Experiments:

1. BigCross(n=500,000, dim=57):

   -All the experiments below have the same parameters about "main.cpp"
   local_peak_threshold = 5000;
   cl = 3;

   //FastDPeak.app main()

   ① Test the performance of "FastDPeak" clustering algorithm for K between 10 and 150

   Fast_Density_Peak(K = 10,batch_num = 250,000,new_size = 500,000,…); 93.50s
   Compute-distance-num = 39711568 Local-density-peak-num = 4578
   Fast_Density_Peak(K = 20,batch_num = 250,000,new_size = 500,000,…); 84.76s
   Compute-distance-num = 30865277 Local-density-peak-num = 3828
   Fast_Density_Peak(K = 30,batch_num = 250,000,new_size = 500,000,…); 101.39s
   Compute-distance-num = 31194465 Local-density-peak-num = 3807
   Fast_Density_Peak(K = 40,batch_num = 250,000,new_size = 500,000,…); 107.30s
   Compute-distance-num = 37371657 Local-density-peak-num = 4317
   Fast_Density_Peak(K = 50,batch_num = 250,000,new_size = 500,000,…); 113.61s
   Compute-distance-num = 22444476 Local-density-peak-num = 3140
   Fast_Density_Peak(K = 60,batch_num = 250,000,new_size = 500,000,…); 112.07s
   Compute-distance-num = 14594104 Local-density-peak-num = 2413
   Fast_Density_Peak(K = 70,batch_num = 250,000,new_size = 500,000,…); 122.09s
   Compute-distance-num = 10074723 Local-density-peak-num = 1937
   Fast_Density_Peak(K = 80,batch_num = 250,000,new_size = 500,000,…); 129.02s
   Compute-distance-num = 7296832 Local-density-peak-num = 1598
   Fast_Density_Peak(K = 90,batch_num = 250,000,new_size = 500,000,…); 138.81s
   Compute-distance-num = 5708128 Local-density-peak-num = 1366
   Fast_Density_Peak(K = 100,batch_num = 250,000,new_size = 500,000,…); 145.72s
   Compute-distance-num = 4423144 Local-density-peak-num = 1178
   Fast_Density_Peak(K = 110,batch_num = 250,000,new_size = 500,000,…); 148.27s
   Compute-distance-num = 3339785 Local-density-peak-num = 1002
   Fast_Density_Peak(K = 120,batch_num = 250,000,new_size = 500,000,…); 159.52s
   Compute-distance-num = 2692020 Local-density-peak-num = 871
   Fast_Density_Peak(K = 130,batch_num = 250,000,new_size = 500,000,…); 160.69s
   Compute-distance-num = 2261783 Local-density-peak-num = 779
   Fast_Density_Peak(K = 140,batch_num = 250,000,new_size = 500,000,…); 172.89s
   Compute-distance-num = 1842243 Local-density-peak-num = 703
   Fast_Density_Peak(K = 150,batch_num = 250,000,new_size = 500,000,…); 178.88s
   Compute-distance-num = 1671590 Local-density-peak-num = 667

   ② Test the performance of "FastDPeak" clustering algorithm for new_size between 100,000 and 500,000 when K is equal to 50,100 or 150.

Fast_Density_Peak(K = 50,batch_num = 50,000,new_size = 100,000,…); 18.78s
Compute-distance-num = 477969 Local-density-peak-num = 374
Fast_Density_Peak(K = 50,batch_num = 100,000,new_size = 200,000,…); 38.53s
Compute-distance-num = 4012207 Local-density-peak-num = 1564
Fast_Density_Peak(K = 50,batch_num = 150,000,new_size = 300,000,…); 67.01s
Compute-distance-num = 7364342 Local-density-peak-num = 1744
Fast_Density_Peak(K = 50,batch_num = 200,000,new_size = 400,000,…); 95.79s
Compute-distance-num = 13300579 Local-density-peak-num = 2275
Fast_Density_Peak(K = 50,batch_num = 250,000,new_size = 500,000,…); 121.55s
Compute-distance-num = 22438506 Local-density-peak-num = 3140

Fast_Density_Peak(K = 100,batch_num = 50,000,new_size = 100,000,…); 25.65s
Compute-distance-num = 102799 Local-density-peak-num = 139
Fast_Density_Peak(K = 100,batch_num = 100,000,new_size = 200,000,…); 51.51s
Compute-distance-num = 733969 Local-density-peak-num = 545
Fast_Density_Peak(K = 100,batch_num = 150,000,new_size = 300,000,…); 88.08s
Compute-distance-num = 1435774 Local-density-peak-num = 627
Fast_Density_Peak(K = 100,batch_num = 200,000,new_size = 400,000,…); 118.01s
Compute-distance-num = 2474011 Local-density-peak-num = 826
Fast_Density_Peak(K = 100,batch_num = 250,000,new_size = 500,000,…); 149.47s
Compute-distance-num = 4423492 Local-density-peak-num = 1178

Fast_Density_Peak(K = 150,batch_num = 50,000,new_size = 100,000,…); 29.83s
Compute-distance-num = 48095 Local-density-peak-num = 91
Fast_Density_Peak(K = 150,batch_num = 100,000,new_size = 200,000,…); 65.63s
Compute-distance-num = 328370 Local-density-peak-num = 337
Fast_Density_Peak(K = 150,batch_num = 150,000,new_size = 300,000,…); 107.82s
Compute-distance-num = 450697 Local-density-peak-num = 309
Fast_Density_Peak(K = 150,batch_num = 200,000,new_size = 400,000,…); 152.95s
Compute-distance-num = 843267 Local-density-peak-num = 441
Fast_Density_Peak(K = 150,batch_num = 250,000,new_size = 500,000,…); 200.65s
Compute-distance-num = 1671538 Local-density-peak-num = 667

③ Test the performance of "FastDPeak" clustering algorithm for new_size between 10,000 and 50,000 when K is equal to 50,100 or 150.

Fast_Density_Peak(K = 50,batch_num = 5,000,new_size = 10,000,…); 0.58s
Fast_Density_Peak(K = 50,batch_num = 10,000,new_size = 20,000,…); 1.45s
Fast_Density_Peak(K = 50,batch_num = 15,000,new_size = 30,000,…); 2.59s
Fast_Density_Peak(K = 50,batch_num = 20,000,new_size = 40,000,…); 3.92s
Fast_Density_Peak(K = 50,batch_num = 25,000,new_size = 50,000,…); 5.51s

Fast_Density_Peak(K = 100,batch_num = 5,000,new_size = 10,000,…); 0.90s
Fast_Density_Peak(K = 100,batch_num = 10,000,new_size = 20,000,…); 2.15s
Fast_Density_Peak(K = 100,batch_num = 15,000,new_size = 30,000,…); 3.78s

Fast_Density_Peak(K = 100,batch_num = 20,000,new_size = 40,000,…); 5.69s
Fast_Density_Peak(K = 100,batch_num = 25,000,new_size = 50,000,…); 7.90s

Fast_Density_Peak(K = 150,batch_num = 5,000,new_size = 10,000,…); 1.30s
Fast_Density_Peak(K = 150,batch_num = 10,000,new_size = 20,000,…); 2.90s
Fast_Density_Peak(K = 150,batch_num = 15,000,new_size = 30,000,…); 5.15s
Fast_Density_Peak(K = 150,batch_num = 20,000,new_size = 40,000,…); 7.63s
Fast_Density_Peak(K = 150,batch_num = 25,000,new_size = 50,000,…); 10.34s

2. KDD99(n=145,580, dim=41):

-All the experiments below have the same parameters about "main.cpp"
local_peak_threshold = 5000;
cl = 40;

//FastDPeak.app main()

① Test the performance of "FastDPeak" clustering algorithm for K between 10 and 150

Fast_Density_Peak(K = 10,batch_num = 72,790,new_size = 145,580,…); 15.86s
Compute-distance-num = 21714967 Local-density-peak-num = 4470
Fast_Density_Peak(K = 20,batch_num = 72,790,new_size = 145,580,…); 12.30s
Compute-distance-num = 11958486 Local-density-peak-num = 3421
Fast_Density_Peak(K = 30,batch_num = 72,790,new_size = 145,580,…); 13.27s
Compute-distance-num = 9014294 Local-density-peak-num = 3802
Fast_Density_Peak(K = 40,batch_num = 72,790,new_size = 145,580,…); 13.58s
Compute-distance-num = 4878614 Local-density-peak-num = 2633
Fast_Density_Peak(K = 50,batch_num = 72,790,new_size = 145,580,…); 14.81s
Compute-distance-num = 3191943 Local-density-peak-num = 1953
Fast_Density_Peak(K = 60,batch_num = 72,790,new_size = 145,580,…); 15.40s
Compute-distance-num = 1984404 Local-density-peak-num = 1391
Fast_Density_Peak(K = 70,batch_num = 72,790,new_size = 145,580,…); 17.03s
Compute-distance-num = 1455446 Local-density-peak-num = 1226
Fast_Density_Peak(K = 80,batch_num = 72,790,new_size = 145,580,…); 18.74s
Compute-distance-num = 1098567 Local-density-peak-num = 995
Fast_Density_Peak(K = 90,batch_num = 72,790,new_size = 145,580,…); 20.69s
Compute-distance-num = 892576 Local-density-peak-num = 835
Fast_Density_Peak(K = 100,batch_num = 72,790,new_size = 145,580,…); 21.62s
Compute-distance-num = 749726 Local-density-peak-num = 831
Fast_Density_Peak(K = 110,batch_num = 72,790,new_size = 145,580,…); 23.68s
Compute-distance-num = 589452 Local-density-peak-num = 685
Fast_Density_Peak(K = 120,batch_num = 72,790,new_size = 145,580,…); 25.38s
Compute-distance-num = 457457 Local-density-peak-num = 505
Fast_Density_Peak(K = 130,batch_num = 72,790,new_size = 145,580,…); 27.20s
Compute-distance-num = 404359 Local-density-peak-num = 482

Fast_Density_Peak(K = 140,batch_num = 72,790,new_size = 145,580,…); 29.13s
Compute-distance-num = 373622 Local-density-peak-num = 544
Fast_Density_Peak(K = 150,batch_num = 72,790,new_size = 145,580,…); 30.99s
Compute-distance-num = 333227 Local-density-peak-num = 540

② Test the performance of "FastDPeak" clustering algorithm for new_size which represent size of the filtered datasets between 67,348 and 145,580 (NEW_SIZE from 100,000 to 500,000) when K is equal to 50,100 or 150.

Fast_Density_Peak(K = 50,batch_num = 33,674,new_size =67,348,…); 5.22s
Compute-distance-num = 509182 Local-density-peak-num = 607
Fast_Density_Peak(K = 50,batch_num = 44,115,new_size = 88,230,…); 7.46s
Compute-distance-num = 965448 Local-density-peak-num = 1004
Fast_Density_Peak(K = 50,batch_num = 44,695,new_size = 89,390,…); 7.62s
Compute-distance-num = 1011767 Local-density-peak-num = 1016
Fast_Density_Peak(K = 50,batch_num = 58,606,new_size = 117,212,…); 11.25s
Compute-distance-num = 1952789 Local-density-peak-num = 1406
Fast_Density_Peak(K = 50,batch_num = 72,790,new_size = 145,580,…); 15.14s
Compute-distance-num = 3172985 Local-density-peak-num = 1946

Fast_Density_Peak(K = 100,batch_num = 33,674,new_size =67,348,…); 8.77s
Compute-distance-num = 130571 Local-density-peak-num = 270
Fast_Density_Peak(K = 100,batch_num = 44,115,new_size = 88,23,…); 12.16s
Compute-distance-num = 238269 Local-density-peak-num = 334
Fast_Density_Peak(K = 100,batch_num = 44,695,new_size = 89,390,…); 12.43s
Compute-distance-num = 243843 Local-density-peak-num = 341
Fast_Density_Peak(K = 100,batch_num = 58,606,new_size = 117,212,…); 17.27s
Compute-distance-num = 458041 Local-density-peak-num = 568
Fast_Density_Peak(K = 100,batch_num = 72,790,new_size = 145,580,…); 22.24s
Compute-distance-num = 750341 Local-density-peak-num = 832

Fast_Density_Peak(K = 150,batch_num = 33,674,new_size =67,348,…); 12.81s
Compute-distance-num = 66715 Local-density-peak-num = 183
Fast_Density_Peak(K = 150,batch_num = 44,115,new_size = 88,23,…); 17.46s
Compute-distance-num = 100593 Local-density-peak-num = 223
Fast_Density_Peak(K = 150,batch_num = 44,695,new_size = 89,390,…); 17.99s
Compute-distance-num = 105654 Local-density-peak-num = 227
Fast_Density_Peak(K = 150,batch_num = 58,606,new_size = 117,212,…); 24.71s
Compute-distance-num = 193115 Local-density-peak-num = 363
Fast_Density_Peak(K = 150,batch_num = 72,790,new_size = 145,580 0,…); 31.33s
Compute-distance-num = 333754 Local-density-peak-num = 542

③ Test the performance of "FastDPeak" clustering algorithm for new_size between 10,000 and 50,000 when K is equal to 50,100 or 150.

Fast_Density_Peak(K = 50,batch_num = 5,000,new_size = 10,000,…); 0.38s
Fast_Density_Peak(K = 50,batch_num = 10,000,new_size = 20,000,…); 1.20s
Fast_Density_Peak(K = 50,batch_num = 15,000,new_size = 30,000,…); 1.92s
Fast_Density_Peak(K = 50,batch_num = 20,000,new_size = 40,000,…); 2.82s
Fast_Density_Peak(K = 50,batch_num = 25,000,new_size = 50,000,…); 3.66s

Fast_Density_Peak(K = 100,batch_num = 5,000,new_size = 10,000,…); 0.63s
Fast_Density_Peak(K = 100,batch_num = 10,000,new_size = 20,000,…); 2.08s
Fast_Density_Peak(K = 100,batch_num = 15,000,new_size = 30,000,…); 3.32s
Fast_Density_Peak(K = 100,batch_num = 20,000,new_size = 40,000,…); 2.89s
Fast_Density_Peak(K = 100,batch_num = 25,000,new_size = 50,000,…); 6.09s

Fast_Density_Peak(K = 150,batch_num = 5,000,new_size = 10,000,…); 0.92s
Fast_Density_Peak(K = 150,batch_num = 10,000,new_size = 20,000,…); 1.81s
Fast_Density_Peak(K = 150,batch_num = 15,000,new_size = 30,000,…); 3.00s
Fast_Density_Peak(K = 150,batch_num = 20,000,new_size = 40,000,…); 6.97s
Fast_Density_Peak(K = 150,batch_num = 25,000,new_size = 50,000,…); 8.85s

3. KDD99(n=145,750, dim=77):

-All the experiments below have the same parameters about "main.cpp"
 local_peak_threshold = 5000;
 cl = 3;

//FastDPeak.app main()

① Test the performance of "FastDPeak" clustering algorithm for K between 10 and 150

Fast_Density_Peak(K = 10,batch_num = 72,875,new_size = 145,750,…); 27.24s
Compute-distance-num = 20287163 Local-density-peak-num = 1879
Fast_Density_Peak(K = 20,batch_num = 72,875,new_size = 145,750,…); 22.70s
Compute-distance-num = 4277060 Local-density-peak-num = 676
Fast_Density_Peak(K = 30,batch_num = 72,875,new_size = 145,750,…); 23.84s
Compute-distance-num = 1580294 Local-density-peak-num = 371
Fast_Density_Peak(K = 40,batch_num = 72,875,new_size = 145,750,…); 25.94s
Compute-distance-num = 781780 Local-density-peak-num = 253
Fast_Density_Peak(K = 50,batch_num = 72,875,new_size = 145,750,…); 27.86s
Compute-distance-num = 478665 Local-density-peak-num = 197
Fast_Density_Peak(K = 60,batch_num = 72,875,new_size = 145,750,…); 28.74s
Compute-distance-num = 300728 Local-density-peak-num = 156
Fast_Density_Peak(K = 70,batch_num = 72,875,new_size = 145,750,…); 30.34s
Compute-distance-num = 238483 Local-density-peak-num = 141
Fast_Density_Peak(K = 80,batch_num = 72,875,new_size = 145,750,…); 31.42s
Compute-distance-num = 190644 Local-density-peak-num = 133

Fast_Density_Peak(K = 90,batch_num = 72,875,new_size = 145,750,…); 32.69s
Compute-distance-num = 154825 Local-density-peak-num = 122
Fast_Density_Peak(K = 100,batch_num = 72,875,new_size = 145,750,…); 33.66s
Compute-distance-num = 118886 Local-density-peak-num = 109
Fast_Density_Peak(K = 110,batch_num = 72,875,new_size = 145,750,…); 35.38s
Compute-distance-num = 105045 Local-density-peak-num = 109
Fast_Density_Peak(K = 120,batch_num = 72,875,new_size = 145,750,…); 36.22s
Compute-distance-num = 91142 Local-density-peak-num = 105
Fast_Density_Peak(K = 130,batch_num = 72,875,new_size = 145,750,…); 37.59s
Compute-distance-num = 81757 Local-density-peak-num = 100
Fast_Density_Peak(K = 140,batch_num = 72,875,new_size = 145,750,…); 38.95s
Compute-distance-num = 72395 Local-density-peak-num = 97
Fast_Density_Peak(K = 150,batch_num = 72,875,new_size = 145,750,…); 42.14s
Compute-distance-num = 73682 Local-density-peak-num = 100

② Test the performance of "FastDPeak" clustering algorithm for new_size between 10,000 and 50,000 when K is equal to 50,100 or 150.

Fast_Density_Peak(K = 50,batch_num = 5,000,new_size = 10,000,…); 0.53s
Fast_Density_Peak(K = 50,batch_num = 10,000,new_size = 20,000,…); 1.26s
Fast_Density_Peak(K = 50,batch_num = 15,000,new_size = 30,000,…); 2.43s
Fast_Density_Peak(K = 50,batch_num = 20,000,new_size = 40,000,…); 3.61s
Fast_Density_Peak(K = 50,batch_num = 25,000,new_size = 50,000,…); 5.28s

Fast_Density_Peak(K = 100,batch_num = 5,000,new_size = 10,000,…); 0.79s
Fast_Density_Peak(K = 100,batch_num = 10,000,new_size = 20,000,…); 1.77s
Fast_Density_Peak(K = 100,batch_num = 15,000,new_size = 30,000,…); 3.49s
Fast_Density_Peak(K = 100,batch_num = 20,000,new_size = 40,000,…); 4.86s
Fast_Density_Peak(K = 100,batch_num = 25,000,new_size = 50,000,…); 6.98s

Fast_Density_Peak(K = 150,batch_num = 5,000,new_size = 10,000,…); 1.06s
Fast_Density_Peak(K = 150,batch_num = 10,000,new_size = 20,000,…); 2.35s
Fast_Density_Peak(K = 150,batch_num = 15,000,new_size = 30,000,…); 4.51s
Fast_Density_Peak(K = 150,batch_num = 20,000,new_size = 40,000,…); 6.26s
Fast_Density_Peak(K = 150,batch_num = 25,000,new_size = 50,000,…); 8.60s

4. SYN1(n=3,000, dim=2):

-All the experiments below have the same parameters about "main.cpp"
 local_peak_threshold = 50;
 cl = 2;

//FastDPeak.app main()

Fast_Density_Peak(K = 16,batch_num = 1,500,new_size = 3,000,…); 0.08s

Compute-distance-num = 21849 Local-density-peak-num = 46

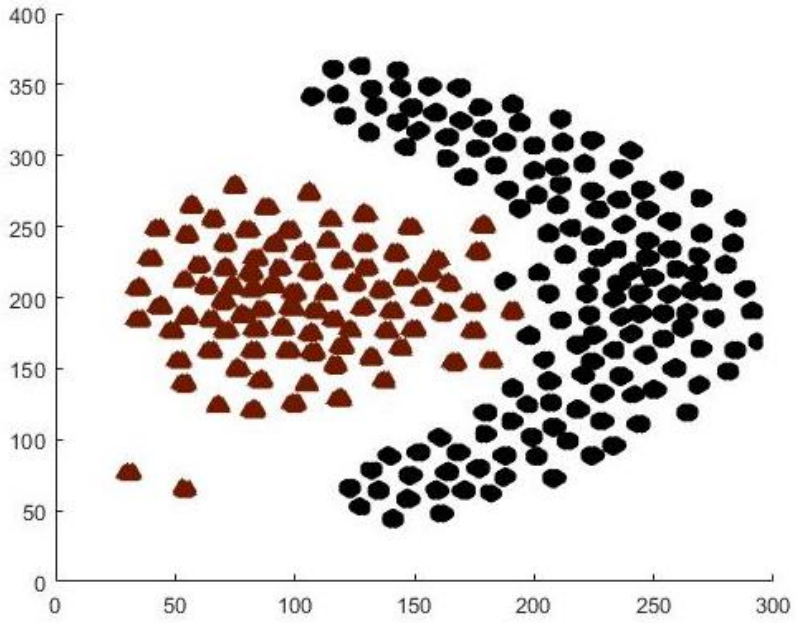

Fig1. SYN1_result

5. SYN2(n=5,800, dim=2):

-All the experiments below have the same parameters about "main.cpp"
local_peak_threshold = 100;
cl = 7;

//FastDPeak.app main()

Fast_Density_Peak(K = 16,batch_num = 2,900,new_size = 5,800,…); 0.23s
Compute-distance-num = 139932 Local-density-peak-num = 95

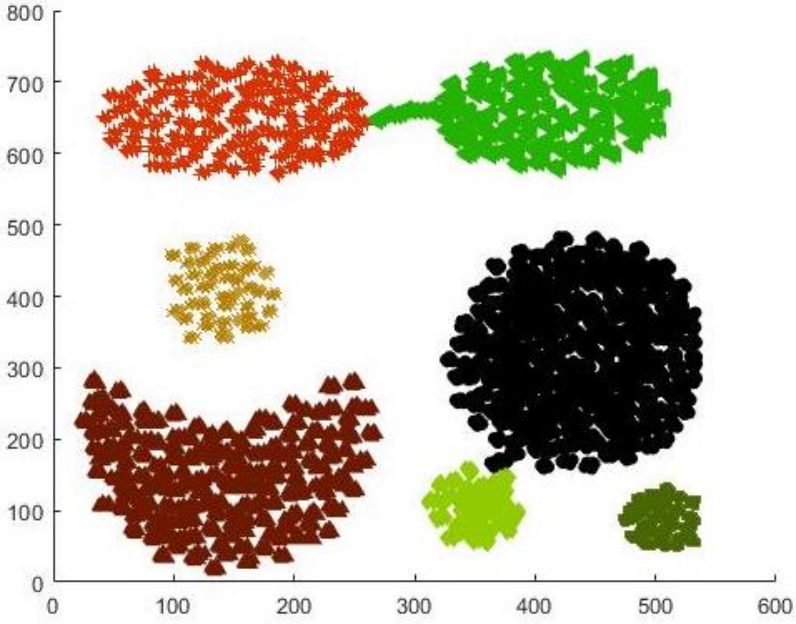

Fig2. SYN2_result

6. SYN3(n=2,000, dim=2):

-All the experiments below have the same parameters about "main.cpp"
local_peak_threshold = 30;
cl = 5;

//FastDPeak.app main()

Fast_Density_Peak(K = 11,batch_num = 1,000,new_size = 2,000,…); 0.03s
Compute-distance-num = 3527 Local-density-peak-num = 17

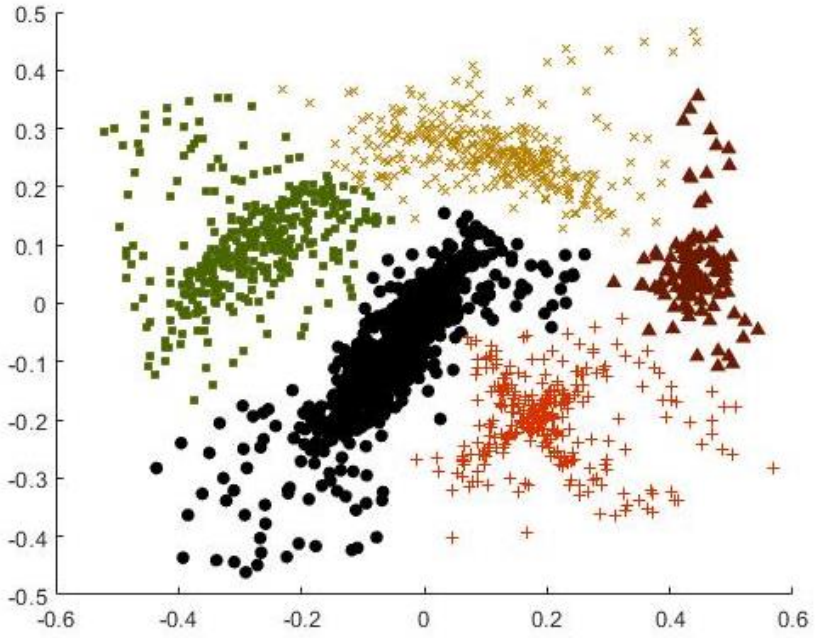

Fig3. SYN3_result