I ran the full data set multiply times, and my resulting purity score is around 0.3. Some conclusions: by increasing the ridge value, purity score increases, but It also have a larger variance. Since all the data are random, there are some expected fluctuations between my output purity scores. I copied and pasted my three outputs below from the console because the required output is too long for screenshots.

The input k 6, eps 0.001, ridge 12, maxiter 100:

At iteration 57, it is convergent

Means: -------------------------------------------------------

[array([ 11.11246329, 20.60587779, 42.21451018, 19.60400081,

41.48199486, 20.52082586, 42.35125417, 19.36350029,

42.12674028, 18.31295649, 58.05116721, 3.25351668,

91.29373128, 18.14143561, 38.60802838, 20.16311347,

46.94211639, 17.30074774, 43.78441595, 3.46479309,

755.87556958, 90.3232084 , 4.12922168, 44.17183536,

1.98702406, 24.87371827]), array([ 11.11246329, 20.60587779, 42.21451018, 19.60400081,

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91.29373128, 18.14143561, 38.60802838, 20.16311347,

46.94211639, 17.30074774, 43.78441595, 3.46479309,

755.87556958, 90.3232084 , 4.12922168, 44.17183536,

1.98702406, 24.87371827]), array([ 1.0023005 , 20.57405896, 41.07316944, 19.25194353,

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80.47722031, 18.62531239, 37.21602483, 20.27114662,

45.29423792, 17.88345677, 43.24367264, 4.87472635,

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2.4438469 , 25.11094268]), array([ 6.75848539, 21.89514062, 38.92203567, 20.67156305,

38.67879032, 22.35865587, 37.88038721, 21.18694586,

37.17105185, 19.64272304, 51.4419794 , 9.19275725,

36.00605381, 20.70681677, 32.48726379, 22.50016164,

39.52635162, 19.66766429, 39.66369423, 8.45066948,

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91.29373128, 18.14143561, 38.60802838, 20.16311347,

46.94211639, 17.30074774, 43.78441595, 3.46479309,

755.87556958, 90.3232084 , 4.12922168, 44.17183536,

1.98702406, 24.87371827]), array([ 11.11246329, 20.60587779, 42.21451018, 19.60400081,

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42.12674028, 18.31295649, 58.05116721, 3.25351668,

91.29373128, 18.14143561, 38.60802838, 20.16311347,

46.94211639, 17.30074774, 43.78441595, 3.46479309,

755.87556958, 90.3232084 , 4.12922168, 44.17183536,

1.98702406, 24.87371827])]

Covariance Matrix: -------------------------------------------------------

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7.48474651e+00, 5.11712212e+00, 1.03798804e+01,

1.03816091e+00, -2.11846427e-01, 1.51734208e+01,

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2.10720345e+00, 3.18858072e-01, 1.55188802e+00,

1.12920463e+00, 1.69027035e+00, 1.82568558e+00,

1.50001994e+00, 3.05551785e+00, 1.90697438e+00,

6.81821502e-02, 1.12291534e+00, 2.28205694e+00,

1.32405822e+00, 8.53386522e-01, 9.18644386e-01,

1.29899860e+00, 1.94938821e+00, -1.45582575e+00,

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1.92201080e+00, 5.03372742e-01],

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4.75060475e-01, 4.22205471e+00, 1.10883526e+01,

7.91513993e+00, -1.62698229e-01, 1.35580157e+01,

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1.01951050e+01, 1.04860198e+01, -7.34189647e+00,

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1.49119533e+00, 3.51501602e+00, 2.95201420e+00,

1.74378210e+00, 9.35767680e-01, 3.58691622e+00,

1.09356087e+00, 2.00319106e+00, 8.06897813e-01,

2.39011247e+00, 2.92327855e+00, -1.44385302e+00,

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1.77773130e+01, 1.35451910e+01, -2.71963375e+00,

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2.44662926e+00, 2.10707045e+02]])]

cluster: 0, Length is 4562

cluster: 1, Length is 0

cluster: 2, Length is 11830

cluster: 3, Length is 3343

cluster: 4, Length is 0

cluster: 5, Length is 0

The purity\_score is: 0.13063085888016215

----------------------------

The input k 6, eps 0.001, ridge 15, maxiter 100:

At iteration 76, it is convergent

Means: -------------------------------------------------------

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755.38719152, 89.16835245, 4.9169751 , 40.7618351 ,

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47.52329358, 17.31640967, 44.63706407, 4.3332599 ,

755.38719152, 89.16835245, 4.9169751 , 40.7618351 ,

2.64128334, 25.03029007]), array([ 4.18048997, 20.42886895, 42.32406846, 19.45952181,

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42.51236791, 18.04736914, 53.27851659, 4.2263751 ,

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47.52329358, 17.31640967, 44.63706407, 4.3332599 ,

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Covariance Matrix: -------------------------------------------------------

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2.12123211e-01, -2.61626269e-01, 2.67547223e-01,

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cluster: 0, Length is 5458

cluster: 1, Length is 3016

cluster: 2, Length is 0

cluster: 3, Length is 7411

cluster: 4, Length is 0

cluster: 5, Length is 3847

The purity\_score is: 0.288383582467697

-----------------------------------------

The input k 6, eps 0.001, ridge 15, maxiter 100:

At iteration 57, it is convergent

Means: -------------------------------------------------------

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Covariance Matrix: -------------------------------------------------------

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1.34527625e+00, 1.36153604e+00, 1.65696486e+00,

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-6.17782169e-01, 1.04449407e+00, -2.19708523e-02,

-1.25208759e+00, 1.57200949e-01, -1.43564528e+00,

7.95654065e-01, -1.38411061e+00, -1.20334622e-01,

2.55652918e+00, 8.50791592e-01, -6.94733481e-01,

1.88207524e+00, 1.18910219e+00, 6.93298635e-01,

4.14361850e-01, 3.01541707e-01, 5.13215641e+00,

1.03815071e+01, -3.00134847e-01, 1.35852349e+02,

2.05910863e+00, -2.70833764e+00],

[ 1.02865147e-01, 2.90524844e+00, 6.70903693e+00,

3.34874900e+00, 6.92441121e+00, 4.15749174e+00,

2.82019788e+00, 3.00429680e+00, 7.05339997e+00,

3.81908234e+00, 1.00656324e+00, 1.41262093e+01,

-3.75708441e+01, 2.70270110e+00, 8.34130488e+00,

3.14139630e+00, 6.49422726e+00, 3.96429196e+00,

5.24768759e+00, 1.28326733e+01, -1.04650752e+01,

9.47746586e+00, 1.15517192e+00, 2.05910863e+00,

1.42151827e+01, -2.43538162e-01],

[-9.41311342e-01, -6.52203699e-02, -1.26012146e+00,

-2.08559472e-01, -1.02730831e+00, -1.34828427e-01,

-1.26798815e+00, 1.34448895e-01, -6.17358134e-01,

-2.16661829e-02, -3.13404415e-01, -1.74528574e+00,

6.12980247e+00, -1.53093147e-01, -5.05563900e-01,

1.45105447e-01, 1.34220476e-01, 3.08208833e-02,

-3.31396317e-01, -1.23557444e+00, -4.68701638e-01,

4.88018618e+00, -1.95612572e-01, -2.70833764e+00,

-2.43538162e-01, 2.08743980e+02]])]

cluster: 0, Length is 9356

cluster: 1, Length is 0

cluster: 2, Length is 3593

cluster: 3, Length is 0

cluster: 4, Length is 3078

cluster: 5, Length is 4331

The purity\_score is: 0.30883962503166963