# Heart Failure Analysis

## K Means

### Results

K-Means Inertia: 420625.57010757184

K-Means Silhouette score: 0.27836932580418405

K-Means Adjusted Mutual Information (AMI) score: 0.06104324230675783

[47]:

array([[ 20.16725786, 96.21315979, 154.77940202, ..., 54.54551207,

24.21606444, 59.17464136],

[ 91.66989509, 34.75707244, 76.04496448, ..., 47.93102021,

85.74798236, 29.60405521],

[ 64.80629525, 99.5686022 , 160.45185141, ..., 58.7116849 ,

28.0246109 , 85.26175433],

...,

[ 50.56654201, 65.44241608, 124.7869516 , ..., 28.1881425 ,

33.35915709, 40.59316256],

[ 71.02340314, 55.09325911, 116.29094242, ..., 14.91945862,

43.14204398, 52.5531032 ],

[103.22556105, 25.24934642, 70.07622009, ..., 46.33497457,

90.98945057, 48.17769776]])

### Silhouette

For n\_clusters = 3 The average silhouette\_score is : 0.36321856909542777

For n\_clusters = 5 The average silhouette\_score is : 0.3147138441295178

For n\_clusters = 7 The average silhouette\_score is : 0.28291871431728216

For n\_clusters = 9 The average silhouette\_score is : 0.26279488643027477

For n\_clusters = 11 The average silhouette\_score is : 0.2383506920510026

For n\_clusters = 13 The average silhouette\_score is : 0.237991172235641

For n\_clusters = 15 The average silhouette\_score is : 0.24069805656135856

## Gaussian Mixture

### Results

GMM BIC: 19652.91798582151

GMM Silhouette score: 0.03308546088741851

GMM Adjusted Mutual Information (AMI) score: 0.07143893026182722

[49]:

array([[0., 1.],

[0., 1.],

[0., 1.],

...,

[0., 1.],

[0., 1.],

[1., 0.]])

## Decision Tree

### Feature Importance

array([0.12867035, 0.05780973, 0.16153352, 0.12361202, 0.15783318,

0.05154923, 0.15191631, 0.16707565])

### Max Features

max\_features: 1

cross\_val\_score (mean): 0.805

cross\_val\_score (std): 0.044

max\_features: 2

cross\_val\_score (mean): 0.799

cross\_val\_score (std): 0.045

max\_features: 3

cross\_val\_score (mean): 0.793

cross\_val\_score (std): 0.046

max\_features: 4

cross\_val\_score (mean): 0.789

cross\_val\_score (std): 0.047

max\_features: 5

cross\_val\_score (mean): 0.783

cross\_val\_score (std): 0.038

max\_features: 6

cross\_val\_score (mean): 0.790

cross\_val\_score (std): 0.035

max\_features: 7

cross\_val\_score (mean): 0.789

cross\_val\_score (std): 0.036

max\_features: 8

cross\_val\_score (mean): 0.792

cross\_val\_score (std): 0.037

# Stroke Analysis

## K Means

### Results

K-Means Inertia: 76226347.29547375

K-Means Silhouette score: 0.4603515076955189

K-Means Adjusted Mutual Information (AMI) score: 0.004724981668235182

[48]:

array([[1337.84898496, 380.13056217, 1751.38464753, ..., 486.97373958,

61.88654272, 2164.06765899],

[ 258.89897566, 1504.72254227, 650.01805412, ..., 642.11118761,

1065.59277452, 1057.33388956],

[ 94.85723962, 1662.47378872, 478.2560449 , ..., 795.9230929 ,

1223.68653351, 888.14632759],

...,

[ 330.12403454, 2037.62636384, 122.10936919, ..., 1174.3490133 ,

1602.45321837, 512.1954596 ],

[1789.54996784, 197.31478803, 2200.23788488, ..., 952.14648347,

545.73584993, 2611.11552497],

[1725.81219716, 74.68394597, 2138.54294674, ..., 878.80611971,

457.58815407, 2550.74340589]])

### Silhouette

For n\_clusters = 3 The average silhouette\_score is : 0.5549551537122922

For n\_clusters = 5 The average silhouette\_score is : 0.5053378342430372

For n\_clusters = 7 The average silhouette\_score is : 0.4603168172139675

For n\_clusters = 9 The average silhouette\_score is : 0.4221625830667821

For n\_clusters = 11 The average silhouette\_score is : 0.3883269764962383

For n\_clusters = 13 The average silhouette\_score is : 0.35858912719050795

For n\_clusters = 15 The average silhouette\_score is : 0.3333169789113984

## Gaussian

### Results

GMM BIC: 94412.39476016807

GMM Silhouette score: 0.08288129746223813

GMM Adjusted Mutual Information (AMI) score: 0.03039886911455334

[64]:

array([[9.99999998e-01, 1.81967845e-09],

[1.00000000e+00, 7.64288853e-21],

[1.00000000e+00, 8.90887367e-13],

...,

[1.00000000e+00, 2.25132403e-10],

[9.99999997e-01, 2.78248720e-09],

[9.99999997e-01, 2.72017481e-09]])

## Decision Tree

### Feature Importances

array([0.04024575, 0.27971624, 0.03116057, 0.02621571, 0.02789612,

0.0648269 , 0.04301255, 0.19723419, 0.19849852, 0.09119345])

### Max Features

max\_features: 1

cross\_val\_score (mean): 0.952

cross\_val\_score (std): 0.003

max\_features: 2

cross\_val\_score (mean): 0.952

cross\_val\_score (std): 0.004

max\_features: 3

cross\_val\_score (mean): 0.952

cross\_val\_score (std): 0.004

max\_features: 4

cross\_val\_score (mean): 0.952

cross\_val\_score (std): 0.005

max\_features: 5

cross\_val\_score (mean): 0.953

cross\_val\_score (std): 0.005

max\_features: 6

cross\_val\_score (mean): 0.952

cross\_val\_score (std): 0.006

max\_features: 7

cross\_val\_score (mean): 0.952

cross\_val\_score (std): 0.006

max\_features: 8

cross\_val\_score (mean): 0.951

cross\_val\_score (std): 0.006

max\_features: 9

cross\_val\_score (mean): 0.952

cross\_val\_score (std): 0.006

max\_features: 10

cross\_val\_score (mean): 0.951

cross\_val\_score (std): 0.006

# After Dimension Reduction

# Heart Failure

## K Means - PCA

### Results

K-Means Inertia: 535951.739938209

K-Means Silhouette score: 0.314985915143216

K-Means Adjusted Mutual Information (AMI) score: 0.07120322979215102

[5]:

array([[142.98444349, 12.88001159, 95.6682132 , 45.84086905,

63.26907699],

[ 63.21628218, 89.88652195, 34.41871079, 62.19930427,

24.79681384],

[152.31700024, 56.0110461 , 99.41847892, 43.5882397 ,

86.58167125],

...,

[114.16684096, 44.79127538, 65.11832215, 25.34162361,

42.1079644 ],

[108.09375671, 64.49661709, 54.58159242, 13.86483227,

50.2067187 ],

[ 60.65426156, 100.32344837, 24.26443774, 62.01917135,

41.45402122]])

### Silhouette

For n\_clusters = 3 The average silhouette\_score is : 0.36338375953725593

For n\_clusters = 5 The average silhouette\_score is : 0.3149392817265534

For n\_clusters = 7 The average silhouette\_score is : 0.2831869318392222

For n\_clusters = 9 The average silhouette\_score is : 0.26502369219061356

For n\_clusters = 11 The average silhouette\_score is : 0.23867060277927338

For n\_clusters = 13 The average silhouette\_score is : 0.2345727018851494

For n\_clusters = 15 The average silhouette\_score is : 0.23179223158210774

## Gaussian - PCA

### Results

GMM BIC: 24420.401171326284

GMM Silhouette score: 0.3974269322560091

GMM Adjusted Mutual Information (AMI) score: 0.0003406216039716423

[12]:

array([[0.019458 , 0.980542 ],

[0.97509796, 0.02490204],

[0.04662197, 0.95337803],

...,

[0.23334334, 0.76665666],

[0.16427752, 0.83572248],

[0.93641997, 0.06358003]])

## K Means – ICA

### Results

K-Means Inertia: 2.8928425257407766

K-Means Silhouette score: 0.1789984001525528

K-Means Adjusted Mutual Information (AMI) score: 0.08696148142361397

[26]:

array([[0.08143857, 0.12315924, 0.11010348, 0.05374579, 0.08746985],

[0.08316704, 0.09528031, 0.04745572, 0.10609374, 0.0792448 ],

[0.1164764 , 0.12817102, 0.16217385, 0.10245799, 0.11689915],

...,

[0.10510865, 0.07417058, 0.11076866, 0.1105864 , 0.05329671],

[0.01809812, 0.09905908, 0.10576431, 0.10143956, 0.09268567],

[0.06406252, 0.09580124, 0.08719627, 0.09895558, 0.10982498]])

### Silhouette

For n\_clusters = 3 The average silhouette\_score is : 0.16998270118137546

For n\_clusters = 5 The average silhouette\_score is : 0.1792028332984392

For n\_clusters = 7 The average silhouette\_score is : 0.17480648814487362

For n\_clusters = 9 The average silhouette\_score is : 0.17764768011814416

For n\_clusters = 11 The average silhouette\_score is : 0.17931638698091545

For n\_clusters = 13 The average silhouette\_score is : 0.17470129924501387

For n\_clusters = 15 The average silhouette\_score is : 0.18101344491540705

## Gaussian – ICA

### Results

GMM BIC: -11719.050705556516

GMM Silhouette score: 0.18667249280966833

GMM Adjusted Mutual Information (AMI) score: 0.0366476281340985

[34]:

array([[4.86361630e-04, 9.99513638e-01],

[9.99985945e-01, 1.40550292e-05],

[7.62163047e-04, 9.99237837e-01],

...,

[9.99998057e-01, 1.94265045e-06],

[9.63096422e-01, 3.69035776e-02],

[9.20243620e-01, 7.97563801e-02]])

## K Means – Random Projection

### Results

K-Means Inertia: 428582.7309559238

K-Means Silhouette score: 0.31190101825417577

K-Means Adjusted Mutual Information (AMI) score: 0.07378100285593381

[43]:

array([[ 46.29454958, 13.35193919, 78.90849417, 39.49008447,

107.07966128],

[ 14.9242633 , 60.49103785, 40.63307697, 59.90793797,

52.26456819],

[ 87.25736334, 58.85760086, 102.26293034, 45.33304407,

142.29460046],

...,

[ 42.62352567, 30.92616039, 66.65248635, 27.30753916,

99.80816308],

[ 50.79085166, 57.56927915, 50.98450569, 14.77030197,

94.68774369],

[ 44.19710891, 85.52892786, 20.86388297, 64.4066491 ,

47.61552647]])

### Silhouette

For n\_clusters = 3 The average silhouette\_score is : 0.3187352283778091

For n\_clusters = 5 The average silhouette\_score is : 0.31169089931105887

For n\_clusters = 7 The average silhouette\_score is : 0.27221460328776403

For n\_clusters = 9 The average silhouette\_score is : 0.2666226488856278

For n\_clusters = 11 The average silhouette\_score is : 0.2624276591677938

For n\_clusters = 13 The average silhouette\_score is : 0.2580098532231206

For n\_clusters = 15 The average silhouette\_score is : 0.25413899534216083

## Gaussian – Random Projection

GMM BIC: 22655.050246490628

GMM Silhouette score: 0.3578241754058751

GMM Adjusted Mutual Information (AMI) score: 0.0030390390210311485

[46]:

array([[0.02538647, 0.97461353],

[0.91774386, 0.08225614],

[0.03576631, 0.96423369],

...,

[0.32058631, 0.67941369],

[0.08147601, 0.91852399],

[0.92160743, 0.07839257]])

## K Means – TSVD

### Results

K-Means Inertia: 535874.1930652295

K-Means Silhouette score: 0.3150072388221797

K-Means Adjusted Mutual Information (AMI) score: 0.07120322979215102

[55]:

array([[142.98325328, 12.87700373, 95.66589609, 45.83753304,

63.26808454],

[ 63.21862548, 89.88527302, 34.42441565, 62.20070876,

24.79453661],

[152.31654684, 56.0071879 , 99.41809012, 43.58675779,

86.5797773 ],

...,

[114.16473068, 44.77942344, 65.11558722, 25.33054394,

42.09711174],

[108.09148172, 64.49573773, 54.5758992 , 13.84946798,

50.20491259],

[ 60.64827137, 100.32197451, 24.24641194, 62.0137801 ,

41.44941434]])

### Silhouette

For n\_clusters = 3 The average silhouette\_score is : 0.36340602282190765

For n\_clusters = 5 The average silhouette\_score is : 0.31496255903824194

For n\_clusters = 7 The average silhouette\_score is : 0.28320963438867586

For n\_clusters = 9 The average silhouette\_score is : 0.26504596626239346

For n\_clusters = 11 The average silhouette\_score is : 0.23869162919133255

For n\_clusters = 13 The average silhouette\_score is : 0.23459230722867008

For n\_clusters = 15 The average silhouette\_score is : 0.2273397600207542

## Gaussian – TSVD

GMM BIC: 21695.59483876553

GMM Silhouette score: 0.03877546524704306

GMM Adjusted Mutual Information (AMI) score: 0.17346473300661014

[59]:

array([[6.11648324e-001, 0.00000000e+000, 3.81857144e-001,

1.58585209e-138, 6.49453223e-003],

[2.58040951e-002, 0.00000000e+000, 1.39807052e-014,

9.71477997e-001, 2.71790745e-003],

[1.92871318e-002, 0.00000000e+000, 5.80011531e-001,

1.76194103e-156, 4.00701337e-001],

...,

[1.16451324e-004, 0.00000000e+000, 1.88693472e-006,

9.99713748e-001, 1.67913270e-004],

[8.82967318e-003, 0.00000000e+000, 8.98170738e-001,

2.56292539e-029, 9.29995891e-002],

[3.13292888e-001, 0.00000000e+000, 3.32045970e-002,

1.09282385e-039, 6.53502515e-001]])

## K Means – Decision Tree

### Results

K-Means Inertia: 536062.3136279329

K-Means Silhouette score: 0.3149226595160197

K-Means Adjusted Mutual Information (AMI) score: 0.07120322979215102

[5]:

array([[142.98616907, 12.90162024, 95.67061319, 45.84729013,

63.2742278 ],

[ 63.22270255, 89.88743241, 34.43070773, 62.20411056,

24.80475567],

[152.31684606, 56.01110615, 99.4181942 , 43.58825847,

86.58182202],

...,

[114.16896575, 44.78966558, 65.12210416, 25.34874588,

42.11018765],

[108.09670209, 64.50206772, 54.5872011 , 13.89218773,

50.21477775],

[ 60.65445225, 100.32484827, 24.26427655, 62.02017667,

41.45653029]])

### Silhouette

For n\_clusters = 3 The average silhouette\_score is : 0.3633403332864446

For n\_clusters = 5 The average silhouette\_score is : 0.31487493184936327

For n\_clusters = 7 The average silhouette\_score is : 0.2831186512237049

For n\_clusters = 9 The average silhouette\_score is : 0.26494433128101985

For n\_clusters = 11 The average silhouette\_score is : 0.2385856959482621

For n\_clusters = 13 The average silhouette\_score is : 0.2344744978743058

For n\_clusters = 15 The average silhouette\_score is : 0.23214954899794069

### Gaussian

GMM BIC: 14832.32645036293

GMM Silhouette score: -0.17869782824256072

GMM Adjusted Mutual Information (AMI) score: 0.16961198894658452

[8]:

array([[1.00000000e+00, 0.00000000e+00, 0.00000000e+00, 0.00000000e+00,

2.69329351e-11],

[0.00000000e+00, 0.00000000e+00, 1.00000000e+00, 0.00000000e+00,

0.00000000e+00],

[0.00000000e+00, 0.00000000e+00, 1.00000000e+00, 0.00000000e+00,

0.00000000e+00],

...,

[3.59185904e-07, 0.00000000e+00, 0.00000000e+00, 9.99999641e-01,

1.18308725e-19],

[9.95907939e-01, 0.00000000e+00, 0.00000000e+00, 0.00000000e+00,

4.09206116e-03],

[0.00000000e+00, 0.00000000e+00, 1.00000000e+00, 0.00000000e+00,

0.00000000e+00]])

# Stroke

## K Means – PCA

### Results

K-Means Inertia: 315853473.8043263

K-Means Silhouette score: 0.5549860319984841

K-Means Adjusted Mutual Information (AMI) score: 0.002297614572442599

[20]:

array([[ 941.26051833, 66.24741451, 1887.16560738],

[ 219.52609454, 1190.04836186, 783.41543915],

[ 346.45139839, 1347.72004745, 612.70419027],

...,

[ 721.24269365, 1724.78903764, 242.30281955],

[1396.92003097, 428.67792842, 2335.35115572],

[1330.27518894, 334.38426035, 2274.14422891]])

### Silhouette

For n\_clusters = 3 The average silhouette\_score is : 0.5549489585320041

For n\_clusters = 5 The average silhouette\_score is : 0.5054592915634518

For n\_clusters = 7 The average silhouette\_score is : 0.4603852299909321

For n\_clusters = 9 The average silhouette\_score is : 0.42259773738258677

For n\_clusters = 11 The average silhouette\_score is : 0.38838345119653545

For n\_clusters = 13 The average silhouette\_score is : 0.3587381170024642

For n\_clusters = 15 The average silhouette\_score is : 0.33335188546751515

## Gaussian – PCA

### Results

GMM BIC: 131344.6356139311

GMM Silhouette score: 0.5921524844964102

GMM Adjusted Mutual Information (AMI) score: 0.0017527984772630761

[23]:

array([[5.27633547e-03, 9.94723665e-01],

[5.15082148e-01, 4.84917852e-01],

[8.62593566e-01, 1.37406434e-01],

...,

[9.95111681e-01, 4.88831905e-03],

[3.03796522e-04, 9.99696203e-01],

[3.93654605e-04, 9.99606345e-01]])

## K Means – ICA

### Results

K-Means Inertia: 1.7139827958003426

K-Means Silhouette score: 0.27913076692242245

K-Means Adjusted Mutual Information (AMI) score: 0.0245260614622256

[37]:

array([[0.03373197, 0.0035187 , 0.03440577],

[0.05311798, 0.05435886, 0.02125756],

[0.0302009 , 0.0359141 , 0.00837623],

...,

[0.02090096, 0.03966168, 0.03329598],

[0.06108851, 0.05019862, 0.06493823],

[0.04297003, 0.02059245, 0.05075857]])

### Silhouette

For n\_clusters = 3 The average silhouette\_score is : 0.2791059873668129

For n\_clusters = 5 The average silhouette\_score is : 0.28327679700960834

For n\_clusters = 7 The average silhouette\_score is : 0.28397373126665754

For n\_clusters = 9 The average silhouette\_score is : 0.266394820581473

For n\_clusters = 11 The average silhouette\_score is : 0.25683424922118353

For n\_clusters = 13 The average silhouette\_score is : 0.26189824395884553

For n\_clusters = 15 The average silhouette\_score is : 0.2607939370493127

## Gaussian – ICA

GMM BIC: -58290.49556338428

GMM Silhouette score: 0.2228074846819641

GMM Adjusted Mutual Information (AMI) score: 0.03309946101932854

[40]:

array([[2.02413189e-02, 9.79758681e-01],

[9.99983731e-01, 1.62692109e-05],

[9.81642816e-01, 1.83571837e-02],

...,

[1.33943380e-01, 8.66056620e-01],

[1.47918282e-06, 9.99998521e-01],

[2.36937945e-03, 9.97630621e-01]])

## K Means – Random Projection

### Results

K-Means Inertia: 273647943.3388884

K-Means Silhouette score: 0.5749773813696454

K-Means Adjusted Mutual Information (AMI) score: 0.0029313145334189197

[49]:

array([[ 920.96583825, 1818.59160433, 46.31554717],

[ 196.980051 , 707.41471581, 1159.5593492 ],

[ 328.28767535, 570.48486581, 1294.63050397],

...,

[ 691.81505731, 207.20579332, 1658.41645654],

[1311.00233972, 2208.23961695, 346.75815349],

[1289.8640473 , 2187.37738211, 323.73880916]])

### Silhouette

For n\_clusters = 3 The average silhouette\_score is : 0.5749773813696454

For n\_clusters = 5 The average silhouette\_score is : 0.549542007130117

For n\_clusters = 7 The average silhouette\_score is : 0.5292346776808666

For n\_clusters = 9 The average silhouette\_score is : 0.5180035849675669

For n\_clusters = 11 The average silhouette\_score is : 0.5021850942163271

For n\_clusters = 13 The average silhouette\_score is : 0.4879284481019051

For n\_clusters = 15 The average silhouette\_score is : 0.47201854665649545

## Gaussian – Random Projection

GMM BIC: 118930.94703739477

GMM Silhouette score: 0.6019999081866617

GMM Adjusted Mutual Information (AMI) score: 0.0018517321131929934

[52]:

array([[5.46003033e-03, 9.94539970e-01],

[5.47103570e-01, 4.52896430e-01],

[8.70399701e-01, 1.29600299e-01],

...,

[9.95558227e-01, 4.44177271e-03],

[3.28691793e-04, 9.99671308e-01],

[4.07611128e-04, 9.99592389e-01]])

## K Means – TSVD

### Results

K-Means Inertia: 678575325.5390552

K-Means Silhouette score: 0.6010683173354701

K-Means Adjusted Mutual Information (AMI) score: 0.0022029487125286937

[67]:

array([[1616.24277664, 182.658592 ],

[ 518.50929324, 943.83741089],

[ 345.49728241, 1100.12734569],

...,

[ 89.15422954, 1477.33866802],

[2065.85593806, 656.93058222],

[2003.60384987, 576.3946337 ]])

### Silhouette

For n\_clusters = 3 The average silhouette\_score is : 0.5549516047940172

For n\_clusters = 5 The average silhouette\_score is : 0.5054643521267762

For n\_clusters = 7 The average silhouette\_score is : 0.46039263138882924

For n\_clusters = 9 The average silhouette\_score is : 0.42260733183750754

For n\_clusters = 11 The average silhouette\_score is : 0.3883946488469933

For n\_clusters = 13 The average silhouette\_score is : 0.35875055189593985

For n\_clusters = 15 The average silhouette\_score is : 0.3333658528599507

## Gaussian – TSVD

GMM BIC: 131341.20580789368

GMM Silhouette score: 0.5921538788746381

GMM Adjusted Mutual Information (AMI) score: 0.0017527984772630761

[65]:

array([[5.27593371e-03, 9.94724066e-01],

[5.15072226e-01, 4.84927774e-01],

[8.62539128e-01, 1.37460872e-01],

...,

[9.95110843e-01, 4.88915658e-03],

[3.03894397e-04, 9.99696106e-01],

[3.93600833e-04, 9.99606399e-01]])

## K Means – Decision Tree

### Results

K-Means Inertia: 678576741.7683924

K-Means Silhouette score: 0.6010677035530803

K-Means Adjusted Mutual Information (AMI) score: 0.0022029487125286937

[11]:

array([[1616.24345439, 182.65990224],

[ 518.50976251, 943.83995981],

[ 345.49834055, 1100.12831477],

...,

[ 89.15382857, 1477.33881993],

[2065.85621289, 656.93004585],

[2003.60543453, 576.39741015]])

### Silhouette

For n\_clusters = 3 The average silhouette\_score is : 0.5549504780368166

For n\_clusters = 5 The average silhouette\_score is : 0.5054621522078563

For n\_clusters = 7 The average silhouette\_score is : 0.46038940159320174

For n\_clusters = 9 The average silhouette\_score is : 0.4226032834237311

For n\_clusters = 11 The average silhouette\_score is : 0.3883897123575949

For n\_clusters = 13 The average silhouette\_score is : 0.3587448468475552

For n\_clusters = 15 The average silhouette\_score is : 0.3333595941448177

## Gaussian

GMM BIC: 131342.67338967067

GMM Silhouette score: 0.5921532379719416

GMM Adjusted Mutual Information (AMI) score: 0.0017527984772630761

[14]:

array([[5.27578919e-03, 9.94724211e-01],

[5.15070901e-01, 4.84929099e-01],

[8.62523770e-01, 1.37476230e-01],

...,

[9.95109310e-01, 4.89068995e-03],

[3.03929767e-04, 9.99696070e-01],

[3.93494120e-04, 9.99606506e-01]])

# Neural Networks

# Heart Failure

## PCA

Accuracy for Neural Network is 0.6342412451361867

Training time for Neural Network: 0.15053272247314453 seconds

Testing time for Neural Network: 0.0010004043579101562 seconds

## ICA

Accuracy for Neural Network is 0.7392996108949417

Training time for Neural Network: 0.0975959300994873 seconds

Testing time for Neural Network: 0.0 seconds

## Random Projection

Accuracy for Neural Network is 0.6536964980544747

Training time for Neural Network: 0.08353447914123535 seconds

Testing time for Neural Network: 0.0009996891021728516 seconds

## Truncated SVD

Accuracy for Neural Network is 0.688715953307393

Training time for Neural Network: 0.14608407020568848 seconds

Testing time for Neural Network: 0.0 seconds

### Decision Tree

Accuracy for Neural Network is 0.7237354085603113

Training time for Neural Network: 0.10807347297668457 seconds

Testing time for Neural Network: 0.0010006427764892578 seconds

# Neural Networks with Clusters

## K Means

Accuracy for Neural Network is 0.5914396887159533

Training time for Neural Network: 0.04117131233215332 seconds

Testing time for Neural Network: 0.0009996891021728516 seconds

## Gaussian Mixture

Accuracy for Neural Network is 0.6498054474708171

Training time for Neural Network: 0.057999610900878906 seconds

Testing time for Neural Network: 0.0 seconds