. There are referred to as Band 1, Band 2, Band 3, and so on until Band 12. There are two Band 8A.

Each of these bands covers a different section of the electromagnetic spectrum, and can be used for different purposes. They are commonly combined into a band combination to detect specific objects or features.

> BREAKOUT GROUPS: Find one potential of a combination of bands in the Sentinel imagery. Go to the link below and read through the bands. Propose a potential research question based on one of the bands combinations.

https://gisgeography.com/sentinel-2-bands-combinations/

> DEMO: We can see the common reflectance of objects using by referring to literature or an example database. I will show this to you.

https://landsat.usgs.gov/spectral-characteristics-viewer

Loading the remote sensing data

We will follow a tutorial for Sentinel 2 imagery developed by Dr. Abdi. Citation is below, along with a nice approach for clearing our RAM, or memory. We will be using all 8 GB in this lecture.

```
#########################################################################################################
# title         : Machine learning exercise for Sentinel-2 data
# purpose       : Implementing a machine learning workflow in R
# author        : Abdulhakim M. Abdi (Twitter: @HakimAbdi / www.hakimabdi.com)
# input         : A multi-temporal raster stack of Sentinel-2 data comprising scenes from four dates
# output        : One classified land cover map from each of three machine learning algorithms
# Note 1        : This brief tutorial assumes that you are already well-grounded in R concepts and are
#               : familiar with image classification procedure and terminology
```

```
# Reference       : Please cite Abdi (2020): "Land cover and land use classification performance of mac
#                       : algorithms in a boreal landscape using Sentinel-2 data" in GIScience & Remote
#               : tutorial useful in a publication.
# Reference URL : https://doi.org/10.1080/15481603.2019.1650447
# Data for Code : http://bit.ly/downloadMLtutorialdata
#########################################################################################################

rm(list = ls(all.names = TRUE)) # will clear all objects, including hidden objects
gc() # free up memory and report memory usage
```

```
##          used (Mb) gc trigger (Mb) max used (Mb)
## Ncells 398644 21.3     819658 43.8   638648 34.2
## Vcells 727737  5.6    8388608 64.0  1632876 12.5
```

Install GDAL

For Windows and MacOS users, you will need to install GDAL. For this class, we will use the TTS Virtual Lab virtual image, but I want to mention this step as it would be necessary to work on your own machines. GDAL is the geodata abstraction library, and is what much of the geodata libraries are built on.

Install libraries

```
# List of all packages
load.lib<-c("tidyverse", "rgdal", "raster","caret","sp",
"nnet","randomForest","kernlab","e1071")

# tidyverse - a collection of packages
# rgdal - the R GeoData Abstraction Layer (GDAL) -

# Loop through the packages, check if not installed, if true, install with dependencies.

install.lib<-load.lib[!load.lib %in% installed.packages()]
for(lib in install.lib) install.packages(lib,dependencies=TRUE)
sapply(load.lib,require,character=TRUE)
```

```
## Loading required package: tidyverse
```

```
## -- Attaching packages --------------------------------- tidyverse 1.3.0 --
```

```
## v ggplot2 3.3.2     v purrr   0.3.4
## v tibble  3.0.3     v dplyr   1.0.1
## v tidyr   1.1.1     v stringr 1.4.0
## v readr   1.3.1     v forcats 0.5.0
```

```
## -- Conflicts ------------------------------------ tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
```

```
## Loading required package: rgdal
```

```
## Loading required package: sp
```

```
## rgdal: version: 1.5-15, (SVN revision 1045)
## Geospatial Data Abstraction Library extensions to R successfully loaded
## Loaded GDAL runtime: GDAL 3.0.4, released 2020/01/28
## Path to GDAL shared files: C:/Program Files/R/library/rgdal/gdal
## GDAL binary built with GEOS: TRUE
```

```
## Loaded PROJ runtime: Rel. 6.3.1, February 10th, 2020, [PJ_VERSION: 631]
## Path to PROJ shared files: C:/Program Files/R/library/rgdal/proj
## Linking to sp version:1.4-2
## To mute warnings of possible GDAL/OSR exportToProj4() degradation,
## use options("rgdal_show_exportToProj4_warnings"="none") before loading rgdal.
## Loading required package: raster
##
## Attaching package: 'raster'
## The following object is masked from 'package:dplyr':
##
##     select
## The following object is masked from 'package:tidyr':
##
##     extract
## Loading required package: caret
## Loading required package: lattice
##
## Attaching package: 'caret'
## The following object is masked from 'package:purrr':
##
##     lift
## Loading required package: nnet
## Loading required package: randomForest
## randomForest 4.6-14
## Type rfNews() to see new features/changes/bug fixes.
##
## Attaching package: 'randomForest'
## The following object is masked from 'package:dplyr':
##
##     combine
## The following object is masked from 'package:ggplot2':
##
##     margin
## Loading required package: kernlab
##
## Attaching package: 'kernlab'
## The following objects are masked from 'package:raster':
##
##     buffer, rotated
## The following object is masked from 'package:purrr':
##
##     cross
## The following object is masked from 'package:ggplot2':
##
```

```
##     alpha
```

```
## Loading required package: e1071
```

```
##
## Attaching package: 'e1071'
```

```
## The following object is masked from 'package:raster':
##
##     interpolate
```

```
##    tidyverse        rgdal       raster        caret           sp         nnet
##         TRUE         TRUE         TRUE         TRUE         TRUE         TRUE
## randomForest      kernlab       e1071
##         TRUE         TRUE         TRUE
```

Load the data

We will load the raster data to get started.

Working directory First set your working directory. Session > Set Working Directory > To Source File Location.

Note: I am deviating from the tutorial a bit, and adding material, just FYI

Now we can load the data using the `raster` package and the `stack` method to load all of the layers.

```
# Load the Sentinel-2 stack of the study area, from the raster library
s2data = raster::stack("Data/S2StackSmall.tif")

# Name the layers of the Sentinel-2 stack based on previously saved information
names(s2data) = as.character(read.csv("Data/S2StackSmall_Names.csv")[,1])
```

> BREAKOUT: Look at the object s2data by clicking on it under the Environment. What is inside?

Look at the data

These are bands of data directly from Sentinel, just cropped to an area of interest. This is focusing on a particular area of Sweden as an example, but you could choose anywhere.

Prediction goal

We select Sweden as we have data for **land cover**, and we would like to use Sentinel data to predict land cover.

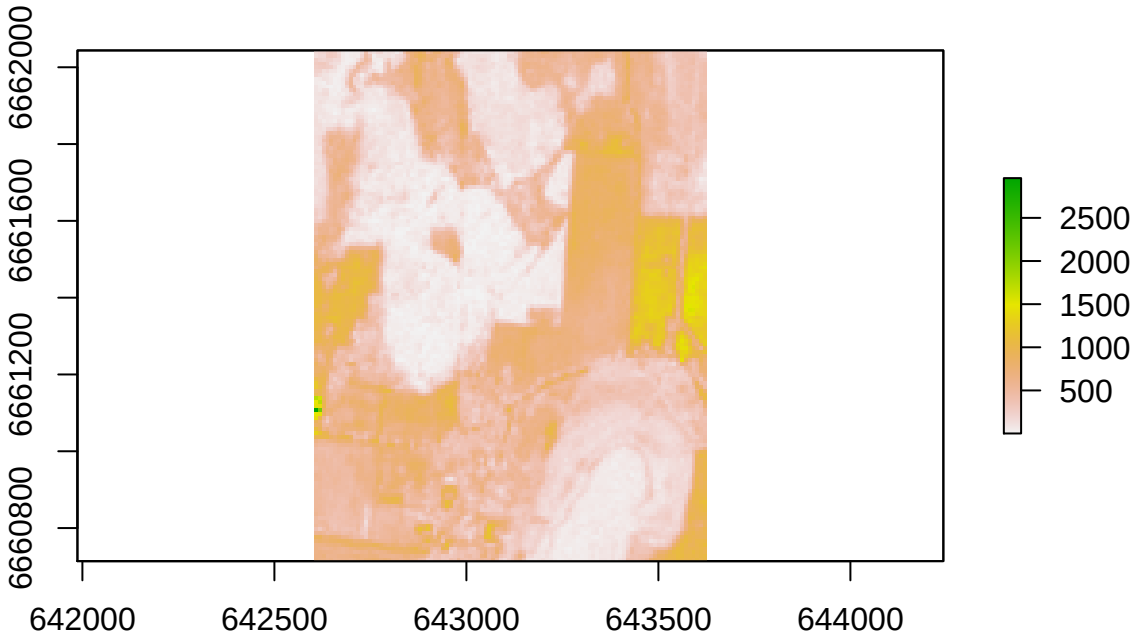
See metadata here:

http://www.swedishepa.se/State-of-the-environment/Maps-and-map-services/National-Land-Cover-Database/

Let's take a look at one of the Sentinel bands.

```
# We can pass the s2data to plot, I will select the Band 2 data.

plot(s2data$B02M)
```



Split the data into test and train

For this approach, we are looking to take all the bands in Sentinel data as inputs, and produce a model.

At this point, we need to decide on a model approach. For this, I would like to compare a random forest with two new approaches: a neural net and a support vector machine.

SVM A support vector machine tries to find the two closest points between two classes, and treats them as the "support vectors". Then, it draws a line (or hyperplane) between those points, and bisects that vector. The distance between this line and the support vectors is the margin, and we iterate to maximize the margin.

Neural net We are also deploying a neural net approach for this model. See this great walkthrough by Google for a good review:

https://developers.google.com/machine-learning/crash-course/multi-class-neural-networks/video-lecture

Now we load the data.

```
# Load the sample data
# Alternatively, you can use the supplied orthophotos to generate a new set of training and validation

# Your samples layer must have a column for each image in the raster stack, a column for the land cover

# You can create such a sample file using QGIS or another GIS software

# In our case, we will use premade samples
samples = read.csv("Data/Samples.csv")
```

```r
# Split the data frame into 70-30 by class
trainx = list(0)
evalx = list(0)
for (i in 1:8){ # loop through all eight classes
  cls = samples[samples$class == i,]
  smpl <- floor(0.70 * nrow(cls))
  tt <- sample(seq_len(nrow(cls)), size = smpl)
  trainx[[i]] <- cls[tt,]
  evalx[[i]] <- cls[-tt,]
}

# combine them all into training and evaluation data frames
trn = do.call(rbind, trainx)
eva = do.call(rbind, evalx)
```

Cross validation and training

We will resample our data, to search through all the potential hyperparameter values that we could select for. Note that as Dr. Zabel mentioned during last class, these sort of search functions to optimize for a value of any given constant are very common in machine learning.

We will use three models to recognize the data in this image:

1. Neural net
2. Random forest
3. Support Vector Machines

```r
# Set up a resampling method in the model training process
tc <- trainControl(method = "repeatedcv", # repeated cross-validation of the training data
                   number = 10, # number of folds
                   repeats = 5, # number of repeats
                   allowParallel = TRUE, # allow use of multiple cores if specified in training
                   verboseIter = TRUE) # view the training iterations

# Generate a grid search of candidate hyper-parameter values for inclusion into  model training

# These hyper-parameter values are examples. You will need a more complex tuning process to achieve hig


# For example, you can play around with the parameters to see which combinations gives you the highest


nnet.grid = expand.grid(size = seq(from = 2, to = 10, by = 2), # number of neurons units in the hidden

                        decay = seq(from = 0.1, to = 0.5, by = 0.1)) # regularization parameter to avoi



rf.grid <- expand.grid(mtry=1:20) # number of variables available for splitting at each tree node

svm.grid <- expand.grid(sigma=seq(from = 0.01, to = 0.10, by = 0.02), # controls for non-linearity in t
                        C=seq(from = 2, to = 10, by = 2)) # controls the influence of each support vect
```

Train the models

```
## # weights:  106
## initial  value 589.880304
## iter  10 value 511.775996
## iter  20 value 500.293742
## iter  30 value 498.753167
## iter  40 value 497.732212
## iter  50 value 496.925081
## iter  60 value 491.444631
## iter  70 value 490.588524
## iter  80 value 486.948668
## iter  90 value 483.019512
## iter 100 value 482.258116
## final  value 482.258116
## stopped after 100 iterations
## # weights:  204
## initial  value 657.031177
## iter  10 value 562.761867
## iter  20 value 492.892096
## iter  30 value 482.185902
## iter  40 value 472.367557
## iter  50 value 466.697483
## iter  60 value 446.060735
## iter  70 value 436.567611
## iter  80 value 422.610542
## iter  90 value 419.780363
## iter 100 value 418.875648
## final  value 418.875648
## stopped after 100 iterations
## # weights:  302
## initial  value 752.251725
## iter  10 value 464.921923
## iter  20 value 422.325422
## iter  30 value 410.395360
## iter  40 value 392.295389
## iter  50 value 380.995742
## iter  60 value 372.845651
## iter  70 value 365.531682
## iter  80 value 357.847123
## iter  90 value 354.623246
## iter 100 value 353.336751
## final  value 353.336751
## stopped after 100 iterations
## # weights:  400
## initial  value 677.948796
## iter  10 value 449.370005
## iter  20 value 419.969081
## iter  30 value 412.040530
## iter  40 value 399.115837
## iter  50 value 394.161683
## iter  60 value 391.602130
## iter  70 value 390.524978
## iter  80 value 388.879542
```

```
## iter  90 value 388.416962
## iter 100 value 385.679956
## final  value 385.679956
## stopped after 100 iterations
## # weights:  498
## initial  value 736.572430
## iter  10 value 527.936659
## iter  20 value 461.369379
## iter  30 value 449.498504
## iter  40 value 436.668655
## iter  50 value 434.629031
## iter  60 value 411.347196
## iter  70 value 393.740731
## iter  80 value 374.296641
## iter  90 value 372.563010
## iter 100 value 372.392583
## final  value 372.392583
## stopped after 100 iterations
## # weights:  106
## initial  value 612.491867
## iter  10 value 580.505029
## iter  20 value 558.411504
## iter  30 value 517.693620
## iter  40 value 500.719081
## iter  50 value 497.942659
## iter  60 value 486.089130
## iter  70 value 475.860639
## iter  80 value 452.984157
## iter  90 value 434.623230
## iter 100 value 433.304460
## final  value 433.304460
## stopped after 100 iterations
## # weights:  204
## initial  value 594.280029
## iter  10 value 482.232371
## iter  20 value 473.596828
## iter  30 value 455.488030
## iter  40 value 451.499350
## iter  50 value 449.229600
## iter  60 value 448.476294
## iter  70 value 438.928785
## iter  80 value 433.034958
## iter  90 value 429.635817
## iter 100 value 427.577124
## final  value 427.577124
## stopped after 100 iterations
## # weights:  302
## initial  value 717.199806
## iter  10 value 550.760137
## iter  20 value 498.360585
## iter  30 value 483.483907
## iter  40 value 477.490975
## iter  50 value 475.998459
## iter  60 value 462.078493
```

```
## iter  70 value 440.517233
## iter  80 value 425.100288
## iter  90 value 407.908104
## iter 100 value 398.914391
## final  value 398.914391
## stopped after 100 iterations
## # weights:  400
## initial  value 706.683861
## iter  10 value 459.850395
## iter  20 value 428.247250
## iter  30 value 406.230209
## iter  40 value 389.029180
## iter  50 value 387.407378
## iter  60 value 380.395617
## iter  70 value 374.029280
## iter  80 value 370.525823
## iter  90 value 368.878620
## iter 100 value 364.167437
## final  value 364.167437
## stopped after 100 iterations
## # weights:  498
## initial  value 718.918376
## iter  10 value 506.600618
## iter  20 value 461.479192
## iter  30 value 444.536693
## iter  40 value 421.240660
## iter  50 value 400.733509
## iter  60 value 394.556989
## iter  70 value 388.893854
## iter  80 value 380.611872
## iter  90 value 368.918517
## iter 100 value 367.513121
## final  value 367.513121
## stopped after 100 iterations
## # weights:  106
## initial  value 616.821026
## iter  10 value 513.871309
## iter  20 value 480.038885
## iter  30 value 474.807883
## iter  40 value 465.347863
## iter  50 value 442.594172
## iter  60 value 442.040464
## iter  70 value 441.997454
## iter  80 value 441.732407
## iter  90 value 436.136500
## iter 100 value 435.233095
## final  value 435.233095
## stopped after 100 iterations
## # weights:  204
## initial  value 641.295147
## iter  10 value 522.797212
## iter  20 value 501.360372
## iter  30 value 459.585947
## iter  40 value 430.599361
```

```
## iter  50 value 418.802128
## iter  60 value 416.282107
## iter  70 value 407.561918
## iter  80 value 402.378462
## iter  90 value 395.189395
## iter 100 value 392.395463
## final  value 392.395463
## stopped after 100 iterations
## # weights:  302
## initial  value 628.871857
## iter  10 value 540.870136
## iter  20 value 493.650235
## iter  30 value 486.035723
## iter  40 value 484.468538
## iter  50 value 465.946678
## iter  60 value 462.890058
## iter  70 value 459.911068
## iter  80 value 439.398866
## iter  90 value 424.855562
## iter 100 value 391.405116
## final  value 391.405116
## stopped after 100 iterations
## # weights:  400
## initial  value 691.323370
## iter  10 value 471.168469
## iter  20 value 456.866082
## iter  30 value 429.050526
## iter  40 value 420.958066
## iter  50 value 416.542958
## iter  60 value 406.157055
## iter  70 value 404.408695
## iter  80 value 392.630089
## iter  90 value 388.482332
## iter 100 value 386.014996
## final  value 386.014996
## stopped after 100 iterations
## # weights:  498
## initial  value 763.983677
## iter  10 value 515.777239
## iter  20 value 486.587063
## iter  30 value 464.565715
## iter  40 value 444.536395
## iter  50 value 438.621116
## iter  60 value 433.794809
## iter  70 value 431.430299
## iter  80 value 430.635210
## iter  90 value 429.889766
## iter 100 value 428.467374
## final  value 428.467374
## stopped after 100 iterations
## # weights:  106
## initial  value 615.667351
## iter  10 value 578.873566
## iter  20 value 577.392851
```

```
## iter  30 value 575.428505
## iter  40 value 566.607186
## iter  50 value 518.801931
## iter  60 value 478.191216
## iter  70 value 466.160561
## iter  80 value 461.906228
## iter  90 value 460.403168
## iter 100 value 459.915671
## final  value 459.915671
## stopped after 100 iterations
## # weights:  204
## initial  value 651.275264
## iter  10 value 571.971753
## iter  20 value 532.058864
## iter  30 value 515.253235
## iter  40 value 508.859639
## iter  50 value 503.701661
## iter  60 value 499.806606
## iter  70 value 495.018730
## iter  80 value 494.883283
## iter  90 value 488.770718
## iter 100 value 485.595037
## final  value 485.595037
## stopped after 100 iterations
## # weights:  302
## initial  value 691.277128
## iter  10 value 513.917846
## iter  20 value 493.821066
## iter  30 value 478.237708
## iter  40 value 476.076726
## iter  50 value 473.576337
## iter  60 value 470.792808
## iter  70 value 466.522549
## iter  80 value 463.073468
## iter  90 value 459.548940
## iter 100 value 456.774979
## final  value 456.774979
## stopped after 100 iterations
## # weights:  400
## initial  value 639.568854
## iter  10 value 511.918701
## iter  20 value 482.269268
## iter  30 value 463.207929
## iter  40 value 461.053513
## iter  50 value 453.680793
## iter  60 value 442.847104
## iter  70 value 431.340304
## iter  80 value 424.062296
## iter  90 value 417.240305
## iter 100 value 413.869327
## final  value 413.869327
## stopped after 100 iterations
## # weights:  498
## initial  value 764.337996
```

```
## iter  10 value 529.784052
## iter  20 value 470.206722
## iter  30 value 457.907586
## iter  40 value 437.896607
## iter  50 value 413.215168
## iter  60 value 399.070860
## iter  70 value 383.520231
## iter  80 value 372.615470
## iter  90 value 363.275365
## iter 100 value 360.652708
## final  value 360.652708
## stopped after 100 iterations
## # weights:  106
## initial  value 615.772667
## iter  10 value 509.268839
## iter  20 value 501.813508
## iter  30 value 501.600506
## iter  40 value 501.396448
## iter  50 value 500.928290
## iter  60 value 495.775004
## iter  70 value 488.383692
## iter  80 value 453.970218
## iter  90 value 451.119387
## iter 100 value 440.621169
## final  value 440.621169
## stopped after 100 iterations
## # weights:  204
## initial  value 629.832220
## iter  10 value 498.434257
## iter  20 value 487.694111
## iter  30 value 479.332078
## iter  40 value 474.124240
## iter  50 value 457.120359
## iter  60 value 449.599808
## iter  70 value 447.048414
## iter  80 value 444.843248
## iter  90 value 443.140518
## iter 100 value 441.413849
## final  value 441.413849
## stopped after 100 iterations
## # weights:  302
## initial  value 682.190433
## iter  10 value 612.510534
## iter  20 value 545.580488
## iter  30 value 535.449525
## iter  40 value 532.956845
## iter  50 value 530.167386
## iter  60 value 526.513246
## iter  70 value 519.178179
## iter  80 value 512.905390
## iter  90 value 511.075435
## iter 100 value 507.603276
## final  value 507.603276
## stopped after 100 iterations
```

```
## # weights:  400
## initial  value 674.883919
## iter  10 value 547.082865
## iter  20 value 512.129049
## iter  30 value 475.878595
## iter  40 value 468.920773
## iter  50 value 458.176859
## iter  60 value 455.856177
## iter  70 value 454.296382
## iter  80 value 453.673071
## iter  90 value 449.225951
## iter 100 value 448.519905
## final  value 448.519905
## stopped after 100 iterations
## # weights:  498
## initial  value 729.915143
## iter  10 value 521.608260
## iter  20 value 445.946380
## iter  30 value 419.937835
## iter  40 value 396.899046
## iter  50 value 362.457086
## iter  60 value 359.437235
## iter  70 value 354.237235
## iter  80 value 350.193279
## iter  90 value 346.042653
## iter 100 value 340.164172
## final  value 340.164172
## stopped after 100 iterations
## # weights:  106
## initial  value 579.562312
## iter  10 value 516.439382
## iter  20 value 484.455936
## iter  30 value 481.693356
## iter  40 value 479.741566
## iter  50 value 478.631140
## iter  60 value 478.448732
## iter  70 value 473.328067
## iter  80 value 469.864489
## iter  90 value 467.444027
## iter 100 value 466.859920
## final  value 466.859920
## stopped after 100 iterations
## # weights:  204
## initial  value 637.761487
## iter  10 value 506.166336
## iter  20 value 456.331611
## iter  30 value 437.853318
## iter  40 value 421.853574
## iter  50 value 406.002721
## iter  60 value 400.586922
## iter  70 value 399.668763
## iter  80 value 397.956615
## iter  90 value 382.785174
## iter 100 value 380.527177
```

```
## final  value 380.527177
## stopped after 100 iterations
## # weights:  302
## initial  value 651.801083
## iter  10 value 441.129835
## iter  20 value 423.178033
## iter  30 value 404.898564
## iter  40 value 399.293704
## iter  50 value 396.718184
## iter  60 value 395.750886
## iter  70 value 395.595730
## iter  80 value 395.370330
## iter  90 value 395.164561
## iter 100 value 388.423353
## final  value 388.423353
## stopped after 100 iterations
## # weights:  400
## initial  value 710.926780
## iter  10 value 426.973404
## iter  20 value 391.470735
## iter  30 value 372.223111
## iter  40 value 367.242291
## iter  50 value 361.535900
## iter  60 value 356.697161
## iter  70 value 353.969697
## iter  80 value 350.994193
## iter  90 value 350.246854
## iter 100 value 348.052377
## final  value 348.052377
## stopped after 100 iterations
## # weights:  498
## initial  value 724.849083
## iter  10 value 488.920465
## iter  20 value 467.024110
## iter  30 value 463.569229
## iter  40 value 459.940489
## iter  50 value 452.869494
## iter  60 value 445.064434
## iter  70 value 433.287003
## iter  80 value 430.334944
## iter  90 value 426.047914
## iter 100 value 424.121685
## final  value 424.121685
## stopped after 100 iterations
## # weights:  106
## initial  value 611.740403
## iter  10 value 514.373237
## iter  20 value 488.780260
## iter  30 value 488.497557
## iter  40 value 487.985322
## iter  50 value 487.008208
## iter  60 value 486.401666
## iter  70 value 485.274104
## iter  80 value 484.591696
```

```
## iter  90 value 483.861096
## iter 100 value 483.452076
## final  value 483.452076
## stopped after 100 iterations
## # weights:  204
## initial  value 616.272919
## iter  10 value 530.607654
## iter  20 value 489.727992
## iter  30 value 455.506051
## iter  40 value 416.112845
## iter  50 value 412.650236
## iter  60 value 410.677623
## iter  70 value 402.474727
## iter  80 value 399.811641
## iter  90 value 398.820465
## iter 100 value 382.611549
## final  value 382.611549
## stopped after 100 iterations
## # weights:  302
## initial  value 669.184190
## iter  10 value 473.805228
## iter  20 value 449.428825
## iter  30 value 440.005763
## iter  40 value 424.535394
## iter  50 value 415.366021
## iter  60 value 407.811428
## iter  70 value 404.991073
## iter  80 value 402.133735
## iter  90 value 400.901057
## iter 100 value 400.134262
## final  value 400.134262
## stopped after 100 iterations
## # weights:  400
## initial  value 698.376310
## iter  10 value 500.687294
## iter  20 value 464.151537
## iter  30 value 432.588902
## iter  40 value 431.247794
## iter  50 value 425.307713
## iter  60 value 417.329446
## iter  70 value 413.375513
## iter  80 value 411.990630
## iter  90 value 411.719966
## iter 100 value 408.620138
## final  value 408.620138
## stopped after 100 iterations
## # weights:  498
## initial  value 702.601231
## iter  10 value 452.566558
## iter  20 value 413.937889
## iter  30 value 394.116606
## iter  40 value 385.958754
## iter  50 value 378.389801
## iter  60 value 374.763838
```

```
## iter  70 value 361.446214
## iter  80 value 345.931351
## iter  90 value 341.513124
## iter 100 value 339.219530
## final  value 339.219530
## stopped after 100 iterations
## # weights:  106
## initial  value 611.011452
## iter  10 value 488.977436
## iter  20 value 482.778022
## iter  30 value 480.184886
## iter  40 value 478.564574
## iter  50 value 477.120192
## iter  60 value 476.196840
## iter  70 value 474.272424
## iter  80 value 468.583164
## iter  90 value 467.430911
## iter 100 value 465.877736
## final  value 465.877736
## stopped after 100 iterations
## # weights:  204
## initial  value 618.622623
## iter  10 value 579.375997
## iter  20 value 579.051545
## iter  30 value 522.723643
## iter  40 value 499.236261
## iter  50 value 495.257295
## iter  60 value 466.943993
## iter  70 value 420.537539
## iter  80 value 412.730759
## iter  90 value 409.209421
## iter 100 value 408.896572
## final  value 408.896572
## stopped after 100 iterations
## # weights:  302
## initial  value 670.148800
## iter  10 value 548.965631
## iter  20 value 542.698261
## iter  30 value 538.804543
## iter  40 value 537.385678
## iter  50 value 532.879792
## iter  60 value 531.655862
## iter  70 value 531.000001
## iter  80 value 529.154233
## iter  90 value 526.824364
## iter 100 value 526.250949
## final  value 526.250949
## stopped after 100 iterations
## # weights:  400
## initial  value 697.232002
## iter  10 value 468.993496
## iter  20 value 456.331099
## iter  30 value 442.693521
## iter  40 value 429.150496
```

```
## iter  50 value 416.401787
## iter  60 value 415.329356
## iter  70 value 414.601437
## iter  80 value 413.101394
## iter  90 value 404.542450
## iter 100 value 392.906254
## final  value 392.906254
## stopped after 100 iterations
## # weights:  498
## initial  value 644.068331
## iter  10 value 489.787503
## iter  20 value 461.924097
## iter  30 value 445.181971
## iter  40 value 417.412955
## iter  50 value 409.837609
## iter  60 value 401.064344
## iter  70 value 398.569912
## iter  80 value 396.741657
## iter  90 value 390.176524
## iter 100 value 376.263375
## final  value 376.263375
## stopped after 100 iterations
## # weights:  106
## initial  value 597.672819
## iter  10 value 579.201842
## iter  20 value 576.705321
## iter  30 value 513.647360
## iter  40 value 504.507336
## iter  50 value 495.011082
## iter  60 value 485.613895
## iter  70 value 480.137215
## iter  80 value 478.035638
## iter  90 value 476.126560
## iter 100 value 458.515875
## final  value 458.515875
## stopped after 100 iterations
## # weights:  204
## initial  value 663.329685
## iter  10 value 537.112488
## iter  20 value 521.748073
## iter  30 value 509.172020
## iter  40 value 497.848341
## iter  50 value 496.096148
## iter  60 value 492.335098
## iter  70 value 484.506599
## iter  80 value 477.184336
## iter  90 value 476.070908
## iter 100 value 473.643616
## final  value 473.643616
## stopped after 100 iterations
## # weights:  302
## initial  value 697.445524
## iter  10 value 505.375214
## iter  20 value 496.983853
```

```
## iter  30 value 495.635911
## iter  40 value 482.668033
## iter  50 value 453.720670
## iter  60 value 435.965197
## iter  70 value 426.659912
## iter  80 value 422.735853
## iter  90 value 420.844664
## iter 100 value 419.356702
## final  value 419.356702
## stopped after 100 iterations
## # weights:  400
## initial  value 670.467358
## iter  10 value 504.196362
## iter  20 value 483.658437
## iter  30 value 450.127412
## iter  40 value 427.212781
## iter  50 value 412.486846
## iter  60 value 384.940176
## iter  70 value 381.991008
## iter  80 value 379.720034
## iter  90 value 378.314385
## iter 100 value 374.427524
## final  value 374.427524
## stopped after 100 iterations
## # weights:  498
## initial  value 700.079736
## iter  10 value 508.848407
## iter  20 value 469.416958
## iter  30 value 455.089613
## iter  40 value 449.352624
## iter  50 value 445.072524
## iter  60 value 426.320352
## iter  70 value 424.990263
## iter  80 value 413.872119
## iter  90 value 409.107341
## iter 100 value 405.546542
## final  value 405.546542
## stopped after 100 iterations
## # weights:  106
## initial  value 689.281409
## iter  10 value 506.531114
## iter  20 value 499.503081
## iter  30 value 498.816156
## iter  40 value 498.623702
## iter  50 value 494.415266
## iter  60 value 493.438765
## iter  70 value 492.699928
## iter  80 value 491.253196
## iter  90 value 489.716878
## iter 100 value 488.863599
## final  value 488.863599
## stopped after 100 iterations
## # weights:  204
## initial  value 673.469454
```

```
## iter  10 value 529.839103
## iter  20 value 487.829292
## iter  30 value 472.768088
## iter  40 value 463.382154
## iter  50 value 460.276639
## iter  60 value 453.534663
## iter  70 value 443.436162
## iter  80 value 438.377531
## iter  90 value 429.916224
## iter 100 value 427.065296
## final  value 427.065296
## stopped after 100 iterations
## # weights:  302
## initial  value 616.335831
## iter  10 value 541.969052
## iter  20 value 481.348821
## iter  30 value 461.050163
## iter  40 value 447.587661
## iter  50 value 447.252415
## iter  60 value 443.855231
## iter  70 value 441.788716
## iter  80 value 441.195387
## iter  90 value 438.727352
## iter 100 value 427.705489
## final  value 427.705489
## stopped after 100 iterations
## # weights:  400
## initial  value 699.307310
## iter  10 value 496.106753
## iter  20 value 490.825700
## iter  30 value 479.166515
## iter  40 value 474.322418
## iter  50 value 472.527636
## iter  60 value 452.275294
## iter  70 value 432.308788
## iter  80 value 421.353454
## iter  90 value 408.554114
## iter 100 value 403.639035
## final  value 403.639035
## stopped after 100 iterations
## # weights:  498
## initial  value 753.288130
## iter  10 value 528.344973
## iter  20 value 484.579942
## iter  30 value 465.742099
## iter  40 value 453.033304
## iter  50 value 442.820165
## iter  60 value 435.175932
## iter  70 value 430.624105
## iter  80 value 426.885244
## iter  90 value 421.394522
## iter 100 value 418.066819
## final  value 418.066819
## stopped after 100 iterations
```

```
## # weights:  106
## initial  value 602.914035
## iter  10 value 561.141129
## iter  20 value 497.714781
## iter  30 value 484.713357
## iter  40 value 484.374417
## iter  50 value 483.462003
## iter  60 value 483.314600
## final  value 483.314565
## converged
## # weights:  204
## initial  value 636.231642
## iter  10 value 533.694353
## iter  20 value 495.531484
## iter  30 value 486.478476
## iter  40 value 483.965591
## iter  50 value 470.214121
## iter  60 value 444.791745
## iter  70 value 440.041910
## iter  80 value 438.083285
## iter  90 value 437.561638
## iter 100 value 436.915360
## final  value 436.915360
## stopped after 100 iterations
## # weights:  302
## initial  value 663.389871
## iter  10 value 515.101003
## iter  20 value 459.797975
## iter  30 value 442.313585
## iter  40 value 437.550413
## iter  50 value 429.939213
## iter  60 value 424.897725
## iter  70 value 421.947775
## iter  80 value 420.213992
## iter  90 value 417.232240
## iter 100 value 414.839298
## final  value 414.839298
## stopped after 100 iterations
## # weights:  400
## initial  value 677.621706
## iter  10 value 525.473913
## iter  20 value 501.669372
## iter  30 value 498.770771
## iter  40 value 430.439107
## iter  50 value 422.903432
## iter  60 value 414.642641
## iter  70 value 413.470464
## iter  80 value 412.491551
## iter  90 value 401.291329
## iter 100 value 396.834865
## final  value 396.834865
## stopped after 100 iterations
## # weights:  498
## initial  value 711.693111
```

```
## iter  10 value 478.361654
## iter  20 value 390.382645
## iter  30 value 374.261293
## iter  40 value 361.764006
## iter  50 value 354.341182
## iter  60 value 350.072321
## iter  70 value 344.677810
## iter  80 value 343.719451
## iter  90 value 340.649615
## iter 100 value 338.322857
## final  value 338.322857
## stopped after 100 iterations
## # weights:  106
## initial  value 580.363755
## iter  10 value 515.277422
## iter  20 value 469.295007
## iter  30 value 458.630050
## iter  40 value 448.154296
## iter  50 value 436.667804
## iter  60 value 434.442947
## iter  70 value 434.178134
## iter  80 value 430.364950
## iter  90 value 429.470439
## iter 100 value 426.261215
## final  value 426.261215
## stopped after 100 iterations
## # weights:  204
## initial  value 664.912410
## iter  10 value 512.696626
## iter  20 value 467.302305
## iter  30 value 454.943245
## iter  40 value 442.162170
## iter  50 value 440.089281
## iter  60 value 438.545536
## iter  70 value 437.568467
## iter  80 value 437.311369
## iter  90 value 436.939123
## iter 100 value 436.557097
## final  value 436.557097
## stopped after 100 iterations
## # weights:  302
## initial  value 622.844488
## iter  10 value 508.025198
## iter  20 value 476.870952
## iter  30 value 450.869922
## iter  40 value 441.275794
## iter  50 value 425.794506
## iter  60 value 408.245602
## iter  70 value 390.423818
## iter  80 value 386.833687
## iter  90 value 383.703799
## iter 100 value 378.943756
## final  value 378.943756
## stopped after 100 iterations
```

```
## # weights:  400
## initial  value 648.321145
## iter  10 value 457.768032
## iter  20 value 419.270591
## iter  30 value 412.904384
## iter  40 value 411.276433
## iter  50 value 403.434835
## iter  60 value 397.915480
## iter  70 value 397.150938
## iter  80 value 393.975038
## iter  90 value 392.828289
## iter 100 value 384.946747
## final  value 384.946747
## stopped after 100 iterations
## # weights:  498
## initial  value 632.568346
## iter  10 value 498.692171
## iter  20 value 481.964620
## iter  30 value 477.052129
## iter  40 value 475.787514
## iter  50 value 474.630405
## iter  60 value 474.060553
## iter  70 value 473.164166
## iter  80 value 443.183341
## iter  90 value 434.496998
## iter 100 value 431.758441
## final  value 431.758441
## stopped after 100 iterations
## # weights:  106
## initial  value 677.001817
## iter  10 value 551.806173
## iter  20 value 543.712958
## iter  30 value 529.077406
## iter  40 value 508.875645
## iter  50 value 496.475465
## iter  60 value 484.384836
## iter  70 value 477.997646
## iter  80 value 468.719348
## iter  90 value 465.727860
## iter 100 value 463.205954
## final  value 463.205954
## stopped after 100 iterations
## # weights:  204
## initial  value 656.500374
## iter  10 value 473.383793
## iter  20 value 456.882051
## iter  30 value 445.376169
## iter  40 value 443.997635
## iter  50 value 442.022404
## iter  60 value 439.643169
## iter  70 value 436.895455
## iter  80 value 435.478893
## iter  90 value 427.308494
## iter 100 value 420.099767
```

```
## final  value 420.099767
## stopped after 100 iterations
## # weights:  302
## initial  value 659.685252
## iter  10 value 503.805752
## iter  20 value 496.806471
## iter  30 value 492.554220
## iter  40 value 486.974881
## iter  50 value 445.218422
## iter  60 value 430.133686
## iter  70 value 421.497373
## iter  80 value 406.966585
## iter  90 value 400.645707
## iter 100 value 388.152914
## final  value 388.152914
## stopped after 100 iterations
## # weights:  400
## initial  value 783.352922
## iter  10 value 571.133050
## iter  20 value 506.932877
## iter  30 value 487.150963
## iter  40 value 478.986615
## iter  50 value 472.413026
## iter  60 value 462.371015
## iter  70 value 450.619185
## iter  80 value 447.069649
## iter  90 value 444.798503
## iter 100 value 441.986724
## final  value 441.986724
## stopped after 100 iterations
## # weights:  498
## initial  value 776.123379
## iter  10 value 489.756260
## iter  20 value 464.657048
## iter  30 value 454.809024
## iter  40 value 434.955866
## iter  50 value 427.220580
## iter  60 value 419.543296
## iter  70 value 417.419080
## iter  80 value 411.918137
## iter  90 value 407.745058
## iter 100 value 407.330390
## final  value 407.330390
## stopped after 100 iterations
## # weights:  106
## initial  value 653.576355
## iter  10 value 531.859253
## iter  20 value 495.210750
## iter  30 value 484.264643
## iter  40 value 481.889711
## iter  50 value 480.858236
## iter  60 value 473.452841
## iter  70 value 458.030092
## iter  80 value 449.983699
```

```
## iter  90 value 433.632436
## iter 100 value 427.198386
## final  value 427.198386
## stopped after 100 iterations
## # weights:  204
## initial  value 618.994527
## iter  10 value 522.010934
## iter  20 value 479.151930
## iter  30 value 473.178968
## iter  40 value 463.389072
## iter  50 value 461.263054
## iter  60 value 456.273844
## iter  70 value 455.335353
## iter  80 value 451.013023
## iter  90 value 446.989038
## iter 100 value 445.963820
## final  value 445.963820
## stopped after 100 iterations
## # weights:  302
## initial  value 746.719153
## iter  10 value 464.672590
## iter  20 value 437.640709
## iter  30 value 424.949518
## iter  40 value 419.836359
## iter  50 value 416.472745
## iter  60 value 413.582900
## iter  70 value 406.990750
## iter  80 value 405.743664
## iter  90 value 404.677725
## iter 100 value 397.491163
## final  value 397.491163
## stopped after 100 iterations
## # weights:  400
## initial  value 687.659504
## iter  10 value 467.582524
## iter  20 value 448.929279
## iter  30 value 432.996571
## iter  40 value 417.296582
## iter  50 value 412.607402
## iter  60 value 411.317778
## iter  70 value 407.123650
## iter  80 value 404.959881
## iter  90 value 403.881703
## iter 100 value 402.551116
## final  value 402.551116
## stopped after 100 iterations
## # weights:  498
## initial  value 740.823687
## iter  10 value 555.963997
## iter  20 value 520.624275
## iter  30 value 489.642516
## iter  40 value 467.547086
## iter  50 value 441.483238
## iter  60 value 423.194608
```

```
## iter  70 value 420.437586
## iter  80 value 414.396350
## iter  90 value 391.484107
## iter 100 value 390.875570
## final  value 390.875570
## stopped after 100 iterations
## # weights:  106
## initial  value 659.723696
## iter  10 value 540.758460
## iter  20 value 503.062871
## iter  30 value 499.534091
## iter  40 value 495.152925
## iter  50 value 489.069769
## iter  60 value 484.348541
## iter  70 value 482.172619
## iter  80 value 480.731857
## iter  90 value 480.085519
## iter 100 value 479.018377
## final  value 479.018377
## stopped after 100 iterations
## # weights:  204
## initial  value 624.640122
## iter  10 value 579.470441
## iter  20 value 576.728792
## iter  30 value 514.100188
## iter  40 value 496.375436
## iter  50 value 476.223717
## iter  60 value 463.512224
## iter  70 value 452.218605
## iter  80 value 449.033854
## iter  90 value 444.627182
## iter 100 value 439.181743
## final  value 439.181743
## stopped after 100 iterations
## # weights:  302
## initial  value 645.199100
## iter  10 value 521.745969
## iter  20 value 498.785715
## iter  30 value 490.978304
## iter  40 value 480.161786
## iter  50 value 459.283953
## iter  60 value 452.395637
## iter  70 value 449.268236
## iter  80 value 448.529445
## iter  90 value 448.118068
## iter 100 value 447.625609
## final  value 447.625609
## stopped after 100 iterations
## # weights:  400
## initial  value 665.753309
## iter  10 value 486.488822
## iter  20 value 461.920944
## iter  30 value 438.410952
## iter  40 value 432.580396
```

```
## iter  50 value 420.903437
## iter  60 value 419.147127
## iter  70 value 417.377065
## iter  80 value 413.878358
## iter  90 value 411.257375
## iter 100 value 410.884082
## final  value 410.884082
## stopped after 100 iterations
## # weights:  498
## initial  value 677.812071
## iter  10 value 529.194984
## iter  20 value 483.552816
## iter  30 value 475.554638
## iter  40 value 472.543665
## iter  50 value 460.248689
## iter  60 value 446.947054
## iter  70 value 427.102410
## iter  80 value 403.407639
## iter  90 value 401.709112
## iter 100 value 400.612100
## final  value 400.612100
## stopped after 100 iterations
## # weights:  106
## initial  value 671.396233
## iter  10 value 505.317277
## iter  20 value 487.843693
## iter  30 value 480.815733
## iter  40 value 478.994377
## iter  50 value 477.692723
## iter  60 value 476.487878
## iter  70 value 475.828738
## iter  80 value 475.596001
## iter  90 value 474.928465
## iter 100 value 474.338035
## final  value 474.338035
## stopped after 100 iterations
## # weights:  204
## initial  value 682.837002
## iter  10 value 507.376162
## iter  20 value 480.807454
## iter  30 value 473.770119
## iter  40 value 470.842932
## iter  50 value 413.448104
## iter  60 value 408.921479
## iter  70 value 384.254743
## iter  80 value 366.574843
## iter  90 value 363.451558
## iter 100 value 354.605324
## final  value 354.605324
## stopped after 100 iterations
## # weights:  302
## initial  value 717.007369
## iter  10 value 506.327299
## iter  20 value 487.908164
```

```
## iter  30 value 485.296815
## iter  40 value 485.146710
## iter  50 value 484.024877
## iter  60 value 482.857114
## iter  70 value 479.886076
## iter  80 value 477.561532
## iter  90 value 473.926710
## iter 100 value 471.174764
## final  value 471.174764
## stopped after 100 iterations
## # weights:  400
## initial  value 684.322294
## iter  10 value 489.904201
## iter  20 value 472.186413
## iter  30 value 465.252906
## iter  40 value 453.727224
## iter  50 value 451.555539
## iter  60 value 449.500908
## iter  70 value 435.486963
## iter  80 value 431.865728
## iter  90 value 425.014095
## iter 100 value 402.768944
## final  value 402.768944
## stopped after 100 iterations
## # weights:  498
## initial  value 650.065962
## iter  10 value 486.095349
## iter  20 value 463.087918
## iter  30 value 451.045172
## iter  40 value 445.405567
## iter  50 value 442.602291
## iter  60 value 440.992517
## iter  70 value 440.083475
## iter  80 value 429.259055
## iter  90 value 393.313446
## iter 100 value 379.272153
## final  value 379.272153
## stopped after 100 iterations
## # weights:  106
## initial  value 595.373559
## iter  10 value 527.403597
## iter  20 value 483.487152
## iter  30 value 478.853456
## iter  40 value 476.728219
## iter  50 value 474.355910
## iter  60 value 467.663413
## iter  70 value 435.608166
## iter  80 value 432.091638
## iter  90 value 427.254868
## iter 100 value 426.865571
## final  value 426.865571
## stopped after 100 iterations
## # weights:  204
## initial  value 611.826597
```

```
## iter  10 value 508.058473
## iter  20 value 487.508768
## iter  30 value 483.164034
## iter  40 value 476.224169
## iter  50 value 475.272216
## iter  60 value 468.256545
## iter  70 value 462.140503
## iter  80 value 460.846951
## iter  90 value 459.172173
## iter 100 value 458.120792
## final  value 458.120792
## stopped after 100 iterations
## # weights:  302
## initial  value 651.616933
## iter  10 value 457.458737
## iter  20 value 428.739406
## iter  30 value 425.316292
## iter  40 value 420.183285
## iter  50 value 415.552614
## iter  60 value 414.678575
## iter  70 value 411.319812
## iter  80 value 407.657338
## iter  90 value 400.146221
## iter 100 value 394.873565
## final  value 394.873565
## stopped after 100 iterations
## # weights:  400
## initial  value 657.129595
## iter  10 value 528.367697
## iter  20 value 518.959566
## iter  30 value 498.891881
## iter  40 value 488.147112
## iter  50 value 463.845225
## iter  60 value 453.271590
## iter  70 value 451.887652
## iter  80 value 449.073581
## iter  90 value 445.499367
## iter 100 value 443.136289
## final  value 443.136289
## stopped after 100 iterations
## # weights:  498
## initial  value 699.699747
## iter  10 value 461.059074
## iter  20 value 431.469368
## iter  30 value 419.435424
## iter  40 value 415.890622
## iter  50 value 410.389125
## iter  60 value 410.057968
## iter  70 value 407.667045
## iter  80 value 405.960946
## iter  90 value 401.031064
## iter 100 value 399.742260
## final  value 399.742260
## stopped after 100 iterations
```

```
## # weights:  106
## initial  value 587.505241
## iter  10 value 519.436897
## iter  20 value 483.389743
## iter  30 value 481.858714
## iter  40 value 475.783109
## iter  50 value 473.149655
## iter  60 value 472.380372
## iter  70 value 469.188925
## iter  80 value 468.628901
## iter  90 value 468.166299
## iter 100 value 467.464212
## final  value 467.464212
## stopped after 100 iterations
## # weights:  204
## initial  value 634.196505
## iter  10 value 542.389025
## iter  20 value 505.606705
## iter  30 value 486.652053
## iter  40 value 477.178856
## iter  50 value 471.507537
## iter  60 value 468.559170
## iter  70 value 467.991760
## iter  80 value 457.586881
## iter  90 value 441.257990
## iter 100 value 399.136852
## final  value 399.136852
## stopped after 100 iterations
## # weights:  302
## initial  value 699.593195
## iter  10 value 573.246972
## iter  20 value 561.308132
## iter  30 value 522.970037
## iter  40 value 506.237221
## iter  50 value 499.310532
## iter  60 value 496.418730
## iter  70 value 495.595263
## iter  80 value 495.406666
## iter  90 value 495.267390
## iter 100 value 489.467694
## final  value 489.467694
## stopped after 100 iterations
## # weights:  400
## initial  value 645.818728
## iter  10 value 494.896967
## iter  20 value 475.885623
## iter  30 value 463.184056
## iter  40 value 458.366013
## iter  50 value 445.516041
## iter  60 value 438.271651
## iter  70 value 434.231518
## iter  80 value 433.555362
## iter  90 value 425.345035
## iter 100 value 422.977230
```

```
## final  value 422.977230
## stopped after 100 iterations
## # weights:  498
## initial  value 699.966964
## iter  10 value 530.650408
## iter  20 value 492.960189
## iter  30 value 487.800910
## iter  40 value 462.960840
## iter  50 value 450.164599
## iter  60 value 447.312565
## iter  70 value 445.184407
## iter  80 value 442.966816
## iter  90 value 437.168965
## iter 100 value 432.672325
## final  value 432.672325
## stopped after 100 iterations
## # weights:  106
## initial  value 619.030518
## iter  10 value 579.458704
## iter  20 value 577.767871
## iter  30 value 517.526305
## iter  40 value 497.609374
## iter  50 value 491.640481
## iter  60 value 478.939438
## iter  70 value 474.452498
## iter  80 value 466.580353
## iter  90 value 460.177239
## iter 100 value 454.167479
## final  value 454.167479
## stopped after 100 iterations
## # weights:  204
## initial  value 641.734141
## iter  10 value 524.660756
## iter  20 value 509.010233
## iter  30 value 493.038725
## iter  40 value 485.948882
## iter  50 value 483.323741
## iter  60 value 482.427012
## iter  70 value 482.257783
## iter  80 value 480.207545
## iter  90 value 476.806223
## iter 100 value 468.642382
## final  value 468.642382
## stopped after 100 iterations
## # weights:  302
## initial  value 660.061792
## iter  10 value 490.282251
## iter  20 value 461.391757
## iter  30 value 450.511662
## iter  40 value 441.578432
## iter  50 value 434.954098
## iter  60 value 431.108266
## iter  70 value 429.875453
## iter  80 value 426.126985
```

```
## iter  90 value 424.929063
## iter 100 value 419.889008
## final  value 419.889008
## stopped after 100 iterations
## # weights:  400
## initial  value 632.784304
## iter  10 value 493.939059
## iter  20 value 464.716784
## iter  30 value 429.108136
## iter  40 value 423.602011
## iter  50 value 418.555789
## iter  60 value 414.332950
## iter  70 value 406.734606
## iter  80 value 401.032546
## iter  90 value 390.558284
## iter 100 value 388.618275
## final  value 388.618275
## stopped after 100 iterations
## # weights:  498
## initial  value 791.065134
## iter  10 value 677.948319
## iter  20 value 640.284825
## iter  30 value 567.657553
## iter  40 value 522.078212
## iter  50 value 490.368343
## iter  60 value 464.735343
## iter  70 value 450.473006
## iter  80 value 433.326134
## iter  90 value 428.104099
## iter 100 value 423.271613
## final  value 423.271613
## stopped after 100 iterations
## # weights:  106
## initial  value 614.327482
## iter  10 value 516.410281
## iter  20 value 495.792669
## iter  30 value 481.659122
## iter  40 value 448.431503
## iter  50 value 442.966857
## iter  60 value 441.778446
## iter  70 value 440.014499
## iter  80 value 439.010755
## iter  90 value 431.258636
## iter 100 value 430.910280
## final  value 430.910280
## stopped after 100 iterations
## # weights:  204
## initial  value 644.121958
## iter  10 value 540.365439
## iter  20 value 533.495659
## iter  30 value 489.083024
## iter  40 value 470.609631
## iter  50 value 457.742350
## iter  60 value 452.064837
```

```
## iter  70 value 446.401247
## iter  80 value 444.829486
## iter  90 value 443.455023
## iter 100 value 427.568525
## final  value 427.568525
## stopped after 100 iterations
## # weights:  302
## initial  value 671.229891
## iter  10 value 490.753302
## iter  20 value 472.858965
## iter  30 value 461.455333
## iter  40 value 450.908178
## iter  50 value 446.008163
## iter  60 value 436.752582
## iter  70 value 433.884069
## iter  80 value 431.461400
## iter  90 value 427.543445
## iter 100 value 426.894431
## final  value 426.894431
## stopped after 100 iterations
## # weights:  400
## initial  value 669.478385
## iter  10 value 504.466935
## iter  20 value 480.648100
## iter  30 value 451.786994
## iter  40 value 444.044620
## iter  50 value 417.619002
## iter  60 value 411.494704
## iter  70 value 407.960898
## iter  80 value 397.316038
## iter  90 value 388.362081
## iter 100 value 383.667872
## final  value 383.667872
## stopped after 100 iterations
## # weights:  498
## initial  value 663.772539
## iter  10 value 535.555011
## iter  20 value 521.626361
## iter  30 value 503.787741
## iter  40 value 460.005412
## iter  50 value 454.724346
## iter  60 value 440.031525
## iter  70 value 435.019860
## iter  80 value 420.880792
## iter  90 value 415.760050
## iter 100 value 399.604015
## final  value 399.604015
## stopped after 100 iterations
## # weights:  106
## initial  value 646.576721
## iter  10 value 576.441219
## iter  20 value 574.936521
## iter  30 value 507.129036
## iter  40 value 496.288490
```

```
## iter  50 value 495.559019
## iter  60 value 494.151418
## iter  70 value 493.964015
## iter  80 value 475.653598
## iter  90 value 462.640902
## iter 100 value 449.184838
## final  value 449.184838
## stopped after 100 iterations
## # weights:  204
## initial  value 622.890632
## iter  10 value 471.461508
## iter  20 value 451.131754
## iter  30 value 448.017405
## iter  40 value 440.371100
## iter  50 value 439.925251
## iter  60 value 438.235891
## iter  70 value 437.836573
## iter  80 value 437.548371
## iter  90 value 437.299733
## iter 100 value 436.315167
## final  value 436.315167
## stopped after 100 iterations
## # weights:  302
## initial  value 657.667641
## iter  10 value 479.845044
## iter  20 value 435.918595
## iter  30 value 420.044841
## iter  40 value 413.498266
## iter  50 value 409.275913
## iter  60 value 405.177621
## iter  70 value 402.271888
## iter  80 value 397.595492
## iter  90 value 391.076044
## iter 100 value 389.564188
## final  value 389.564188
## stopped after 100 iterations
## # weights:  400
## initial  value 645.969838
## iter  10 value 516.226739
## iter  20 value 509.874804
## iter  30 value 486.846493
## iter  40 value 484.370751
## iter  50 value 479.797477
## iter  60 value 478.482494
## iter  70 value 478.358355
## iter  80 value 476.670586
## iter  90 value 471.878778
## iter 100 value 467.164581
## final  value 467.164581
## stopped after 100 iterations
## # weights:  498
## initial  value 645.269306
## iter  10 value 519.644938
## iter  20 value 486.416535
```

```
## iter  30 value 457.447905
## iter  40 value 442.797842
## iter  50 value 433.328560
## iter  60 value 432.093151
## iter  70 value 429.622426
## iter  80 value 428.170014
## iter  90 value 424.591563
## iter 100 value 422.353967
## final  value 422.353967
## stopped after 100 iterations
## # weights:  106
## initial  value 618.455937
## iter  10 value 498.979085
## iter  20 value 475.564132
## iter  30 value 440.216731
## iter  40 value 435.562365
## iter  50 value 426.181643
## iter  60 value 420.000628
## iter  70 value 418.595991
## iter  80 value 413.903375
## iter  90 value 396.148231
## iter 100 value 378.877675
## final  value 378.877675
## stopped after 100 iterations
## # weights:  204
## initial  value 715.986038
## iter  10 value 510.264076
## iter  20 value 497.581985
## iter  30 value 481.953599
## iter  40 value 477.881133
## iter  50 value 470.227773
## iter  60 value 457.765826
## iter  70 value 453.606280
## iter  80 value 449.199722
## iter  90 value 441.944815
## iter 100 value 435.194136
## final  value 435.194136
## stopped after 100 iterations
## # weights:  302
## initial  value 649.820303
## iter  10 value 527.187185
## iter  20 value 513.821696
## iter  30 value 502.454010
## iter  40 value 491.223801
## iter  50 value 482.573273
## iter  60 value 473.639092
## iter  70 value 468.995042
## iter  80 value 459.980395
## iter  90 value 458.238263
## iter 100 value 457.574092
## final  value 457.574092
## stopped after 100 iterations
## # weights:  400
## initial  value 643.450474
```

```
## iter  10 value 468.710093
## iter  20 value 446.105919
## iter  30 value 429.435409
## iter  40 value 423.343497
## iter  50 value 405.540554
## iter  60 value 399.400620
## iter  70 value 392.098001
## iter  80 value 389.275234
## iter  90 value 386.110124
## iter 100 value 385.236719
## final  value 385.236719
## stopped after 100 iterations
## # weights:  498
## initial  value 686.888495
## iter  10 value 515.643417
## iter  20 value 504.045555
## iter  30 value 499.024334
## iter  40 value 498.193159
## iter  50 value 496.902269
## iter  60 value 492.425424
## iter  70 value 487.075701
## iter  80 value 484.793006
## iter  90 value 479.988401
## iter 100 value 461.506859
## final  value 461.506859
## stopped after 100 iterations
## # weights:  106
## initial  value 637.973371
## iter  10 value 513.707502
## iter  20 value 507.679724
## iter  30 value 506.790048
## iter  40 value 488.134128
## iter  50 value 482.976551
## iter  60 value 476.853310
## iter  70 value 469.829367
## iter  80 value 464.338706
## iter  90 value 460.165202
## iter 100 value 459.171004
## final  value 459.171004
## stopped after 100 iterations
## # weights:  204
## initial  value 607.398150
## iter  10 value 551.849052
## iter  20 value 537.811877
## iter  30 value 536.352444
## iter  40 value 535.639235
## iter  50 value 534.294425
## iter  60 value 532.412533
## iter  70 value 528.068239
## iter  80 value 494.426794
## iter  90 value 473.538751
## iter 100 value 458.477381
## final  value 458.477381
## stopped after 100 iterations
```

```
## # weights:  302
## initial  value 662.801813
## iter  10 value 521.492762
## iter  20 value 490.574565
## iter  30 value 443.280121
## iter  40 value 420.223456
## iter  50 value 407.209805
## iter  60 value 387.113087
## iter  70 value 386.215030
## iter  80 value 382.522552
## iter  90 value 381.008729
## iter 100 value 380.670161
## final  value 380.670161
## stopped after 100 iterations
## # weights:  400
## initial  value 727.210881
## iter  10 value 548.507488
## iter  20 value 539.004250
## iter  30 value 530.519327
## iter  40 value 505.476296
## iter  50 value 499.299928
## iter  60 value 497.192187
## iter  70 value 492.719761
## iter  80 value 486.711675
## iter  90 value 483.600108
## iter 100 value 483.200733
## final  value 483.200733
## stopped after 100 iterations
## # weights:  498
## initial  value 639.023118
## iter  10 value 519.545763
## iter  20 value 484.763569
## iter  30 value 459.187682
## iter  40 value 431.918324
## iter  50 value 418.594408
## iter  60 value 413.226227
## iter  70 value 406.065018
## iter  80 value 398.974294
## iter  90 value 398.329912
## iter 100 value 395.189985
## final  value 395.189985
## stopped after 100 iterations
## # weights:  106
## initial  value 623.931788
## iter  10 value 549.496164
## iter  20 value 539.417295
## iter  30 value 531.465057
## iter  40 value 530.969117
## iter  50 value 529.096752
## iter  60 value 526.498488
## iter  70 value 525.971911
## iter  80 value 524.136595
## iter  90 value 523.583380
## iter 100 value 520.116916
```

```
## final  value 520.116916
## stopped after 100 iterations
## # weights:  204
## initial  value 618.514197
## iter  10 value 521.365780
## iter  20 value 491.594526
## iter  30 value 464.622634
## iter  40 value 446.763269
## iter  50 value 442.993250
## iter  60 value 435.941150
## iter  70 value 435.292776
## iter  80 value 432.955217
## iter  90 value 432.560968
## iter 100 value 432.121235
## final  value 432.121235
## stopped after 100 iterations
## # weights:  302
## initial  value 739.068413
## iter  10 value 510.274721
## iter  20 value 490.285140
## iter  30 value 488.591613
## iter  40 value 480.843401
## iter  50 value 471.836651
## iter  60 value 469.411046
## iter  70 value 468.773960
## iter  80 value 467.547554
## iter  90 value 465.477805
## iter 100 value 457.102290
## final  value 457.102290
## stopped after 100 iterations
## # weights:  400
## initial  value 710.671749
## iter  10 value 510.798747
## iter  20 value 474.988710
## iter  30 value 451.015383
## iter  40 value 442.655804
## iter  50 value 434.600289
## iter  60 value 429.555422
## iter  70 value 425.246350
## iter  80 value 415.841864
## iter  90 value 406.660591
## iter 100 value 406.058754
## final  value 406.058754
## stopped after 100 iterations
## # weights:  498
## initial  value 632.565075
## iter  10 value 462.762907
## iter  20 value 445.170810
## iter  30 value 426.778017
## iter  40 value 423.405989
## iter  50 value 419.763991
## iter  60 value 417.701228
## iter  70 value 414.020309
## iter  80 value 408.757114
```

```
## iter  90 value 400.324701
## iter 100 value 398.460435
## final  value 398.460435
## stopped after 100 iterations
## # weights:  106
## initial  value 594.796150
## iter  10 value 552.953471
## iter  20 value 532.322223
## iter  30 value 513.012487
## iter  40 value 495.250681
## iter  50 value 493.955541
## iter  60 value 486.826188
## iter  70 value 485.587557
## iter  80 value 482.928450
## iter  90 value 482.240355
## iter 100 value 469.466213
## final  value 469.466213
## stopped after 100 iterations
## # weights:  204
## initial  value 663.181239
## iter  10 value 545.674312
## iter  20 value 516.615473
## iter  30 value 501.163274
## iter  40 value 489.260057
## iter  50 value 479.621033
## iter  60 value 474.750723
## iter  70 value 473.388616
## iter  80 value 468.565397
## iter  90 value 465.467273
## iter 100 value 460.647161
## final  value 460.647161
## stopped after 100 iterations
## # weights:  302
## initial  value 639.821583
## iter  10 value 521.956440
## iter  20 value 511.554551
## iter  30 value 505.659127
## iter  40 value 499.277668
## iter  50 value 490.944279
## iter  60 value 479.799254
## iter  70 value 476.746720
## iter  80 value 470.077198
## iter  90 value 454.158334
## iter 100 value 452.237248
## final  value 452.237248
## stopped after 100 iterations
## # weights:  400
## initial  value 626.336976
## iter  10 value 540.422165
## iter  20 value 509.604432
## iter  30 value 500.328864
## iter  40 value 475.875946
## iter  50 value 464.983545
## iter  60 value 451.573282
```

```
## iter  70 value 442.475995
## iter  80 value 436.242079
## iter  90 value 430.792693
## iter 100 value 424.317239
## final  value 424.317239
## stopped after 100 iterations
## # weights:  498
## initial  value 804.757389
## iter  10 value 564.761618
## iter  20 value 494.628392
## iter  30 value 488.917439
## iter  40 value 461.390192
## iter  50 value 433.230666
## iter  60 value 416.327789
## iter  70 value 405.205805
## iter  80 value 401.027121
## iter  90 value 397.087045
## iter 100 value 391.067696
## final  value 391.067696
## stopped after 100 iterations
## # weights:  106
## initial  value 615.662980
## iter  10 value 508.376448
## iter  20 value 498.187172
## iter  30 value 497.255853
## iter  40 value 493.563816
## iter  50 value 492.183443
## iter  60 value 491.517128
## iter  70 value 491.020702
## iter  80 value 490.818080
## iter  90 value 490.772190
## iter 100 value 486.839318
## final  value 486.839318
## stopped after 100 iterations
## # weights:  204
## initial  value 597.364317
## iter  10 value 580.111545
## iter  20 value 556.724780
## iter  30 value 499.525185
## iter  40 value 490.619385
## iter  50 value 488.816128
## iter  60 value 488.104653
## iter  70 value 486.483977
## iter  80 value 453.394104
## iter  90 value 432.783587
## iter 100 value 419.089985
## final  value 419.089985
## stopped after 100 iterations
## # weights:  302
## initial  value 631.000400
## iter  10 value 489.149419
## iter  20 value 469.383952
## iter  30 value 448.102955
## iter  40 value 436.105635
```

```
## iter  50 value 425.699391
## iter  60 value 422.144089
## iter  70 value 419.682267
## iter  80 value 416.323644
## iter  90 value 415.819502
## iter 100 value 414.842860
## final  value 414.842860
## stopped after 100 iterations
## # weights:  400
## initial  value 632.963446
## iter  10 value 473.507502
## iter  20 value 445.620997
## iter  30 value 432.087962
## iter  40 value 428.938573
## iter  50 value 421.364403
## iter  60 value 417.065166
## iter  70 value 414.489194
## iter  80 value 414.305236
## iter  90 value 413.764651
## iter 100 value 411.972008
## final  value 411.972008
## stopped after 100 iterations
## # weights:  498
## initial  value 686.958234
## iter  10 value 509.952227
## iter  20 value 490.798109
## iter  30 value 469.728458
## iter  40 value 443.810026
## iter  50 value 430.421029
## iter  60 value 424.663813
## iter  70 value 418.112927
## iter  80 value 412.232861
## iter  90 value 404.520323
## iter 100 value 403.387007
## final  value 403.387007
## stopped after 100 iterations
## # weights:  106
## initial  value 682.254314
## iter  10 value 591.689760
## iter  20 value 589.175689
## iter  30 value 534.149506
## iter  40 value 521.249529
## iter  50 value 507.186519
## iter  60 value 498.383265
## iter  70 value 494.934805
## iter  80 value 494.015648
## iter  90 value 492.449106
## iter 100 value 492.070916
## final  value 492.070916
## stopped after 100 iterations
## # weights:  204
## initial  value 637.918783
## iter  10 value 581.950312
## iter  20 value 580.276955
```

```
## iter  30 value 568.414262
## iter  40 value 562.001108
## iter  50 value 512.744927
## iter  60 value 498.619156
## iter  70 value 496.125466
## iter  80 value 495.051890
## iter  90 value 486.313645
## iter 100 value 477.791222
## final  value 477.791222
## stopped after 100 iterations
## # weights:  302
## initial  value 684.893701
## iter  10 value 571.606818
## iter  20 value 511.840135
## iter  30 value 461.100979
## iter  40 value 455.882696
## iter  50 value 441.872257
## iter  60 value 436.691314
## iter  70 value 429.919882
## iter  80 value 415.657179
## iter  90 value 411.097536
## iter 100 value 380.469401
## final  value 380.469401
## stopped after 100 iterations
## # weights:  400
## initial  value 614.016043
## iter  10 value 525.367983
## iter  20 value 481.248267
## iter  30 value 443.976967
## iter  40 value 421.861408
## iter  50 value 413.296632
## iter  60 value 411.664089
## iter  70 value 410.810587
## iter  80 value 410.456194
## iter  90 value 410.066800
## iter 100 value 408.708603
## final  value 408.708603
## stopped after 100 iterations
## # weights:  498
## initial  value 656.612653
## iter  10 value 495.528316
## iter  20 value 454.725634
## iter  30 value 449.899935
## iter  40 value 445.916866
## iter  50 value 430.479727
## iter  60 value 420.314230
## iter  70 value 412.622676
## iter  80 value 409.644897
## iter  90 value 405.365637
## iter 100 value 403.891722
## final  value 403.891722
## stopped after 100 iterations
## # weights:  106
## initial  value 634.437616
```

```
## iter  10 value 568.323126
## iter  20 value 540.420999
## iter  30 value 520.530078
## iter  40 value 515.156775
## iter  50 value 504.468110
## iter  60 value 495.140887
## iter  70 value 486.283973
## iter  80 value 479.913875
## iter  90 value 478.250142
## iter 100 value 475.459440
## final  value 475.459440
## stopped after 100 iterations
## # weights:  204
## initial  value 666.378170
## iter  10 value 550.750589
## iter  20 value 542.161599
## iter  30 value 538.919593
## iter  40 value 528.325178
## iter  50 value 521.971957
## iter  60 value 519.663175
## iter  70 value 491.311842
## iter  80 value 447.843281
## iter  90 value 440.342599
## iter 100 value 435.105680
## final  value 435.105680
## stopped after 100 iterations
## # weights:  302
## initial  value 646.307347
## iter  10 value 453.889006
## iter  20 value 436.380580
## iter  30 value 430.602642
## iter  40 value 420.531410
## iter  50 value 415.292906
## iter  60 value 403.564112
## iter  70 value 391.453363
## iter  80 value 388.721114
## iter  90 value 386.658812
## iter 100 value 384.244480
## final  value 384.244480
## stopped after 100 iterations
## # weights:  400
## initial  value 638.682299
## iter  10 value 494.891769
## iter  20 value 465.425136
## iter  30 value 462.168916
## iter  40 value 451.838998
## iter  50 value 445.537719
## iter  60 value 426.480456
## iter  70 value 423.727900
## iter  80 value 420.124147
## iter  90 value 414.889070
## iter 100 value 407.973785
## final  value 407.973785
## stopped after 100 iterations
```

```
## # weights:  498
## initial  value 729.940282
## iter  10 value 544.394926
## iter  20 value 515.185300
## iter  30 value 501.026933
## iter  40 value 469.065385
## iter  50 value 451.923781
## iter  60 value 443.345381
## iter  70 value 437.023267
## iter  80 value 431.905580
## iter  90 value 425.713014
## iter 100 value 406.297208
## final  value 406.297208
## stopped after 100 iterations
## # weights:  106
## initial  value 616.609104
## iter  10 value 576.421836
## iter  20 value 575.185766
## iter  30 value 574.191410
## iter  40 value 569.295596
## iter  50 value 565.790910
## iter  60 value 556.885419
## iter  70 value 546.172298
## iter  80 value 532.314357
## iter  90 value 521.126763
## iter 100 value 513.803982
## final  value 513.803982
## stopped after 100 iterations
## # weights:  204
## initial  value 764.736001
## iter  10 value 492.271332
## iter  20 value 480.572254
## iter  30 value 465.526038
## iter  40 value 451.741771
## iter  50 value 446.758080
## iter  60 value 444.687216
## iter  70 value 440.556795
## iter  80 value 435.673191
## iter  90 value 433.701735
## iter 100 value 428.925659
## final  value 428.925659
## stopped after 100 iterations
## # weights:  302
## initial  value 675.214204
## iter  10 value 533.598890
## iter  20 value 507.978941
## iter  30 value 485.987737
## iter  40 value 472.214330
## iter  50 value 468.255383
## iter  60 value 459.362550
## iter  70 value 456.759545
## iter  80 value 456.369956
## iter  90 value 453.416184
## iter 100 value 452.852707
```

```
## final  value 452.852707
## stopped after 100 iterations
## # weights:  400
## initial  value 720.462670
## iter  10 value 529.130896
## iter  20 value 466.639500
## iter  30 value 452.031043
## iter  40 value 431.912790
## iter  50 value 430.132247
## iter  60 value 428.152834
## iter  70 value 426.945388
## iter  80 value 426.171286
## iter  90 value 425.550146
## iter 100 value 425.282218
## final  value 425.282218
## stopped after 100 iterations
## # weights:  498
## initial  value 828.773941
## iter  10 value 611.639038
## iter  20 value 520.356766
## iter  30 value 513.110004
## iter  40 value 500.894743
## iter  50 value 483.909358
## iter  60 value 472.232789
## iter  70 value 463.891138
## iter  80 value 462.880971
## iter  90 value 458.463719
## iter 100 value 458.277145
## final  value 458.277145
## stopped after 100 iterations
## # weights:  106
## initial  value 680.204035
## iter  10 value 576.150774
## iter  20 value 559.530383
## iter  30 value 541.178291
## iter  40 value 513.174425
## iter  50 value 512.354557
## iter  60 value 508.317624
## iter  70 value 505.479736
## iter  80 value 505.261350
## iter  90 value 504.234762
## iter 100 value 503.539624
## final  value 503.539624
## stopped after 100 iterations
## # weights:  204
## initial  value 629.040833
## iter  10 value 538.507004
## iter  20 value 508.374584
## iter  30 value 507.786915
## iter  40 value 507.377627
## iter  50 value 506.301292
## iter  60 value 498.865368
## iter  70 value 491.149410
## iter  80 value 458.908862
```

```
## iter  90 value 456.123199
## iter 100 value 447.687971
## final  value 447.687971
## stopped after 100 iterations
## # weights:  302
## initial  value 691.292832
## iter  10 value 520.598438
## iter  20 value 503.986652
## iter  30 value 488.725528
## iter  40 value 479.467107
## iter  50 value 471.971459
## iter  60 value 470.469315
## iter  70 value 467.491741
## iter  80 value 459.822007
## iter  90 value 456.654979
## iter 100 value 455.377037
## final  value 455.377037
## stopped after 100 iterations
## # weights:  400
## initial  value 710.669735
## iter  10 value 599.236058
## iter  20 value 560.030778
## iter  30 value 505.205905
## iter  40 value 502.350796
## iter  50 value 501.720203
## iter  60 value 501.599522
## iter  70 value 500.884765
## iter  80 value 481.439050
## iter  90 value 472.585549
## iter 100 value 462.411690
## final  value 462.411690
## stopped after 100 iterations
## # weights:  498
## initial  value 715.296071
## iter  10 value 563.203051
## iter  20 value 530.514080
## iter  30 value 510.584263
## iter  40 value 499.666248
## iter  50 value 492.513547
## iter  60 value 484.604302
## iter  70 value 477.951815
## iter  80 value 442.301138
## iter  90 value 427.741890
## iter 100 value 408.895126
## final  value 408.895126
## stopped after 100 iterations
## # weights:  106
## initial  value 611.923211
## iter  10 value 560.668922
## iter  20 value 505.686369
## iter  30 value 504.009637
## iter  40 value 470.646699
## iter  50 value 460.644509
## iter  60 value 454.233129
```

```
## iter  70 value 453.044552
## iter  80 value 452.668373
## iter  90 value 452.244974
## iter 100 value 440.833388
## final  value 440.833388
## stopped after 100 iterations
## # weights:  204
## initial  value 701.872453
## iter  10 value 491.515216
## iter  20 value 482.734199
## iter  30 value 477.077088
## iter  40 value 462.900744
## iter  50 value 457.418577
## iter  60 value 448.472963
## iter  70 value 444.792400
## iter  80 value 442.211898
## iter  90 value 435.345352
## iter 100 value 434.589606
## final  value 434.589606
## stopped after 100 iterations
## # weights:  302
## initial  value 660.684705
## iter  10 value 563.893202
## iter  20 value 523.348558
## iter  30 value 515.402284
## iter  40 value 504.427019
## iter  50 value 490.965444
## iter  60 value 484.251255
## iter  70 value 482.794086
## iter  80 value 481.426040
## iter  90 value 470.861323
## iter 100 value 461.064195
## final  value 461.064195
## stopped after 100 iterations
## # weights:  400
## initial  value 606.144968
## iter  10 value 447.214208
## iter  20 value 416.092571
## iter  30 value 409.042230
## iter  40 value 403.321691
## iter  50 value 380.321169
## iter  60 value 365.282721
## iter  70 value 356.636187
## iter  80 value 348.009127
## iter  90 value 345.167284
## iter 100 value 338.928029
## final  value 338.928029
## stopped after 100 iterations
## # weights:  498
## initial  value 671.320182
## iter  10 value 466.558175
## iter  20 value 454.874151
## iter  30 value 441.659899
## iter  40 value 435.982335
```

```
## iter  50 value 435.242023
## iter  60 value 432.708754
## iter  70 value 431.850856
## iter  80 value 431.574462
## iter  90 value 430.174610
## iter 100 value 424.856245
## final  value 424.856245
## stopped after 100 iterations
## # weights:  106
## initial  value 620.091158
## iter  10 value 520.573925
## iter  20 value 512.633392
## iter  30 value 507.817292
## iter  40 value 506.765011
## iter  50 value 502.525218
## iter  60 value 501.675448
## iter  70 value 500.633041
## iter  80 value 499.841978
## iter  90 value 494.313893
## iter 100 value 493.120612
## final  value 493.120612
## stopped after 100 iterations
## # weights:  204
## initial  value 637.271162
## iter  10 value 581.156922
## iter  20 value 580.000224
## iter  30 value 574.631256
## iter  40 value 520.670271
## iter  50 value 503.172647
## iter  60 value 473.080387
## iter  70 value 464.675009
## iter  80 value 455.196335
## iter  90 value 452.129897
## iter 100 value 449.474373
## final  value 449.474373
## stopped after 100 iterations
## # weights:  302
## initial  value 650.337606
## iter  10 value 519.621106
## iter  20 value 496.010476
## iter  30 value 491.335471
## iter  40 value 486.047802
## iter  50 value 479.552904
## iter  60 value 464.697407
## iter  70 value 458.444385
## iter  80 value 450.270333
## iter  90 value 447.230824
## iter 100 value 441.648835
## final  value 441.648835
## stopped after 100 iterations
## # weights:  400
## initial  value 661.478470
## iter  10 value 469.075231
## iter  20 value 462.058385
```

```
## iter  30 value 447.670709
## iter  40 value 442.461482
## iter  50 value 429.510019
## iter  60 value 427.923177
## iter  70 value 427.045567
## iter  80 value 425.380973
## iter  90 value 423.226282
## iter 100 value 422.237515
## final  value 422.237515
## stopped after 100 iterations
## # weights:  498
## initial  value 708.768336
## iter  10 value 480.599181
## iter  20 value 453.066086
## iter  30 value 433.868963
## iter  40 value 425.161366
## iter  50 value 422.476259
## iter  60 value 407.203584
## iter  70 value 398.777433
## iter  80 value 397.582399
## iter  90 value 394.989528
## iter 100 value 392.862995
## final  value 392.862995
## stopped after 100 iterations
## # weights:  106
## initial  value 614.864012
## iter  10 value 551.453345
## iter  20 value 540.015956
## iter  30 value 525.362892
## iter  40 value 521.587756
## iter  50 value 519.269750
## iter  60 value 515.750043
## iter  70 value 514.506185
## iter  80 value 513.748955
## iter  90 value 509.787176
## iter 100 value 509.272856
## final  value 509.272856
## stopped after 100 iterations
## # weights:  204
## initial  value 667.182836
## iter  10 value 528.119188
## iter  20 value 508.244510
## iter  30 value 489.740137
## iter  40 value 485.669775
## iter  50 value 484.128430
## iter  60 value 483.398051
## iter  70 value 481.725608
## iter  80 value 479.784620
## iter  90 value 477.290911
## iter 100 value 476.433147
## final  value 476.433147
## stopped after 100 iterations
## # weights:  302
## initial  value 603.660049
```

```
## iter  10 value 506.700193
## iter  20 value 489.225894
## iter  30 value 473.467023
## iter  40 value 456.354101
## iter  50 value 445.871498
## iter  60 value 440.845322
## iter  70 value 435.853138
## iter  80 value 431.645861
## iter  90 value 425.491114
## iter 100 value 423.875283
## final  value 423.875283
## stopped after 100 iterations
## # weights:  400
## initial  value 695.266477
## iter  10 value 451.377388
## iter  20 value 432.880950
## iter  30 value 422.409528
## iter  40 value 418.442625
## iter  50 value 409.608382
## iter  60 value 405.624616
## iter  70 value 403.734308
## iter  80 value 400.417794
## iter  90 value 396.927060
## iter 100 value 394.529301
## final  value 394.529301
## stopped after 100 iterations
## # weights:  498
## initial  value 636.460039
## iter  10 value 476.502039
## iter  20 value 451.643143
## iter  30 value 428.808209
## iter  40 value 415.138714
## iter  50 value 398.819716
## iter  60 value 390.422547
## iter  70 value 387.054975
## iter  80 value 382.827218
## iter  90 value 378.190908
## iter 100 value 376.926671
## final  value 376.926671
## stopped after 100 iterations
## # weights:  106
## initial  value 636.968844
## iter  10 value 526.883061
## iter  20 value 512.653157
## iter  30 value 502.347282
## iter  40 value 486.935524
## iter  50 value 485.903284
## iter  60 value 478.231620
## iter  70 value 475.474079
## iter  80 value 468.621511
## iter  90 value 466.162523
## iter 100 value 465.154123
## final  value 465.154123
## stopped after 100 iterations
```

```
## # weights:  204
## initial  value 610.658214
## iter  10 value 531.292611
## iter  20 value 487.095957
## iter  30 value 470.507339
## iter  40 value 456.505088
## iter  50 value 451.205914
## iter  60 value 448.763907
## iter  70 value 448.116856
## iter  80 value 446.095486
## iter  90 value 445.380932
## iter 100 value 444.994770
## final  value 444.994770
## stopped after 100 iterations
## # weights:  302
## initial  value 830.634964
## iter  10 value 612.698760
## iter  20 value 523.335021
## iter  30 value 513.821310
## iter  40 value 501.371660
## iter  50 value 492.315184
## iter  60 value 487.118906
## iter  70 value 462.843492
## iter  80 value 459.044305
## iter  90 value 455.552731
## iter 100 value 449.398929
## final  value 449.398929
## stopped after 100 iterations
## # weights:  400
## initial  value 682.840580
## iter  10 value 511.254335
## iter  20 value 481.912039
## iter  30 value 466.740807
## iter  40 value 464.624844
## iter  50 value 461.005899
## iter  60 value 453.908906
## iter  70 value 453.122604
## iter  80 value 450.732567
## iter  90 value 449.677502
## iter 100 value 447.592284
## final  value 447.592284
## stopped after 100 iterations
## # weights:  498
## initial  value 821.968484
## iter  10 value 529.991826
## iter  20 value 510.122160
## iter  30 value 488.405391
## iter  40 value 444.036266
## iter  50 value 425.887955
## iter  60 value 419.360899
## iter  70 value 414.854677
## iter  80 value 409.106874
## iter  90 value 404.610746
## iter 100 value 400.191762
```

```
## final  value 400.191762
## stopped after 100 iterations
## # weights:  106
## initial  value 640.271636
## iter  10 value 588.512141
## iter  20 value 572.381526
## iter  30 value 541.991148
## iter  40 value 518.343617
## iter  50 value 508.988190
## iter  60 value 505.068282
## iter  70 value 503.732685
## iter  80 value 503.147425
## iter  90 value 502.997658
## iter 100 value 502.709152
## final  value 502.709152
## stopped after 100 iterations
## # weights:  204
## initial  value 691.476990
## iter  10 value 528.344122
## iter  20 value 516.704058
## iter  30 value 504.296882
## iter  40 value 477.145729
## iter  50 value 472.877848
## iter  60 value 471.302538
## iter  70 value 466.654137
## iter  80 value 460.090946
## iter  90 value 444.934320
## iter 100 value 431.236740
## final  value 431.236740
## stopped after 100 iterations
## # weights:  302
## initial  value 660.540833
## iter  10 value 557.823181
## iter  20 value 539.426786
## iter  30 value 513.820274
## iter  40 value 483.860666
## iter  50 value 480.062806
## iter  60 value 477.910672
## iter  70 value 476.513122
## iter  80 value 476.118097
## iter  90 value 475.833503
## iter 100 value 470.719251
## final  value 470.719251
## stopped after 100 iterations
## # weights:  400
## initial  value 680.278694
## iter  10 value 509.672881
## iter  20 value 459.924781
## iter  30 value 452.694239
## iter  40 value 438.034368
## iter  50 value 426.267085
## iter  60 value 421.114254
## iter  70 value 419.960250
## iter  80 value 416.209562
```

```
## iter  90 value 411.458223
## iter 100 value 407.820865
## final  value 407.820865
## stopped after 100 iterations
## # weights:  498
## initial  value 697.162849
## iter  10 value 574.614367
## iter  20 value 539.945412
## iter  30 value 521.760307
## iter  40 value 508.284734
## iter  50 value 499.721022
## iter  60 value 488.504614
## iter  70 value 478.996840
## iter  80 value 472.114020
## iter  90 value 463.064562
## iter 100 value 454.547879
## final  value 454.547879
## stopped after 100 iterations
## # weights:  106
## initial  value 603.638366
## iter  10 value 521.183182
## iter  20 value 507.975889
## iter  30 value 501.182865
## iter  40 value 488.142738
## iter  50 value 480.969572
## iter  60 value 478.217810
## iter  70 value 473.987777
## iter  80 value 472.896403
## iter  90 value 470.086356
## iter 100 value 469.438758
## final  value 469.438758
## stopped after 100 iterations
## # weights:  204
## initial  value 629.635233
## iter  10 value 512.504887
## iter  20 value 479.334993
## iter  30 value 473.012870
## iter  40 value 471.189256
## iter  50 value 469.930009
## iter  60 value 467.029347
## iter  70 value 466.550172
## iter  80 value 461.696240
## iter  90 value 453.968018
## iter 100 value 450.374518
## final  value 450.374518
## stopped after 100 iterations
## # weights:  302
## initial  value 689.303216
## iter  10 value 492.435041
## iter  20 value 436.457931
## iter  30 value 415.874211
## iter  40 value 400.816769
## iter  50 value 375.339162
## iter  60 value 373.071586
```

```
## iter  70 value 367.700507
## iter  80 value 361.363640
## iter  90 value 356.720516
## iter 100 value 351.276304
## final  value 351.276304
## stopped after 100 iterations
## # weights:  400
## initial  value 670.767942
## iter  10 value 519.882285
## iter  20 value 495.955517
## iter  30 value 484.545662
## iter  40 value 473.119683
## iter  50 value 460.820218
## iter  60 value 451.043853
## iter  70 value 445.796122
## iter  80 value 444.872175
## iter  90 value 437.375857
## iter 100 value 434.349088
## final  value 434.349088
## stopped after 100 iterations
## # weights:  498
## initial  value 758.600053
## iter  10 value 542.159598
## iter  20 value 514.077507
## iter  30 value 493.994538
## iter  40 value 482.448532
## iter  50 value 473.463721
## iter  60 value 471.147815
## iter  70 value 444.865990
## iter  80 value 405.180850
## iter  90 value 399.788773
## iter 100 value 397.119719
## final  value 397.119719
## stopped after 100 iterations
## # weights:  106
## initial  value 623.351129
## iter  10 value 507.830625
## iter  20 value 497.549898
## iter  30 value 495.129756
## iter  40 value 492.544166
## iter  50 value 491.977716
## iter  60 value 489.015504
## iter  70 value 485.463331
## iter  80 value 472.744896
## iter  90 value 425.646887
## iter 100 value 419.350571
## final  value 419.350571
## stopped after 100 iterations
## # weights:  204
## initial  value 621.147328
## iter  10 value 581.656829
## iter  20 value 546.880049
## iter  30 value 540.723204
## iter  40 value 536.613917
```

```
## iter  50 value 534.104783
## iter  60 value 533.488215
## iter  70 value 532.611699
## iter  80 value 532.584136
## iter  90 value 530.454580
## iter 100 value 518.806343
## final  value 518.806343
## stopped after 100 iterations
## # weights:  302
## initial  value 629.302313
## iter  10 value 524.781573
## iter  20 value 471.103150
## iter  30 value 448.065736
## iter  40 value 437.649942
## iter  50 value 434.737138
## iter  60 value 422.133537
## iter  70 value 414.493006
## iter  80 value 411.457331
## iter  90 value 407.368180
## iter 100 value 392.759299
## final  value 392.759299
## stopped after 100 iterations
## # weights:  400
## initial  value 691.698089
## iter  10 value 504.864054
## iter  20 value 472.395063
## iter  30 value 456.979227
## iter  40 value 452.855305
## iter  50 value 405.114475
## iter  60 value 396.243639
## iter  70 value 381.595287
## iter  80 value 371.606850
## iter  90 value 364.982012
## iter 100 value 360.642694
## final  value 360.642694
## stopped after 100 iterations
## # weights:  498
## initial  value 716.943923
## iter  10 value 458.246135
## iter  20 value 431.054726
## iter  30 value 419.099075
## iter  40 value 405.449994
## iter  50 value 399.792729
## iter  60 value 396.288572
## iter  70 value 395.084559
## iter  80 value 392.814757
## iter  90 value 387.691992
## iter 100 value 379.782238
## final  value 379.782238
## stopped after 100 iterations
## # weights:  106
## initial  value 648.174494
## iter  10 value 545.036095
## iter  20 value 502.406548
```

```
## iter  30 value 501.532766
## iter  40 value 478.958127
## iter  50 value 476.367690
## iter  60 value 474.774374
## iter  70 value 471.958308
## iter  80 value 464.658224
## iter  90 value 459.998654
## iter 100 value 457.893883
## final  value 457.893883
## stopped after 100 iterations
## # weights:  204
## initial  value 627.809130
## iter  10 value 559.625577
## iter  20 value 518.233527
## iter  30 value 497.543191
## iter  40 value 492.758368
## iter  50 value 463.364697
## iter  60 value 459.228946
## iter  70 value 442.400303
## iter  80 value 426.232764
## iter  90 value 425.326430
## iter 100 value 425.111971
## final  value 425.111971
## stopped after 100 iterations
## # weights:  302
## initial  value 679.064451
## iter  10 value 548.119263
## iter  20 value 511.813430
## iter  30 value 499.045780
## iter  40 value 451.350092
## iter  50 value 437.149956
## iter  60 value 435.593748
## iter  70 value 432.607257
## iter  80 value 432.062157
## iter  90 value 428.556516
## iter 100 value 419.147195
## final  value 419.147195
## stopped after 100 iterations
## # weights:  400
## initial  value 712.553544
## iter  10 value 498.277812
## iter  20 value 477.106600
## iter  30 value 455.335343
## iter  40 value 444.935324
## iter  50 value 438.372646
## iter  60 value 432.648322
## iter  70 value 431.816167
## iter  80 value 429.839569
## iter  90 value 428.001237
## iter 100 value 424.164320
## final  value 424.164320
## stopped after 100 iterations
## # weights:  498
## initial  value 740.338814
```

```
## iter  10 value 484.907618
## iter  20 value 432.517362
## iter  30 value 420.424643
## iter  40 value 414.017320
## iter  50 value 409.020622
## iter  60 value 397.343185
## iter  70 value 379.579753
## iter  80 value 373.839606
## iter  90 value 371.378343
## iter 100 value 369.994530
## final  value 369.994530
## stopped after 100 iterations
## # weights:  106
## initial  value 651.083136
## iter  10 value 547.768096
## iter  20 value 542.440226
## iter  30 value 520.587018
## iter  40 value 499.848495
## iter  50 value 497.936092
## iter  60 value 497.866369
## iter  70 value 496.373952
## iter  80 value 492.274435
## iter  90 value 455.727415
## iter 100 value 447.738783
## final  value 447.738783
## stopped after 100 iterations
## # weights:  204
## initial  value 632.472659
## iter  10 value 504.594178
## iter  20 value 497.267235
## iter  30 value 476.835204
## iter  40 value 472.188272
## iter  50 value 465.808191
## iter  60 value 462.155047
## iter  70 value 445.831901
## iter  80 value 443.851041
## iter  90 value 443.532516
## iter 100 value 441.977954
## final  value 441.977954
## stopped after 100 iterations
## # weights:  302
## initial  value 735.811213
## iter  10 value 465.268546
## iter  20 value 440.215469
## iter  30 value 435.872935
## iter  40 value 427.127467
## iter  50 value 423.745661
## iter  60 value 421.486521
## iter  70 value 420.880389
## iter  80 value 418.894870
## iter  90 value 418.179043
## iter 100 value 417.012842
## final  value 417.012842
## stopped after 100 iterations
```

```
## # weights:  400
## initial  value 748.218149
## iter  10 value 480.049352
## iter  20 value 432.329470
## iter  30 value 428.918366
## iter  40 value 419.098115
## iter  50 value 390.245348
## iter  60 value 384.956354
## iter  70 value 357.278033
## iter  80 value 352.192955
## iter  90 value 347.845428
## iter 100 value 343.668832
## final  value 343.668832
## stopped after 100 iterations
## # weights:  498
## initial  value 751.832881
## iter  10 value 538.868672
## iter  20 value 515.333020
## iter  30 value 496.770421
## iter  40 value 490.293187
## iter  50 value 475.532362
## iter  60 value 470.751500
## iter  70 value 464.372854
## iter  80 value 447.980528
## iter  90 value 439.322113
## iter 100 value 433.013336
## final  value 433.013336
## stopped after 100 iterations
## # weights:  106
## initial  value 634.521759
## iter  10 value 536.311347
## iter  20 value 525.600521
## iter  30 value 516.409112
## iter  40 value 509.088497
## iter  50 value 497.316440
## iter  60 value 493.533542
## iter  70 value 490.413744
## iter  80 value 486.846090
## iter  90 value 483.644233
## iter 100 value 479.334909
## final  value 479.334909
## stopped after 100 iterations
## # weights:  204
## initial  value 672.708009
## iter  10 value 564.990631
## iter  20 value 530.750681
## iter  30 value 512.910477
## iter  40 value 474.689286
## iter  50 value 444.374731
## iter  60 value 430.532808
## iter  70 value 415.946708
## iter  80 value 409.237056
## iter  90 value 396.453506
## iter 100 value 393.571223
```

```
## final  value 393.571223
## stopped after 100 iterations
## # weights:  302
## initial  value 750.713882
## iter  10 value 550.778478
## iter  20 value 522.241278
## iter  30 value 502.087558
## iter  40 value 492.810198
## iter  50 value 477.819627
## iter  60 value 462.733458
## iter  70 value 457.429987
## iter  80 value 448.416391
## iter  90 value 444.411846
## iter 100 value 441.367478
## final  value 441.367478
## stopped after 100 iterations
## # weights:  400
## initial  value 661.004315
## iter  10 value 505.704852
## iter  20 value 486.505311
## iter  30 value 465.819855
## iter  40 value 451.930540
## iter  50 value 448.684595
## iter  60 value 447.925186
## iter  70 value 442.900789
## iter  80 value 437.804222
## iter  90 value 435.475529
## iter 100 value 434.981845
## final  value 434.981845
## stopped after 100 iterations
## # weights:  498
## initial  value 706.732752
## iter  10 value 464.621399
## iter  20 value 433.644964
## iter  30 value 410.878086
## iter  40 value 402.055686
## iter  50 value 399.585709
## iter  60 value 397.690237
## iter  70 value 396.991477
## iter  80 value 394.087650
## iter  90 value 392.773859
## iter 100 value 389.590074
## final  value 389.590074
## stopped after 100 iterations
## # weights:  106
## initial  value 634.335823
## iter  10 value 580.324966
## iter  20 value 527.484201
## iter  30 value 526.778139
## iter  40 value 526.075310
## iter  50 value 506.793202
## iter  60 value 504.137931
## iter  70 value 495.921969
## iter  80 value 463.824280
```

```
## iter  90 value 458.910085
## iter 100 value 447.236217
## final  value 447.236217
## stopped after 100 iterations
## # weights:  204
## initial  value 610.836866
## iter  10 value 547.027085
## iter  20 value 498.429847
## iter  30 value 476.458070
## iter  40 value 473.002949
## iter  50 value 463.417747
## iter  60 value 430.426386
## iter  70 value 414.718750
## iter  80 value 413.206659
## iter  90 value 410.604045
## iter 100 value 410.015758
## final  value 410.015758
## stopped after 100 iterations
## # weights:  302
## initial  value 621.937308
## iter  10 value 495.275785
## iter  20 value 488.363279
## iter  30 value 476.886553
## iter  40 value 457.444663
## iter  50 value 454.571464
## iter  60 value 446.497036
## iter  70 value 445.066194
## iter  80 value 444.255138
## iter  90 value 443.956233
## iter 100 value 442.792023
## final  value 442.792023
## stopped after 100 iterations
## # weights:  400
## initial  value 861.159068
## iter  10 value 490.250930
## iter  20 value 450.578940
## iter  30 value 442.595553
## iter  40 value 437.783975
## iter  50 value 434.173654
## iter  60 value 433.357719
## iter  70 value 431.311455
## iter  80 value 428.780061
## iter  90 value 428.141340
## iter 100 value 423.654974
## final  value 423.654974
## stopped after 100 iterations
## # weights:  498
## initial  value 668.924034
## iter  10 value 554.054314
## iter  20 value 539.976239
## iter  30 value 534.503243
## iter  40 value 528.321824
## iter  50 value 525.147457
## iter  60 value 522.973732
```

```
## iter  70 value 521.227920
## iter  80 value 520.965795
## iter  90 value 514.837361
## iter 100 value 509.871645
## final  value 509.871645
## stopped after 100 iterations
## # weights:  106
## initial  value 609.261846
## iter  10 value 533.797522
## iter  20 value 513.624396
## iter  30 value 508.686779
## iter  40 value 506.000129
## iter  50 value 503.630279
## iter  60 value 503.037236
## iter  70 value 502.205256
## iter  80 value 501.503139
## iter  90 value 500.497750
## iter 100 value 499.070628
## final  value 499.070628
## stopped after 100 iterations
## # weights:  204
## initial  value 595.749675
## iter  10 value 443.479370
## iter  20 value 423.242392
## iter  30 value 420.884721
## iter  40 value 419.670248
## iter  50 value 417.766277
## iter  60 value 412.969565
## iter  70 value 410.347050
## iter  80 value 409.759362
## iter  90 value 408.175038
## iter 100 value 407.718272
## final  value 407.718272
## stopped after 100 iterations
## # weights:  302
## initial  value 636.605305
## iter  10 value 516.981866
## iter  20 value 500.039187
## iter  30 value 477.133402
## iter  40 value 450.299271
## iter  50 value 441.689125
## iter  60 value 435.877997
## iter  70 value 434.980606
## iter  80 value 432.375539
## iter  90 value 426.835916
## iter 100 value 423.250821
## final  value 423.250821
## stopped after 100 iterations
## # weights:  400
## initial  value 701.460146
## iter  10 value 522.768948
## iter  20 value 456.571185
## iter  30 value 433.126099
## iter  40 value 407.020975
```

```
## iter  50 value 397.210068
## iter  60 value 393.885834
## iter  70 value 383.965851
## iter  80 value 379.689350
## iter  90 value 373.601549
## iter 100 value 372.514037
## final  value 372.514037
## stopped after 100 iterations
## # weights:  498
## initial  value 705.800875
## iter  10 value 464.659899
## iter  20 value 427.864629
## iter  30 value 424.687203
## iter  40 value 421.941695
## iter  50 value 414.044946
## iter  60 value 411.337976
## iter  70 value 409.615747
## iter  80 value 406.336651
## iter  90 value 405.472876
## iter 100 value 404.019037
## final  value 404.019037
## stopped after 100 iterations
## # weights:  106
## initial  value 604.973896
## iter  10 value 580.899534
## iter  20 value 580.017807
## iter  30 value 580.009381
## iter  40 value 548.082612
## iter  50 value 496.473098
## iter  60 value 471.273068
## iter  70 value 466.955830
## iter  80 value 456.158378
## iter  90 value 455.954326
## iter 100 value 454.273227
## final  value 454.273227
## stopped after 100 iterations
## # weights:  204
## initial  value 726.431947
## iter  10 value 579.851393
## iter  20 value 542.559068
## iter  30 value 528.770742
## iter  40 value 510.084479
## iter  50 value 503.488169
## iter  60 value 495.392359
## iter  70 value 466.795216
## iter  80 value 453.673824
## iter  90 value 433.714623
## iter 100 value 429.845061
## final  value 429.845061
## stopped after 100 iterations
## # weights:  302
## initial  value 621.013828
## iter  10 value 509.229410
## iter  20 value 490.777782
```

```
## iter  30 value 456.272184
## iter  40 value 439.255595
## iter  50 value 427.922380
## iter  60 value 424.480700
## iter  70 value 417.681382
## iter  80 value 408.874298
## iter  90 value 402.684711
## iter 100 value 396.978170
## final  value 396.978170
## stopped after 100 iterations
## # weights:  400
## initial  value 627.580471
## iter  10 value 483.104450
## iter  20 value 466.743994
## iter  30 value 457.705978
## iter  40 value 443.702119
## iter  50 value 431.740542
## iter  60 value 423.197092
## iter  70 value 419.688414
## iter  80 value 418.553925
## iter  90 value 418.262622
## iter 100 value 418.075530
## final  value 418.075530
## stopped after 100 iterations
## # weights:  498
## initial  value 873.861845
## iter  10 value 529.358953
## iter  20 value 487.210107
## iter  30 value 478.550348
## iter  40 value 463.218107
## iter  50 value 445.836041
## iter  60 value 432.511022
## iter  70 value 409.294402
## iter  80 value 396.817610
## iter  90 value 388.674254
## iter 100 value 386.959521
## final  value 386.959521
## stopped after 100 iterations
## # weights:  106
## initial  value 606.715518
## iter  10 value 565.584769
## iter  20 value 542.847780
## iter  30 value 539.451983
## iter  40 value 538.550109
## iter  50 value 537.371133
## iter  60 value 532.689293
## iter  70 value 527.016033
## iter  80 value 522.164355
## iter  90 value 521.913766
## iter 100 value 521.814235
## final  value 521.814235
## stopped after 100 iterations
## # weights:  204
## initial  value 602.203963
```

```
## iter  10 value 540.328036
## iter  20 value 509.618533
## iter  30 value 500.332865
## iter  40 value 498.137066
## iter  50 value 492.492356
## iter  60 value 489.898239
## iter  70 value 485.323979
## iter  80 value 484.315777
## iter  90 value 484.182753
## iter 100 value 482.908749
## final  value 482.908749
## stopped after 100 iterations
## # weights:  302
## initial  value 698.585500
## iter  10 value 533.818800
## iter  20 value 521.665775
## iter  30 value 510.995437
## iter  40 value 501.702140
## iter  50 value 499.036677
## iter  60 value 497.319361
## iter  70 value 495.592077
## iter  80 value 468.468117
## iter  90 value 461.447170
## iter 100 value 456.319744
## final  value 456.319744
## stopped after 100 iterations
## # weights:  400
## initial  value 693.007752
## iter  10 value 478.581967
## iter  20 value 454.289135
## iter  30 value 447.375201
## iter  40 value 442.934738
## iter  50 value 442.248809
## iter  60 value 441.854870
## iter  70 value 436.792080
## iter  80 value 436.620694
## iter  90 value 435.627479
## iter 100 value 432.370148
## final  value 432.370148
## stopped after 100 iterations
## # weights:  498
## initial  value 897.763659
## iter  10 value 588.887505
## iter  20 value 496.981998
## iter  30 value 483.940721
## iter  40 value 475.002986
## iter  50 value 472.709691
## iter  60 value 466.012807
## iter  70 value 452.591256
## iter  80 value 437.468311
## iter  90 value 432.026439
## iter 100 value 418.736903
## final  value 418.736903
## stopped after 100 iterations
```

```
## # weights:  106
## initial  value 656.569141
## iter  10 value 523.441084
## iter  20 value 515.820929
## iter  30 value 512.940003
## iter  40 value 512.208646
## iter  50 value 510.435550
## iter  60 value 509.091514
## iter  70 value 494.986043
## iter  80 value 479.071205
## iter  90 value 477.041198
## iter 100 value 474.440192
## final  value 474.440192
## stopped after 100 iterations
## # weights:  204
## initial  value 622.315688
## iter  10 value 504.922799
## iter  20 value 493.016080
## iter  30 value 489.551105
## iter  40 value 485.589873
## iter  50 value 481.019800
## iter  60 value 475.539698
## iter  70 value 474.539955
## iter  80 value 467.725929
## iter  90 value 461.890954
## iter 100 value 459.375878
## final  value 459.375878
## stopped after 100 iterations
## # weights:  302
## initial  value 635.324951
## iter  10 value 521.712833
## iter  20 value 508.000092
## iter  30 value 498.482954
## iter  40 value 478.760014
## iter  50 value 473.688255
## iter  60 value 470.761516
## iter  70 value 469.834459
## iter  80 value 469.301066
## iter  90 value 466.969504
## iter 100 value 464.705157
## final  value 464.705157
## stopped after 100 iterations
## # weights:  400
## initial  value 686.551162
## iter  10 value 552.205937
## iter  20 value 487.040961
## iter  30 value 456.600563
## iter  40 value 441.849812
## iter  50 value 431.556767
## iter  60 value 418.984596
## iter  70 value 410.685300
## iter  80 value 401.451530
## iter  90 value 398.837261
## iter 100 value 396.296561
```

```
## final  value 396.296561
## stopped after 100 iterations
## # weights:  498
## initial  value 733.076848
## iter  10 value 535.006254
## iter  20 value 498.100592
## iter  30 value 478.928563
## iter  40 value 464.327092
## iter  50 value 443.992706
## iter  60 value 438.426079
## iter  70 value 436.264630
## iter  80 value 431.156268
## iter  90 value 430.326635
## iter 100 value 426.131201
## final  value 426.131201
## stopped after 100 iterations
## # weights:  106
## initial  value 603.489780
## iter  10 value 576.702348
## iter  20 value 548.013622
## iter  30 value 497.216256
## iter  40 value 487.391558
## iter  50 value 481.967831
## iter  60 value 478.520722
## iter  70 value 474.858164
## iter  80 value 474.153608
## iter  90 value 469.410459
## iter 100 value 460.718762
## final  value 460.718762
## stopped after 100 iterations
## # weights:  204
## initial  value 639.060075
## iter  10 value 479.301885
## iter  20 value 462.927342
## iter  30 value 454.108263
## iter  40 value 451.945886
## iter  50 value 449.990705
## iter  60 value 449.480574
## iter  70 value 448.396619
## iter  80 value 443.296087
## iter  90 value 435.526293
## iter 100 value 428.752719
## final  value 428.752719
## stopped after 100 iterations
## # weights:  302
## initial  value 660.944177
## iter  10 value 481.068294
## iter  20 value 471.038279
## iter  30 value 466.439841
## iter  40 value 450.558468
## iter  50 value 435.001277
## iter  60 value 432.393828
## iter  70 value 429.211981
## iter  80 value 428.795447
```

```
## iter  90 value 428.277217
## iter 100 value 420.207894
## final  value 420.207894
## stopped after 100 iterations
## # weights:  400
## initial  value 693.967929
## iter  10 value 476.229215
## iter  20 value 459.029539
## iter  30 value 442.103209
## iter  40 value 431.577607
## iter  50 value 424.467582
## iter  60 value 419.266733
## iter  70 value 409.154075
## iter  80 value 404.937357
## iter  90 value 403.333829
## iter 100 value 400.366575
## final  value 400.366575
## stopped after 100 iterations
## # weights:  498
## initial  value 681.358416
## iter  10 value 507.313393
## iter  20 value 479.197322
## iter  30 value 469.396017
## iter  40 value 457.447769
## iter  50 value 450.647827
## iter  60 value 447.645491
## iter  70 value 439.573301
## iter  80 value 431.692193
## iter  90 value 426.264940
## iter 100 value 424.288942
## final  value 424.288942
## stopped after 100 iterations
## # weights:  106
## initial  value 608.487489
## iter  10 value 578.385055
## iter  20 value 577.906278
## iter  30 value 538.285905
## iter  40 value 505.309413
## iter  50 value 499.291122
## iter  60 value 479.898289
## iter  70 value 477.407888
## iter  80 value 473.621971
## iter  90 value 471.202980
## iter 100 value 466.410841
## final  value 466.410841
## stopped after 100 iterations
## # weights:  204
## initial  value 650.534009
## iter  10 value 512.302916
## iter  20 value 500.536635
## iter  30 value 498.451459
## iter  40 value 492.566516
## iter  50 value 491.002309
## iter  60 value 490.935719
```

```
## iter  70 value 490.891064
## iter  80 value 490.264591
## iter  90 value 489.108042
## iter 100 value 488.177836
## final  value 488.177836
## stopped after 100 iterations
## # weights:  302
## initial  value 703.618126
## iter  10 value 501.064495
## iter  20 value 476.078989
## iter  30 value 465.080034
## iter  40 value 451.047973
## iter  50 value 448.780394
## iter  60 value 446.123225
## iter  70 value 440.340847
## iter  80 value 439.574356
## iter  90 value 438.462673
## iter 100 value 438.032418
## final  value 438.032418
## stopped after 100 iterations
## # weights:  400
## initial  value 595.395801
## iter  10 value 467.509693
## iter  20 value 451.136330
## iter  30 value 440.444387
## iter  40 value 430.600488
## iter  50 value 426.921588
## iter  60 value 423.834979
## iter  70 value 418.814363
## iter  80 value 412.760300
## iter  90 value 406.366994
## iter 100 value 400.392650
## final  value 400.392650
## stopped after 100 iterations
## # weights:  498
## initial  value 812.220121
## iter  10 value 538.433666
## iter  20 value 508.510267
## iter  30 value 453.304323
## iter  40 value 440.556038
## iter  50 value 435.621418
## iter  60 value 426.287899
## iter  70 value 417.091491
## iter  80 value 405.593910
## iter  90 value 396.047709
## iter 100 value 393.399758
## final  value 393.399758
## stopped after 100 iterations
## # weights:  106
## initial  value 694.549471
## iter  10 value 577.922071
## iter  20 value 577.548382
## iter  30 value 512.330168
## iter  40 value 510.135359
```

```
## iter  50 value 509.795677
## iter  60 value 507.219740
## iter  70 value 488.785274
## iter  80 value 476.704608
## iter  90 value 471.842694
## iter 100 value 442.599319
## final  value 442.599319
## stopped after 100 iterations
## # weights:  204
## initial  value 674.956730
## iter  10 value 520.986464
## iter  20 value 505.914613
## iter  30 value 504.780301
## iter  40 value 504.236189
## iter  50 value 494.956494
## iter  60 value 492.234921
## iter  70 value 483.396331
## iter  80 value 481.545630
## iter  90 value 463.374434
## iter 100 value 451.131593
## final  value 451.131593
## stopped after 100 iterations
## # weights:  302
## initial  value 634.985108
## iter  10 value 511.211439
## iter  20 value 498.339223
## iter  30 value 493.744136
## iter  40 value 477.298717
## iter  50 value 443.464785
## iter  60 value 436.176595
## iter  70 value 427.958761
## iter  80 value 422.718960
## iter  90 value 411.778097
## iter 100 value 400.787847
## final  value 400.787847
## stopped after 100 iterations
## # weights:  400
## initial  value 702.081814
## iter  10 value 473.917432
## iter  20 value 449.864919
## iter  30 value 445.513862
## iter  40 value 444.164284
## iter  50 value 428.271170
## iter  60 value 402.744963
## iter  70 value 398.116671
## iter  80 value 395.509604
## iter  90 value 387.358713
## iter 100 value 386.005613
## final  value 386.005613
## stopped after 100 iterations
## # weights:  498
## initial  value 692.724920
## iter  10 value 532.366964
## iter  20 value 511.458653
```

```
## iter  30 value 496.982116
## iter  40 value 483.739357
## iter  50 value 458.800780
## iter  60 value 449.433010
## iter  70 value 446.181966
## iter  80 value 426.717740
## iter  90 value 420.344743
## iter 100 value 416.086906
## final  value 416.086906
## stopped after 100 iterations
## # weights:  106
## initial  value 627.093734
## iter  10 value 575.646250
## iter  20 value 567.115594
## iter  30 value 567.034917
## iter  40 value 526.929833
## iter  50 value 519.414924
## iter  60 value 513.993270
## iter  70 value 506.616555
## iter  80 value 500.114017
## iter  90 value 487.445865
## iter 100 value 485.961442
## final  value 485.961442
## stopped after 100 iterations
## # weights:  204
## initial  value 647.836318
## iter  10 value 556.280817
## iter  20 value 530.007948
## iter  30 value 508.213582
## iter  40 value 495.267923
## iter  50 value 490.621947
## iter  60 value 471.831048
## iter  70 value 461.655389
## iter  80 value 460.559816
## iter  90 value 459.453034
## iter 100 value 455.428234
## final  value 455.428234
## stopped after 100 iterations
## # weights:  302
## initial  value 688.233710
## iter  10 value 512.494273
## iter  20 value 501.904863
## iter  30 value 494.637111
## iter  40 value 470.000926
## iter  50 value 467.578030
## iter  60 value 459.809441
## iter  70 value 454.422839
## iter  80 value 442.931989
## iter  90 value 416.613647
## iter 100 value 404.799343
## final  value 404.799343
## stopped after 100 iterations
## # weights:  400
## initial  value 707.359651
```

```
## iter  10 value 534.403289
## iter  20 value 460.770960
## iter  30 value 451.284273
## iter  40 value 436.846301
## iter  50 value 432.277246
## iter  60 value 429.976733
## iter  70 value 428.261495
## iter  80 value 421.230734
## iter  90 value 420.806301
## iter 100 value 420.321885
## final  value 420.321885
## stopped after 100 iterations
## # weights:  498
## initial  value 760.857635
## iter  10 value 580.313633
## iter  20 value 519.435574
## iter  30 value 487.687035
## iter  40 value 471.872716
## iter  50 value 442.475374
## iter  60 value 432.230345
## iter  70 value 429.710429
## iter  80 value 426.718706
## iter  90 value 423.295741
## iter 100 value 421.125662
## final  value 421.125662
## stopped after 100 iterations
## # weights:  106
## initial  value 604.201172
## iter  10 value 521.038547
## iter  20 value 517.179540
## iter  30 value 513.631502
## iter  40 value 485.968356
## iter  50 value 474.043456
## iter  60 value 462.260022
## iter  70 value 455.765129
## iter  80 value 451.187602
## iter  90 value 450.545761
## iter 100 value 447.354366
## final  value 447.354366
## stopped after 100 iterations
## # weights:  204
## initial  value 669.264757
## iter  10 value 523.915616
## iter  20 value 517.634589
## iter  30 value 511.574235
## iter  40 value 498.470877
## iter  50 value 477.200177
## iter  60 value 473.011498
## iter  70 value 471.933641
## iter  80 value 469.769990
## iter  90 value 468.472124
## iter 100 value 467.944307
## final  value 467.944307
## stopped after 100 iterations
```

```
## # weights:  302
## initial  value 629.914158
## iter  10 value 587.621010
## iter  20 value 534.563628
## iter  30 value 525.701601
## iter  40 value 488.862898
## iter  50 value 473.229847
## iter  60 value 461.400446
## iter  70 value 455.527028
## iter  80 value 444.664257
## iter  90 value 441.729622
## iter 100 value 437.167941
## final  value 437.167941
## stopped after 100 iterations
## # weights:  400
## initial  value 795.923870
## iter  10 value 507.004785
## iter  20 value 463.266956
## iter  30 value 457.051150
## iter  40 value 437.021816
## iter  50 value 427.165284
## iter  60 value 420.734590
## iter  70 value 408.731318
## iter  80 value 405.892243
## iter  90 value 401.706605
## iter 100 value 399.248280
## final  value 399.248280
## stopped after 100 iterations
## # weights:  498
## initial  value 679.192919
## iter  10 value 541.336517
## iter  20 value 503.045415
## iter  30 value 488.732800
## iter  40 value 483.712114
## iter  50 value 480.551945
## iter  60 value 472.547941
## iter  70 value 466.700010
## iter  80 value 464.926475
## iter  90 value 460.778856
## iter 100 value 460.344725
## final  value 460.344725
## stopped after 100 iterations
## # weights:  106
## initial  value 627.295294
## iter  10 value 506.179678
## iter  20 value 495.672675
## iter  30 value 490.896060
## iter  40 value 489.054852
## iter  50 value 488.525449
## iter  60 value 486.850506
## iter  70 value 478.930766
## iter  80 value 476.629729
## iter  90 value 472.801298
## iter 100 value 470.021661
```

```
## final  value 470.021661
## stopped after 100 iterations
## # weights:  204
## initial  value 672.995866
## iter  10 value 488.171603
## iter  20 value 468.079751
## iter  30 value 431.525799
## iter  40 value 423.361800
## iter  50 value 420.818460
## iter  60 value 418.052995
## iter  70 value 409.559366
## iter  80 value 404.908029
## iter  90 value 404.526129
## iter 100 value 404.124043
## final  value 404.124043
## stopped after 100 iterations
## # weights:  302
## initial  value 640.618415
## iter  10 value 504.779458
## iter  20 value 479.681029
## iter  30 value 472.464120
## iter  40 value 468.199845
## iter  50 value 456.183106
## iter  60 value 449.786959
## iter  70 value 447.759941
## iter  80 value 445.940032
## iter  90 value 442.893904
## iter 100 value 442.609561
## final  value 442.609561
## stopped after 100 iterations
## # weights:  400
## initial  value 758.498805
## iter  10 value 493.465241
## iter  20 value 466.796323
## iter  30 value 462.234154
## iter  40 value 441.680315
## iter  50 value 432.301718
## iter  60 value 429.028759
## iter  70 value 423.497141
## iter  80 value 417.784556
## iter  90 value 415.645762
## iter 100 value 411.041014
## final  value 411.041014
## stopped after 100 iterations
## # weights:  498
## initial  value 691.846365
## iter  10 value 480.445777
## iter  20 value 447.777907
## iter  30 value 438.536096
## iter  40 value 426.255344
## iter  50 value 409.988646
## iter  60 value 400.497870
## iter  70 value 382.722980
## iter  80 value 376.886192
```

```
## iter  90 value 375.698291
## iter 100 value 372.324675
## final  value 372.324675
## stopped after 100 iterations
## # weights:  106
## initial  value 614.093192
## iter  10 value 581.054477
## iter  20 value 576.477129
## iter  30 value 513.038846
## iter  40 value 508.553788
## iter  50 value 496.341282
## iter  60 value 470.326666
## iter  70 value 439.916501
## iter  80 value 432.351592
## iter  90 value 432.226960
## iter 100 value 425.065712
## final  value 425.065712
## stopped after 100 iterations
## # weights:  204
## initial  value 620.556053
## iter  10 value 487.099307
## iter  20 value 470.183565
## iter  30 value 439.237181
## iter  40 value 431.086806
## iter  50 value 413.431730
## iter  60 value 405.363728
## iter  70 value 403.764744
## iter  80 value 401.950320
## iter  90 value 401.628811
## iter 100 value 401.157820
## final  value 401.157820
## stopped after 100 iterations
## # weights:  302
## initial  value 588.702412
## iter  10 value 480.660379
## iter  20 value 466.831655
## iter  30 value 448.777912
## iter  40 value 399.369792
## iter  50 value 363.706716
## iter  60 value 345.072917
## iter  70 value 336.678929
## iter  80 value 330.778366
## iter  90 value 329.929763
## iter 100 value 329.491283
## final  value 329.491283
## stopped after 100 iterations
## # weights:  400
## initial  value 646.009625
## iter  10 value 531.401992
## iter  20 value 499.829068
## iter  30 value 470.289020
## iter  40 value 445.363164
## iter  50 value 442.026356
## iter  60 value 439.065283
```

```
## iter  70 value 435.637069
## iter  80 value 434.513712
## iter  90 value 434.022611
## iter 100 value 432.441821
## final  value 432.441821
## stopped after 100 iterations
## # weights:  498
## initial  value 956.721927
## iter  10 value 566.472208
## iter  20 value 509.512333
## iter  30 value 486.488830
## iter  40 value 469.143691
## iter  50 value 456.038785
## iter  60 value 441.318017
## iter  70 value 433.386253
## iter  80 value 429.378604
## iter  90 value 419.345863
## iter 100 value 416.912839
## final  value 416.912839
## stopped after 100 iterations
## # weights:  106
## initial  value 612.083025
## iter  10 value 518.724508
## iter  20 value 482.284998
## iter  30 value 473.261624
## iter  40 value 463.919807
## iter  50 value 455.052691
## iter  60 value 453.687609
## iter  70 value 447.281064
## iter  80 value 440.150569
## iter  90 value 431.477215
## iter 100 value 429.708906
## final  value 429.708906
## stopped after 100 iterations
## # weights:  204
## initial  value 600.279903
## iter  10 value 503.909530
## iter  20 value 459.952274
## iter  30 value 450.474286
## iter  40 value 440.123660
## iter  50 value 436.536443
## iter  60 value 433.768529
## iter  70 value 421.202673
## iter  80 value 417.659167
## iter  90 value 413.445418
## iter 100 value 406.414406
## final  value 406.414406
## stopped after 100 iterations
## # weights:  302
## initial  value 615.434312
## iter  10 value 493.397193
## iter  20 value 472.392936
## iter  30 value 449.259396
## iter  40 value 444.603428
```

```
## iter  50 value 435.596503
## iter  60 value 432.466183
## iter  70 value 431.175505
## iter  80 value 429.639832
## iter  90 value 429.425815
## iter 100 value 428.650332
## final  value 428.650332
## stopped after 100 iterations
## # weights:  400
## initial  value 625.012883
## iter  10 value 454.820002
## iter  20 value 439.037436
## iter  30 value 431.041291
## iter  40 value 427.236947
## iter  50 value 423.579472
## iter  60 value 416.962405
## iter  70 value 413.750422
## iter  80 value 412.314570
## iter  90 value 407.699378
## iter 100 value 406.215466
## final  value 406.215466
## stopped after 100 iterations
## # weights:  498
## initial  value 836.253749
## iter  10 value 484.596601
## iter  20 value 459.591783
## iter  30 value 457.694113
## iter  40 value 454.030652
## iter  50 value 453.190902
## iter  60 value 448.276976
## iter  70 value 438.428948
## iter  80 value 434.612920
## iter  90 value 416.861147
## iter 100 value 402.026746
## final  value 402.026746
## stopped after 100 iterations
## # weights:  106
## initial  value 630.292626
## iter  10 value 519.374843
## iter  20 value 505.049928
## iter  30 value 498.153953
## iter  40 value 493.741932
## iter  50 value 490.515830
## iter  60 value 479.902950
## iter  70 value 474.889133
## iter  80 value 468.037777
## iter  90 value 464.199959
## iter 100 value 460.646797
## final  value 460.646797
## stopped after 100 iterations
## # weights:  204
## initial  value 754.522634
## iter  10 value 552.716235
## iter  20 value 514.357892
```

```
## iter  30 value 506.011723
## iter  40 value 488.382387
## iter  50 value 485.264852
## iter  60 value 483.853480
## iter  70 value 483.132816
## iter  80 value 482.228561
## iter  90 value 480.085090
## iter 100 value 479.686874
## final  value 479.686874
## stopped after 100 iterations
## # weights:  302
## initial  value 648.468977
## iter  10 value 505.630425
## iter  20 value 465.437381
## iter  30 value 457.236946
## iter  40 value 449.368776
## iter  50 value 442.275861
## iter  60 value 436.533090
## iter  70 value 432.133051
## iter  80 value 425.540730
## iter  90 value 421.486017
## iter 100 value 412.469822
## final  value 412.469822
## stopped after 100 iterations
## # weights:  400
## initial  value 700.536455
## iter  10 value 525.207679
## iter  20 value 501.301981
## iter  30 value 478.198226
## iter  40 value 457.639777
## iter  50 value 454.622615
## iter  60 value 452.650384
## iter  70 value 442.601320
## iter  80 value 438.700013
## iter  90 value 435.950035
## iter 100 value 431.741609
## final  value 431.741609
## stopped after 100 iterations
## # weights:  498
## initial  value 827.689035
## iter  10 value 544.898258
## iter  20 value 471.188034
## iter  30 value 468.077702
## iter  40 value 452.416288
## iter  50 value 443.068689
## iter  60 value 438.213068
## iter  70 value 434.059574
## iter  80 value 432.012480
## iter  90 value 428.677385
## iter 100 value 424.893348
## final  value 424.893348
## stopped after 100 iterations
## # weights:  106
## initial  value 634.813866
```

```
## iter  10 value 554.294203
## iter  20 value 523.336081
## iter  30 value 513.530289
## iter  40 value 510.849681
## iter  50 value 510.638264
## iter  60 value 510.100873
## iter  70 value 509.144171
## iter  80 value 507.707059
## iter  90 value 472.043456
## iter 100 value 463.395744
## final  value 463.395744
## stopped after 100 iterations
## # weights:  204
## initial  value 661.663851
## iter  10 value 516.635012
## iter  20 value 494.792011
## iter  30 value 471.209028
## iter  40 value 456.895853
## iter  50 value 444.362040
## iter  60 value 439.818650
## iter  70 value 430.124376
## iter  80 value 426.143910
## iter  90 value 422.474385
## iter 100 value 421.481212
## final  value 421.481212
## stopped after 100 iterations
## # weights:  302
## initial  value 627.727442
## iter  10 value 567.251836
## iter  20 value 550.424916
## iter  30 value 541.122487
## iter  40 value 534.259797
## iter  50 value 529.501258
## iter  60 value 521.543123
## iter  70 value 485.510700
## iter  80 value 479.529076
## iter  90 value 470.218742
## iter 100 value 467.788011
## final  value 467.788011
## stopped after 100 iterations
## # weights:  400
## initial  value 679.521845
## iter  10 value 529.637500
## iter  20 value 502.323615
## iter  30 value 490.867913
## iter  40 value 476.292701
## iter  50 value 457.685289
## iter  60 value 453.546755
## iter  70 value 446.878554
## iter  80 value 443.491180
## iter  90 value 440.063714
## iter 100 value 434.492742
## final  value 434.492742
## stopped after 100 iterations
```

```
## # weights:  498
## initial  value 732.280576
## iter  10 value 516.368570
## iter  20 value 483.564573
## iter  30 value 445.042189
## iter  40 value 429.337930
## iter  50 value 420.956001
## iter  60 value 413.240706
## iter  70 value 403.185513
## iter  80 value 395.475727
## iter  90 value 394.085391
## iter 100 value 392.085902
## final  value 392.085902
## stopped after 100 iterations
## # weights:  106
## initial  value 628.780254
## iter  10 value 579.757677
## iter  20 value 579.205878
## iter  30 value 535.888090
## iter  40 value 524.193012
## iter  50 value 521.357815
## iter  60 value 516.002707
## iter  70 value 513.588390
## iter  80 value 512.462456
## iter  90 value 511.158018
## iter 100 value 506.348016
## final  value 506.348016
## stopped after 100 iterations
## # weights:  204
## initial  value 616.972925
## iter  10 value 511.027313
## iter  20 value 499.894665
## iter  30 value 497.168868
## iter  40 value 496.942729
## iter  50 value 496.851001
## iter  60 value 494.479188
## iter  70 value 492.120073
## iter  80 value 491.067198
## iter  90 value 489.625899
## iter 100 value 481.414333
## final  value 481.414333
## stopped after 100 iterations
## # weights:  302
## initial  value 609.907124
## iter  10 value 489.355404
## iter  20 value 475.700845
## iter  30 value 472.899098
## iter  40 value 451.772109
## iter  50 value 444.351642
## iter  60 value 435.237276
## iter  70 value 432.405006
## iter  80 value 431.596391
## iter  90 value 430.922702
## iter 100 value 428.993313
```

```
## final  value 428.993313
## stopped after 100 iterations
## # weights:  400
## initial  value 690.108514
## iter  10 value 515.540497
## iter  20 value 493.041411
## iter  30 value 472.393799
## iter  40 value 455.163200
## iter  50 value 430.499394
## iter  60 value 422.331974
## iter  70 value 412.800330
## iter  80 value 408.274735
## iter  90 value 405.677295
## iter 100 value 400.013767
## final  value 400.013767
## stopped after 100 iterations
## # weights:  498
## initial  value 713.267314
## iter  10 value 573.349645
## iter  20 value 550.529797
## iter  30 value 542.634591
## iter  40 value 534.421897
## iter  50 value 531.998124
## iter  60 value 528.875403
## iter  70 value 523.756137
## iter  80 value 517.921882
## iter  90 value 511.167001
## iter 100 value 504.165897
## final  value 504.165897
## stopped after 100 iterations
## # weights:  106
## initial  value 618.576653
## iter  10 value 508.537681
## iter  20 value 484.193288
## iter  30 value 478.625432
## iter  40 value 470.713254
## iter  50 value 468.767539
## iter  60 value 467.994171
## iter  70 value 464.919778
## iter  80 value 456.818827
## iter  90 value 454.605701
## iter 100 value 453.124364
## final  value 453.124364
## stopped after 100 iterations
## # weights:  204
## initial  value 713.993061
## iter  10 value 514.082255
## iter  20 value 490.388811
## iter  30 value 471.810006
## iter  40 value 468.508012
## iter  50 value 468.066278
## iter  60 value 467.480285
## iter  70 value 467.165652
## iter  80 value 465.860117
```

```
## iter  90 value 465.293406
## iter 100 value 464.764755
## final  value 464.764755
## stopped after 100 iterations
## # weights:  302
## initial  value 623.826138
## iter  10 value 543.729185
## iter  20 value 511.069698
## iter  30 value 501.943418
## iter  40 value 492.010798
## iter  50 value 482.786262
## iter  60 value 472.324662
## iter  70 value 469.031910
## iter  80 value 466.309571
## iter  90 value 462.682010
## iter 100 value 460.474007
## final  value 460.474007
## stopped after 100 iterations
## # weights:  400
## initial  value 743.820971
## iter  10 value 516.428560
## iter  20 value 497.698715
## iter  30 value 481.243379
## iter  40 value 474.266836
## iter  50 value 460.304812
## iter  60 value 445.896229
## iter  70 value 433.183622
## iter  80 value 430.472985
## iter  90 value 416.755106
## iter 100 value 404.914065
## final  value 404.914065
## stopped after 100 iterations
## # weights:  498
## initial  value 660.952549
## iter  10 value 512.397569
## iter  20 value 483.858891
## iter  30 value 479.899814
## iter  40 value 472.118690
## iter  50 value 463.559758
## iter  60 value 458.634429
## iter  70 value 456.022271
## iter  80 value 451.298019
## iter  90 value 441.504594
## iter 100 value 441.149349
## final  value 441.149349
## stopped after 100 iterations
## # weights:  106
## initial  value 619.703898
## iter  10 value 533.420193
## iter  20 value 506.233667
## iter  30 value 484.405539
## iter  40 value 475.487868
## iter  50 value 472.684592
## iter  60 value 471.655504
```

```
## iter  70 value 470.748097
## iter  80 value 469.216948
## iter  90 value 468.227625
## iter 100 value 466.487231
## final  value 466.487231
## stopped after 100 iterations
## # weights:  204
## initial  value 687.757020
## iter  10 value 523.272431
## iter  20 value 518.001398
## iter  30 value 494.785796
## iter  40 value 473.841091
## iter  50 value 469.973614
## iter  60 value 462.380082
## iter  70 value 461.601885
## iter  80 value 461.051431
## iter  90 value 452.886036
## iter 100 value 450.518516
## final  value 450.518516
## stopped after 100 iterations
## # weights:  302
## initial  value 651.852903
## iter  10 value 546.295431
## iter  20 value 523.343803
## iter  30 value 508.627683
## iter  40 value 483.187921
## iter  50 value 474.694611
## iter  60 value 467.816797
## iter  70 value 465.040603
## iter  80 value 463.123882
## iter  90 value 456.257162
## iter 100 value 448.263770
## final  value 448.263770
## stopped after 100 iterations
## # weights:  400
## initial  value 630.864893
## iter  10 value 555.438329
## iter  20 value 534.252518
## iter  30 value 532.254661
## iter  40 value 523.081900
## iter  50 value 521.448694
## iter  60 value 519.408846
## iter  70 value 518.692433
## iter  80 value 515.563866
## iter  90 value 514.839350
## iter 100 value 514.772256
## final  value 514.772256
## stopped after 100 iterations
## # weights:  498
## initial  value 664.808306
## iter  10 value 536.905992
## iter  20 value 496.667459
## iter  30 value 491.997155
## iter  40 value 481.702287
```

```
## iter  50 value 477.248125
## iter  60 value 471.673040
## iter  70 value 467.132591
## iter  80 value 458.979138
## iter  90 value 450.624092
## iter 100 value 439.984518
## final  value 439.984518
## stopped after 100 iterations
## # weights:  106
## initial  value 616.746028
## iter  10 value 587.748251
## iter  20 value 534.598050
## iter  30 value 525.694954
## iter  40 value 523.846380
## iter  50 value 508.978155
## iter  60 value 498.071341
## iter  70 value 495.908608
## iter  80 value 490.523732
## iter  90 value 485.274422
## iter 100 value 483.362584
## final  value 483.362584
## stopped after 100 iterations
## # weights:  204
## initial  value 645.054350
## iter  10 value 589.049696
## iter  20 value 570.043121
## iter  30 value 548.680929
## iter  40 value 522.360389
## iter  50 value 472.927950
## iter  60 value 467.269937
## iter  70 value 464.823604
## iter  80 value 463.573539
## iter  90 value 459.772107
## iter 100 value 457.628983
## final  value 457.628983
## stopped after 100 iterations
## # weights:  302
## initial  value 708.917905
## iter  10 value 596.219483
## iter  20 value 536.970949
## iter  30 value 513.383023
## iter  40 value 508.491898
## iter  50 value 501.168147
## iter  60 value 495.736474
## iter  70 value 485.410375
## iter  80 value 478.314242
## iter  90 value 465.144143
## iter 100 value 462.171467
## final  value 462.171467
## stopped after 100 iterations
## # weights:  400
## initial  value 643.520339
## iter  10 value 537.404663
## iter  20 value 502.019359
```

```
## iter  30 value 473.137860
## iter  40 value 456.513525
## iter  50 value 434.848996
## iter  60 value 422.360069
## iter  70 value 420.047149
## iter  80 value 415.985110
## iter  90 value 407.122442
## iter 100 value 403.290639
## final  value 403.290639
## stopped after 100 iterations
## # weights:  498
## initial  value 670.308391
## iter  10 value 538.697663
## iter  20 value 512.532996
## iter  30 value 462.264008
## iter  40 value 439.011464
## iter  50 value 436.237888
## iter  60 value 428.318454
## iter  70 value 425.300477
## iter  80 value 422.600112
## iter  90 value 420.673717
## iter 100 value 419.746760
## final  value 419.746760
## stopped after 100 iterations
## # weights:  106
## initial  value 653.398860
## iter  10 value 571.776923
## iter  20 value 559.604478
## iter  30 value 546.541209
## iter  40 value 538.575975
## iter  50 value 532.532630
## iter  60 value 531.740586
## iter  70 value 529.986828
## iter  80 value 528.963370
## iter  90 value 525.633213
## iter 100 value 523.547140
## final  value 523.547140
## stopped after 100 iterations
## # weights:  204
## initial  value 624.382736
## iter  10 value 537.718142
## iter  20 value 515.301405
## iter  30 value 501.847192
## iter  40 value 495.161576
## iter  50 value 493.157232
## iter  60 value 489.456434
## iter  70 value 485.504326
## iter  80 value 481.056337
## iter  90 value 480.628844
## iter 100 value 477.209357
## final  value 477.209357
## stopped after 100 iterations
## # weights:  302
## initial  value 654.014370
```

```
## iter  10 value 533.940400
## iter  20 value 500.608472
## iter  30 value 489.739086
## iter  40 value 486.591684
## iter  50 value 485.495836
## iter  60 value 476.019809
## iter  70 value 471.202430
## iter  80 value 463.775459
## iter  90 value 454.322070
## iter 100 value 443.564422
## final  value 443.564422
## stopped after 100 iterations
## # weights:  400
## initial  value 683.892641
## iter  10 value 518.137451
## iter  20 value 502.125315
## iter  30 value 493.593108
## iter  40 value 490.222618
## iter  50 value 489.146881
## iter  60 value 488.410526
## iter  70 value 484.917642
## iter  80 value 483.779037
## iter  90 value 482.259282
## iter 100 value 472.117379
## final  value 472.117379
## stopped after 100 iterations
## # weights:  498
## initial  value 639.959062
## iter  10 value 556.822811
## iter  20 value 521.419615
## iter  30 value 514.015713
## iter  40 value 511.826846
## iter  50 value 486.658839
## iter  60 value 478.431139
## iter  70 value 477.128971
## iter  80 value 470.708629
## iter  90 value 463.555476
## iter 100 value 450.328654
## final  value 450.328654
## stopped after 100 iterations
## # weights:  106
## initial  value 659.539396
## iter  10 value 547.151356
## iter  20 value 523.351571
## iter  30 value 512.932226
## iter  40 value 506.690092
## iter  50 value 502.368736
## iter  60 value 498.376440
## iter  70 value 498.215865
## iter  80 value 496.227643
## iter  90 value 496.098034
## iter 100 value 496.020152
## final  value 496.020152
## stopped after 100 iterations
```

```
## # weights:  204
## initial  value 706.048089
## iter  10 value 488.364553
## iter  20 value 475.479503
## iter  30 value 473.634726
## iter  40 value 473.352120
## iter  50 value 471.123992
## iter  60 value 469.730995
## iter  70 value 469.325051
## iter  80 value 468.818228
## iter  90 value 465.068885
## iter 100 value 459.439663
## final  value 459.439663
## stopped after 100 iterations
## # weights:  302
## initial  value 665.993437
## iter  10 value 467.546078
## iter  20 value 441.141593
## iter  30 value 435.859944
## iter  40 value 426.051626
## iter  50 value 425.187886
## iter  60 value 422.870940
## iter  70 value 411.540449
## iter  80 value 397.006837
## iter  90 value 390.347113
## iter 100 value 382.421970
## final  value 382.421970
## stopped after 100 iterations
## # weights:  400
## initial  value 663.797564
## iter  10 value 495.248982
## iter  20 value 485.128919
## iter  30 value 474.016205
## iter  40 value 463.845803
## iter  50 value 460.427986
## iter  60 value 457.515946
## iter  70 value 457.074216
## iter  80 value 456.746789
## iter  90 value 455.914954
## iter 100 value 451.625813
## final  value 451.625813
## stopped after 100 iterations
## # weights:  498
## initial  value 735.810202
## iter  10 value 502.826903
## iter  20 value 469.259972
## iter  30 value 461.246063
## iter  40 value 455.757549
## iter  50 value 450.540215
## iter  60 value 449.689570
## iter  70 value 447.778777
## iter  80 value 447.474453
## iter  90 value 446.675322
## iter 100 value 446.511308
```

```
## final  value 446.511308
## stopped after 100 iterations
## # weights:  106
## initial  value 606.750322
## iter  10 value 581.325169
## iter  20 value 581.109884
## iter  30 value 526.141645
## iter  40 value 505.389571
## iter  50 value 492.654641
## iter  60 value 485.827902
## iter  70 value 480.169287
## iter  80 value 470.180516
## iter  90 value 459.898050
## iter 100 value 457.337194
## final  value 457.337194
## stopped after 100 iterations
## # weights:  204
## initial  value 606.987418
## iter  10 value 497.039547
## iter  20 value 483.440509
## iter  30 value 474.894757
## iter  40 value 465.944081
## iter  50 value 440.471874
## iter  60 value 435.472586
## iter  70 value 434.091788
## iter  80 value 425.059897
## iter  90 value 418.932308
## iter 100 value 414.697808
## final  value 414.697808
## stopped after 100 iterations
## # weights:  302
## initial  value 651.168936
## iter  10 value 501.912572
## iter  20 value 490.507839
## iter  30 value 487.629319
## iter  40 value 457.912561
## iter  50 value 454.887295
## iter  60 value 451.440661
## iter  70 value 446.262301
## iter  80 value 444.047404
## iter  90 value 439.225545
## iter 100 value 437.705625
## final  value 437.705625
## stopped after 100 iterations
## # weights:  400
## initial  value 673.280544
## iter  10 value 557.638151
## iter  20 value 521.186597
## iter  30 value 465.400153
## iter  40 value 437.132717
## iter  50 value 433.654842
## iter  60 value 428.818375
## iter  70 value 424.203609
## iter  80 value 420.760970
```

```
## iter  90 value 418.455007
## iter 100 value 413.780682
## final  value 413.780682
## stopped after 100 iterations
## # weights:  498
## initial  value 661.171452
## iter  10 value 475.164315
## iter  20 value 447.371154
## iter  30 value 421.564342
## iter  40 value 416.551024
## iter  50 value 410.716551
## iter  60 value 396.031998
## iter  70 value 385.722414
## iter  80 value 384.715828
## iter  90 value 383.786033
## iter 100 value 381.236310
## final  value 381.236310
## stopped after 100 iterations
## # weights:  106
## initial  value 659.501795
## iter  10 value 553.757104
## iter  20 value 522.295811
## iter  30 value 514.261613
## iter  40 value 493.626184
## iter  50 value 488.279489
## iter  60 value 484.410956
## iter  70 value 483.359990
## iter  80 value 482.926226
## iter  90 value 482.698719
## iter 100 value 480.733120
## final  value 480.733120
## stopped after 100 iterations
## # weights:  204
## initial  value 660.400337
## iter  10 value 514.740788
## iter  20 value 500.374149
## iter  30 value 476.119159
## iter  40 value 463.179512
## iter  50 value 451.401416
## iter  60 value 440.998317
## iter  70 value 439.000001
## iter  80 value 433.660435
## iter  90 value 430.392254
## iter 100 value 421.065467
## final  value 421.065467
## stopped after 100 iterations
## # weights:  302
## initial  value 689.027196
## iter  10 value 519.272642
## iter  20 value 497.095478
## iter  30 value 489.369847
## iter  40 value 485.022935
## iter  50 value 481.793599
## iter  60 value 479.408164
```

```
## iter  70 value 458.771623
## iter  80 value 448.605846
## iter  90 value 442.027765
## iter 100 value 436.413966
## final  value 436.413966
## stopped after 100 iterations
## # weights:  400
## initial  value 879.639985
## iter  10 value 544.589831
## iter  20 value 487.842949
## iter  30 value 479.076357
## iter  40 value 476.456356
## iter  50 value 450.071538
## iter  60 value 436.354217
## iter  70 value 432.673514
## iter  80 value 428.099319
## iter  90 value 426.723460
## iter 100 value 426.345273
## final  value 426.345273
## stopped after 100 iterations
## # weights:  498
## initial  value 733.472020
## iter  10 value 556.621489
## iter  20 value 486.783392
## iter  30 value 477.957543
## iter  40 value 451.189743
## iter  50 value 448.124923
## iter  60 value 442.365016
## iter  70 value 439.136017
## iter  80 value 437.711606
## iter  90 value 425.981719
## iter 100 value 416.696102
## final  value 416.696102
## stopped after 100 iterations
## # weights:  106
## initial  value 614.284031
## iter  10 value 576.742784
## iter  20 value 536.579788
## iter  30 value 528.163481
## iter  40 value 526.415381
## iter  50 value 525.589408
## iter  60 value 525.393288
## iter  70 value 524.876199
## iter  80 value 514.354344
## iter  90 value 507.109308
## iter 100 value 474.722267
## final  value 474.722267
## stopped after 100 iterations
## # weights:  204
## initial  value 639.343076
## iter  10 value 574.833642
## iter  20 value 552.384685
## iter  30 value 524.010435
## iter  40 value 504.866361
```

```
## iter  50 value 471.447580
## iter  60 value 437.861537
## iter  70 value 433.182227
## iter  80 value 430.838985
## iter  90 value 428.081676
## iter 100 value 423.148404
## final  value 423.148404
## stopped after 100 iterations
## # weights:  302
## initial  value 644.295938
## iter  10 value 508.227789
## iter  20 value 489.843507
## iter  30 value 472.902268
## iter  40 value 457.365833
## iter  50 value 452.053422
## iter  60 value 442.970785
## iter  70 value 441.473630
## iter  80 value 438.633080
## iter  90 value 432.207653
## iter 100 value 420.778204
## final  value 420.778204
## stopped after 100 iterations
## # weights:  400
## initial  value 667.966570
## iter  10 value 575.825243
## iter  20 value 548.777701
## iter  30 value 542.450657
## iter  40 value 536.509573
## iter  50 value 532.839822
## iter  60 value 531.636686
## iter  70 value 531.152624
## iter  80 value 529.040858
## iter  90 value 528.747158
## iter 100 value 528.275889
## final  value 528.275889
## stopped after 100 iterations
## # weights:  498
## initial  value 655.253096
## iter  10 value 536.477116
## iter  20 value 502.662720
## iter  30 value 481.360373
## iter  40 value 470.907547
## iter  50 value 461.883775
## iter  60 value 459.990350
## iter  70 value 459.649529
## iter  80 value 459.457615
## iter  90 value 459.294653
## iter 100 value 452.720563
## final  value 452.720563
## stopped after 100 iterations
## # weights:  106
## initial  value 662.662276
## iter  10 value 531.473110
## iter  20 value 513.421111
```

```
## iter  30 value 500.650622
## iter  40 value 492.553442
## iter  50 value 488.429645
## iter  60 value 487.394677
## iter  70 value 483.791982
## iter  80 value 477.400692
## iter  90 value 476.749112
## iter 100 value 467.519844
## final  value 467.519844
## stopped after 100 iterations
## # weights:  204
## initial  value 636.233588
## iter  10 value 501.172498
## iter  20 value 456.570356
## iter  30 value 449.592241
## iter  40 value 442.122741
## iter  50 value 425.893803
## iter  60 value 422.446675
## iter  70 value 408.817639
## iter  80 value 405.324144
## iter  90 value 402.077287
## iter 100 value 399.681670
## final  value 399.681670
## stopped after 100 iterations
## # weights:  302
## initial  value 691.711327
## iter  10 value 538.690925
## iter  20 value 488.413916
## iter  30 value 474.064265
## iter  40 value 467.506726
## iter  50 value 465.079391
## iter  60 value 464.665927
## iter  70 value 464.362077
## iter  80 value 464.048098
## iter  90 value 462.422840
## iter 100 value 460.984044
## final  value 460.984044
## stopped after 100 iterations
## # weights:  400
## initial  value 665.203563
## iter  10 value 496.092927
## iter  20 value 470.055628
## iter  30 value 461.994757
## iter  40 value 458.983575
## iter  50 value 453.896208
## iter  60 value 450.973327
## iter  70 value 447.235541
## iter  80 value 443.935718
## iter  90 value 438.466614
## iter 100 value 433.324763
## final  value 433.324763
## stopped after 100 iterations
## # weights:  498
## initial  value 818.141962
```

```
## iter  10 value 506.457241
## iter  20 value 472.875678
## iter  30 value 443.789424
## iter  40 value 414.294881
## iter  50 value 400.813444
## iter  60 value 387.845700
## iter  70 value 373.141786
## iter  80 value 367.313536
## iter  90 value 359.049730
## iter 100 value 356.663979
## final  value 356.663979
## stopped after 100 iterations
## # weights:  106
## initial  value 608.499864
## iter  10 value 561.422186
## iter  20 value 551.674819
## iter  30 value 549.190200
## iter  40 value 521.724027
## iter  50 value 516.764700
## iter  60 value 515.043882
## iter  70 value 497.071767
## iter  80 value 470.384897
## iter  90 value 442.282872
## iter 100 value 437.482358
## final  value 437.482358
## stopped after 100 iterations
## # weights:  204
## initial  value 619.693840
## iter  10 value 479.716711
## iter  20 value 464.431075
## iter  30 value 461.458173
## iter  40 value 460.973057
## iter  50 value 458.103953
## iter  60 value 457.942049
## iter  70 value 457.792870
## iter  80 value 454.440920
## iter  90 value 453.737095
## iter 100 value 453.426426
## final  value 453.426426
## stopped after 100 iterations
## # weights:  302
## initial  value 708.021961
## iter  10 value 533.593148
## iter  20 value 504.519124
## iter  30 value 501.546174
## iter  40 value 501.164694
## iter  50 value 489.908286
## iter  60 value 444.520807
## iter  70 value 429.023342
## iter  80 value 419.747858
## iter  90 value 404.339869
## iter 100 value 377.276058
## final  value 377.276058
## stopped after 100 iterations
```

```
## # weights:  400
## initial  value 718.863847
## iter  10 value 437.779546
## iter  20 value 404.655106
## iter  30 value 374.862187
## iter  40 value 369.029313
## iter  50 value 366.966010
## iter  60 value 363.712807
## iter  70 value 362.399322
## iter  80 value 356.560854
## iter  90 value 353.445389
## iter 100 value 351.803521
## final  value 351.803521
## stopped after 100 iterations
## # weights:  498
## initial  value 847.654195
## iter  10 value 518.456405
## iter  20 value 423.097820
## iter  30 value 406.581582
## iter  40 value 402.933946
## iter  50 value 398.006663
## iter  60 value 391.246665
## iter  70 value 383.113165
## iter  80 value 379.403820
## iter  90 value 371.903311
## iter 100 value 370.176977
## final  value 370.176977
## stopped after 100 iterations
## # weights:  106
## initial  value 605.107295
## iter  10 value 513.630582
## iter  20 value 509.510653
## iter  30 value 505.339691
## iter  40 value 503.130271
## iter  50 value 496.772686
## iter  60 value 493.605978
## iter  70 value 483.847635
## iter  80 value 479.192969
## iter  90 value 469.579270
## iter 100 value 464.381252
## final  value 464.381252
## stopped after 100 iterations
## # weights:  204
## initial  value 606.576154
## iter  10 value 530.773010
## iter  20 value 523.680771
## iter  30 value 521.567035
## iter  40 value 488.245988
## iter  50 value 444.212533
## iter  60 value 441.021805
## iter  70 value 435.253498
## iter  80 value 433.959985
## iter  90 value 421.800554
## iter 100 value 420.929979
```

```
## final  value 420.929979
## stopped after 100 iterations
## # weights:  302
## initial  value 599.889818
## iter  10 value 491.956841
## iter  20 value 473.635906
## iter  30 value 444.195299
## iter  40 value 438.023065
## iter  50 value 415.068501
## iter  60 value 407.917672
## iter  70 value 404.485229
## iter  80 value 400.803671
## iter  90 value 392.460244
## iter 100 value 387.779960
## final  value 387.779960
## stopped after 100 iterations
## # weights:  400
## initial  value 641.413512
## iter  10 value 529.703411
## iter  20 value 512.337076
## iter  30 value 505.733423
## iter  40 value 478.722978
## iter  50 value 460.105874
## iter  60 value 451.357571
## iter  70 value 437.065017
## iter  80 value 434.707870
## iter  90 value 428.977076
## iter 100 value 427.749015
## final  value 427.749015
## stopped after 100 iterations
## # weights:  498
## initial  value 755.912276
## iter  10 value 497.392152
## iter  20 value 441.876810
## iter  30 value 422.198702
## iter  40 value 401.530194
## iter  50 value 375.733064
## iter  60 value 363.401943
## iter  70 value 357.786974
## iter  80 value 351.864888
## iter  90 value 348.811795
## iter 100 value 347.439153
## final  value 347.439153
## stopped after 100 iterations
## # weights:  106
## initial  value 619.008469
## iter  10 value 516.912717
## iter  20 value 511.742221
## iter  30 value 508.218018
## iter  40 value 503.516679
## iter  50 value 502.214956
## iter  60 value 493.709128
## iter  70 value 492.538619
## iter  80 value 490.776026
```

```
## iter  90 value 486.446984
## iter 100 value 485.483386
## final  value 485.483386
## stopped after 100 iterations
## # weights:  204
## initial  value 629.009750
## iter  10 value 530.456861
## iter  20 value 524.972892
## iter  30 value 509.696048
## iter  40 value 498.916065
## iter  50 value 497.400164
## iter  60 value 465.281542
## iter  70 value 435.246129
## iter  80 value 424.922750
## iter  90 value 418.593893
## iter 100 value 415.472661
## final  value 415.472661
## stopped after 100 iterations
## # weights:  302
## initial  value 627.687193
## iter  10 value 511.960543
## iter  20 value 497.139355
## iter  30 value 479.720702
## iter  40 value 472.809061
## iter  50 value 467.072409
## iter  60 value 464.688075
## iter  70 value 464.463593
## iter  80 value 463.268912
## iter  90 value 462.635886
## iter 100 value 462.497789
## final  value 462.497789
## stopped after 100 iterations
## # weights:  400
## initial  value 671.698875
## iter  10 value 496.105977
## iter  20 value 489.083055
## iter  30 value 477.434183
## iter  40 value 466.883764
## iter  50 value 443.071602
## iter  60 value 436.254118
## iter  70 value 428.785848
## iter  80 value 424.479039
## iter  90 value 423.237681
## iter 100 value 422.979299
## final  value 422.979299
## stopped after 100 iterations
## # weights:  498
## initial  value 747.843673
## iter  10 value 498.843255
## iter  20 value 458.994563
## iter  30 value 387.327707
## iter  40 value 376.828542
## iter  50 value 367.850307
## iter  60 value 361.325247
```

```
## iter  70 value 356.938995
## iter  80 value 355.569864
## iter  90 value 353.646855
## iter 100 value 352.636081
## final  value 352.636081
## stopped after 100 iterations
## # weights:  106
## initial  value 610.881709
## iter  10 value 579.733704
## iter  20 value 579.638225
## iter  30 value 571.864253
## iter  40 value 524.819252
## iter  50 value 520.565737
## iter  60 value 495.709447
## iter  70 value 493.102815
## iter  80 value 462.219872
## iter  90 value 450.240764
## iter 100 value 443.231766
## final  value 443.231766
## stopped after 100 iterations
## # weights:  204
## initial  value 710.045351
## iter  10 value 531.958553
## iter  20 value 495.296150
## iter  30 value 425.821504
## iter  40 value 421.020089
## iter  50 value 417.898061
## iter  60 value 416.540441
## iter  70 value 415.537666
## iter  80 value 404.620468
## iter  90 value 403.301850
## iter 100 value 401.798410
## final  value 401.798410
## stopped after 100 iterations
## # weights:  302
## initial  value 658.868398
## iter  10 value 501.618854
## iter  20 value 490.260619
## iter  30 value 474.884105
## iter  40 value 465.616242
## iter  50 value 452.459884
## iter  60 value 443.026208
## iter  70 value 434.684835
## iter  80 value 429.116722
## iter  90 value 423.374175
## iter 100 value 416.343093
## final  value 416.343093
## stopped after 100 iterations
## # weights:  400
## initial  value 698.096850
## iter  10 value 552.570497
## iter  20 value 523.454478
## iter  30 value 511.419818
## iter  40 value 497.726606
```

```
## iter  50 value 470.607054
## iter  60 value 462.909972
## iter  70 value 458.690647
## iter  80 value 456.856975
## iter  90 value 454.715615
## iter 100 value 452.261563
## final  value 452.261563
## stopped after 100 iterations
## # weights:  498
## initial  value 741.079488
## iter  10 value 513.154078
## iter  20 value 471.255561
## iter  30 value 454.492540
## iter  40 value 447.972416
## iter  50 value 426.351166
## iter  60 value 422.890157
## iter  70 value 413.906418
## iter  80 value 408.931585
## iter  90 value 405.039989
## iter 100 value 403.693859
## final  value 403.693859
## stopped after 100 iterations
## # weights:  106
## initial  value 658.795227
## iter  10 value 557.656815
## iter  20 value 533.395624
## iter  30 value 508.159390
## iter  40 value 501.594703
## iter  50 value 497.360950
## iter  60 value 496.486393
## iter  70 value 494.912373
## iter  80 value 491.043560
## iter  90 value 474.549874
## iter 100 value 449.702968
## final  value 449.702968
## stopped after 100 iterations
## # weights:  204
## initial  value 595.236818
## iter  10 value 526.056243
## iter  20 value 508.063081
## iter  30 value 506.586009
## iter  40 value 465.235167
## iter  50 value 460.360597
## iter  60 value 440.121921
## iter  70 value 425.931490
## iter  80 value 412.635196
## iter  90 value 410.993714
## iter 100 value 398.913940
## final  value 398.913940
## stopped after 100 iterations
## # weights:  302
## initial  value 638.156870
## iter  10 value 516.338826
## iter  20 value 497.688798
```

```
## iter  30 value 495.537484
## iter  40 value 469.404184
## iter  50 value 461.757495
## iter  60 value 458.859795
## iter  70 value 457.088736
## iter  80 value 451.035503
## iter  90 value 446.668309
## iter 100 value 444.442386
## final  value 444.442386
## stopped after 100 iterations
## # weights:  400
## initial  value 705.779718
## iter  10 value 556.927567
## iter  20 value 539.731953
## iter  30 value 510.676378
## iter  40 value 503.405060
## iter  50 value 487.451739
## iter  60 value 473.230001
## iter  70 value 463.945576
## iter  80 value 434.488510
## iter  90 value 408.362476
## iter 100 value 397.886225
## final  value 397.886225
## stopped after 100 iterations
## # weights:  498
## initial  value 741.318850
## iter  10 value 504.962002
## iter  20 value 466.877376
## iter  30 value 423.504920
## iter  40 value 415.853396
## iter  50 value 413.732181
## iter  60 value 393.384464
## iter  70 value 391.654492
## iter  80 value 387.690813
## iter  90 value 387.043599
## iter 100 value 385.798794
## final  value 385.798794
## stopped after 100 iterations
## # weights:  106
## initial  value 652.108292
## iter  10 value 501.248152
## iter  20 value 492.463964
## iter  30 value 491.723955
## iter  40 value 491.599842
## iter  50 value 486.972675
## iter  60 value 482.398951
## iter  70 value 470.793701
## iter  80 value 464.452622
## iter  90 value 453.918630
## iter 100 value 450.610583
## final  value 450.610583
## stopped after 100 iterations
## # weights:  204
## initial  value 616.261443
```

```
## iter  10 value 528.273780
## iter  20 value 520.603701
## iter  30 value 495.278300
## iter  40 value 481.518531
## iter  50 value 478.421961
## iter  60 value 478.041698
## iter  70 value 474.330004
## iter  80 value 473.612310
## iter  90 value 470.533578
## iter 100 value 469.961925
## final  value 469.961925
## stopped after 100 iterations
## # weights:  302
## initial  value 660.277672
## iter  10 value 531.606057
## iter  20 value 484.766261
## iter  30 value 471.590330
## iter  40 value 457.962506
## iter  50 value 453.807891
## iter  60 value 451.718953
## iter  70 value 447.699094
## iter  80 value 439.737612
## iter  90 value 436.701866
## iter 100 value 434.168398
## final  value 434.168398
## stopped after 100 iterations
## # weights:  400
## initial  value 684.534465
## iter  10 value 507.083999
## iter  20 value 488.665243
## iter  30 value 473.660641
## iter  40 value 458.132793
## iter  50 value 451.881727
## iter  60 value 445.305849
## iter  70 value 438.820470
## iter  80 value 427.120728
## iter  90 value 410.137489
## iter 100 value 397.829365
## final  value 397.829365
## stopped after 100 iterations
## # weights:  498
## initial  value 667.390434
## iter  10 value 474.374631
## iter  20 value 436.310757
## iter  30 value 428.281213
## iter  40 value 422.403903
## iter  50 value 421.348364
## iter  60 value 421.221030
## iter  70 value 418.706867
## iter  80 value 408.972953
## iter  90 value 404.354898
## iter 100 value 403.319701
## final  value 403.319701
## stopped after 100 iterations
```

```
## # weights:  106
## initial  value 620.381119
## iter  10 value 580.545681
## iter  20 value 578.683392
## iter  30 value 510.264067
## iter  40 value 502.170208
## iter  50 value 495.561148
## iter  60 value 488.018504
## iter  70 value 475.135235
## iter  80 value 472.268197
## iter  90 value 467.207241
## iter 100 value 459.849947
## final  value 459.849947
## stopped after 100 iterations
## # weights:  204
## initial  value 629.211651
## iter  10 value 531.365453
## iter  20 value 498.397584
## iter  30 value 496.595049
## iter  40 value 496.381946
## iter  50 value 493.293695
## iter  60 value 488.680479
## iter  70 value 443.748406
## iter  80 value 435.708669
## iter  90 value 423.755634
## iter 100 value 419.295466
## final  value 419.295466
## stopped after 100 iterations
## # weights:  302
## initial  value 785.906763
## iter  10 value 544.942449
## iter  20 value 504.949661
## iter  30 value 498.777400
## iter  40 value 475.101642
## iter  50 value 427.215672
## iter  60 value 402.299493
## iter  70 value 394.167894
## iter  80 value 392.308036
## iter  90 value 391.993313
## iter 100 value 391.684654
## final  value 391.684654
## stopped after 100 iterations
## # weights:  400
## initial  value 718.156632
## iter  10 value 496.025458
## iter  20 value 443.753052
## iter  30 value 432.326595
## iter  40 value 427.594490
## iter  50 value 407.270685
## iter  60 value 401.997480
## iter  70 value 394.074620
## iter  80 value 378.383806
## iter  90 value 371.361303
## iter 100 value 364.763780
```

```
## final  value 364.763780
## stopped after 100 iterations
## # weights:  498
## initial  value 713.739529
## iter  10 value 469.072840
## iter  20 value 452.460056
## iter  30 value 446.228716
## iter  40 value 442.378358
## iter  50 value 440.848298
## iter  60 value 439.105402
## iter  70 value 435.273818
## iter  80 value 433.884805
## iter  90 value 432.465641
## iter 100 value 427.133232
## final  value 427.133232
## stopped after 100 iterations
## # weights:  106
## initial  value 644.201535
## iter  10 value 579.416169
## iter  20 value 577.700371
## iter  30 value 503.317115
## iter  40 value 497.574530
## iter  50 value 496.517951
## iter  60 value 496.133530
## iter  70 value 495.145966
## iter  80 value 492.824569
## iter  90 value 485.992709
## iter 100 value 480.448008
## final  value 480.448008
## stopped after 100 iterations
## # weights:  204
## initial  value 663.485402
## iter  10 value 575.810488
## iter  20 value 547.586616
## iter  30 value 534.725070
## iter  40 value 529.561236
## iter  50 value 528.121671
## iter  60 value 519.311392
## iter  70 value 504.833827
## iter  80 value 498.667642
## iter  90 value 497.098791
## iter 100 value 467.946139
## final  value 467.946139
## stopped after 100 iterations
## # weights:  302
## initial  value 639.534278
## iter  10 value 514.323901
## iter  20 value 493.545989
## iter  30 value 488.688859
## iter  40 value 487.513876
## iter  50 value 475.855850
## iter  60 value 461.630446
## iter  70 value 444.931570
## iter  80 value 411.768171
```

```
## iter  90 value 399.584293
## iter 100 value 387.400992
## final  value 387.400992
## stopped after 100 iterations
## # weights:  400
## initial  value 642.436398
## iter  10 value 512.953643
## iter  20 value 492.464647
## iter  30 value 484.863283
## iter  40 value 479.833919
## iter  50 value 475.455716
## iter  60 value 445.251425
## iter  70 value 443.965110
## iter  80 value 442.208957
## iter  90 value 428.269809
## iter 100 value 417.302623
## final  value 417.302623
## stopped after 100 iterations
## # weights:  498
## initial  value 617.581952
## iter  10 value 521.701501
## iter  20 value 493.346702
## iter  30 value 486.989560
## iter  40 value 486.013760
## iter  50 value 482.316386
## iter  60 value 480.862545
## iter  70 value 479.715927
## iter  80 value 477.763734
## iter  90 value 470.977529
## iter 100 value 468.411260
## final  value 468.411260
## stopped after 100 iterations
## # weights:  106
## initial  value 617.155077
## iter  10 value 511.959367
## iter  20 value 505.266047
## iter  30 value 498.720178
## iter  40 value 468.884555
## iter  50 value 462.956903
## iter  60 value 454.667744
## iter  70 value 453.402137
## iter  80 value 452.779470
## iter  90 value 452.456171
## iter 100 value 447.297330
## final  value 447.297330
## stopped after 100 iterations
## # weights:  204
## initial  value 633.527248
## iter  10 value 537.337103
## iter  20 value 528.068160
## iter  30 value 505.820984
## iter  40 value 501.205357
## iter  50 value 500.095630
## iter  60 value 489.059291
```

```
## iter  70 value 482.733987
## iter  80 value 481.408643
## iter  90 value 478.151437
## iter 100 value 476.644430
## final  value 476.644430
## stopped after 100 iterations
## # weights:  302
## initial  value 622.262461
## iter  10 value 466.861297
## iter  20 value 446.905655
## iter  30 value 427.886253
## iter  40 value 420.360885
## iter  50 value 415.212016
## iter  60 value 409.176993
## iter  70 value 401.635906
## iter  80 value 399.567208
## iter  90 value 395.902845
## iter 100 value 385.159433
## final  value 385.159433
## stopped after 100 iterations
## # weights:  400
## initial  value 736.938837
## iter  10 value 532.104237
## iter  20 value 508.637255
## iter  30 value 472.152283
## iter  40 value 466.012245
## iter  50 value 463.958264
## iter  60 value 458.251595
## iter  70 value 449.039050
## iter  80 value 443.108421
## iter  90 value 438.768911
## iter 100 value 431.919724
## final  value 431.919724
## stopped after 100 iterations
## # weights:  498
## initial  value 701.020840
## iter  10 value 546.883905
## iter  20 value 496.127437
## iter  30 value 459.243143
## iter  40 value 434.404825
## iter  50 value 419.777612
## iter  60 value 405.829614
## iter  70 value 392.238017
## iter  80 value 390.200092
## iter  90 value 377.194622
## iter 100 value 375.940394
## final  value 375.940394
## stopped after 100 iterations
## # weights:  106
## initial  value 623.356249
## iter  10 value 579.278105
## iter  20 value 524.303468
## iter  30 value 517.004851
## iter  40 value 510.353589
```

```
## iter  50 value 498.451802
## iter  60 value 491.890004
## iter  70 value 486.680174
## iter  80 value 476.148724
## iter  90 value 466.842215
## iter 100 value 459.045645
## final  value 459.045645
## stopped after 100 iterations
## # weights:  204
## initial  value 627.576245
## iter  10 value 542.812852
## iter  20 value 509.804287
## iter  30 value 502.852188
## iter  40 value 481.898197
## iter  50 value 475.875818
## iter  60 value 470.005160
## iter  70 value 460.088527
## iter  80 value 458.278188
## iter  90 value 453.832072
## iter 100 value 449.974877
## final  value 449.974877
## stopped after 100 iterations
## # weights:  302
## initial  value 697.122044
## iter  10 value 505.548520
## iter  20 value 493.638526
## iter  30 value 490.010991
## iter  40 value 482.336712
## iter  50 value 478.227638
## iter  60 value 464.793814
## iter  70 value 462.342605
## iter  80 value 461.902274
## iter  90 value 428.171388
## iter 100 value 416.335824
## final  value 416.335824
## stopped after 100 iterations
## # weights:  400
## initial  value 804.005448
## iter  10 value 550.979987
## iter  20 value 526.418051
## iter  30 value 503.234747
## iter  40 value 491.693867
## iter  50 value 472.856767
## iter  60 value 451.389645
## iter  70 value 430.840000
## iter  80 value 428.134926
## iter  90 value 421.296697
## iter 100 value 419.838038
## final  value 419.838038
## stopped after 100 iterations
## # weights:  498
## initial  value 657.658584
## iter  10 value 504.754927
## iter  20 value 490.120820
```

```
## iter  30 value 475.215795
## iter  40 value 464.280145
## iter  50 value 446.404131
## iter  60 value 439.226826
## iter  70 value 427.685696
## iter  80 value 425.349033
## iter  90 value 421.994039
## iter 100 value 418.934809
## final  value 418.934809
## stopped after 100 iterations
## # weights:  106
## initial  value 609.093723
## iter  10 value 581.305731
## iter  20 value 575.988821
## iter  30 value 500.349663
## iter  40 value 493.981255
## iter  50 value 488.764296
## iter  60 value 464.953205
## iter  70 value 451.578733
## iter  80 value 441.310786
## iter  90 value 437.183753
## iter 100 value 437.003010
## final  value 437.003010
## stopped after 100 iterations
## # weights:  204
## initial  value 665.296955
## iter  10 value 525.882885
## iter  20 value 496.309614
## iter  30 value 477.834784
## iter  40 value 459.967455
## iter  50 value 444.530671
## iter  60 value 420.292616
## iter  70 value 412.764941
## iter  80 value 405.992621
## iter  90 value 405.065691
## iter 100 value 403.500705
## final  value 403.500705
## stopped after 100 iterations
## # weights:  302
## initial  value 808.505248
## iter  10 value 501.095668
## iter  20 value 491.002715
## iter  30 value 465.288366
## iter  40 value 441.993018
## iter  50 value 434.936294
## iter  60 value 432.085182
## iter  70 value 431.631855
## iter  80 value 430.949346
## iter  90 value 430.517156
## iter 100 value 429.547296
## final  value 429.547296
## stopped after 100 iterations
## # weights:  400
## initial  value 706.396092
```

```
## iter  10 value 505.125941
## iter  20 value 491.265891
## iter  30 value 473.120348
## iter  40 value 462.535616
## iter  50 value 452.357145
## iter  60 value 442.121828
## iter  70 value 438.225434
## iter  80 value 434.392822
## iter  90 value 433.823316
## iter 100 value 432.762391
## final  value 432.762391
## stopped after 100 iterations
## # weights:  498
## initial  value 679.105574
## iter  10 value 472.031747
## iter  20 value 440.848767
## iter  30 value 435.331515
## iter  40 value 427.106590
## iter  50 value 409.836343
## iter  60 value 406.592678
## iter  70 value 405.315200
## iter  80 value 404.565883
## iter  90 value 404.162500
## iter 100 value 403.918148
## final  value 403.918148
## stopped after 100 iterations
## # weights:  106
## initial  value 584.638081
## iter  10 value 524.363200
## iter  20 value 523.747833
## iter  30 value 520.595200
## iter  40 value 513.907008
## iter  50 value 506.733860
## iter  60 value 450.894804
## iter  70 value 443.209875
## iter  80 value 438.154608
## iter  90 value 433.116421
## iter 100 value 431.318513
## final  value 431.318513
## stopped after 100 iterations
## # weights:  204
## initial  value 612.894869
## iter  10 value 578.171347
## iter  20 value 567.995564
## iter  30 value 545.150100
## iter  40 value 535.741932
## iter  50 value 522.290739
## iter  60 value 521.603184
## iter  70 value 521.354038
## iter  80 value 517.393792
## iter  90 value 514.408374
## iter 100 value 513.999706
## final  value 513.999706
## stopped after 100 iterations
```

```
## # weights:  302
## initial  value 679.841848
## iter  10 value 497.677193
## iter  20 value 470.487479
## iter  30 value 448.946829
## iter  40 value 444.000438
## iter  50 value 434.519913
## iter  60 value 431.861241
## iter  70 value 425.689083
## iter  80 value 424.908091
## iter  90 value 422.194865
## iter 100 value 421.777282
## final  value 421.777282
## stopped after 100 iterations
## # weights:  400
## initial  value 680.486760
## iter  10 value 514.771953
## iter  20 value 476.039171
## iter  30 value 463.505769
## iter  40 value 452.444145
## iter  50 value 444.296691
## iter  60 value 440.864803
## iter  70 value 429.832627
## iter  80 value 416.493501
## iter  90 value 410.316932
## iter 100 value 407.975261
## final  value 407.975261
## stopped after 100 iterations
## # weights:  498
## initial  value 695.148959
## iter  10 value 507.441503
## iter  20 value 485.913255
## iter  30 value 474.739920
## iter  40 value 461.072963
## iter  50 value 459.646056
## iter  60 value 452.602702
## iter  70 value 444.498996
## iter  80 value 441.481408
## iter  90 value 421.891861
## iter 100 value 415.499304
## final  value 415.499304
## stopped after 100 iterations
## # weights:  106
## initial  value 611.257924
## iter  10 value 583.253438
## iter  20 value 540.384030
## iter  30 value 528.899128
## iter  40 value 525.662003
## iter  50 value 514.259852
## iter  60 value 508.050326
## iter  70 value 479.222118
## iter  80 value 474.064649
## iter  90 value 471.630546
## iter 100 value 471.441390
```

```
## final  value 471.441390
## stopped after 100 iterations
## # weights:  204
## initial  value 608.302362
## iter  10 value 507.100942
## iter  20 value 482.081637
## iter  30 value 452.673218
## iter  40 value 448.898854
## iter  50 value 444.934938
## iter  60 value 441.912706
## iter  70 value 434.808323
## iter  80 value 429.923674
## iter  90 value 425.802574
## iter 100 value 422.843319
## final  value 422.843319
## stopped after 100 iterations
## # weights:  302
## initial  value 649.888001
## iter  10 value 520.993918
## iter  20 value 501.587934
## iter  30 value 486.546985
## iter  40 value 481.956436
## iter  50 value 480.872670
## iter  60 value 477.465084
## iter  70 value 476.551774
## iter  80 value 453.333082
## iter  90 value 437.536784
## iter 100 value 411.226885
## final  value 411.226885
## stopped after 100 iterations
## # weights:  400
## initial  value 794.407963
## iter  10 value 495.535871
## iter  20 value 465.703002
## iter  30 value 451.897716
## iter  40 value 442.500790
## iter  50 value 427.332042
## iter  60 value 411.481262
## iter  70 value 408.741436
## iter  80 value 406.097799
## iter  90 value 402.179268
## iter 100 value 401.163105
## final  value 401.163105
## stopped after 100 iterations
## # weights:  498
## initial  value 670.232825
## iter  10 value 524.041132
## iter  20 value 496.019771
## iter  30 value 476.725028
## iter  40 value 439.111425
## iter  50 value 428.693507
## iter  60 value 421.591306
## iter  70 value 419.263673
## iter  80 value 409.006331
```

```
## iter  90 value 406.698954
## iter 100 value 402.083705
## final  value 402.083705
## stopped after 100 iterations
## # weights:  106
## initial  value 632.563779
## iter  10 value 554.666312
## iter  20 value 541.022215
## iter  30 value 534.221806
## iter  40 value 533.105267
## iter  50 value 532.896365
## iter  60 value 525.970761
## iter  70 value 525.211642
## iter  80 value 524.995009
## iter  90 value 520.223975
## iter 100 value 510.186496
## final  value 510.186496
## stopped after 100 iterations
## # weights:  204
## initial  value 681.426202
## iter  10 value 524.169540
## iter  20 value 470.951993
## iter  30 value 433.201893
## iter  40 value 427.320965
## iter  50 value 425.733417
## iter  60 value 416.882500
## iter  70 value 410.342083
## iter  80 value 405.895633
## iter  90 value 398.792488
## iter 100 value 397.315195
## final  value 397.315195
## stopped after 100 iterations
## # weights:  302
## initial  value 629.573772
## iter  10 value 532.618068
## iter  20 value 524.572155
## iter  30 value 504.156407
## iter  40 value 496.245717
## iter  50 value 491.240321
## iter  60 value 487.968964
## iter  70 value 486.680099
## iter  80 value 486.228553
## iter  90 value 486.017336
## iter 100 value 481.681024
## final  value 481.681024
## stopped after 100 iterations
## # weights:  400
## initial  value 695.111439
## iter  10 value 521.152763
## iter  20 value 479.499467
## iter  30 value 442.053134
## iter  40 value 423.212487
## iter  50 value 416.025419
## iter  60 value 408.387028
```

```
## iter  70 value 403.348754
## iter  80 value 399.219134
## iter  90 value 398.348982
## iter 100 value 397.481445
## final  value 397.481445
## stopped after 100 iterations
## # weights:  498
## initial  value 669.245265
## iter  10 value 534.052004
## iter  20 value 452.146719
## iter  30 value 433.101611
## iter  40 value 426.407327
## iter  50 value 417.007389
## iter  60 value 411.352040
## iter  70 value 410.618192
## iter  80 value 407.655582
## iter  90 value 404.111701
## iter 100 value 400.815769
## final  value 400.815769
## stopped after 100 iterations
## # weights:  106
## initial  value 634.120768
## iter  10 value 550.131024
## iter  20 value 509.780420
## iter  30 value 503.776295
## iter  40 value 498.381282
## iter  50 value 496.663273
## iter  60 value 496.450002
## iter  70 value 496.421912
## iter  80 value 496.413980
## iter  90 value 496.384698
## iter 100 value 496.108337
## final  value 496.108337
## stopped after 100 iterations
## # weights:  204
## initial  value 621.212959
## iter  10 value 516.839101
## iter  20 value 504.840556
## iter  30 value 502.238308
## iter  40 value 501.545043
## iter  50 value 501.259016
## iter  60 value 500.374740
## iter  70 value 499.681353
## iter  80 value 498.800537
## iter  90 value 497.914056
## iter 100 value 496.216071
## final  value 496.216071
## stopped after 100 iterations
## # weights:  302
## initial  value 689.074898
## iter  10 value 480.573712
## iter  20 value 446.974599
## iter  30 value 429.157085
## iter  40 value 428.305699
```

```
## iter  50 value 426.294075
## iter  60 value 420.201455
## iter  70 value 408.815507
## iter  80 value 384.182732
## iter  90 value 377.856569
## iter 100 value 374.423674
## final  value 374.423674
## stopped after 100 iterations
## # weights:  400
## initial  value 721.808383
## iter  10 value 539.001689
## iter  20 value 486.750411
## iter  30 value 470.962899
## iter  40 value 462.391183
## iter  50 value 455.991296
## iter  60 value 441.740579
## iter  70 value 437.945993
## iter  80 value 435.856347
## iter  90 value 429.626622
## iter 100 value 413.473371
## final  value 413.473371
## stopped after 100 iterations
## # weights:  498
## initial  value 660.587032
## iter  10 value 510.808187
## iter  20 value 482.031854
## iter  30 value 440.051887
## iter  40 value 424.905019
## iter  50 value 411.250792
## iter  60 value 396.752066
## iter  70 value 383.681941
## iter  80 value 374.996450
## iter  90 value 365.021423
## iter 100 value 358.198901
## final  value 358.198901
## stopped after 100 iterations
## # weights:  106
## initial  value 587.253152
## iter  10 value 512.448698
## iter  20 value 501.922712
## iter  30 value 500.378213
## iter  40 value 499.416793
## iter  50 value 495.573317
## iter  60 value 494.423397
## iter  70 value 493.915882
## iter  80 value 493.849526
## iter  90 value 493.534926
## iter 100 value 493.146514
## final  value 493.146514
## stopped after 100 iterations
## # weights:  204
## initial  value 666.132781
## iter  10 value 515.181757
## iter  20 value 501.751778
```

```
## iter  30 value 479.866824
## iter  40 value 469.308340
## iter  50 value 464.800237
## iter  60 value 462.801489
## iter  70 value 459.312102
## iter  80 value 458.232895
## iter  90 value 456.270940
## iter 100 value 455.580125
## final  value 455.580125
## stopped after 100 iterations
## # weights:  302
## initial  value 726.827460
## iter  10 value 467.054849
## iter  20 value 452.440096
## iter  30 value 436.875420
## iter  40 value 436.419971
## iter  50 value 433.078816
## iter  60 value 432.723658
## iter  70 value 426.121509
## iter  80 value 423.178507
## iter  90 value 422.244357
## iter 100 value 413.995169
## final  value 413.995169
## stopped after 100 iterations
## # weights:  400
## initial  value 610.150535
## iter  10 value 489.582509
## iter  20 value 425.725564
## iter  30 value 420.123231
## iter  40 value 415.927867
## iter  50 value 387.031244
## iter  60 value 367.871680
## iter  70 value 363.246469
## iter  80 value 358.471905
## iter  90 value 356.716642
## iter 100 value 354.355970
## final  value 354.355970
## stopped after 100 iterations
## # weights:  498
## initial  value 742.759574
## iter  10 value 493.761789
## iter  20 value 453.534465
## iter  30 value 449.074683
## iter  40 value 442.470712
## iter  50 value 425.030259
## iter  60 value 420.986712
## iter  70 value 419.727886
## iter  80 value 418.783217
## iter  90 value 418.421087
## iter 100 value 412.980954
## final  value 412.980954
## stopped after 100 iterations
## # weights:  106
## initial  value 664.824423
```

```
## iter  10 value 580.145353
## iter  20 value 516.471598
## iter  30 value 513.028151
## iter  40 value 489.558215
## iter  50 value 485.316743
## iter  60 value 484.679066
## iter  70 value 483.338264
## iter  80 value 475.076692
## iter  90 value 464.872694
## iter 100 value 452.812975
## final  value 452.812975
## stopped after 100 iterations
## # weights:  204
## initial  value 640.309640
## iter  10 value 511.112379
## iter  20 value 496.207659
## iter  30 value 488.666224
## iter  40 value 480.355361
## iter  50 value 475.821188
## iter  60 value 462.421022
## iter  70 value 441.837437
## iter  80 value 426.649103
## iter  90 value 425.691861
## iter 100 value 423.783649
## final  value 423.783649
## stopped after 100 iterations
## # weights:  302
## initial  value 619.271820
## iter  10 value 515.841694
## iter  20 value 487.187430
## iter  30 value 470.260762
## iter  40 value 438.435684
## iter  50 value 432.800030
## iter  60 value 427.970258
## iter  70 value 424.344682
## iter  80 value 423.533389
## iter  90 value 423.232040
## iter 100 value 422.805716
## final  value 422.805716
## stopped after 100 iterations
## # weights:  400
## initial  value 795.390653
## iter  10 value 482.340374
## iter  20 value 443.593876
## iter  30 value 421.576279
## iter  40 value 413.255660
## iter  50 value 411.475845
## iter  60 value 409.893264
## iter  70 value 403.910348
## iter  80 value 402.766550
## iter  90 value 398.387059
## iter 100 value 395.990201
## final  value 395.990201
## stopped after 100 iterations
```

```
## # weights:  498
## initial  value 751.815433
## iter  10 value 517.222190
## iter  20 value 497.514702
## iter  30 value 482.801281
## iter  40 value 460.496235
## iter  50 value 447.826025
## iter  60 value 437.962495
## iter  70 value 432.343005
## iter  80 value 430.436846
## iter  90 value 428.802463
## iter 100 value 420.983000
## final  value 420.983000
## stopped after 100 iterations
## # weights:  106
## initial  value 640.894574
## iter  10 value 497.481694
## iter  20 value 485.400836
## iter  30 value 481.562755
## iter  40 value 478.635949
## iter  50 value 476.073607
## iter  60 value 472.146825
## iter  70 value 470.348689
## iter  80 value 468.867052
## iter  90 value 459.880734
## iter 100 value 458.018220
## final  value 458.018220
## stopped after 100 iterations
## # weights:  204
## initial  value 648.670646
## iter  10 value 512.241221
## iter  20 value 505.516510
## iter  30 value 488.004548
## iter  40 value 469.858846
## iter  50 value 451.091821
## iter  60 value 444.298933
## iter  70 value 421.596754
## iter  80 value 396.272885
## iter  90 value 394.965042
## iter 100 value 390.440818
## final  value 390.440818
## stopped after 100 iterations
## # weights:  302
## initial  value 687.179228
## iter  10 value 493.658174
## iter  20 value 459.799552
## iter  30 value 418.153509
## iter  40 value 395.556900
## iter  50 value 390.410176
## iter  60 value 388.330658
## iter  70 value 383.339118
## iter  80 value 382.594482
## iter  90 value 381.490806
## iter 100 value 380.509961
```

```
## final  value 380.509961
## stopped after 100 iterations
## # weights:  400
## initial  value 712.229379
## iter  10 value 527.388951
## iter  20 value 463.564284
## iter  30 value 443.379357
## iter  40 value 421.535399
## iter  50 value 402.860688
## iter  60 value 384.284520
## iter  70 value 378.020785
## iter  80 value 371.918123
## iter  90 value 370.358947
## iter 100 value 368.961019
## final  value 368.961019
## stopped after 100 iterations
## # weights:  498
## initial  value 612.973627
## iter  10 value 459.478644
## iter  20 value 436.882600
## iter  30 value 427.983258
## iter  40 value 412.481457
## iter  50 value 395.729501
## iter  60 value 393.361727
## iter  70 value 390.223739
## iter  80 value 383.637032
## iter  90 value 376.667136
## iter 100 value 374.637866
## final  value 374.637866
## stopped after 100 iterations
## # weights:  106
## initial  value 594.229812
## iter  10 value 517.573411
## iter  20 value 504.751827
## iter  30 value 478.134338
## iter  40 value 471.759386
## iter  50 value 463.572532
## iter  60 value 462.249853
## iter  70 value 460.708434
## iter  80 value 456.138351
## iter  90 value 455.417636
## iter 100 value 455.210338
## final  value 455.210338
## stopped after 100 iterations
## # weights:  204
## initial  value 737.280653
## iter  10 value 523.931089
## iter  20 value 486.025257
## iter  30 value 473.432175
## iter  40 value 466.411276
## iter  50 value 463.725254
## iter  60 value 461.759448
## iter  70 value 458.514071
## iter  80 value 458.077180
```

```
## iter  90 value 455.614669
## iter 100 value 449.482454
## final  value 449.482454
## stopped after 100 iterations
## # weights:  302
## initial  value 648.616462
## iter  10 value 490.235358
## iter  20 value 456.350775
## iter  30 value 450.901132
## iter  40 value 449.503204
## iter  50 value 438.980314
## iter  60 value 427.225094
## iter  70 value 424.456678
## iter  80 value 421.380663
## iter  90 value 419.043552
## iter 100 value 417.955713
## final  value 417.955713
## stopped after 100 iterations
## # weights:  400
## initial  value 676.183953
## iter  10 value 559.956165
## iter  20 value 501.114303
## iter  30 value 446.791657
## iter  40 value 437.689934
## iter  50 value 422.170962
## iter  60 value 421.604867
## iter  70 value 418.150051
## iter  80 value 414.869137
## iter  90 value 410.756057
## iter 100 value 398.238129
## final  value 398.238129
## stopped after 100 iterations
## # weights:  498
## initial  value 745.055698
## iter  10 value 489.816436
## iter  20 value 460.866259
## iter  30 value 443.736843
## iter  40 value 425.964833
## iter  50 value 410.071808
## iter  60 value 400.628525
## iter  70 value 395.857135
## iter  80 value 393.416403
## iter  90 value 391.524716
## iter 100 value 389.589780
## final  value 389.589780
## stopped after 100 iterations
## # weights:  106
## initial  value 646.877911
## iter  10 value 580.083223
## iter  20 value 569.623645
## iter  30 value 555.671677
## iter  40 value 507.456222
## iter  50 value 503.922744
## iter  60 value 499.303132
```

```
## iter  70 value 487.577887
## iter  80 value 480.850020
## iter  90 value 480.447015
## iter 100 value 479.706322
## final  value 479.706322
## stopped after 100 iterations
## # weights:  204
## initial  value 634.452475
## iter  10 value 579.281639
## iter  20 value 578.358949
## iter  30 value 562.339860
## iter  40 value 467.361110
## iter  50 value 452.682848
## iter  60 value 424.234927
## iter  70 value 415.224928
## iter  80 value 407.555941
## iter  90 value 396.005594
## iter 100 value 394.749523
## final  value 394.749523
## stopped after 100 iterations
## # weights:  302
## initial  value 750.349788
## iter  10 value 548.055219
## iter  20 value 526.228760
## iter  30 value 513.167988
## iter  40 value 510.885043
## iter  50 value 506.185538
## iter  60 value 493.714834
## iter  70 value 487.015705
## iter  80 value 479.838303
## iter  90 value 459.291367
## iter 100 value 448.854227
## final  value 448.854227
## stopped after 100 iterations
## # weights:  400
## initial  value 696.403711
## iter  10 value 552.384271
## iter  20 value 512.579368
## iter  30 value 471.106184
## iter  40 value 448.182830
## iter  50 value 442.172720
## iter  60 value 423.844840
## iter  70 value 415.269427
## iter  80 value 409.494374
## iter  90 value 403.944706
## iter 100 value 397.467091
## final  value 397.467091
## stopped after 100 iterations
## # weights:  498
## initial  value 707.740136
## iter  10 value 489.428642
## iter  20 value 453.863393
## iter  30 value 424.273731
## iter  40 value 420.133787
```

```
## iter  50 value 417.717634
## iter  60 value 409.207226
## iter  70 value 405.510861
## iter  80 value 397.341913
## iter  90 value 391.266882
## iter 100 value 385.140556
## final  value 385.140556
## stopped after 100 iterations
## # weights:  106
## initial  value 646.047010
## iter  10 value 549.175389
## iter  20 value 514.091295
## iter  30 value 508.016975
## iter  40 value 507.484953
## iter  50 value 505.350300
## iter  60 value 504.629142
## iter  70 value 504.083400
## iter  80 value 501.753935
## iter  90 value 500.720927
## iter 100 value 500.639925
## final  value 500.639925
## stopped after 100 iterations
## # weights:  204
## initial  value 636.976234
## iter  10 value 563.303443
## iter  20 value 551.553893
## iter  30 value 539.130810
## iter  40 value 535.877697
## iter  50 value 531.169688
## iter  60 value 530.115307
## iter  70 value 528.707467
## iter  80 value 528.183798
## iter  90 value 525.269270
## iter 100 value 523.869282
## final  value 523.869282
## stopped after 100 iterations
## # weights:  302
## initial  value 623.026570
## iter  10 value 530.333897
## iter  20 value 529.017651
## iter  30 value 457.283873
## iter  40 value 441.840315
## iter  50 value 436.422130
## iter  60 value 434.212227
## iter  70 value 428.579785
## iter  80 value 427.027247
## iter  90 value 423.970815
## iter 100 value 418.486996
## final  value 418.486996
## stopped after 100 iterations
## # weights:  400
## initial  value 613.807268
## iter  10 value 510.776576
## iter  20 value 452.167469
```

```
## iter  30 value 443.199406
## iter  40 value 440.354925
## iter  50 value 439.136701
## iter  60 value 438.147066
## iter  70 value 434.929475
## iter  80 value 425.281942
## iter  90 value 414.523708
## iter 100 value 411.376881
## final  value 411.376881
## stopped after 100 iterations
## # weights:  498
## initial  value 708.369872
## iter  10 value 501.707425
## iter  20 value 473.510574
## iter  30 value 467.571172
## iter  40 value 462.416566
## iter  50 value 461.594605
## iter  60 value 460.416147
## iter  70 value 451.877923
## iter  80 value 448.505193
## iter  90 value 447.139798
## iter 100 value 444.921114
## final  value 444.921114
## stopped after 100 iterations
## # weights:  106
## initial  value 610.537770
## iter  10 value 536.431531
## iter  20 value 520.381956
## iter  30 value 512.776680
## iter  40 value 511.224607
## iter  50 value 506.867013
## iter  60 value 506.098795
## iter  70 value 505.356872
## iter  80 value 503.261999
## iter  90 value 502.052905
## iter 100 value 499.340827
## final  value 499.340827
## stopped after 100 iterations
## # weights:  204
## initial  value 645.849474
## iter  10 value 572.467702
## iter  20 value 540.441645
## iter  30 value 535.661626
## iter  40 value 533.756529
## iter  50 value 530.424638
## iter  60 value 526.977524
## iter  70 value 517.524137
## iter  80 value 511.573291
## iter  90 value 508.245127
## iter 100 value 505.753654
## final  value 505.753654
## stopped after 100 iterations
## # weights:  302
## initial  value 670.517347
```

```
## iter  10 value 511.534942
## iter  20 value 503.891172
## iter  30 value 476.222087
## iter  40 value 461.656584
## iter  50 value 454.840872
## iter  60 value 446.909127
## iter  70 value 444.832858
## iter  80 value 442.347815
## iter  90 value 438.571106
## iter 100 value 434.003182
## final  value 434.003182
## stopped after 100 iterations
## # weights:  400
## initial  value 643.069456
## iter  10 value 519.607422
## iter  20 value 468.551850
## iter  30 value 449.248115
## iter  40 value 444.384361
## iter  50 value 439.306431
## iter  60 value 430.678324
## iter  70 value 421.071320
## iter  80 value 420.077016
## iter  90 value 415.784727
## iter 100 value 411.256262
## final  value 411.256262
## stopped after 100 iterations
## # weights:  498
## initial  value 991.737756
## iter  10 value 583.321231
## iter  20 value 520.940056
## iter  30 value 461.967537
## iter  40 value 417.594366
## iter  50 value 412.098563
## iter  60 value 401.532966
## iter  70 value 396.908364
## iter  80 value 396.212249
## iter  90 value 394.945879
## iter 100 value 392.120232
## final  value 392.120232
## stopped after 100 iterations
## # weights:  106
## initial  value 626.233853
## iter  10 value 531.957156
## iter  20 value 515.007110
## iter  30 value 490.982434
## iter  40 value 479.378087
## iter  50 value 477.191387
## iter  60 value 475.281773
## iter  70 value 473.190908
## iter  80 value 463.015478
## iter  90 value 460.898131
## iter 100 value 460.386116
## final  value 460.386116
## stopped after 100 iterations
```

```
## # weights:  204
## initial  value 695.260344
## iter  10 value 523.363608
## iter  20 value 495.516093
## iter  30 value 484.069147
## iter  40 value 470.188910
## iter  50 value 449.591881
## iter  60 value 443.132423
## iter  70 value 441.066615
## iter  80 value 425.394882
## iter  90 value 419.079132
## iter 100 value 416.186957
## final  value 416.186957
## stopped after 100 iterations
## # weights:  302
## initial  value 611.872424
## iter  10 value 535.295307
## iter  20 value 514.362818
## iter  30 value 487.820599
## iter  40 value 475.086851
## iter  50 value 463.902517
## iter  60 value 457.501828
## iter  70 value 455.254558
## iter  80 value 453.546747
## iter  90 value 446.797548
## iter 100 value 442.243360
## final  value 442.243360
## stopped after 100 iterations
## # weights:  400
## initial  value 632.131095
## iter  10 value 523.458273
## iter  20 value 514.202035
## iter  30 value 510.613629
## iter  40 value 483.742486
## iter  50 value 480.506705
## iter  60 value 476.376386
## iter  70 value 470.962840
## iter  80 value 463.588321
## iter  90 value 460.713598
## iter 100 value 455.373577
## final  value 455.373577
## stopped after 100 iterations
## # weights:  498
## initial  value 651.888457
## iter  10 value 534.708481
## iter  20 value 511.295045
## iter  30 value 485.662317
## iter  40 value 478.547039
## iter  50 value 471.899053
## iter  60 value 467.171533
## iter  70 value 460.578044
## iter  80 value 455.111609
## iter  90 value 450.252813
## iter 100 value 448.034748
```

```
## final  value 448.034748
## stopped after 100 iterations
## # weights:  106
## initial  value 626.868633
## iter  10 value 539.165629
## iter  20 value 520.507772
## iter  30 value 512.509746
## iter  40 value 511.792336
## iter  50 value 510.707446
## iter  60 value 508.192017
## iter  70 value 504.924433
## iter  80 value 502.663343
## iter  90 value 500.679850
## iter 100 value 492.312634
## final  value 492.312634
## stopped after 100 iterations
## # weights:  204
## initial  value 658.515687
## iter  10 value 592.927728
## iter  20 value 572.157566
## iter  30 value 543.183225
## iter  40 value 535.671042
## iter  50 value 501.941862
## iter  60 value 481.336062
## iter  70 value 479.846753
## iter  80 value 472.285992
## iter  90 value 471.740029
## iter 100 value 469.721603
## final  value 469.721603
## stopped after 100 iterations
## # weights:  302
## initial  value 684.015516
## iter  10 value 470.681695
## iter  20 value 420.910455
## iter  30 value 415.369120
## iter  40 value 414.339972
## iter  50 value 413.121214
## iter  60 value 411.255850
## iter  70 value 409.587346
## iter  80 value 407.171426
## iter  90 value 395.952446
## iter 100 value 393.397680
## final  value 393.397680
## stopped after 100 iterations
## # weights:  400
## initial  value 670.269088
## iter  10 value 554.221132
## iter  20 value 514.604885
## iter  30 value 494.674511
## iter  40 value 489.812767
## iter  50 value 479.141929
## iter  60 value 472.276019
## iter  70 value 462.052084
## iter  80 value 460.256476
```

```
## iter  90 value 455.970818
## iter 100 value 454.877046
## final  value 454.877046
## stopped after 100 iterations
## # weights:  498
## initial  value 655.564819
## iter  10 value 450.333123
## iter  20 value 432.097306
## iter  30 value 416.732827
## iter  40 value 408.699248
## iter  50 value 403.234965
## iter  60 value 398.092089
## iter  70 value 394.653130
## iter  80 value 389.196821
## iter  90 value 382.661753
## iter 100 value 381.553430
## final  value 381.553430
## stopped after 100 iterations
## # weights:  106
## initial  value 653.721770
## iter  10 value 547.333185
## iter  20 value 531.972522
## iter  30 value 523.933014
## iter  40 value 522.405302
## iter  50 value 519.051016
## iter  60 value 514.506223
## iter  70 value 506.320055
## iter  80 value 502.829791
## iter  90 value 485.884600
## iter 100 value 481.257532
## final  value 481.257532
## stopped after 100 iterations
## # weights:  204
## initial  value 625.024872
## iter  10 value 509.578084
## iter  20 value 500.923501
## iter  30 value 490.015567
## iter  40 value 475.044276
## iter  50 value 469.347765
## iter  60 value 463.671187
## iter  70 value 459.474455
## iter  80 value 451.306773
## iter  90 value 448.423690
## iter 100 value 445.653620
## final  value 445.653620
## stopped after 100 iterations
## # weights:  302
## initial  value 698.289204
## iter  10 value 492.319602
## iter  20 value 475.663152
## iter  30 value 464.295617
## iter  40 value 456.021941
## iter  50 value 439.259891
## iter  60 value 430.313473
```

```
## iter  70 value 424.957607
## iter  80 value 417.807063
## iter  90 value 412.139924
## iter 100 value 411.679361
## final  value 411.679361
## stopped after 100 iterations
## # weights:  400
## initial  value 661.502348
## iter  10 value 544.469512
## iter  20 value 521.151545
## iter  30 value 517.292782
## iter  40 value 508.608964
## iter  50 value 500.926175
## iter  60 value 496.214811
## iter  70 value 477.662343
## iter  80 value 449.721909
## iter  90 value 424.919933
## iter 100 value 412.860492
## final  value 412.860492
## stopped after 100 iterations
## # weights:  498
## initial  value 688.935796
## iter  10 value 537.585112
## iter  20 value 493.404209
## iter  30 value 467.447923
## iter  40 value 453.625863
## iter  50 value 445.472491
## iter  60 value 434.836983
## iter  70 value 431.741469
## iter  80 value 429.031327
## iter  90 value 427.175337
## iter 100 value 421.171640
## final  value 421.171640
## stopped after 100 iterations
## # weights:  106
## initial  value 613.290891
## iter  10 value 533.437542
## iter  20 value 516.725731
## iter  30 value 476.998815
## iter  40 value 460.747201
## iter  50 value 419.191766
## iter  60 value 412.415426
## iter  70 value 409.030101
## iter  80 value 406.146289
## iter  90 value 405.304864
## iter 100 value 405.156669
## final  value 405.156669
## stopped after 100 iterations
## # weights:  204
## initial  value 643.739512
## iter  10 value 554.472627
## iter  20 value 511.069588
## iter  30 value 482.894195
## iter  40 value 472.374411
```

```
## iter  50 value 470.562798
## iter  60 value 469.939914
## iter  70 value 468.466790
## iter  80 value 467.721164
## iter  90 value 467.161558
## iter 100 value 466.928814
## final  value 466.928814
## stopped after 100 iterations
## # weights:  302
## initial  value 656.444813
## iter  10 value 490.998470
## iter  20 value 477.207444
## iter  30 value 459.453525
## iter  40 value 451.511856
## iter  50 value 437.002074
## iter  60 value 434.115272
## iter  70 value 433.128305
## iter  80 value 432.426260
## iter  90 value 404.773779
## iter 100 value 401.959784
## final  value 401.959784
## stopped after 100 iterations
## # weights:  400
## initial  value 702.403247
## iter  10 value 526.093289
## iter  20 value 508.618002
## iter  30 value 507.545684
## iter  40 value 488.350466
## iter  50 value 445.416925
## iter  60 value 425.417761
## iter  70 value 416.709863
## iter  80 value 412.913264
## iter  90 value 411.875895
## iter 100 value 409.695028
## final  value 409.695028
## stopped after 100 iterations
## # weights:  498
## initial  value 663.196177
## iter  10 value 485.017160
## iter  20 value 457.185450
## iter  30 value 424.201520
## iter  40 value 418.485336
## iter  50 value 407.732938
## iter  60 value 406.192653
## iter  70 value 405.198750
## iter  80 value 402.792586
## iter  90 value 401.639417
## iter 100 value 397.908531
## final  value 397.908531
## stopped after 100 iterations
## # weights:  106
## initial  value 603.167187
## iter  10 value 580.993656
## iter  20 value 579.946458
```

```
## iter  30 value 513.993647
## iter  40 value 498.226592
## iter  50 value 492.789690
## iter  60 value 490.787849
## iter  70 value 488.348084
## iter  80 value 486.663082
## iter  90 value 486.644850
## iter 100 value 486.638310
## final  value 486.638310
## stopped after 100 iterations
## # weights:  204
## initial  value 672.374084
## iter  10 value 492.620808
## iter  20 value 474.327175
## iter  30 value 471.916499
## iter  40 value 461.521105
## iter  50 value 447.267552
## iter  60 value 442.027537
## iter  70 value 427.209304
## iter  80 value 423.465439
## iter  90 value 406.489942
## iter 100 value 402.271184
## final  value 402.271184
## stopped after 100 iterations
## # weights:  302
## initial  value 657.753605
## iter  10 value 474.125249
## iter  20 value 465.444329
## iter  30 value 456.314510
## iter  40 value 429.060311
## iter  50 value 419.874236
## iter  60 value 386.358731
## iter  70 value 375.837712
## iter  80 value 372.614617
## iter  90 value 371.087355
## iter 100 value 366.803832
## final  value 366.803832
## stopped after 100 iterations
## # weights:  400
## initial  value 641.498765
## iter  10 value 470.432372
## iter  20 value 431.781314
## iter  30 value 419.083232
## iter  40 value 405.996311
## iter  50 value 399.513200
## iter  60 value 398.377879
## iter  70 value 396.096899
## iter  80 value 388.565900
## iter  90 value 387.264078
## iter 100 value 383.289916
## final  value 383.289916
## stopped after 100 iterations
## # weights:  498
## initial  value 659.774061
```

```
## iter  10 value 542.850497
## iter  20 value 495.896469
## iter  30 value 468.095792
## iter  40 value 448.954124
## iter  50 value 403.329381
## iter  60 value 392.774246
## iter  70 value 379.836450
## iter  80 value 371.383668
## iter  90 value 367.415796
## iter 100 value 365.269374
## final  value 365.269374
## stopped after 100 iterations
## # weights:  106
## initial  value 604.683352
## iter  10 value 580.529532
## iter  20 value 577.175613
## iter  30 value 531.316779
## iter  40 value 496.772330
## iter  50 value 490.113356
## iter  60 value 486.529295
## iter  70 value 485.360731
## iter  80 value 480.818132
## iter  90 value 467.195271
## iter 100 value 460.821385
## final  value 460.821385
## stopped after 100 iterations
## # weights:  204
## initial  value 598.653260
## iter  10 value 508.926130
## iter  20 value 486.413065
## iter  30 value 482.974528
## iter  40 value 481.898311
## iter  50 value 467.836200
## iter  60 value 451.909753
## iter  70 value 446.557383
## iter  80 value 443.154690
## iter  90 value 441.178447
## iter 100 value 440.983781
## final  value 440.983781
## stopped after 100 iterations
## # weights:  302
## initial  value 687.288917
## iter  10 value 474.635224
## iter  20 value 414.329253
## iter  30 value 375.109786
## iter  40 value 365.155248
## iter  50 value 358.242551
## iter  60 value 351.133943
## iter  70 value 345.301758
## iter  80 value 343.592729
## iter  90 value 342.302276
## iter 100 value 341.981492
## final  value 341.981492
## stopped after 100 iterations
```

```
## # weights:  400
## initial  value 733.043990
## iter  10 value 494.819070
## iter  20 value 477.766934
## iter  30 value 442.174024
## iter  40 value 435.256914
## iter  50 value 414.137282
## iter  60 value 404.363004
## iter  70 value 402.889648
## iter  80 value 401.677007
## iter  90 value 399.810853
## iter 100 value 399.552971
## final  value 399.552971
## stopped after 100 iterations
## # weights:  498
## initial  value 707.604056
## iter  10 value 448.171087
## iter  20 value 426.841933
## iter  30 value 418.274291
## iter  40 value 394.567145
## iter  50 value 385.280606
## iter  60 value 378.977508
## iter  70 value 374.129306
## iter  80 value 368.754449
## iter  90 value 367.591946
## iter 100 value 359.091202
## final  value 359.091202
## stopped after 100 iterations
## # weights:  106
## initial  value 611.761797
## iter  10 value 497.684235
## iter  20 value 491.463708
## iter  30 value 489.841565
## iter  40 value 488.387351
## iter  50 value 488.334621
## iter  60 value 485.680778
## iter  70 value 485.455908
## iter  80 value 485.151661
## iter  90 value 453.902031
## iter 100 value 447.129736
## final  value 447.129736
## stopped after 100 iterations
## # weights:  204
## initial  value 666.808391
## iter  10 value 505.494301
## iter  20 value 487.259587
## iter  30 value 463.837200
## iter  40 value 459.100690
## iter  50 value 455.881017
## iter  60 value 454.963407
## iter  70 value 453.825443
## iter  80 value 453.416472
## iter  90 value 452.722222
## iter 100 value 450.696162
```

```
## final  value 450.696162
## stopped after 100 iterations
## # weights:  302
## initial  value 790.142486
## iter  10 value 518.963210
## iter  20 value 493.496896
## iter  30 value 484.374223
## iter  40 value 471.161468
## iter  50 value 463.140184
## iter  60 value 462.127542
## iter  70 value 460.826914
## iter  80 value 448.145448
## iter  90 value 437.587964
## iter 100 value 435.575437
## final  value 435.575437
## stopped after 100 iterations
## # weights:  400
## initial  value 688.402545
## iter  10 value 500.103076
## iter  20 value 479.303308
## iter  30 value 447.538309
## iter  40 value 440.592599
## iter  50 value 432.167032
## iter  60 value 412.073290
## iter  70 value 405.370225
## iter  80 value 398.768484
## iter  90 value 394.619690
## iter 100 value 391.043067
## final  value 391.043067
## stopped after 100 iterations
## # weights:  498
## initial  value 812.583212
## iter  10 value 481.631377
## iter  20 value 455.585756
## iter  30 value 436.673744
## iter  40 value 424.347434
## iter  50 value 416.292795
## iter  60 value 411.930079
## iter  70 value 406.891348
## iter  80 value 397.123144
## iter  90 value 391.398124
## iter 100 value 389.518205
## final  value 389.518205
## stopped after 100 iterations
## # weights:  106
## initial  value 613.534088
## iter  10 value 586.566140
## iter  20 value 581.327074
## iter  30 value 503.736728
## iter  40 value 491.054661
## iter  50 value 480.949038
## iter  60 value 477.710606
## iter  70 value 477.450202
## iter  80 value 477.284151
```

```
## iter  90 value 471.826678
## iter 100 value 463.269396
## final  value 463.269396
## stopped after 100 iterations
## # weights:  204
## initial  value 700.938137
## iter  10 value 554.554433
## iter  20 value 514.881124
## iter  30 value 492.773004
## iter  40 value 484.423549
## iter  50 value 479.074520
## iter  60 value 445.640999
## iter  70 value 445.231785
## iter  80 value 444.804723
## iter  90 value 438.907030
## iter 100 value 432.737643
## final  value 432.737643
## stopped after 100 iterations
## # weights:  302
## initial  value 648.164646
## iter  10 value 458.732231
## iter  20 value 452.076196
## iter  30 value 439.032782
## iter  40 value 435.304643
## iter  50 value 425.916594
## iter  60 value 422.708182
## iter  70 value 405.444359
## iter  80 value 403.557786
## iter  90 value 402.329444
## iter 100 value 400.389115
## final  value 400.389115
## stopped after 100 iterations
## # weights:  400
## initial  value 618.758184
## iter  10 value 457.104155
## iter  20 value 423.229401
## iter  30 value 408.271837
## iter  40 value 399.227332
## iter  50 value 390.631641
## iter  60 value 373.417156
## iter  70 value 361.515414
## iter  80 value 358.534299
## iter  90 value 353.233700
## iter 100 value 350.279204
## final  value 350.279204
## stopped after 100 iterations
## # weights:  498
## initial  value 765.762585
## iter  10 value 480.561436
## iter  20 value 453.531458
## iter  30 value 438.037672
## iter  40 value 432.811550
## iter  50 value 422.280289
## iter  60 value 419.675150
```

```
## iter  70 value 416.901683
## iter  80 value 410.000161
## iter  90 value 403.260107
## iter 100 value 401.103377
## final  value 401.103377
## stopped after 100 iterations
## # weights:  106
## initial  value 629.025752
## iter  10 value 492.823174
## iter  20 value 487.931459
## iter  30 value 477.946599
## iter  40 value 449.411099
## iter  50 value 444.825560
## iter  60 value 444.316422
## iter  70 value 443.293007
## iter  80 value 442.637248
## iter  90 value 441.044614
## iter 100 value 440.696507
## final  value 440.696507
## stopped after 100 iterations
## # weights:  204
## initial  value 616.639179
## iter  10 value 579.350721
## iter  20 value 524.242583
## iter  30 value 503.297327
## iter  40 value 497.137655
## iter  50 value 439.473965
## iter  60 value 417.908709
## iter  70 value 404.493033
## iter  80 value 391.853612
## iter  90 value 382.587943
## iter 100 value 372.118645
## final  value 372.118645
## stopped after 100 iterations
## # weights:  302
## initial  value 641.328161
## iter  10 value 501.339661
## iter  20 value 488.025376
## iter  30 value 482.163029
## iter  40 value 481.630882
## iter  50 value 477.775353
## iter  60 value 476.258954
## iter  70 value 471.690550
## iter  80 value 469.429413
## iter  90 value 468.274039
## iter 100 value 467.678744
## final  value 467.678744
## stopped after 100 iterations
## # weights:  400
## initial  value 572.358537
## iter  10 value 492.109418
## iter  20 value 477.129362
## iter  30 value 470.997730
## iter  40 value 468.397850
```

```
## iter  50 value 467.447532
## iter  60 value 456.369820
## iter  70 value 453.230030
## iter  80 value 429.391678
## iter  90 value 420.694909
## iter 100 value 417.169106
## final  value 417.169106
## stopped after 100 iterations
## # weights:  498
## initial  value 784.131629
## iter  10 value 522.693953
## iter  20 value 450.192422
## iter  30 value 443.705542
## iter  40 value 434.287937
## iter  50 value 425.126676
## iter  60 value 412.545956
## iter  70 value 402.252746
## iter  80 value 392.343863
## iter  90 value 389.484589
## iter 100 value 385.575155
## final  value 385.575155
## stopped after 100 iterations
## # weights:  106
## initial  value 642.385788
## iter  10 value 511.302006
## iter  20 value 504.147586
## iter  30 value 502.009584
## iter  40 value 497.424485
## iter  50 value 497.023218
## iter  60 value 496.371280
## iter  70 value 496.289269
## iter  80 value 493.009912
## iter  90 value 488.672301
## iter 100 value 484.839512
## final  value 484.839512
## stopped after 100 iterations
## # weights:  204
## initial  value 673.451808
## iter  10 value 576.965692
## iter  20 value 544.281576
## iter  30 value 526.621210
## iter  40 value 473.256441
## iter  50 value 467.249108
## iter  60 value 452.946529
## iter  70 value 423.335400
## iter  80 value 420.025272
## iter  90 value 419.246553
## iter 100 value 412.078017
## final  value 412.078017
## stopped after 100 iterations
## # weights:  302
## initial  value 753.948585
## iter  10 value 548.025028
## iter  20 value 542.152661
```

```
## iter  30 value 536.055909
## iter  40 value 532.964636
## iter  50 value 528.933687
## iter  60 value 528.808205
## iter  70 value 527.415977
## iter  80 value 526.461714
## iter  90 value 523.585163
## iter 100 value 519.901803
## final  value 519.901803
## stopped after 100 iterations
## # weights:  400
## initial  value 628.381600
## iter  10 value 463.232698
## iter  20 value 425.956926
## iter  30 value 414.655839
## iter  40 value 411.349441
## iter  50 value 403.962692
## iter  60 value 398.772680
## iter  70 value 391.628105
## iter  80 value 389.769870
## iter  90 value 382.536644
## iter 100 value 379.783453
## final  value 379.783453
## stopped after 100 iterations
## # weights:  498
## initial  value 646.114435
## iter  10 value 491.794049
## iter  20 value 435.851042
## iter  30 value 428.633171
## iter  40 value 419.115957
## iter  50 value 415.682755
## iter  60 value 413.137144
## iter  70 value 410.457858
## iter  80 value 408.960472
## iter  90 value 408.456076
## iter 100 value 406.475088
## final  value 406.475088
## stopped after 100 iterations
## # weights:  106
## initial  value 640.421697
## iter  10 value 575.813922
## iter  20 value 563.931865
## iter  30 value 540.104809
## iter  40 value 522.184297
## iter  50 value 509.927956
## iter  60 value 494.733740
## iter  70 value 457.034284
## iter  80 value 450.094871
## iter  90 value 448.416217
## iter 100 value 448.132360
## final  value 448.132360
## stopped after 100 iterations
## # weights:  204
## initial  value 656.023766
```

```
## iter  10 value 527.437980
## iter  20 value 498.939280
## iter  30 value 495.794902
## iter  40 value 494.721486
## iter  50 value 477.385824
## iter  60 value 459.002730
## iter  70 value 455.175519
## iter  80 value 452.957321
## iter  90 value 452.316332
## iter 100 value 450.754036
## final  value 450.754036
## stopped after 100 iterations
## # weights:  302
## initial  value 689.228069
## iter  10 value 583.487692
## iter  20 value 579.323162
## iter  30 value 573.867398
## iter  40 value 557.996754
## iter  50 value 535.957864
## iter  60 value 513.581325
## iter  70 value 503.442559
## iter  80 value 502.213833
## iter  90 value 500.699528
## iter 100 value 482.014308
## final  value 482.014308
## stopped after 100 iterations
## # weights:  400
## initial  value 659.509618
## iter  10 value 554.033504
## iter  20 value 517.510916
## iter  30 value 490.467217
## iter  40 value 468.117284
## iter  50 value 462.622584
## iter  60 value 453.954772
## iter  70 value 440.337985
## iter  80 value 437.466452
## iter  90 value 431.929686
## iter 100 value 430.033807
## final  value 430.033807
## stopped after 100 iterations
## # weights:  498
## initial  value 686.892591
## iter  10 value 527.286476
## iter  20 value 467.873742
## iter  30 value 448.528368
## iter  40 value 443.273159
## iter  50 value 437.190328
## iter  60 value 434.685107
## iter  70 value 429.127019
## iter  80 value 427.907124
## iter  90 value 426.850376
## iter 100 value 426.093082
## final  value 426.093082
## stopped after 100 iterations
```

```
## # weights:  106
## initial  value 623.841402
## iter  10 value 580.196061
## iter  20 value 538.916295
## iter  30 value 531.519834
## iter  40 value 527.886095
## iter  50 value 527.040583
## iter  60 value 517.268728
## iter  70 value 515.299475
## iter  80 value 514.613392
## iter  90 value 514.382238
## iter 100 value 514.033542
## final  value 514.033542
## stopped after 100 iterations
## # weights:  204
## initial  value 665.226938
## iter  10 value 464.180188
## iter  20 value 454.855005
## iter  30 value 451.515112
## iter  40 value 433.998803
## iter  50 value 431.625393
## iter  60 value 429.551386
## iter  70 value 428.634406
## iter  80 value 428.246249
## iter  90 value 416.513563
## iter 100 value 408.992737
## final  value 408.992737
## stopped after 100 iterations
## # weights:  302
## initial  value 685.277012
## iter  10 value 588.535080
## iter  20 value 556.484394
## iter  30 value 533.028288
## iter  40 value 521.377226
## iter  50 value 514.948908
## iter  60 value 504.485684
## iter  70 value 502.818218
## iter  80 value 493.629265
## iter  90 value 487.662642
## iter 100 value 486.662733
## final  value 486.662733
## stopped after 100 iterations
## # weights:  400
## initial  value 769.836052
## iter  10 value 557.398037
## iter  20 value 467.335812
## iter  30 value 448.363794
## iter  40 value 436.506765
## iter  50 value 431.045901
## iter  60 value 426.893624
## iter  70 value 417.879129
## iter  80 value 414.157856
## iter  90 value 412.923517
## iter 100 value 412.472866
```

```
## final  value 412.472866
## stopped after 100 iterations
## # weights:  498
## initial  value 702.283892
## iter  10 value 480.638966
## iter  20 value 454.171427
## iter  30 value 429.373190
## iter  40 value 426.886609
## iter  50 value 425.919301
## iter  60 value 420.975095
## iter  70 value 414.685613
## iter  80 value 410.417356
## iter  90 value 408.439713
## iter 100 value 405.142167
## final  value 405.142167
## stopped after 100 iterations
## # weights:  106
## initial  value 636.249626
## iter  10 value 549.302307
## iter  20 value 519.140372
## iter  30 value 473.536280
## iter  40 value 467.121325
## iter  50 value 457.606036
## iter  60 value 449.987861
## iter  70 value 446.789215
## iter  80 value 445.838133
## iter  90 value 445.595294
## iter 100 value 445.461592
## final  value 445.461592
## stopped after 100 iterations
## # weights:  204
## initial  value 635.256434
## iter  10 value 512.192074
## iter  20 value 482.911074
## iter  30 value 474.865746
## iter  40 value 460.822759
## iter  50 value 454.770761
## iter  60 value 450.508672
## iter  70 value 447.110842
## iter  80 value 444.888969
## iter  90 value 443.788365
## iter 100 value 441.845351
## final  value 441.845351
## stopped after 100 iterations
## # weights:  302
## initial  value 668.574069
## iter  10 value 528.025553
## iter  20 value 500.712530
## iter  30 value 487.795573
## iter  40 value 485.836716
## iter  50 value 483.718764
## iter  60 value 479.771937
## iter  70 value 472.058598
## iter  80 value 463.145830
```

```
## iter  90 value 428.451634
## iter 100 value 418.944925
## final  value 418.944925
## stopped after 100 iterations
## # weights:  400
## initial  value 685.934055
## iter  10 value 576.511510
## iter  20 value 527.311984
## iter  30 value 508.536916
## iter  40 value 490.275552
## iter  50 value 486.630306
## iter  60 value 477.246767
## iter  70 value 466.910041
## iter  80 value 464.852012
## iter  90 value 437.610777
## iter 100 value 426.142030
## final  value 426.142030
## stopped after 100 iterations
## # weights:  498
## initial  value 697.209198
## iter  10 value 519.392965
## iter  20 value 505.463177
## iter  30 value 469.476622
## iter  40 value 457.371383
## iter  50 value 452.289804
## iter  60 value 450.328178
## iter  70 value 445.421675
## iter  80 value 443.642608
## iter  90 value 441.312751
## iter 100 value 434.188703
## final  value 434.188703
## stopped after 100 iterations
## # weights:  106
## initial  value 640.981005
## iter  10 value 579.631738
## iter  20 value 579.450305
## iter  30 value 515.310803
## iter  40 value 514.395808
## iter  50 value 500.067229
## iter  60 value 495.481978
## iter  70 value 490.856767
## iter  80 value 489.120965
## iter  90 value 488.337506
## iter 100 value 486.162068
## final  value 486.162068
## stopped after 100 iterations
## # weights:  204
## initial  value 609.065041
## iter  10 value 492.110031
## iter  20 value 474.043826
## iter  30 value 453.350433
## iter  40 value 431.694988
## iter  50 value 425.867909
## iter  60 value 424.008138
```

```
## iter  70 value 423.339788
## iter  80 value 422.195545
## iter  90 value 421.553030
## iter 100 value 421.386904
## final  value 421.386904
## stopped after 100 iterations
## # weights:  302
## initial  value 642.417464
## iter  10 value 488.673828
## iter  20 value 423.961300
## iter  30 value 400.462985
## iter  40 value 396.315594
## iter  50 value 393.193240
## iter  60 value 388.848590
## iter  70 value 385.942654
## iter  80 value 384.721142
## iter  90 value 382.784768
## iter 100 value 382.215090
## final  value 382.215090
## stopped after 100 iterations
## # weights:  400
## initial  value 743.184228
## iter  10 value 494.850959
## iter  20 value 476.358325
## iter  30 value 468.753314
## iter  40 value 456.337143
## iter  50 value 454.027251
## iter  60 value 452.470583
## iter  70 value 444.616280
## iter  80 value 441.905314
## iter  90 value 429.377004
## iter 100 value 416.482513
## final  value 416.482513
## stopped after 100 iterations
## # weights:  498
## initial  value 605.681772
## iter  10 value 481.867020
## iter  20 value 455.122210
## iter  30 value 433.044362
## iter  40 value 427.138291
## iter  50 value 415.139217
## iter  60 value 403.636152
## iter  70 value 400.069887
## iter  80 value 398.955687
## iter  90 value 398.758711
## iter 100 value 396.538697
## final  value 396.538697
## stopped after 100 iterations
## # weights:  106
## initial  value 630.942333
## iter  10 value 504.588343
## iter  20 value 487.568047
## iter  30 value 452.291646
## iter  40 value 438.966158
```

```
## iter  50 value 436.350282
## iter  60 value 435.742800
## iter  70 value 435.220577
## iter  80 value 426.443258
## iter  90 value 425.401255
## iter 100 value 423.381302
## final  value 423.381302
## stopped after 100 iterations
## # weights:  204
## initial  value 673.121381
## iter  10 value 504.576467
## iter  20 value 450.297357
## iter  30 value 441.631805
## iter  40 value 430.510196
## iter  50 value 423.174142
## iter  60 value 420.183636
## iter  70 value 418.828115
## iter  80 value 407.385141
## iter  90 value 404.951151
## iter 100 value 399.436933
## final  value 399.436933
## stopped after 100 iterations
## # weights:  302
## initial  value 652.046673
## iter  10 value 487.203531
## iter  20 value 443.037635
## iter  30 value 430.928539
## iter  40 value 426.883680
## iter  50 value 426.800509
## iter  60 value 426.759028
## iter  70 value 422.718266
## iter  80 value 414.619859
## iter  90 value 412.596630
## iter 100 value 402.781797
## final  value 402.781797
## stopped after 100 iterations
## # weights:  400
## initial  value 675.730496
## iter  10 value 468.609204
## iter  20 value 458.037374
## iter  30 value 444.819732
## iter  40 value 440.003728
## iter  50 value 429.831637
## iter  60 value 420.544293
## iter  70 value 420.133442
## iter  80 value 417.592332
## iter  90 value 415.824689
## iter 100 value 413.968859
## final  value 413.968859
## stopped after 100 iterations
## # weights:  498
## initial  value 873.355308
## iter  10 value 672.798978
## iter  20 value 532.283467
```

```
## iter  30 value 436.882700
## iter  40 value 400.669726
## iter  50 value 390.368619
## iter  60 value 381.217328
## iter  70 value 362.128790
## iter  80 value 360.757270
## iter  90 value 357.831767
## iter 100 value 348.175761
## final  value 348.175761
## stopped after 100 iterations
## # weights:  106
## initial  value 667.119398
## iter  10 value 510.948046
## iter  20 value 506.239913
## iter  30 value 504.322839
## iter  40 value 502.492889
## iter  50 value 496.252413
## iter  60 value 484.462119
## iter  70 value 468.478288
## iter  80 value 455.075251
## iter  90 value 449.314261
## iter 100 value 446.328423
## final  value 446.328423
## stopped after 100 iterations
## # weights:  204
## initial  value 634.238262
## iter  10 value 524.835324
## iter  20 value 514.523677
## iter  30 value 500.583078
## iter  40 value 459.095932
## iter  50 value 445.355977
## iter  60 value 436.662871
## iter  70 value 429.277944
## iter  80 value 427.712741
## iter  90 value 426.597383
## iter 100 value 419.623965
## final  value 419.623965
## stopped after 100 iterations
## # weights:  302
## initial  value 637.100772
## iter  10 value 491.434000
## iter  20 value 471.681804
## iter  30 value 461.757282
## iter  40 value 461.551375
## iter  50 value 459.397688
## iter  60 value 458.463800
## iter  70 value 458.158956
## iter  80 value 457.578378
## iter  90 value 448.424277
## iter 100 value 444.264361
## final  value 444.264361
## stopped after 100 iterations
## # weights:  400
## initial  value 841.381531
```

```
## iter  10 value 506.796347
## iter  20 value 482.399421
## iter  30 value 466.889086
## iter  40 value 438.699991
## iter  50 value 426.161262
## iter  60 value 423.349159
## iter  70 value 420.315794
## iter  80 value 415.529905
## iter  90 value 410.111356
## iter 100 value 409.810140
## final  value 409.810140
## stopped after 100 iterations
## # weights:  498
## initial  value 647.953198
## iter  10 value 457.977306
## iter  20 value 438.874606
## iter  30 value 416.800501
## iter  40 value 400.742626
## iter  50 value 390.673414
## iter  60 value 382.594095
## iter  70 value 379.533980
## iter  80 value 377.531919
## iter  90 value 375.949775
## iter 100 value 373.462454
## final  value 373.462454
## stopped after 100 iterations
## # weights:  106
## initial  value 661.061581
## iter  10 value 584.184474
## iter  20 value 515.640299
## iter  30 value 501.948227
## iter  40 value 501.118066
## iter  50 value 500.405704
## iter  60 value 500.106775
## iter  70 value 489.969309
## iter  80 value 483.367603
## iter  90 value 478.320229
## iter 100 value 476.073628
## final  value 476.073628
## stopped after 100 iterations
## # weights:  204
## initial  value 618.983328
## iter  10 value 501.987989
## iter  20 value 483.055941
## iter  30 value 469.091398
## iter  40 value 463.126502
## iter  50 value 458.581691
## iter  60 value 457.378553
## iter  70 value 452.777255
## iter  80 value 446.664726
## iter  90 value 428.725966
## iter 100 value 425.551401
## final  value 425.551401
## stopped after 100 iterations
```

```
## # weights:  302
## initial  value 702.129809
## iter  10 value 516.573163
## iter  20 value 479.723131
## iter  30 value 466.297501
## iter  40 value 465.064302
## iter  50 value 449.026026
## iter  60 value 431.150305
## iter  70 value 430.487467
## iter  80 value 417.804466
## iter  90 value 416.899879
## iter 100 value 393.489683
## final  value 393.489683
## stopped after 100 iterations
## # weights:  400
## initial  value 639.717932
## iter  10 value 483.715261
## iter  20 value 471.787633
## iter  30 value 470.623621
## iter  40 value 457.480702
## iter  50 value 451.125525
## iter  60 value 430.144553
## iter  70 value 423.871920
## iter  80 value 423.109890
## iter  90 value 418.949779
## iter 100 value 417.619930
## final  value 417.619930
## stopped after 100 iterations
## # weights:  498
## initial  value 787.030511
## iter  10 value 495.762663
## iter  20 value 456.979469
## iter  30 value 423.190600
## iter  40 value 411.516399
## iter  50 value 401.067230
## iter  60 value 389.936178
## iter  70 value 386.699295
## iter  80 value 384.097701
## iter  90 value 382.082255
## iter 100 value 381.354483
## final  value 381.354483
## stopped after 100 iterations
## # weights:  106
## initial  value 599.374473
## iter  10 value 514.121526
## iter  20 value 485.977522
## iter  30 value 482.648943
## iter  40 value 476.354441
## iter  50 value 472.744870
## iter  60 value 457.927363
## iter  70 value 456.644138
## iter  80 value 450.517201
## iter  90 value 446.267612
## iter 100 value 446.197158
```

```
## final  value 446.197158
## stopped after 100 iterations
## # weights:  204
## initial  value 653.337245
## iter  10 value 581.819577
## iter  20 value 516.070395
## iter  30 value 493.307925
## iter  40 value 426.842462
## iter  50 value 414.854160
## iter  60 value 412.574647
## iter  70 value 405.296270
## iter  80 value 394.561868
## iter  90 value 381.883338
## iter 100 value 370.061225
## final  value 370.061225
## stopped after 100 iterations
## # weights:  302
## initial  value 643.217296
## iter  10 value 534.710284
## iter  20 value 491.684058
## iter  30 value 480.973352
## iter  40 value 473.406144
## iter  50 value 468.928508
## iter  60 value 463.673196
## iter  70 value 462.821363
## iter  80 value 460.930079
## iter  90 value 459.875138
## iter 100 value 459.056962
## final  value 459.056962
## stopped after 100 iterations
## # weights:  400
## initial  value 626.844418
## iter  10 value 461.710136
## iter  20 value 429.310458
## iter  30 value 411.732793
## iter  40 value 410.945420
## iter  50 value 403.035842
## iter  60 value 397.244908
## iter  70 value 396.279395
## iter  80 value 392.995993
## iter  90 value 391.895051
## iter 100 value 391.309000
## final  value 391.309000
## stopped after 100 iterations
## # weights:  498
## initial  value 697.441631
## iter  10 value 516.457304
## iter  20 value 474.826663
## iter  30 value 452.788088
## iter  40 value 444.444835
## iter  50 value 435.926105
## iter  60 value 429.599447
## iter  70 value 420.698837
## iter  80 value 408.769498
```

```
## iter  90 value 392.756760
## iter 100 value 385.461842
## final  value 385.461842
## stopped after 100 iterations
## # weights:  106
## initial  value 642.038284
## iter  10 value 477.523021
## iter  20 value 456.786616
## iter  30 value 447.416266
## iter  40 value 445.551186
## iter  50 value 440.676498
## iter  60 value 436.971031
## iter  70 value 436.308568
## iter  80 value 436.259568
## iter  90 value 435.466797
## iter 100 value 434.354243
## final  value 434.354243
## stopped after 100 iterations
## # weights:  204
## initial  value 638.892451
## iter  10 value 492.475610
## iter  20 value 484.749458
## iter  30 value 483.995536
## iter  40 value 475.287092
## iter  50 value 473.021782
## iter  60 value 454.912388
## iter  70 value 448.985292
## iter  80 value 436.883567
## iter  90 value 430.656145
## iter 100 value 425.691190
## final  value 425.691190
## stopped after 100 iterations
## # weights:  302
## initial  value 595.403903
## iter  10 value 493.990376
## iter  20 value 472.317347
## iter  30 value 462.647755
## iter  40 value 458.463723
## iter  50 value 454.781837
## iter  60 value 452.459170
## iter  70 value 438.809484
## iter  80 value 437.430300
## iter  90 value 434.199242
## iter 100 value 431.537122
## final  value 431.537122
## stopped after 100 iterations
## # weights:  400
## initial  value 720.809629
## iter  10 value 556.705783
## iter  20 value 533.929832
## iter  30 value 520.341423
## iter  40 value 500.310257
## iter  50 value 475.548613
## iter  60 value 462.504231
```

```
## iter  70 value 442.290822
## iter  80 value 434.318968
## iter  90 value 426.364942
## iter 100 value 422.212160
## final  value 422.212160
## stopped after 100 iterations
## # weights:  498
## initial  value 756.518781
## iter  10 value 483.926863
## iter  20 value 432.907964
## iter  30 value 413.099437
## iter  40 value 404.913192
## iter  50 value 388.513684
## iter  60 value 381.200566
## iter  70 value 380.088599
## iter  80 value 377.750401
## iter  90 value 376.209194
## iter 100 value 371.170149
## final  value 371.170149
## stopped after 100 iterations
## # weights:  106
## initial  value 606.840658
## iter  10 value 579.004533
## iter  20 value 539.460621
## iter  30 value 462.237542
## iter  40 value 455.953592
## iter  50 value 451.433234
## iter  60 value 443.568882
## iter  70 value 435.632468
## iter  80 value 429.849005
## iter  90 value 426.325537
## iter 100 value 421.269841
## final  value 421.269841
## stopped after 100 iterations
## # weights:  204
## initial  value 650.003869
## iter  10 value 560.867350
## iter  20 value 552.596285
## iter  30 value 540.665081
## iter  40 value 538.956222
## iter  50 value 532.775618
## iter  60 value 531.655027
## iter  70 value 528.054904
## iter  80 value 527.433541
## iter  90 value 526.998018
## iter 100 value 526.695150
## final  value 526.695150
## stopped after 100 iterations
## # weights:  302
## initial  value 672.573483
## iter  10 value 531.289552
## iter  20 value 508.415956
## iter  30 value 500.024081
## iter  40 value 493.130714
```

```
## iter  50 value 489.158682
## iter  60 value 484.775020
## iter  70 value 479.997378
## iter  80 value 479.338749
## iter  90 value 476.772247
## iter 100 value 473.320967
## final  value 473.320967
## stopped after 100 iterations
## # weights:  400
## initial  value 701.608742
## iter  10 value 553.920903
## iter  20 value 533.160542
## iter  30 value 498.990799
## iter  40 value 481.411176
## iter  50 value 475.485573
## iter  60 value 471.153794
## iter  70 value 456.623319
## iter  80 value 441.930316
## iter  90 value 438.239639
## iter 100 value 437.055385
## final  value 437.055385
## stopped after 100 iterations
## # weights:  498
## initial  value 834.415320
## iter  10 value 515.303732
## iter  20 value 412.084415
## iter  30 value 403.432195
## iter  40 value 389.017156
## iter  50 value 373.247688
## iter  60 value 358.151706
## iter  70 value 352.324276
## iter  80 value 350.320976
## iter  90 value 341.505076
## iter 100 value 336.047059
## final  value 336.047059
## stopped after 100 iterations
## # weights:  106
## initial  value 633.374298
## iter  10 value 518.848632
## iter  20 value 507.395396
## iter  30 value 504.874217
## iter  40 value 497.219890
## iter  50 value 496.634060
## iter  60 value 487.532232
## iter  70 value 481.797517
## iter  80 value 479.274854
## iter  90 value 476.000226
## iter 100 value 474.716176
## final  value 474.716176
## stopped after 100 iterations
## # weights:  204
## initial  value 641.238021
## iter  10 value 514.434552
## iter  20 value 512.726059
```

```
## iter  30 value 507.674672
## iter  40 value 488.050791
## iter  50 value 483.739417
## iter  60 value 481.657459
## iter  70 value 480.505265
## iter  80 value 474.403170
## iter  90 value 473.892799
## iter 100 value 472.697909
## final  value 472.697909
## stopped after 100 iterations
## # weights:  302
## initial  value 794.739986
## iter  10 value 528.472419
## iter  20 value 495.993561
## iter  30 value 487.503077
## iter  40 value 483.240019
## iter  50 value 469.342205
## iter  60 value 461.468792
## iter  70 value 450.541888
## iter  80 value 447.804152
## iter  90 value 445.095662
## iter 100 value 426.437759
## final  value 426.437759
## stopped after 100 iterations
## # weights:  400
## initial  value 784.288925
## iter  10 value 530.478932
## iter  20 value 497.740372
## iter  30 value 488.567437
## iter  40 value 475.346772
## iter  50 value 460.431635
## iter  60 value 454.823592
## iter  70 value 453.389565
## iter  80 value 451.808340
## iter  90 value 445.574263
## iter 100 value 444.943665
## final  value 444.943665
## stopped after 100 iterations
## # weights:  498
## initial  value 617.394324
## iter  10 value 510.206553
## iter  20 value 422.831997
## iter  30 value 404.520950
## iter  40 value 396.611311
## iter  50 value 391.278558
## iter  60 value 380.027553
## iter  70 value 379.513760
## iter  80 value 378.486101
## iter  90 value 377.788804
## iter 100 value 377.234241
## final  value 377.234241
## stopped after 100 iterations
## # weights:  106
## initial  value 613.795879
```

```
## iter  10 value 588.896589
## iter  20 value 583.699285
## iter  30 value 581.701089
## iter  40 value 575.800732
## iter  50 value 514.329288
## iter  60 value 512.890360
## iter  70 value 505.363183
## iter  80 value 467.771266
## iter  90 value 457.543025
## iter 100 value 450.749528
## final  value 450.749528
## stopped after 100 iterations
## # weights:  204
## initial  value 647.206472
## iter  10 value 516.577568
## iter  20 value 510.569453
## iter  30 value 504.749346
## iter  40 value 480.424064
## iter  50 value 477.388761
## iter  60 value 476.488605
## iter  70 value 474.527463
## iter  80 value 469.848801
## iter  90 value 467.605645
## iter 100 value 460.371002
## final  value 460.371002
## stopped after 100 iterations
## # weights:  302
## initial  value 617.549562
## iter  10 value 462.502535
## iter  20 value 444.539216
## iter  30 value 441.946472
## iter  40 value 437.361886
## iter  50 value 423.785698
## iter  60 value 416.075331
## iter  70 value 413.432849
## iter  80 value 407.955346
## iter  90 value 404.382611
## iter 100 value 398.365428
## final  value 398.365428
## stopped after 100 iterations
## # weights:  400
## initial  value 730.026409
## iter  10 value 561.160550
## iter  20 value 539.656726
## iter  30 value 536.391984
## iter  40 value 481.133983
## iter  50 value 432.785470
## iter  60 value 427.994947
## iter  70 value 413.470833
## iter  80 value 408.522609
## iter  90 value 391.644324
## iter 100 value 380.173150
## final  value 380.173150
## stopped after 100 iterations
```

```
## # weights:  498
## initial  value 690.013545
## iter  10 value 582.075809
## iter  20 value 536.044724
## iter  30 value 532.889538
## iter  40 value 500.211328
## iter  50 value 489.441204
## iter  60 value 483.898228
## iter  70 value 480.631607
## iter  80 value 479.657759
## iter  90 value 477.520856
## iter 100 value 476.337250
## final  value 476.337250
## stopped after 100 iterations
## # weights:  106
## initial  value 582.302768
## iter  10 value 482.437191
## iter  20 value 477.404866
## iter  30 value 467.599888
## iter  40 value 460.613710
## iter  50 value 453.139154
## iter  60 value 449.781608
## iter  70 value 448.574460
## iter  80 value 448.360191
## iter  90 value 448.169727
## iter 100 value 444.635372
## final  value 444.635372
## stopped after 100 iterations
## # weights:  204
## initial  value 643.586012
## iter  10 value 537.482784
## iter  20 value 513.261096
## iter  30 value 504.050561
## iter  40 value 501.543933
## iter  50 value 499.195456
## iter  60 value 498.166309
## iter  70 value 497.377986
## iter  80 value 488.728417
## iter  90 value 483.120787
## iter 100 value 480.950663
## final  value 480.950663
## stopped after 100 iterations
## # weights:  302
## initial  value 690.874913
## iter  10 value 565.589767
## iter  20 value 558.010127
## iter  30 value 543.310669
## iter  40 value 538.493099
## iter  50 value 536.763175
## iter  60 value 531.297465
## iter  70 value 527.938967
## iter  80 value 524.796678
## iter  90 value 504.459333
## iter 100 value 463.728138
```

```
## final  value 463.728138
## stopped after 100 iterations
## # weights:  400
## initial  value 685.363378
## iter  10 value 462.420832
## iter  20 value 429.433440
## iter  30 value 417.542901
## iter  40 value 405.501472
## iter  50 value 403.704611
## iter  60 value 403.431090
## iter  70 value 401.871472
## iter  80 value 393.853315
## iter  90 value 391.342510
## iter 100 value 388.281076
## final  value 388.281076
## stopped after 100 iterations
## # weights:  498
## initial  value 664.852621
## iter  10 value 472.750742
## iter  20 value 444.367104
## iter  30 value 432.650773
## iter  40 value 420.491366
## iter  50 value 416.854649
## iter  60 value 410.688204
## iter  70 value 408.969527
## iter  80 value 407.504766
## iter  90 value 402.435358
## iter 100 value 401.379089
## final  value 401.379089
## stopped after 100 iterations
## # weights:  106
## initial  value 642.979502
## iter  10 value 507.279666
## iter  20 value 487.706567
## iter  30 value 483.716638
## iter  40 value 475.827336
## iter  50 value 473.662657
## iter  60 value 469.121781
## iter  70 value 464.837176
## iter  80 value 463.266069
## iter  90 value 453.780066
## iter 100 value 431.882313
## final  value 431.882313
## stopped after 100 iterations
## # weights:  204
## initial  value 637.950209
## iter  10 value 555.040373
## iter  20 value 503.853026
## iter  30 value 493.059521
## iter  40 value 458.408159
## iter  50 value 448.950243
## iter  60 value 443.731086
## iter  70 value 441.542992
## iter  80 value 439.910580
```

```
## iter  90 value 439.689175
## iter 100 value 439.048510
## final  value 439.048510
## stopped after 100 iterations
## # weights:  302
## initial  value 670.100822
## iter  10 value 491.282383
## iter  20 value 484.381472
## iter  30 value 479.556796
## iter  40 value 473.034962
## iter  50 value 465.764224
## iter  60 value 449.603649
## iter  70 value 426.314332
## iter  80 value 424.834717
## iter  90 value 414.900739
## iter 100 value 413.195940
## final  value 413.195940
## stopped after 100 iterations
## # weights:  400
## initial  value 636.420744
## iter  10 value 474.392614
## iter  20 value 447.888122
## iter  30 value 437.100666
## iter  40 value 434.834473
## iter  50 value 429.781973
## iter  60 value 429.434955
## iter  70 value 429.412156
## iter  80 value 428.747197
## iter  90 value 428.332848
## iter 100 value 428.223818
## final  value 428.223818
## stopped after 100 iterations
## # weights:  498
## initial  value 725.478302
## iter  10 value 488.970013
## iter  20 value 435.053075
## iter  30 value 425.270350
## iter  40 value 420.589516
## iter  50 value 417.831391
## iter  60 value 407.873728
## iter  70 value 403.873389
## iter  80 value 401.011731
## iter  90 value 400.367370
## iter 100 value 400.096883
## final  value 400.096883
## stopped after 100 iterations
## # weights:  106
## initial  value 654.162797
## iter  10 value 581.148027
## iter  20 value 548.339155
## iter  30 value 522.778604
## iter  40 value 486.295283
## iter  50 value 474.312060
## iter  60 value 459.466700
```

```
## iter  70 value 453.958889
## iter  80 value 443.885412
## iter  90 value 441.091916
## iter 100 value 439.860185
## final  value 439.860185
## stopped after 100 iterations
## # weights:  204
## initial  value 671.739179
## iter  10 value 534.893344
## iter  20 value 513.511799
## iter  30 value 498.075921
## iter  40 value 478.322959
## iter  50 value 475.652865
## iter  60 value 470.962904
## iter  70 value 465.999527
## iter  80 value 463.711811
## iter  90 value 462.485883
## iter 100 value 457.428503
## final  value 457.428503
## stopped after 100 iterations
## # weights:  302
## initial  value 625.762573
## iter  10 value 516.905407
## iter  20 value 482.922491
## iter  30 value 461.342725
## iter  40 value 452.210956
## iter  50 value 448.111345
## iter  60 value 445.731217
## iter  70 value 430.321569
## iter  80 value 425.536176
## iter  90 value 418.545646
## iter 100 value 412.012365
## final  value 412.012365
## stopped after 100 iterations
## # weights:  400
## initial  value 703.865413
## iter  10 value 465.927064
## iter  20 value 427.918417
## iter  30 value 412.579697
## iter  40 value 394.591372
## iter  50 value 386.906468
## iter  60 value 385.562420
## iter  70 value 384.909084
## iter  80 value 383.484085
## iter  90 value 381.699116
## iter 100 value 380.340332
## final  value 380.340332
## stopped after 100 iterations
## # weights:  498
## initial  value 750.818954
## iter  10 value 607.387455
## iter  20 value 562.215173
## iter  30 value 506.216009
## iter  40 value 494.886493
```

```
## iter  50 value 472.690720
## iter  60 value 468.086886
## iter  70 value 467.099569
## iter  80 value 462.416337
## iter  90 value 456.918465
## iter 100 value 452.214236
## final  value 452.214236
## stopped after 100 iterations
## # weights:  106
## initial  value 628.150794
## iter  10 value 552.057293
## iter  20 value 532.401097
## iter  30 value 529.231526
## iter  40 value 526.553668
## iter  50 value 523.422402
## iter  60 value 520.668005
## iter  70 value 518.317789
## iter  80 value 500.951987
## iter  90 value 492.223861
## iter 100 value 485.429613
## final  value 485.429613
## stopped after 100 iterations
## # weights:  204
## initial  value 636.622442
## iter  10 value 499.051233
## iter  20 value 455.575055
## iter  30 value 437.152806
## iter  40 value 428.564389
## iter  50 value 426.815701
## iter  60 value 423.367959
## iter  70 value 421.726508
## iter  80 value 421.247335
## iter  90 value 420.903894
## iter 100 value 417.723300
## final  value 417.723300
## stopped after 100 iterations
## # weights:  302
## initial  value 625.987566
## iter  10 value 500.883220
## iter  20 value 486.699798
## iter  30 value 481.490905
## iter  40 value 469.649871
## iter  50 value 457.998725
## iter  60 value 454.589386
## iter  70 value 452.460968
## iter  80 value 451.041475
## iter  90 value 447.052816
## iter 100 value 443.276454
## final  value 443.276454
## stopped after 100 iterations
## # weights:  400
## initial  value 679.489559
## iter  10 value 475.938931
## iter  20 value 454.746798
```

```
## iter  30 value 438.244039
## iter  40 value 434.065590
## iter  50 value 431.890125
## iter  60 value 415.473010
## iter  70 value 413.341822
## iter  80 value 410.586229
## iter  90 value 410.099619
## iter 100 value 409.773734
## final  value 409.773734
## stopped after 100 iterations
## # weights:  498
## initial  value 661.236536
## iter  10 value 502.169664
## iter  20 value 445.948481
## iter  30 value 409.022099
## iter  40 value 401.071197
## iter  50 value 392.812409
## iter  60 value 363.668808
## iter  70 value 353.313093
## iter  80 value 352.127289
## iter  90 value 349.541828
## iter 100 value 342.366248
## final  value 342.366248
## stopped after 100 iterations
## # weights:  106
## initial  value 605.955785
## iter  10 value 519.013676
## iter  20 value 493.525156
## iter  30 value 488.749605
## iter  40 value 466.355272
## iter  50 value 452.844857
## iter  60 value 444.396633
## iter  70 value 442.018190
## iter  80 value 439.765562
## iter  90 value 438.926766
## iter 100 value 436.550987
## final  value 436.550987
## stopped after 100 iterations
## # weights:  204
## initial  value 602.744949
## iter  10 value 521.154819
## iter  20 value 500.050773
## iter  30 value 492.738880
## iter  40 value 483.675659
## iter  50 value 481.266796
## iter  60 value 475.482525
## iter  70 value 457.767305
## iter  80 value 444.207489
## iter  90 value 427.233350
## iter 100 value 415.931631
## final  value 415.931631
## stopped after 100 iterations
## # weights:  302
## initial  value 689.636079
```

```
## iter  10 value 505.973119
## iter  20 value 493.193943
## iter  30 value 484.849513
## iter  40 value 468.938555
## iter  50 value 457.146146
## iter  60 value 451.422711
## iter  70 value 450.298068
## iter  80 value 449.462052
## iter  90 value 446.897299
## iter 100 value 443.536374
## final  value 443.536374
## stopped after 100 iterations
## # weights:  400
## initial  value 656.140939
## iter  10 value 527.391891
## iter  20 value 510.856614
## iter  30 value 485.372037
## iter  40 value 468.771349
## iter  50 value 467.469749
## iter  60 value 465.867626
## iter  70 value 465.036153
## iter  80 value 461.234887
## iter  90 value 423.025873
## iter 100 value 414.532946
## final  value 414.532946
## stopped after 100 iterations
## # weights:  498
## initial  value 775.085310
## iter  10 value 480.696257
## iter  20 value 448.369645
## iter  30 value 437.258005
## iter  40 value 435.055458
## iter  50 value 431.435552
## iter  60 value 428.496206
## iter  70 value 423.931063
## iter  80 value 413.865555
## iter  90 value 408.630790
## iter 100 value 405.442949
## final  value 405.442949
## stopped after 100 iterations
## # weights:  106
## initial  value 638.810790
## iter  10 value 579.508383
## iter  20 value 548.022802
## iter  30 value 484.944882
## iter  40 value 476.083599
## iter  50 value 465.579847
## iter  60 value 461.455818
## iter  70 value 460.143739
## iter  80 value 453.171903
## iter  90 value 448.584069
## iter 100 value 447.305825
## final  value 447.305825
## stopped after 100 iterations
```

```
## # weights:  204
## initial  value 656.471445
## iter  10 value 562.651551
## iter  20 value 519.293901
## iter  30 value 502.361096
## iter  40 value 501.389938
## iter  50 value 500.380687
## iter  60 value 495.672141
## iter  70 value 490.592048
## iter  80 value 482.723125
## iter  90 value 465.838088
## iter 100 value 461.447953
## final  value 461.447953
## stopped after 100 iterations
## # weights:  302
## initial  value 695.913561
## iter  10 value 555.793918
## iter  20 value 497.185173
## iter  30 value 473.196093
## iter  40 value 469.820212
## iter  50 value 463.900019
## iter  60 value 459.789201
## iter  70 value 453.472316
## iter  80 value 447.943806
## iter  90 value 442.988218
## iter 100 value 431.123774
## final  value 431.123774
## stopped after 100 iterations
## # weights:  400
## initial  value 751.665006
## iter  10 value 507.503868
## iter  20 value 492.801423
## iter  30 value 478.637776
## iter  40 value 462.399788
## iter  50 value 455.759577
## iter  60 value 451.336766
## iter  70 value 444.436111
## iter  80 value 441.513058
## iter  90 value 439.531034
## iter 100 value 424.823544
## final  value 424.823544
## stopped after 100 iterations
## # weights:  498
## initial  value 658.854978
## iter  10 value 571.967497
## iter  20 value 556.876017
## iter  30 value 475.793391
## iter  40 value 453.164472
## iter  50 value 445.681524
## iter  60 value 427.595848
## iter  70 value 416.222329
## iter  80 value 402.523016
## iter  90 value 399.682853
## iter 100 value 394.658410
```

```
## final  value 394.658410
## stopped after 100 iterations
## # weights:  106
## initial  value 593.966133
## iter  10 value 487.084350
## iter  20 value 477.278435
## iter  30 value 466.923163
## iter  40 value 465.892419
## iter  50 value 464.209301
## iter  60 value 461.611504
## iter  70 value 439.258754
## iter  80 value 435.929613
## iter  90 value 430.040135
## iter 100 value 424.734364
## final  value 424.734364
## stopped after 100 iterations
## # weights:  204
## initial  value 666.321896
## iter  10 value 548.637843
## iter  20 value 533.835586
## iter  30 value 497.837285
## iter  40 value 493.965017
## iter  50 value 492.094831
## iter  60 value 490.997929
## iter  70 value 489.878081
## iter  80 value 477.290267
## iter  90 value 467.672801
## iter 100 value 463.786443
## final  value 463.786443
## stopped after 100 iterations
## # weights:  302
## initial  value 603.646792
## iter  10 value 465.089766
## iter  20 value 449.172539
## iter  30 value 439.661583
## iter  40 value 436.255778
## iter  50 value 435.153450
## iter  60 value 431.308083
## iter  70 value 413.368143
## iter  80 value 400.027241
## iter  90 value 384.792008
## iter 100 value 383.420789
## final  value 383.420789
## stopped after 100 iterations
## # weights:  400
## initial  value 637.460821
## iter  10 value 511.862921
## iter  20 value 485.104955
## iter  30 value 475.689073
## iter  40 value 472.481184
## iter  50 value 471.475758
## iter  60 value 471.025060
## iter  70 value 470.117379
## iter  80 value 469.511577
```

```
## iter  90 value 468.881343
## iter 100 value 468.424464
## final  value 468.424464
## stopped after 100 iterations
## # weights:  498
## initial  value 631.880178
## iter  10 value 496.099493
## iter  20 value 457.953503
## iter  30 value 449.934403
## iter  40 value 437.300808
## iter  50 value 431.441693
## iter  60 value 424.988319
## iter  70 value 418.192208
## iter  80 value 413.016553
## iter  90 value 409.581016
## iter 100 value 409.039946
## final  value 409.039946
## stopped after 100 iterations
## # weights:  106
## initial  value 626.719542
## iter  10 value 504.583099
## iter  20 value 495.529466
## iter  30 value 466.718700
## iter  40 value 444.347963
## iter  50 value 433.690854
## iter  60 value 420.308030
## iter  70 value 417.457685
## iter  80 value 416.463137
## iter  90 value 413.065180
## iter 100 value 397.342532
## final  value 397.342532
## stopped after 100 iterations
## # weights:  204
## initial  value 743.149839
## iter  10 value 486.594621
## iter  20 value 444.733508
## iter  30 value 442.788622
## iter  40 value 415.545520
## iter  50 value 411.490146
## iter  60 value 408.157471
## iter  70 value 406.455005
## iter  80 value 402.398079
## iter  90 value 401.773433
## iter 100 value 395.092877
## final  value 395.092877
## stopped after 100 iterations
## # weights:  302
## initial  value 730.724729
## iter  10 value 536.810498
## iter  20 value 497.969102
## iter  30 value 468.644901
## iter  40 value 446.317394
## iter  50 value 422.019408
## iter  60 value 407.215778
```

```
## iter  70 value 399.977993
## iter  80 value 389.759457
## iter  90 value 387.698316
## iter 100 value 385.185119
## final  value 385.185119
## stopped after 100 iterations
## # weights:  400
## initial  value 731.681083
## iter  10 value 483.895358
## iter  20 value 458.830326
## iter  30 value 451.206509
## iter  40 value 448.136920
## iter  50 value 444.550123
## iter  60 value 443.500482
## iter  70 value 439.245301
## iter  80 value 438.777255
## iter  90 value 437.264027
## iter 100 value 434.971034
## final  value 434.971034
## stopped after 100 iterations
## # weights:  498
## initial  value 766.885900
## iter  10 value 506.315502
## iter  20 value 483.553180
## iter  30 value 469.187082
## iter  40 value 464.264464
## iter  50 value 458.439135
## iter  60 value 450.502212
## iter  70 value 446.013448
## iter  80 value 443.628513
## iter  90 value 443.396004
## iter 100 value 442.447700
## final  value 442.447700
## stopped after 100 iterations
## # weights:  106
## initial  value 667.379820
## iter  10 value 541.862845
## iter  20 value 502.563089
## iter  30 value 483.187429
## iter  40 value 481.582069
## iter  50 value 479.971895
## iter  60 value 479.923770
## iter  70 value 479.918722
## iter  80 value 479.911898
## iter  90 value 479.906352
## iter 100 value 479.878588
## final  value 479.878588
## stopped after 100 iterations
## # weights:  204
## initial  value 650.411603
## iter  10 value 538.205276
## iter  20 value 522.046321
## iter  30 value 507.773249
## iter  40 value 500.743477
```

```
## iter  50 value 494.207889
## iter  60 value 475.371700
## iter  70 value 461.613938
## iter  80 value 461.469928
## iter  90 value 457.102759
## iter 100 value 450.932228
## final  value 450.932228
## stopped after 100 iterations
## # weights:  302
## initial  value 628.510866
## iter  10 value 428.992991
## iter  20 value 416.179987
## iter  30 value 408.816800
## iter  40 value 397.800118
## iter  50 value 391.448347
## iter  60 value 386.004536
## iter  70 value 384.784434
## iter  80 value 384.528047
## iter  90 value 383.697792
## iter 100 value 372.293095
## final  value 372.293095
## stopped after 100 iterations
## # weights:  400
## initial  value 687.360890
## iter  10 value 499.232155
## iter  20 value 459.306394
## iter  30 value 450.816361
## iter  40 value 448.263726
## iter  50 value 446.050591
## iter  60 value 442.920869
## iter  70 value 442.770201
## iter  80 value 440.085584
## iter  90 value 422.721644
## iter 100 value 411.806007
## final  value 411.806007
## stopped after 100 iterations
## # weights:  498
## initial  value 704.192663
## iter  10 value 529.107328
## iter  20 value 504.913182
## iter  30 value 493.201089
## iter  40 value 477.788354
## iter  50 value 469.744655
## iter  60 value 456.481826
## iter  70 value 446.623782
## iter  80 value 431.548363
## iter  90 value 422.279466
## iter 100 value 416.996543
## final  value 416.996543
## stopped after 100 iterations
## # weights:  106
## initial  value 606.706595
## iter  10 value 508.559796
## iter  20 value 502.900547
```

```
## iter  30 value 502.046070
## iter  40 value 501.138614
## iter  50 value 497.358806
## iter  60 value 494.978922
## iter  70 value 488.048293
## iter  80 value 483.391727
## iter  90 value 483.138537
## iter 100 value 478.987157
## final  value 478.987157
## stopped after 100 iterations
## # weights:  204
## initial  value 684.758978
## iter  10 value 521.807976
## iter  20 value 510.918655
## iter  30 value 508.117640
## iter  40 value 507.195079
## iter  50 value 506.727456
## iter  60 value 505.780843
## iter  70 value 505.463571
## iter  80 value 503.272050
## iter  90 value 501.368256
## iter 100 value 496.678564
## final  value 496.678564
## stopped after 100 iterations
## # weights:  302
## initial  value 726.634249
## iter  10 value 572.892411
## iter  20 value 569.587225
## iter  30 value 563.752139
## iter  40 value 551.848286
## iter  50 value 541.967476
## iter  60 value 522.110378
## iter  70 value 505.376786
## iter  80 value 500.129856
## iter  90 value 499.019862
## iter 100 value 496.184357
## final  value 496.184357
## stopped after 100 iterations
## # weights:  400
## initial  value 736.178305
## iter  10 value 593.840533
## iter  20 value 557.005005
## iter  30 value 520.786867
## iter  40 value 491.712762
## iter  50 value 459.594416
## iter  60 value 448.392684
## iter  70 value 446.068050
## iter  80 value 444.436149
## iter  90 value 424.924828
## iter 100 value 412.687069
## final  value 412.687069
## stopped after 100 iterations
## # weights:  498
## initial  value 627.300056
```

```
## iter  10 value 489.475173
## iter  20 value 453.885745
## iter  30 value 433.346678
## iter  40 value 424.930596
## iter  50 value 405.804776
## iter  60 value 399.411792
## iter  70 value 389.149504
## iter  80 value 386.832887
## iter  90 value 383.196105
## iter 100 value 378.303151
## final  value 378.303151
## stopped after 100 iterations
## # weights:  106
## initial  value 637.500059
## iter  10 value 568.728720
## iter  20 value 519.273725
## iter  30 value 515.080500
## iter  40 value 504.421409
## iter  50 value 494.382952
## iter  60 value 490.211021
## iter  70 value 489.574090
## iter  80 value 489.321900
## iter  90 value 489.190743
## iter 100 value 488.923211
## final  value 488.923211
## stopped after 100 iterations
## # weights:  204
## initial  value 725.289057
## iter  10 value 523.177465
## iter  20 value 511.511671
## iter  30 value 509.640778
## iter  40 value 506.724582
## iter  50 value 505.316103
## iter  60 value 504.843923
## iter  70 value 464.254207
## iter  80 value 443.859882
## iter  90 value 435.166661
## iter 100 value 431.817037
## final  value 431.817037
## stopped after 100 iterations
## # weights:  302
## initial  value 713.144772
## iter  10 value 565.326986
## iter  20 value 493.170416
## iter  30 value 484.334566
## iter  40 value 452.423335
## iter  50 value 438.559488
## iter  60 value 432.822499
## iter  70 value 428.934753
## iter  80 value 425.558840
## iter  90 value 422.442567
## iter 100 value 421.610421
## final  value 421.610421
## stopped after 100 iterations
```

```
## # weights:  400
## initial  value 763.602399
## iter  10 value 505.112769
## iter  20 value 475.650700
## iter  30 value 445.695202
## iter  40 value 438.594765
## iter  50 value 436.663252
## iter  60 value 434.513384
## iter  70 value 430.711605
## iter  80 value 429.287594
## iter  90 value 428.539946
## iter 100 value 423.880948
## final  value 423.880948
## stopped after 100 iterations
## # weights:  498
## initial  value 715.747386
## iter  10 value 559.710394
## iter  20 value 497.916174
## iter  30 value 460.750018
## iter  40 value 451.291855
## iter  50 value 435.171023
## iter  60 value 421.158606
## iter  70 value 408.383448
## iter  80 value 400.041712
## iter  90 value 393.849109
## iter 100 value 379.860198
## final  value 379.860198
## stopped after 100 iterations
## # weights:  106
## initial  value 659.184167
## iter  10 value 541.109716
## iter  20 value 523.583807
## iter  30 value 513.160409
## iter  40 value 487.349809
## iter  50 value 476.835417
## iter  60 value 476.110723
## iter  70 value 475.419633
## iter  80 value 475.090236
## iter  90 value 474.914338
## iter 100 value 474.669838
## final  value 474.669838
## stopped after 100 iterations
## # weights:  204
## initial  value 664.440231
## iter  10 value 540.924026
## iter  20 value 510.243100
## iter  30 value 505.354320
## iter  40 value 499.611898
## iter  50 value 498.706600
## iter  60 value 498.358016
## iter  70 value 496.255042
## iter  80 value 495.093769
## iter  90 value 493.289565
## iter 100 value 492.096921
```

```
## final  value 492.096921
## stopped after 100 iterations
## # weights:  302
## initial  value 655.331105
## iter  10 value 495.174872
## iter  20 value 476.614412
## iter  30 value 474.767040
## iter  40 value 443.566908
## iter  50 value 411.296911
## iter  60 value 406.388901
## iter  70 value 401.342139
## iter  80 value 401.174064
## iter  90 value 394.557630
## iter 100 value 391.264104
## final  value 391.264104
## stopped after 100 iterations
## # weights:  400
## initial  value 691.638056
## iter  10 value 481.878401
## iter  20 value 462.066451
## iter  30 value 456.994449
## iter  40 value 444.769480
## iter  50 value 437.863489
## iter  60 value 426.611215
## iter  70 value 407.813927
## iter  80 value 398.186989
## iter  90 value 394.014388
## iter 100 value 385.798858
## final  value 385.798858
## stopped after 100 iterations
## # weights:  498
## initial  value 743.518083
## iter  10 value 521.599318
## iter  20 value 491.496253
## iter  30 value 466.921169
## iter  40 value 462.071578
## iter  50 value 450.964095
## iter  60 value 438.261190
## iter  70 value 435.549325
## iter  80 value 434.175862
## iter  90 value 430.550712
## iter 100 value 428.440904
## final  value 428.440904
## stopped after 100 iterations
## # weights:  106
## initial  value 614.699686
## iter  10 value 527.288381
## iter  20 value 502.132181
## iter  30 value 477.204814
## iter  40 value 445.165223
## iter  50 value 438.950818
## iter  60 value 436.675398
## iter  70 value 436.275027
## iter  80 value 427.216251
```

```
## iter  90 value 424.323767
## iter 100 value 422.149902
## final  value 422.149902
## stopped after 100 iterations
## # weights:  204
## initial  value 593.793418
## iter  10 value 507.014911
## iter  20 value 501.217421
## iter  30 value 499.941490
## iter  40 value 498.360893
## iter  50 value 496.028029
## iter  60 value 495.163930
## iter  70 value 493.472000
## iter  80 value 491.008393
## iter  90 value 487.981359
## iter 100 value 485.185394
## final  value 485.185394
## stopped after 100 iterations
## # weights:  302
## initial  value 637.154232
## iter  10 value 538.130868
## iter  20 value 517.241499
## iter  30 value 486.788428
## iter  40 value 466.795833
## iter  50 value 456.684586
## iter  60 value 441.216808
## iter  70 value 434.053342
## iter  80 value 431.554508
## iter  90 value 428.148573
## iter 100 value 420.355401
## final  value 420.355401
## stopped after 100 iterations
## # weights:  400
## initial  value 764.297891
## iter  10 value 560.842308
## iter  20 value 543.671540
## iter  30 value 522.159675
## iter  40 value 515.345320
## iter  50 value 514.788269
## iter  60 value 513.726612
## iter  70 value 513.503331
## iter  80 value 513.170311
## iter  90 value 512.767922
## iter 100 value 512.468656
## final  value 512.468656
## stopped after 100 iterations
## # weights:  498
## initial  value 720.322037
## iter  10 value 480.396282
## iter  20 value 441.001103
## iter  30 value 425.483232
## iter  40 value 405.657136
## iter  50 value 391.312210
## iter  60 value 383.958657
```

```
## iter  70 value 372.733519
## iter  80 value 369.498927
## iter  90 value 363.407979
## iter 100 value 359.218691
## final  value 359.218691
## stopped after 100 iterations
## # weights:  106
## initial  value 617.324595
## iter  10 value 555.180310
## iter  20 value 536.354908
## iter  30 value 519.386257
## iter  40 value 482.829609
## iter  50 value 477.972461
## iter  60 value 475.762400
## iter  70 value 470.822486
## iter  80 value 466.614820
## iter  90 value 466.107146
## iter 100 value 465.271380
## final  value 465.271380
## stopped after 100 iterations
## # weights:  204
## initial  value 630.055378
## iter  10 value 537.846058
## iter  20 value 515.135503
## iter  30 value 477.343745
## iter  40 value 453.259523
## iter  50 value 448.207303
## iter  60 value 447.369957
## iter  70 value 441.400964
## iter  80 value 437.665467
## iter  90 value 436.857762
## iter 100 value 436.428120
## final  value 436.428120
## stopped after 100 iterations
## # weights:  302
## initial  value 662.590983
## iter  10 value 514.670228
## iter  20 value 484.267952
## iter  30 value 467.128987
## iter  40 value 457.963906
## iter  50 value 455.985378
## iter  60 value 438.453630
## iter  70 value 423.984710
## iter  80 value 421.552379
## iter  90 value 417.048576
## iter 100 value 416.109404
## final  value 416.109404
## stopped after 100 iterations
## # weights:  400
## initial  value 685.620971
## iter  10 value 524.308194
## iter  20 value 491.643972
## iter  30 value 475.809962
## iter  40 value 446.926674
```

```
## iter  50 value 429.350439
## iter  60 value 424.786696
## iter  70 value 418.541463
## iter  80 value 416.560548
## iter  90 value 416.309764
## iter 100 value 415.666202
## final  value 415.666202
## stopped after 100 iterations
## # weights:  498
## initial  value 658.274903
## iter  10 value 517.788015
## iter  20 value 502.439855
## iter  30 value 495.068893
## iter  40 value 488.195063
## iter  50 value 481.857647
## iter  60 value 463.355430
## iter  70 value 455.608918
## iter  80 value 435.292327
## iter  90 value 411.568838
## iter 100 value 381.877976
## final  value 381.877976
## stopped after 100 iterations
## # weights:  106
## initial  value 607.654706
## iter  10 value 519.558351
## iter  20 value 505.841393
## iter  30 value 497.081854
## iter  40 value 481.061418
## iter  50 value 464.179423
## iter  60 value 450.687202
## iter  70 value 447.381320
## iter  80 value 431.312293
## iter  90 value 422.042964
## iter 100 value 417.514704
## final  value 417.514704
## stopped after 100 iterations
## # weights:  204
## initial  value 664.999458
## iter  10 value 496.108660
## iter  20 value 451.981937
## iter  30 value 444.678923
## iter  40 value 426.190858
## iter  50 value 420.240931
## iter  60 value 417.454625
## iter  70 value 416.555665
## iter  80 value 409.708240
## iter  90 value 409.280441
## iter 100 value 407.052896
## final  value 407.052896
## stopped after 100 iterations
## # weights:  302
## initial  value 625.244206
## iter  10 value 525.155450
## iter  20 value 514.647555
```

```
## iter  30 value 507.435408
## iter  40 value 499.969662
## iter  50 value 487.702682
## iter  60 value 479.818392
## iter  70 value 470.942410
## iter  80 value 468.748961
## iter  90 value 461.376439
## iter 100 value 460.973810
## final  value 460.973810
## stopped after 100 iterations
## # weights:  400
## initial  value 693.463314
## iter  10 value 514.112611
## iter  20 value 485.266589
## iter  30 value 464.753275
## iter  40 value 452.212949
## iter  50 value 448.795580
## iter  60 value 420.653370
## iter  70 value 413.315965
## iter  80 value 408.393283
## iter  90 value 404.816644
## iter 100 value 401.145334
## final  value 401.145334
## stopped after 100 iterations
## # weights:  498
## initial  value 806.022227
## iter  10 value 595.187031
## iter  20 value 567.511153
## iter  30 value 557.427335
## iter  40 value 527.059368
## iter  50 value 516.034944
## iter  60 value 508.864559
## iter  70 value 499.492399
## iter  80 value 497.056880
## iter  90 value 479.111988
## iter 100 value 474.305501
## final  value 474.305501
## stopped after 100 iterations
## # weights:  106
## initial  value 634.181383
## iter  10 value 567.994926
## iter  20 value 541.801205
## iter  30 value 537.657195
## iter  40 value 498.939644
## iter  50 value 491.967473
## iter  60 value 481.413247
## iter  70 value 468.026288
## iter  80 value 466.802380
## iter  90 value 465.565988
## iter 100 value 462.140204
## final  value 462.140204
## stopped after 100 iterations
## # weights:  204
## initial  value 639.451119
```

```
## iter  10 value 536.443694
## iter  20 value 514.614741
## iter  30 value 503.993020
## iter  40 value 503.645541
## iter  50 value 502.427044
## iter  60 value 499.187261
## iter  70 value 498.218849
## iter  80 value 497.269833
## iter  90 value 488.426460
## iter 100 value 478.578186
## final  value 478.578186
## stopped after 100 iterations
## # weights:  302
## initial  value 694.867489
## iter  10 value 547.789931
## iter  20 value 515.209133
## iter  30 value 486.676932
## iter  40 value 477.823181
## iter  50 value 468.659535
## iter  60 value 461.599947
## iter  70 value 458.457142
## iter  80 value 455.936032
## iter  90 value 454.882938
## iter 100 value 451.793964
## final  value 451.793964
## stopped after 100 iterations
## # weights:  400
## initial  value 640.625925
## iter  10 value 496.392559
## iter  20 value 461.324375
## iter  30 value 444.315090
## iter  40 value 437.636748
## iter  50 value 429.707266
## iter  60 value 415.409266
## iter  70 value 400.779340
## iter  80 value 393.416177
## iter  90 value 390.050661
## iter 100 value 385.131410
## final  value 385.131410
## stopped after 100 iterations
## # weights:  498
## initial  value 828.284623
## iter  10 value 505.489804
## iter  20 value 462.276427
## iter  30 value 449.194250
## iter  40 value 443.612114
## iter  50 value 431.960946
## iter  60 value 424.240605
## iter  70 value 408.063199
## iter  80 value 401.867841
## iter  90 value 397.335882
## iter 100 value 395.798915
## final  value 395.798915
## stopped after 100 iterations
```

```
## # weights:  498
## initial  value 717.057713
## iter  10 value 540.775403
## iter  20 value 510.833817
## iter  30 value 488.265266
## iter  40 value 469.599837
## iter  50 value 469.013412
## iter  60 value 450.743890
## iter  70 value 430.742332
## iter  80 value 426.474342
## iter  90 value 421.783479
## iter 100 value 414.833940
## final  value 414.833940
## stopped after 100 iterations
```

> BREAKOUT GROUPS: While you are waiting for this model to run, look up the tunegrid inside of the caret::train package. What object does it require as input? Does this change for method nnet versus method rf? Find an example and walk me through it.

Predict using this model

After training, we have to predict given our trained model, which normally takes less time then the training. This has lead to the popularity of transfer learning, where you use a pre-trained model.

```
## Apply the models to data. This took three minutes.

# Apply the neural network model to the Sentinel-2 data.
nnet_prediction = raster::predict(s2data, model=nnet_model)

# Apply the random forest model to the Sentinel-2 data
rf_prediction = raster::predict(s2data, model=rf_model)

# Apply the support vector machines model to the Sentinel-2 data
svm_prediction = raster::predict(s2data, model=svm_model)

# Convert the evaluation data into a spatial object using the X and Y coordinates and extract predicted
eva.sp = SpatialPointsDataFrame(coords = cbind(eva$x, eva$y), data = eva,
                                proj4string = crs("+proj=utm +zone=33 +datum=WGS84 +units=m +no_defs +el
```

```
## Warning in showSRID(uprojargs, format = "PROJ", multiline = "NO"): Discarded datum WGS_1984 in CRS de
##  but +towgs84= values preserved
```

Validation

We can validate our data by extracting the points from our evaluation data, and comparing our predicted classes to the actual values.

After that, we can create a confusion matrix and extract accuracy values.

```
## Superimpose evaluation points on the predicted classification and extract the values
# neural network
nnet_Eval = raster::extract(nnet_prediction, eva.sp)
# random forest
rf_Eval = raster::extract(rf_prediction, eva.sp)
# support vector machines
svm_Eval = raster::extract((svm_prediction), eva.sp)
```

```
# Create an error matrix for each of the classifiers
nnet_errorM = confusionMatrix(as.factor(nnet_Eval),as.factor(eva$class)) # nnet is a poor classifier, s
```

```
## Warning in levels(reference) != levels(data): longer object length is not a
## multiple of shorter object length
```

```
## Warning in confusionMatrix.default(as.factor(nnet_Eval), as.factor(eva$class)):
## Levels are not in the same order for reference and data. Refactoring data to
## match.
```

```
rf_errorM = confusionMatrix(as.factor(rf_Eval),as.factor(eva$class))
svm_errorM = confusionMatrix(as.factor(svm_Eval),as.factor(eva$class))

paste0("  Neural net accuracy:  ", round(nnet_errorM$overall[1],2))
```

```
## [1] "  Neural net accuracy:  0.44"
```

```
paste0("  Random Forest accuracy:  ", round(rf_errorM$overall[1],2))
```

```
## [1] "  Random Forest accuracy:  0.69"
```

```
paste0("  SVM accuracy:  ", round(svm_errorM$overall[1],2))
```

```
## [1] "  SVM accuracy:  0.71"
```

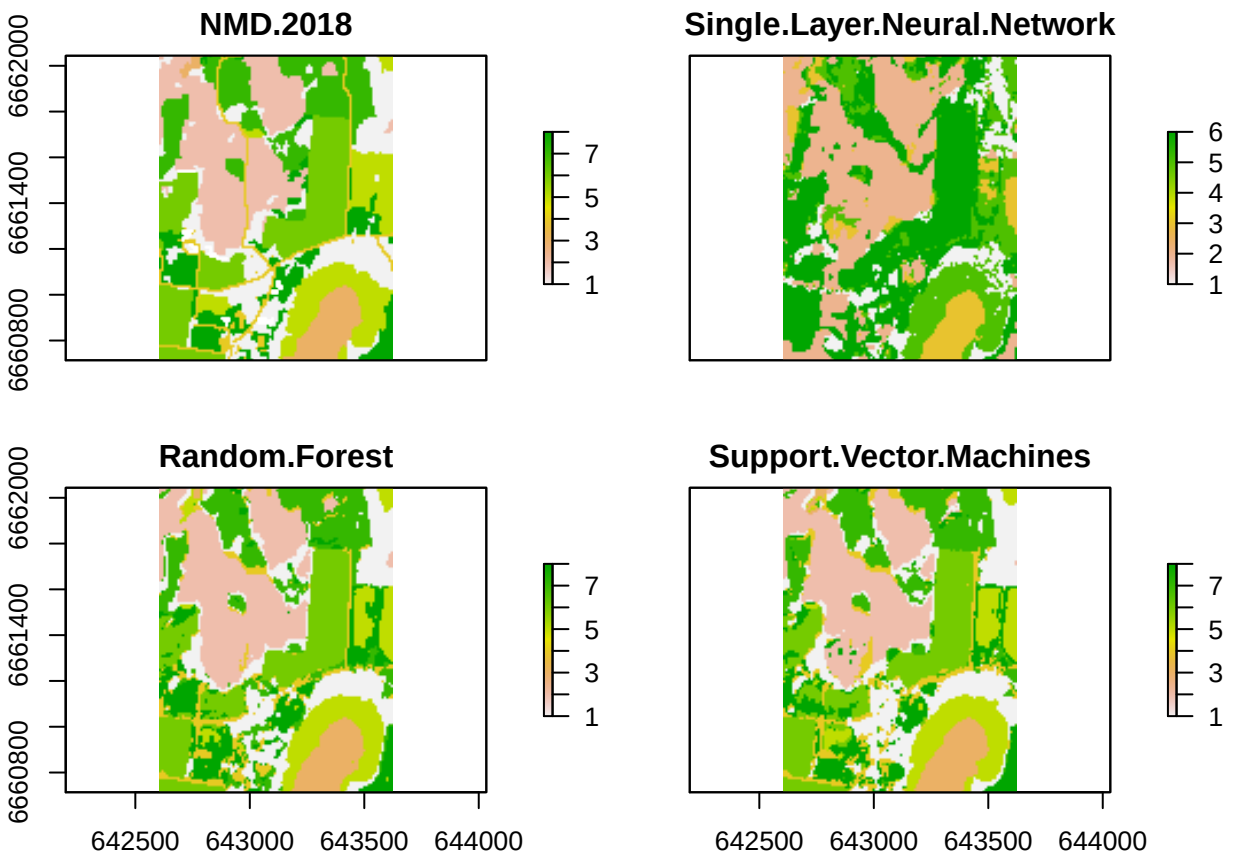
Plot results

With geographic data, it's easiest to view visually.

```
# Plot the results next to one another along with the 2018 NMD dataset for comparison
nmd2018 = raster("Data/NMD_S2Small.tif") # load NMD dataset (Nationella Marktaeckedata, Swedish Nationa
```

```
## Warning in showSRID(uprojargs, format = "PROJ", multiline = "NO"): Discarded
## datum Unknown based on GRS80 ellipsoid in CRS definition
```

```
crs(nmd2018) <- crs(nnet_prediction) # Correct the coordinate reference system so it matches with the r
rstack = stack(nmd2018, nnet_prediction, rf_prediction, svm_prediction) # combine the layers into one s
names(rstack) = c("NMD 2018", "Single Layer Neural Network", "Random Forest", "Support Vector Machines"
plot(rstack) # plot it!
```



Summary of what we did

- The same techniques of splitting into testing and training work here
- Remotely sensed data can be more complex, but quite robust.
- There are many GIS classes that will train you more in these methods, and this is one of my favorite topics in data science.
- Neural nets, random forest and SVMs can all be adapted to use as a classifier.
- In our case, random forst and SVMs worked best, but this may change depending on the problem.

Learning more

For more details on this, check out NEON multiband raster training: https://www.neonscience.org/dc-multiband-rasters-r