K-means Algorithm:

Η υλοποίηση του Kmeans έχει γίνει με τρεις κλάσεις.

Κλάση Cluster: Περιέχει τα σημεία που ανήκουν σε αυτό το cluster, το centroid του cluster, και ένα μοναδικό ακέραιο id για το cluster αυτό. Σημαντική μέθοδος σε αυτή τη κλάση είναι η compute SSE η οποία υπολογίζει για όλα τα σημεία του cluster τη απόστασή τους από το centroid χρησιμοποιώντας μία μέθοδο μιας άλλης κλάσης που θα δούμε στη συνέχεια.

Εάν κατά τη διάρκεια που τρέχει το πρόγραμμα επιθυμούμε να δούμε ποια σημεία ανήκουν σε ποιο cluster τότε βγάζουμε τα σχόλια που υπάρχουν στη μέθοδο printCluster.

Κλάση Point: Περιέχει τον ορισμό ενός σημείου στο χώρο. Έχει ως πεδία τις συντεταγμένες του σημείο καθώς και σε ποιο Cluster ανήκει το σημείο αυτό. Η μέθοδος distance είναι αυτή που έχει τη πράξη για την ευκλείδεια απόσταση δύο σημείων σε 2 διαστάσεις. Η μέθοδος producePoints είναι υπεύθυνη να κατασκευάσει ένα αρχείο με τυχαίες συντεταγμένες με βάση τα ορίσματά της και η μέθοδος loadPoints να φορτώσει αυτό το αρχείο και να δημιουργήσει τα σημεία.

Κλάση Kmeans: Είναι η βασική κλάση. Περιέχει ως πεδία της τον αριθμό των clusters που διμιουργούνται, το πλήθος των σημείων, τα όρια των συντεταγμένων αλλά και τα ίδια τα σημεία και τα clusters. Στην αρχικοποίηση της κλάσης με τη μέθοδο init, γίνεται μόνο δημιουργία νέου αρχείου με νέα random points(αν το επιθυμούμε, δηλαδή πρέπει να βγουν τα σχόλια αλλιώς θα χρησιμοποιεί το υπάρχων αρχείο point.txt). Στη συνέχεια φορτώνεται το αρχείο και γίνονται ανάθεση στα clusters τυχαία centroids από το πλήθος των point και παρουσιάζει την αρχική κατάσταση του αλγορίθμου.

Η μέθοδος assignPointsToClusters αναθέτει κάθε σημείο σε ένα Cluster. Για κάθε σημείο κρατάει βρίσκει σε πιο cluster έχει τη κοντινότερη απόσταση και ανατίθεται σε αυτό.

Η μέθοδος rellocateCentroids δημιουργεί νέο point και το αναθέτει ως centroid για κάθε Cluster χρησιμοποιώντας για συντεταγμένες το μέσο όρο των συντεταγμένων των σημείων που υπάρχουν ήδη στο Clyster.

Η μέθοδος computeSSE χρησιμοποιεί τις μεθόδους των δύο παραπάνω κλάσεων για τον υπολογισμό του αθροίσματος των

Η μέθοδος run είναι αυτή που 'κινεί' τον αλγόριθμο. Τρέχει τις δύο βασικές μεθόδους του αλγορίθμου έως ότου η απόσταση των centroids (πριν εκτελεστούν οι μέθοδοι assignPointsToClusters, rellocateCentroid) και των centroids αφού εκτελεστούν αυτές, να μην αλλάξει κατά 0.01.

Η μέθοδος logClusters είναι μία μέθοδος που εκτελείται στο τέλος του αλγορίθμου και έχει σκοπό τη δημιουργία αρχείων με τη μορφή Clusters"αριθμός από Clusters""σε ποιο cluster είναι εκείνη τη στιγμή". Με λίγα λόγια δημιουργεί αρχεία που απλά περιέχουν τα σημεία που ανατίθενται σε κάθε Cluster για κάθε αριθμό Μ που τρέχουμε το πρόγραμμα.

Η μέθοδος produceLogFile ανάλογα με τα ορίσματά της, δημιουργεί είτε ένα αρχείο που περιέχει τα SSE και τα Μ (πλήθος Cluster), είτε τα κέντρα των Clusters για κάθε Μ.

Η μέθοδος main έχει υλοποιηθεί δυναμικά ώστε να μπορεί ο χρήστης να ελέγξει για οποιοδήποτε αριθμό από Clusters το αποτέλεσμα. Για κάθε είσοδο του χρήστη 'τρέχει' ο αλγόριθμο 20 φορές και κρατάει το καλύτερο αποτέλεσμα. Στο τέλος καλούνται οι μέθοδοι που δημιουργούν τα αρχεία για να έχουμε και οπτικό αποτέλεσμα.

Οι παρακάτω 8 φωτογραφίες είναι τα αποτελέσματα του terminal για εισόδους: 3,5,7,9,11,13.

2 Enter the number of clusters(bigger than 0) you want the program to apply to your data. Enter '-1' in order to stop execution: 3 Cluster: 4 Centroid: (0.8320918930633545,-0.7874095439910889) Number of points at this cluster: 8 Initial State: Controld: (-8.9012879467816498,-8.9041778182983398) Number of points at this cluster: 0 Current distance: 1400.58638600 Current distance: 1398.2792787542837 Current distance: 1396.8447473843148 Centroid: (-0.7635915279388428,-0.5955430269241333) Current distance: 1395.9341235538964 Current distance: 1395.458171886281 Current distance: 1395.1200575905893 Current distance: 1394.941982181132 Cluster: 2 Current distance: 1394,9855014274809 Current distance: 1394,9863854660614 Number of points at this cluster: 0 Current distance: 1394.8872368371856 Current distance: 1394.8823389917468 Current distance: 1876.595555222119 Current distance: 1394.8723564683319 Current distance: 1394.8723564683319 Current distance: 1871,3972558965218 Current distance: 1868.769558184839 Current distance: 1866.714636998584 Current distance: 1865.431686912181 Current distance: 1394,8723564683319 Current distance: 1304.8723564683319 Current distance: 1864.6705794355664 Current distance: 1864.2814987424126 Current distance: 1394.8723564683319 Current distance: 1394.8723564683319 Current distance: 1863.9300861159584 Current distance: 1863.6701695123963 Current distance: 1394.8723564683319 Current distance: 1394.8723564683319 Current distance: 1863.408983721723 Current distance: 1863,3252758143443 Current distance: 1863.3669662770499 Current distance: 1863.3473694315367 1863.1369618862831 Current distance: 1862.9542922918643 Current distance: 1862.7876135557863 Centroid: (-8.6601142793263554,-8.4747118832133682) Number of points at this cluster: 662 Cluster: 1 Centrold: (-0.5381491851858697,0.5354664878813981) Current distance: 1862.4838384998544 Ourrent distance: 1862.2395021475552 Current distance: 1862.0560616613584 Current distance: 1861.056676910902 Number of points at this cluster: 916 Centroid: (8.000200049812211859, 0.45174209073119325) Number of points at this cluster: 700 Final State Centrold: (8.5824017185362247, 8.5332812104655915) Centroid: (8.86549171774818989, 8.5925653664328246) Number of points at this cluster: 1615 er of points at this cluster: Centroid: (0.6670901809516145,-0.5245572102940385) Number of points at this cluster: 671 Centroid: (-8.5709646857079814,8.33882663731857217) Number of points at this cluster: 1234 Cluster: 2 Centrold: (0.5128934488748313,8.442982458322593) Number of points at this cluster: 1151 System finished clustering after with SSE 1394.8723564683319 Reading from file Enter the number of clusters(bigger than 0) you want the program to apply to your data. Enter '-1' in order to stop execution: 7 System finished clustering after with SSE 1861.866676918982 Reading from file Initial State: Enter the number of clusters(bigger than 8) you want the program to apply to your data. Enter '-1' in order to stop execution: 5 Cluster: 0 Centrold: (-8.7381568324856983,-8.9284954637756348) Initial State Claster: 1 Cluster: 6 Centrold: (-8.6286511421203613,-8.9588823318481445) Centrold: (0.6096430751342773,-0.21616637706756592) Number of points at this cluster: 0 Number of points at this cluster: 0 Cluster: 1 Centrold: (0.7006278038824902, 0.6039154529571533) Centroid: (-0.3823966979986469,8.5632857884274292) Number of goints at this cluster: 8 er of points at this cluster: Centroid: (-8.48823797782789387,-0.74878688\$4144897) Centroid: (0.6782481588255805,-8.5628772838502529) Number of points at this cluster: 0 Number of points at this cluster: 0

3

Centrold: (0.6364260011941528,0.4434852660007656) Number of points at this cluster: 0

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Centroid: (-0.39635777473449707,-0.3865245580673218)
                                                                                   Centroid: (-0.39635777473449707,-0.3865245580673218)
Number of points at this cluster: 0
                                                                                   Number of points at this cluster: 0
Cluster: 3
                                                                                   Cluster: 3
Centroid: (0.2771197557449341,0.7419818639755249)
                                                                                   Centroid: (0.2771197557449341,0.7419818639755249)
Number of points at this cluster: 0
                                                                                   Number of points at this cluster: 0
Cluster: 4
                                                                                   Cluster: 4
Centroid: (-0.7590712308883667,0.8163819313049316)
                                                                                   Centroid: (-0.7590712308883667,0.8163819313049316)
Number of points at this cluster: 0
                                                                                   Number of points at this cluster: 0
Centroid: (0.03767716884613037,0.9549295902252197)
                                                                                   Centroid: (0.03767716884613037,0.9549295902252197)
Number of points at this cluster: 0
                                                                                   Number of points at this cluster: 0
Cluster: 6
                                                                                   Cluster: 6
Centroid: (-0.1043778657913208,-0.009638071060180664)
                                                                                   Centroid: (-0.1043778657913208,-0.009638071060180664)
Number of points at this cluster: 0
                                                                                   Number of points at this cluster: 0
Cluster: 7
                                                                                   Cluster: 7
Centroid: (0.16022086143493652,-0.8695952892303467)
                                                                                   Centroid: (0.16022086143493652, -0.8695952892303467)
Number of points at this cluster: 0
                                                                                   Number of points at this cluster: 0
Cluster: 8
                                                                                   Cluster: 8
Centroid: (-0.12416934967041016,0.8281183242797852)
                                                                                   Centroid: (-0.12416934967041016,0.8281183242797852)
Number of points at this cluster: 0
                                                                                   Number of points at this cluster: 0
Current distance: 1004.8309304959926
                                                                                   Current distance: 1004.8309304959926
Current distance: 1003,1127878061524
                                                                                   Current distance: 1003.1127878061524
                                                                                   Current distance: 1002,1146350400471
Current distance: 1882 1146358488471
Current distance: 1001.6404864860568
                                                                                   Current distance: 1001.6404864860568
Current distance: 1001.2692006098255
                                                                                   Current distance: 1001.2692006098255
Current distance: 1000.9479834070922
                                                                                   Current distance: 1000.9479834070922
Current distance: 1000.8664840854645
                                                                                   Current distance: 1000.8664840854645
Current distance: 1000.8536498917956
                                                                                   Current distance: 1000.8536498917956
Current distance: 1000.8348406361688
                                                                                   Current distance: 1000.8348406361688
Current distance: 1000.811590221497
                                                                                   Current distance: 1000.811590221497
Current distance: 1000.7823360699512
                                                                                   Current distance: 1000.7823360699512
Current distance: 1000.778905349543
                                                                                   Current distance: 1000.778905349543
Current distance: 1000.7626801392506
                                                                                   Current distance: 1000.7626801392506
Current distance: 1000.7513022205375
                                                                                   Current distance: 1000.7513022205375
Current distance: 1000.7483365280248
                                                                                   Current distance: 1000.7483365280248
Current distance: 1000.7659817182503
                                                                                   Current distance: 1000.7659817182503
Current distance: 1000.7469051637394
                                                                                   Current distance: 1000.7469051637394
Current distance: 1000.7324880798668
                                                                                   Current distance: 1000.7324880798668
Current distance: 1000.7256047287398
                                                                                   Current distance: 1000.7256047287398
Current distance: 1000.7256047287398
                                                                                   Current distance: 1000.7256047287398
Final State
                                                                                   Final State
Cluster: 0
                                                                                   Cluster: A
Centroid: (-0.6414059653426661,-0.03907827716885191)
                                                                                   Centroid: (-0.6414059653426661,-0.03907827716885191)
Number of points at this cluster: 462
                                                                                   Number of points at this cluster: 462
Centroid: (0.6788513931219634, -0.02445264211211441)
                                                                                   Centroid: (0.6788513931219634,-0.02445264211211441)
Number of points at this cluster: 383
                                                                                   Number of points at this cluster: 383
Cluster: 2
                                                                                   Cluster: 2
Centroid: (-0.6667485258966216,-0.6900458710355909)
                                                                                   Centroid: (-0.6667485258966216,-0.6900458710355909)
                                                                                   Number of points at this cluster: 382
Number of points at this cluster: 382
Cluster: 3
                                                                                   Cluster: 3
Centroid: (0.039308877271764416, -0.02588208142448874)
                                                                                   Centroid: (0.039308877271764416,-0.02588208142448874)
Number of points at this cluster: 425
                                                                                   Number of points at this cluster: 425
Cluster: 4
Centroid: (-0.7014423887940902,0.650272059289715)
                                                                                   Centroid: (-0.7014423887940902,0.650272059289715)
Number of points at this cluster: 474
                                                                                   Number of points at this cluster: 474
Cluster: 5
                                                                                   Cluster: 5
Centroid: (0.6590552901124356.0.6741322553307442)
                                                                                   Centroid: (0.6590552901124356.0.6741322553307442)
Number of points at this cluster: 478
                                                                                   Number of points at this cluster: 478
Cluster: 6
                                                                                   Cluster: 6
Centroid: (-0.011804290042644869,-0.6719594983080281)
                                                                                   Centroid: (-0.011804290042644869,-0.6719594983080281)
Number of points at this cluster: 509
                                                                                   Number of points at this cluster: 509
                                                                                   Cluster: 7
Centroid: (0.6737522629842366,-0.6882588681020693)
                                                                                   Centroid: (0.6737522629842366,-0.6882588681020693)
Number of points at this cluster: 438
                                                                                   Number of points at this cluster: 438
Cluster: 8
                                                                                   Cluster: 8
Centroid: (-0.012870615468524346,0.6370363947012376)
                                                                                   Centroid: (-0.012870615468524346,0.6370363947012376)
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5

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Aumber of points at this cluster: 449
                                                                                                                  Centroid: (0.6651930818765625,-0.005012232211370234)
                                                                                                                     mber of points at this cluster:
                                                                                                                  Cluster: 1
                                                                                                                  Centroid: (0.03609453471603095,-0.05257660270366659)
Number of points at this cluster: 403
System finished clustering after with SSE 1888.7256847287398
                                                                                                                  Cluster: 2
Reading from file
                                                                                                                  Centroid: (-0.2829315418633409,0.5482950519068173)
Enter the number of clusters(bigger than 0) you want the program to apply to your data. Enter '-1' in order to stop execution: 11
                                                                                                                  Number of points at this cluster: 313
                                                                                                                  Cluster: 3
                                                                                                                  Centrold: (-0.7548688876599982,0.6752282583371155)
Number of points at this cluster: 383
Initial State:
Cluster: 0
                                                                                                                  Centroid: (-0.7312871001837274,-0.6906978398219069)
Centroid: (0.5018041133880615,-0.30083680152893066)
Number of points at this cluster: 0
                                                                                                                  Number of points at this cluster: 311
Cluster: 1
                                                                                                                  Centrold: (8.726358185338852,8.669882264852896)
Centroid: (0.4665839672888623, -0.39106738567352295)
                                                                                                                     mber of points at this cluster: 391
Number of points at this cluster
                                                                                                                  Cluster: 6
Cluster: 2
Centroid: (-8.65644345283588381,0.85767818344696845)
                                                                                                                  Centroid: (8.28461494897798586,-8.7227122272763934)
                                                                                                                  Number of points at this cluster: 322
Number of points at this cluster
                                                                                                                  Cluster: 7
Cluster: 3
                                                                                                                  Centroid: (0.195252693436119,0.6611483998327642)
Centroid: (-0.16707539558410645,0.8330187797546387)
                                                                                                                  Number of points at this cluster: 356
Number of points at this cluster:
Cluster: 4
                                                                                                                  Centroid: (-8.19540022300316435,-0.6309051725303118)
Number of points at this cluster: 407
Centrold: (-0.7368882894515991,-0.9723618838548896)
Number of points at this cluster: 0
Cluster: S
                                                                                                                  Centroid: (0.7675469966893219,-0.6580619556385992)
Number of points at this cluster: 331
Centrold: (0.6619813442230225,0.13296246528625408)
Number of points at this cluster: 0
                                                                                                                  Cluster: 18
Cluster: 6
                                                                                                                  Centruid: (-0.6729876168266894,-0.8336348528685128)
Number of points at this cluster: 421
Cantroid: (0.3339548958464541, 0.927528977394164)
Number of points at this cluster: 8
Centroid: (0.4010787010192871,0.8591305017471313)
Number of points at this cluster: 0
                                                                                                                  System finished clustering after with SSE 921.2818330467643
Centrold: (0.3148594959259833,-0.9438143968582153)
Number of points at this cluster: 0
                                                                                                                  Reading from file
                                                                                                                  Enter the number of clusters(bigger than 0) you want the program to apply to your data.
Enter '-1' in order to stop execution: 13
Centroid: (0.5512828826904297,-0.6786551475524982)
Number of points at this cluster: 0
                                                                                                                  Initial State
Cluster: 18
Centroid: (-0.6647669876919556,-0.9293598252914429)
Number of points at this cluster: 0
                                                                                                                  Centroid: (-0.5647205114364624,-0.024459242820739746)
                                                                                                                  Number of points at this cluster: 0
Current distance: 924.1921697946478
                                                                                                                  Centrold: (0.32155323828564453, 0.7541853189468384)
Current distance: 923.8882478442596
Current distance: 923.6422163327989
                                                                                                                   Number of points at this cluster: 0
                                                                                                                  Cluster: 2
Current distance: 923,5511561563388
                                                                                                                  Centroid: (8.6866519451141357, 8.9828335846768188)
Current distance: 923,5486798965564
                                                                                                                  Number of points at this cluster: 0
Current distance: 923.5366274888414
                                                                                                                  Cluster: 3
Centroid: (-8.5914775133132935,-8.87237374782562256)
Current distance: 923,5281431858955
Current distance: 923,4787255542535
                                                                                                                  Number of points at this cluster: 0
Current distance: 923.3995847700636
                                                                                                                  Cluster: 4
Current distance: 923.3578384811213
                                                                                                                  Centruid: (0.6974606513977051,0.341341495513916)
Current distance: 923,3866720364533
                                                                                                                  Number of points at this cluster: 0
Current distance: 923.3005569261773
Current distance: 923.2652878371934
                                                                                                                  Centrold: (-8.47988973693847656,8.5158836811828613)
Number of points at this cluster: 8
Current distance: 923.204914364743
Current distance: 923.1778391673888
Current distance: 923.8768953635482
                                                                                                                  Centrold: (0.5123419761657715, 0.8712958997457886)
Current distance: 022.8572951849988
                                                                                                                     mber of points at this cluster: 8
                                                                                                                  Cluster: 7
Current distance: 922,4939666723192
Current distance: 921.9151490264053
                                                                                                                  Centroid: (-8.3621821483583418,-8.7982261818753852)
                                                                                                                     mber of points at this cluster
Current distance: 921,2818330467643
                                                                                                                  Cluster: 8
```

Centroid: (-0.7391767501831855,-0.0926971435546875)

Number of points at this cluster: 0

Final State

8

7

```
Centroid: (8.86282436847686768,8.6887653636932373)
Number of points at this cluster: 8
Cluster: 10
Centrold: (8.4799131155814838,8.18227549876888322)
Number of points at this cluster: 8
Cluster: 11
Centroid: (-8.9315271377563477,-8.8782726526268376)
  mber of points at this cluster: 0
Centroid: (0.28301310539245605,0.2062983512878418)
Number of points at this cluster: 0
Current distance: 851.6737694197986
Current distance: 851.1317318969352
Current distance: 858.748443212269
Current distance: 858.4476252288949
Current distance: 850.1672500160273
Current distance: 858.0889805294648
Current distance: 849.8998987238426
Current distance: 849.8868786912217
Current distance: 849.7792257774468
Current distance: 849.7815998927831
Current distance: 849.7571667592241
Current distance: 849,7252711352443
Current distance: 849.694353628365
Current distance: 849.679358988899
Current distance: 849.6654618563623
Final State
Cluster: 0
Centroid: (-8.3526567332446575,8.33688485328659415)
Number of points at this cluster: 256
Centrold: (0.20616777221877852,-0.657710174848507)
Number of points at this cluster: 308
Cluster: 2
Centroid: (0.7206399975424985,-0.7593188927419162)
Number of points at this cluster: 301
Cluster: 3
Centroid: (-0.28173151754197623,-0.2905262883017663)
Number of points at this cluster: 294
Centroid: (8.7885477885553393,8.34535447419699977)
Number of points at this cluster: 295
cluster: 5
Centroid: (-0.7251787397795751,0.6974468138582426)
Number of points at this cluster: 399
cluster: 6
Centroid: (0.6659810718122896, 0.8060593446651538)
Number of points at this cluster: 286
Centroid: (-8.21007476933300495,-8.7879845515280962)
Number of points at this cluster: 256
Cluster: 8
Centroid: (-0.7510526301684203, -0.02869726257559694)
Number of points at this cluster: 324
Cluster: 9
Centroid: (0.05635173583593894,0.6813263933802527)
Number of points at this cluster: 381
Centrold: (0.7819937601582757, -0.22655932656649885)
  mber of points at this cluster: 298
```

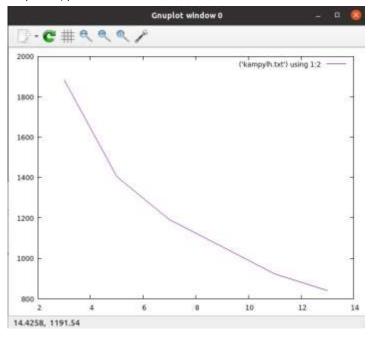
Θα μπορούσαμε να επιλέξουμε και το 5 ως καλό αριθμό από clusters, αλλά το 9 παρουσιάζει επίσης μία

Centroid: (-0.7539337564715378,-0.6973043452921531) Number of points at this cluster: 278 Cluster: 12 Centroid: (0.1679409232484289,0.004154861332422279) Number of points at this cluster: 332 System finished clustering after with SSE 849.6654618563623 Reading from file Enter the number of clusters(bigger than 0) you want the program to apply to your data. Enter '-1' in order to stop execution: -1 For 3 cluster -> SSE: 1861.866676910902 For 5 cluster -> SSE: 1394.8723564683319 For 7 cluster -> SSE: 1173.8886997779084 For 9 cluster -> SSE: 1000.7256047287398 For 11 cluster -> SSE: 921.2818330467643 For 13 cluster -> SSE: 849.6654618563623 PS D:\UNIVERSITY\SEMESTER_9\Ypologistikh_Nohmosynh\ask1>

Επίσης υπάρχουν ιδιαίτερες περιπτώσεις:

Reading from file
Enter the number of clusters(bigger than 0) you want the program to apply to your data.
Enter '-1' in order to stop execution: -1
PS D:\UNIVERSITY\SEMESTER_9\Ypologistikh_Nohmosynh\ask1> java Kmeans
Reading from file
Enter the number of clusters(bigger than 0) you want the program to apply to your data.
Enter '-1' in order to stop execution: 0
Enter the number of clusters(bigger than 0) you want the program to apply to your data.
Enter '-1' in order to stop execution: -1
PS D:\UNIVERSITY\SEMESTER_9\Ypologistikh_Nohmosynh\ask1>

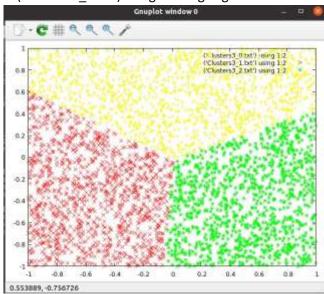
Η καμπύλη με το SSE και τα M:



μορφή γονάτου στη γραφική, έχει και χαμηλότερο SSE, οπότε το 9 είναι ο καλύτερος αριθμός για τη δημιουργία των clusters. Η καμπύλη παρουσιάζεται μέσω του gnuplot στα ubuntu με την εντολή: plot ('kampylh.txt') using 1:2 with line

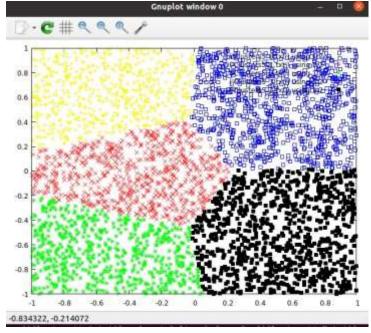
Τα αποτελέσματα του κάθε Cluster για κάθε αριθμό από Clusters:

plot('Clusters3_0.txt') using 1:2 lt rgb "yellow", ('Clusters3_1.txt') using 1:2 lt rgb "red", ('Clusters3_2.txt') using 1:2 lt rgb "green"



plot('Clusters5_0.txt') using 1:2 lt rgb "yellow", ('Clusters5_1.txt') using 1:2 lt rgb "red", ('Clusters5_2.txt') using 1:2 lt rgb "green", \

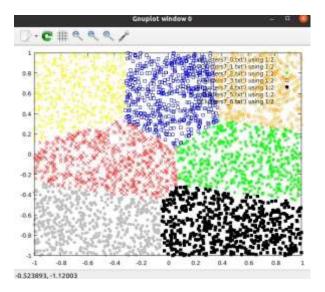
('Clusters5_3.txt') using 1:2 lt rgb "blue", ('Clusters5_4.txt') using 1:2 lt rgb "black"



plot('Clusters7_0.txt') using 1:2 lt rgb "yellow", ('Clusters7_1.txt') using 1:2 lt rgb "red", ('Clusters7_2.txt') using 1:2 lt rgb "green", \

('Clusters7_3.txt') using 1:2 lt rgb "blue", ('Clusters7_4.txt') using 1:2 lt rgb "black", ('Clusters7_5.txt') using 1:2 lt rgb "orange"\

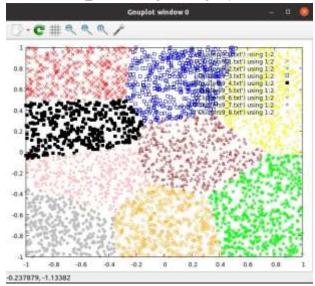
, ('Clusters7_6.txt') using 1:2 lt rgb "grey"



plot('Clusters9_0.txt') using 1:2 lt rgb "yellow", ('Clusters9_1.txt') using 1:2 lt rgb "red", ('Clusters9_2.txt') using 1:2 lt rgb "green", \

('Clusters9_3.txt') using 1:2 lt rgb "blue", ('Clusters9_4.txt') using 1:2 lt rgb "black", ('Clusters9_5.txt') using 1:2 lt rgb "orange"\

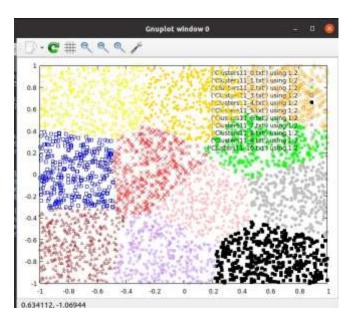
, ('Clusters9_6.txt') using 1:2 lt rgb "grey", ('Clusters9_7.txt') using 1:2 lt rgb "brown", ('Clusters9_8.txt') using 1:2 lt rgb "pink"



plot('Clusters11_0.txt') using 1:2 lt rgb "yellow", ('Clusters11_1.txt') using 1:2 lt rgb "red", ('Clusters11_2.txt') using 1:2 lt rgb "green", \('Clusters11_3.txt') using 1:2 lt rgb "blue", ('Clusters11_4.txt') using 1:2 lt rgb "black", ('Clusters11_5.txt') using 1:2 lt rgb "orange"\

, ('Clusters11_6.txt') using 1:2 lt rgb "grey", ('Clusters11_7.txt') using 1:2 lt rgb "brown", ('Clusters11_8.txt') using 1:2 lt rgb "pink"\

, ('Clusters11_9.txt') using 1:2 lt rgb "purple", ('Clusters11_10.txt') using 1:2 lt rgb "gold"



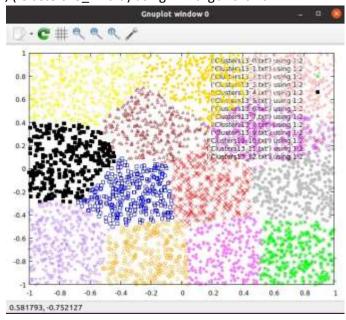
 $plot('Clusters13_0.txt') \ using \ 1:2 \ lt \ rgb \ "yellow", ('Clusters13_1.txt') \ using \ 1:2 \ lt \ rgb \ "red", ('Clusters13_2.txt') \ using \ 1:2 \ lt \ rgb \ "green", \\$

('Clusters13_3.txt') using 1:2 lt rgb "blue", ('Clusters13_4.txt') using 1:2 lt rgb "black", ('Clusters13_5.txt') using 1:2 lt rgb "orange"\

, ('Clusters13_6.txt') using 1:2 lt rgb "grey", ('Clusters13_7.txt') using 1:2 lt rgb "brown", ('Clusters13_8.txt') using 1:2 lt rgb "pink"\

, ('Clusters13_9.txt') using 1:2 lt rgb "purple", ('Clusters13_10.txt') using 1:2 lt rgb "gold", ('Clusters13_11.txt') using 1:2 lt rgb "magenta"\





Εντολή μεταγλώττισης: javac ./Kmeans.java

Εντολή εκτέλεσης: java Kmeans