Appendix

1. Partial raw data

114.109901 22.555218

113.939766 22.535618

114.059486 22.812082

113.939766 22.535618

114.059486 22.812082

114.025887 22.6402

114.057251 22.569683

114.057251 22.569683

114.058632 22.570534

114.059166 22.571068

114.061447 22.571016

114.059166 22.571068

114.061447 22.571016

113.911835 22.507366

113.925598 22.535418

114.05928 22.53125

114.101486 22.626801

113.979919 22.550301

114.101486 22.626801

113.979919 22.550301

114.133102 22.617018

114.090767 22.5453

114.119637 22.546133

113.940483 22.550983

114.063004 22.535334

114.053101 22.53125

114.105614 22.566

114.062302 22.638817

114.074265 22.570883

114.063004 22.535334

114.053101 22.53125

114.105614 22.566

114.062302 22.638817

114.074265 22.570883

114.077133 22.535851

114.225899 22.620001

114.225899 22.620001

114.063164 22.532883

114.100197 22.7404

113.851097 22.5902

114.110397 22.5949

114.119598 22.540716

113.963501 22.548401

113.8825 22.557966

114.262299 22.7393

114.099449 22.538

114.081329 22.628134

113.857002 22.57398

113.862785 22.664635

114.118385 22.541018

113.921303 22.555799

113.881798 22.577299

114.215302 22.6376

114.099503 22.555

114.032501 22.6621

114.082047 22.534666

113.883698 22.594

114.117302 22.537201

114.032501 22.6621

114.082047 22.534666

113.883698 22.594

114.117302 22.537201

114.130165 22.613684

113.981331 22.551933

114.081779 22.537933

114.081596 22.5401

114.081383 22.5401

114.068665 22.544167

114.047165 22.567499

114.047165 22.567499

114.125847 22.548267

114.141853 22.548283

113.893265 22.48115

113.842979 22.771049

114.125847 22.548267

114.141853 22.548283

113.893265 22.48115

113.842979 22.771049

113.912102 22.5443

113.912102 22.5443

114.131401 22.615

113.891899 22.5042

114.038033 22.657644

114.116882 22.544268

113.891899 22.5042

113.813301 22.624399

113.813301 22.624399

113.888199 22.562599

113.8498 22.566799

113.8498 22.566799

114.009483 22.733217

114.112083 22.531433

114.112083 22.531433

114.111267 22.534918

114.110916 22.537518

114.110886 22.537649

113.840202 22.6208

114.117584 22.546183

114.0905 22.631599

114.117561 22.544827

114.117561 22.544827

114.043785 22.556433

114.136497 22.625799

114.026398 22.6287

114.033699 22.5278

113.914619 22.536207

114.211617 22.6922

113.866364 22.785383

114.211617 22.6922

113.866364 22.785383

114.07943 22.535784

114.115631 22.621134

114.117882 22.5674

114.11087 22.595783

114.105202 22.549982

114.024399 22.659367

114.26123 22.733883

114.115631 22.621134

114.117882 22.5674

114.11087 22.595783

114.105202 22.549982

114.024399 22.659367

114.26123 22.733883

114.017883 22.6425

114.009697 22.631201

114.009697 22.631201

114.137581 22.752417

114.245384 22.718

114.109749 22.589701

114.027718 22.668568

113.966599 22.555866

114.1315 22.548849

114.007446 22.67655

114.087364 22.628817

114.035583 22.519632

114.058098 22.535101

114.1315 22.548849

114.007446 22.67655

114.087364 22.628817

114.035583 22.519632

114.058098 22.535101

114.040001 22.694

114.271782 22.73105

114.076401 22.6555

114.027702 22.6492

114.029518 22.612766

114.232483 22.561167

114.252068 22.735783

114.099617 22.557983

114.099617 22.557983

114.067314 22.630199

114.067314 22.630199

114.124298 22.5543

114.124298 22.5543

114.081917 22.553932

114.063599 22.772301

114.063599 22.772301

114.059898 22.531799

113.841202 22.599501

114.059898 22.531799

113.841202 22.599501

113.854797 22.5721

114.120285 22.541718

114.030998 22.6654

114.053619 22.524918

114.053619 22.524918

114.002365 22.536016

113.998985 22.5354

113.994637 22.534918

113.816399 22.6535

113.996803 22.693501

114.077202 22.648001

114.035797 22.620701

114.035797 22.620701

114.113167 22.59445

114.113167 22.59445

114.022102 22.651182

114.022102 22.651182

114.102837 22.61035

114.102837 22.61035

113.864899 22.584101

113.915428 22.540915

113.915428 22.540915

114.151176 22.556232

113.918915 22.53533

114.039764 22.550234

114.0485 22.537533

114.250969 22.720966

114.135803 22.566601

114.129051 22.55785

113.800468 22.7101

114.0439 22.5312

114.225304 22.694

114.076218 22.54575

114.069199 22.5319

114.034882 22.687834

114.112198 22.6033

114.034882 22.687834

114.112198 22.6033

113.9021 22.568899

113.8134 22.6245

113.913551 22.496201

114.064903 22.5222

114.099831 22.570351

114.11525 22.55385

114.053398 22.6227

114.042732 22.712217

114.099831 22.570351

114.11525 22.55385

114.053398 22.6227

114.042732 22.712217

114.109085 22.541517

114.023582 22.647301

114.107964 22.572433

114.051598 22.525883

114.047783 22.538366

113.840698 22.606899

114.106384 22.545033

114.049881 22.589968

113.851936 22.775499

114.0466 22.600599

114.0466 22.600599

113.851936 22.775499

113.851936 22.775499

113.851936 22.775499

113.851936 22.775499

113.88517 22.580183

114.045952 22.629717

114.015503 22.5376

114.051399 22.637234

114.051399 22.637234

113.854485 22.61335

114.103302 22.6574

114.079735 22.628366

114.086121 22.537634

114.121185 22.55785

114.086121 22.537634

114.121185 22.55785

113.884018 22.564466

114.203835 22.988916

114.071884 22.530283

114.100136 22.579201

114.09935 22.54705

113.8806 22.5905

114.081703 22.571501

113.8806 22.5905

114.081703 22.571501

114.134148 22.609949

114.01152 22.663767

113.918434 22.549133

114.075119 22.533649

113.918434 22.549133

114.075119 22.533649

113.959068 22.544533

114.115402 22.558201

114.028198 22.648001

114.105202 22.597099

114.045799 22.6397

114.115234 22.5459

114.02742 22.525368

114.053932 22.531384

114.02742 22.525368

114.053932 22.531384

113.938316 22.543034

1：experimental data

113.911102 22.49

113.9198 22.523399

113.821404 22.613001

114.0457 22.6388

114.021065 22.733784

114.104797 22.558399

113.986969 22.737667

114.034767 22.671507

114.044403 22.597

113.927132 22.517982

114.031715 22.5235

114.030098 22.6754

114.031715 22.5235

114.030098 22.6754

114.14975 22.609234

113.848236 22.623301

114.027313 22.623367

114.024879 22.671267

114.031303 22.634501

114.015732 22.743717

114.04393 22.598101

114.174149 22.562483

114.145401 22.609917

114.024879 22.671267

114.031303 22.634501

114.258904 22.7204

114.0541 22.523968

113.900497 22.565599

113.900497 22.565599

114.084 22.5494

113.82795 22.616318

114.071602 22.547899

114.018204 22.638201

114.018204 22.638201

114.0382 22.6464

114.0382 22.6464

113.927696 22.519699

114.061203 22.521

114.061203 22.521

114.032204 22.679701

114.032204 22.679701

113.924271 22.529066

114.071968 22.527884

114.071968 22.527884

114.138351 22.610268

113.88372 22.5646

114.098602 22.641199

114.098602 22.641199

113.962402 22.522833

114.007431 22.550117

114.112999 22.5462

114.112999 22.5462

113.928848 22.545868

113.928848 22.545868

113.858749 22.606483

113.796547 23.030416

113.826202 22.687401

113.826202 22.687401

114.113731 22.534218

114.125069 22.5697

114.125069 22.5697

113.960381 22.546967

113.924438 22.547539

113.924438 22.547539

114.039818 22.522266

114.116951 22.551567

114.135201 22.558901

114.02462 22.620449

114.016884 22.531

114.106865 22.537149

114.068382 22.523783

114.2472 22.7363

114.272202 22.7363

113.854797 22.5721

113.854797 22.5721

114.072479 22.535851

114.041946 22.603201

114.110703 22.6175

114.1492 22.623501

113.919617 22.543253

114.110703 22.6175

114.1492 22.623501

113.919617 22.543253

114.1306 22.613899

114.062897 22.639

113.933456 22.683071

114.08297 22.549168

2 experimental data

>> X=a;

>> P1 = figure;clf;

scatter(X(:,1),X(:,2),10,'ro');

>> [cidx2,cmeans2,sumd2,D2] = kmeans(X,2,'dist','sqEuclidean');

P2 = figure;clf;

[silh2,h2] = silhouette(X,cidx2,'sqeuclidean');

>> eucD = pdist(X,'euclidean');

clustTreeEuc = linkage(eucD,'average');

cophenet(clustTreeEuc,eucD);

P3 = figure;clf;

[h,nodes] = dendrogram(clustTreeEuc,20);

set(gca,'TickDir','out','TickLength',[.002 0],'XTickLabel',[]);

Error using pdistmex

Out of memory. Type HELP MEMORY for your options.

Error in pdist (line 252)

Y = pdistmex(X',dist,additionalArg);

>> [cidx3,cmeans3,sumd3,D3] = kmeans(X,3,'dist','sqEuclidean');

P4 = figure;clf;

[silh3,h3] = silhouette(X,cidx3,'sqeuclidean');

>> P5 = figure;clf

ptsymb = {'bo','ro','go',',mo','c+'};

MarkFace = {[0 0 1],[.8 0 0],[0 .5 0]};

hold on

for i =1:3

clust = find(cidx3 == i);

plot(X(clust,1),X(clust,2),ptsymb{i},'MarkerSize',3,'MarkerFace',MarkFace{i},'MarkerEdgeColor','black');

plot(cmeans3(i,1),cmeans3(i,2),ptsymb{i},'MarkerSize',10,'MarkerFace',MarkFace{i});

end

hold off

>> options = statset('Display','off');

gm = gmdistribution.fit(X,3,'Options',options);

P6 = figure;clf

scatter(X(:,1),X(:,2),10,'ro');

hold on

ezcontour(@(x,y) pdf(gm,[x,y]),[-15 15],[-15 10]);

hold off

P7 = figure;clf

scatter(X(:,1),X(:,2),10,'ro');

hold on

ezsurf(@(x,y) pdf(gm,[x,y]),[-15 15],[-15 10]);

hold off

view(33,24)

>> cluster1 = (cidx3 == 1);

cluster3 = (cidx3 == 2);

cluster2 = (cidx3 == 3);

P = posterior(gm,X);

P8 = figure;clf

plot3(X(cluster1,1),X(cluster1,2),P(cluster1,1),'r.')

grid on;hold on

plot3(X(cluster2,1),X(cluster2,2),P(cluster2,2),'bo')

plot3(X(cluster3,1),X(cluster3,2),P(cluster3,3),'g\*')

legend(' 1 ',' 2 ',' 3 ','Location','NW')

clrmap = jet(80); colormap(clrmap(9:72,:))

ylabel(colorbar,'Component 1 Posterior Probability')

view(-45,20);

>> P9 = figure;clf

[~,order] = sort(P(:,1));

plot(1:size(X,1),P(order,1),'r-',1:size(X,1),P(order,2),'b-',1:size(X,1),P(order,3),'y-');

legend({'Cluster 1 Score' 'Cluster 2 Score' 'Cluster 3 Score'},'location','NW');

ylabel('Cluster Membership Score');

xlabel('Point Ranking');

>>

3.SOM data

[P,trainx]=mapminmax(trainx);

net=newsom(minmax(P),[6,6]);

plotsom(net.layers{1}.positions)

net.trainparam.epochs=100;

net=train(net,P);

y=sim(net,P);

A1=vec2ind(y);

plotsom(net.iw{1,1},net.layers{1}.distances)

4.SQL data

6.09：

select convert(nvarchar(4000),License plate)

from Sheet1$

intersect

select convert(nvarchar(4000),License plate)

from Sheet2$

6.10：

select convert(nvarchar(4000),License plate)

from Sheet3$

intersect

select convert(nvarchar(4000),License plate)

from Sheet4$

6.11：

select convert(nvarchar(4000),License plate)

from Sheet5$

intersect

select convert(nvarchar(4000),License plate)

from Sheet11$

6.12：

select convert(nvarchar(4000),License plate)

from Sheet12$

intersect

select convert(nvarchar(4000),License plate)

from Sheet13$

6.13：

select convert(nvarchar(4000),License plate)

from Sheet14$

intersect

select convert(nvarchar(4000),License plate)

from Sheet15$

5 subway data

Metro line No.2:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time** | **Company name** | **Line name** | **License plate number** | **In or Out** |
| 2014/6/9 6:50 | Metro line No.2 | Grand Theatre | AGM-116 | inbound |
| 2014/6/9 7:00 | Metro line No.2 | Grand Theatre | AGM-116 | inbound |
| 2014/6/9 7:00 | Metro line No.2 | Grand Theatre | AGM-116 | inbound |
| 2014/6/9 7:01 | Metro line No.2 | Grand Theatre | AGM-116 | inbound |
| 2014/6/9 7:02 | Metro line No.2 | Grand Theatre | AGM-116 | inbound |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time** | **Company name** | **Line name** | **License plate number** | **In or Out** |
| 2014/6/9 7:40 | Metro line No.2 | Gangxia north | AGM-116 | outbound |
| 2014/6/9 7:52 | Metro line No.2 | Gangxia north | AGM-116 | outbound |
| 2014/6/9 7:53 | Metro line No.2 | Gangxia north | AGM-116 | outbound |
| 2014/6/9 7:53 | Metro line No.2 | Gangxia north | AGM-116 | outbound |
| 2014/6/9 7:53 | Metro line No.2 | Gangxia north | AGM-116 | outbound |

Metro line No.3:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time** | **Company name** | **Line name** | **License plate number** | **In or Out** |
| 2014/6/9 0:28 | Metro line No.3 | Huaxin | AGM-116 | inbound |
| 2014/6/9 0:28 | Metro line No.3 | Huaxin | AGM-116 | inbound |
| 2014/6/9 0:29 | Metro line No.3 | Huaxin | AGM-116 | inbound |
| 2014/6/9 0:30 | Metro line No.3 | Huaxin | AGM-116 | inbound |
| 2014/6/9 0:33 | Metro line No.3 | Huaxin | AGM-116 | inbound |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Time** | **Company name** | **Line name** | **License plate number** | **In or Out** |
| 2014/6/9 0:32 | Metro line No.3 | Huaxin | AGM-116 | outbound |
| 2014/6/9 0:39 | Metro line No.3 | Huaxin | AGM-116 | outbound |
| 2014/6/9 0:39 | Metro line No.3 | Huaxin | AGM-116 | outbound |
| 2014/6/9 0:39 | Metro line No.3 | Huaxin | AGM-116 | outbound |
| 2014/6/9 0:39 | Metro line No.3 | Huaxin | AGM-116 | outbound |