该代码为基于FCM-GRNN的聚类算法

该案例作者申明:

1:本人长期驻扎在此板块里,对该案例提问,做到有问必答。本套书籍官方网站为:video.ourmatlab.com

2:点此从当当预定本书:«Matlab神经网络30个案例分析»。

3:此案例有配套的教学视频,视频下载方式video.ourmatlab.com/vbuy.html。

4:此案例为原创案例,转载请注明出处(«Matlab神经网络30个案例分析»)。

5:若此案例碰巧与您的研究有关联,我们欢迎您提意见,要求等,我们考虑后可以加在案例里。

Contents

清空环境文件

```
clear all;
clc;
```

提取攻击数据

```
%攻击样本数据
load netattack;
P1=netattack;
T1=P1(:,39)';
P1(:,39)=[];

%数据大小
[R1,C1]=size(P1);
csum=20;   %提取训练数据多少
```

模糊聚类

```
data=P1;
[center,U,obj_fcn] = fcm(data,5);
for i=1:R1
    [value,idx]=max(U(:,i));
    a1(i)=idx;
end
```

```
Iteration count = 1, obj. fcn = 816684391225.362430
Iteration count = 2, obj. fcn = 615465369164.578490
Iteration count = 3, obj. fcn = 600908236624.285030
Iteration count = 4, obj. fcn = 427845347701.986940
Iteration count = 5, obj. fcn = 10309578557.033461
Iteration count = 6, obj. fcn = 992987469.165449
Iteration count = 7, obj. fcn = 917568041.141942
Iteration count = 8, obj. fcn = 823418929.818642
Iteration count = 9, obj. fcn = 732812711.405862
Iteration count = 10, obj. fcn = 676133231.903434
Iteration count = 11, obj. fcn = 653013251.690190
```

```
Iteration count = 12, obj. fcn = 645527896.996075
Iteration count = 13, obj. fcn = 643118177.479442
Iteration count = 14, obj. fcn = 642323044.634751
Iteration count = 15, obj. fcn = 642056483.253320
Iteration count = 16, obj. fcn = 641966294.815772
Iteration count = 17, obj. fcn = 641935616.358264
Iteration count = 18, obj. fcn = 641925148.251762
Iteration count = 19, obj. fcn = 641921569.931576
Iteration count = 20, obj. fcn = 641920345.508539
Iteration count = 21, obj. fcn = 641919926.297744
Iteration count = 22, obj. fcn = 641919782.724755
Iteration count = 23, obj. fcn = 641919733.544505
Iteration count = 24, obj. fcn = 641919716.696375
Iteration count = 25, obj. fcn = 641919710.924225
Iteration count = 26, obj. fcn = 641919708.946640
Iteration count = 27, obj. fcn = 641919708.269087
Iteration count = 28, obj. fcn = 641919708.036943
Iteration count = 29, obj. fcn = 641919707.957413
Iteration count = 30, obj. fcn = 641919707.930172
Iteration count = 31, obj. fcn = 641919707.920823
Iteration count = 32, obj. fcn = 641919707.917630
Iteration count = 33, obj. fcn = 641919707.916527
Iteration count = 34, obj. fcn = 641919707.916157
Iteration count = 35, obj. fcn = 641919707.916023
Iteration count = 36, obj. fcn = 641919707.915990
Iteration count = 37, obj. fcn = 641919707.915959
Iteration count = 38, obj. fcn = 641919707.915960
```

模糊聚类结果分析

```
Confusion_Matrix_FCM=zeros(6,6);
Confusion_Matrix_FCM(1,:)=[0:5];
Confusion_Matrix_FCM(:,1)=[0:5]';
for nf=1:5
    for nc=1:5
        Confusion_Matrix_FCM(nf+1,nc+1)=length(find(a1(find(T1==nf))==nc));
    end
end
```

网络训练样本提取

```
cent1=P1(find(a1==1),:);cent1=mean(cent1);
cent2=P1(find(a1==2),:);cent2=mean(cent2);
cent3=P1(find(a1==3),:);cent3=mean(cent3);
cent4=P1(find(a1==4),:);cent4=mean(cent4);
cent5=P1(find(a1==5),:);cent5=mean(cent5);

%提取范数最小为训练样本
for n=1:R1;
    ecent1(n)=norm(P1(n,:)-cent1);
    ecent2(n)=norm(P1(n,:)-cent2);
    ecent3(n)=norm(P1(n,:)-cent3);
    ecent4(n)=norm(P1(n,:)-cent4);
    ecent5(n)=norm(P1(n,:)-cent5);
end
for n=1:csum
    [va me1]=min(ecent1);
    [va me2]=min(ecent2);
    [va me3]=min(ecent3);
    [va me4]=min(ecent4);
    [va me5]=min(ecent5);
    ecnt1(n,:)=P1(me1(1),:);ecent1(me1(1))=[];tcl(n)=1;
    ecnt2(n,:)=P1(me2(1),:);ecent2(me2(1))=[];tc2(n)=2;
    ecnt3(n,:)=P1(me3(1),:);ecent3(me3(1))=[];tc3(n)=3;
    ecnt4(n,:)=P1(me4(1),:);ecent4(me4(1))=[];tc4(n)=4;
    ecnt5(n,:)=P1(me5(1),:);ecent5(me5(1))=[];tc5(n)=5;
end
P2=[ecnt1;ecnt2;ecnt3;ecnt4;ecnt5];T2=[tcl,tc2,tc3,tc4,tc5];
k=0;
```

迭代计算

```
for nit=1:10%开始迭代
```

广义神经网络聚类

```
    net = newgrnn(P2',T2,50);    %训练广义网络

    a2=sim(net,P1') ;  %预测结果
    %输出标准化(根据输出来分类)
    a2(find(a2<=1.5))=1;
    a2(find(a2>1.5&a2<=2.5))=2;
    a2(find(a2>2.5&a2<=3.5))=3;
    a2(find(a2>3.5&a2<=4.5))=4;
    a2(find(a2>4.5))=5;
```

网络训练数据再次提取

```
    cent1=P1(find(a2==1),:);cent1=mean(cent1);
    cent2=P1(find(a2==2),:);cent2=mean(cent2);
    cent3=P1(find(a2==3),:);cent3=mean(cent3);
    cent4=P1(find(a2==4),:);cent4=mean(cent4);
    cent5=P1(find(a2==5),:);cent5=mean(cent5);

    for n=1:R1%计算样本到各个中心的距离
        ecent1(n)=norm(P1(n,:)-cent1);
        ecent2(n)=norm(P1(n,:)-cent2);
        ecent3(n)=norm(P1(n,:)-cent3);
        ecent4(n)=norm(P1(n,:)-cent4);
        ecent5(n)=norm(P1(n,:)-cent5);
    end

    %选择离每类中心最近的csum个样本
    for n=1:csum
        [va me1]=min(ecent1);
        [va me2]=min(ecent2);
        [va me3]=min(ecent3);
        [va me4]=min(ecent4);
        [va me5]=min(ecent5);
        ecnt1(n,:)=P1(me1(1),:);ecent1(me1(1))=[];tc1(n)=1;
        ecnt2(n,:)=P1(me2(1),:);ecent2(me2(1))=[];tc2(n)=2;
        ecnt3(n,:)=P1(me3(1),:);ecent3(me3(1))=[];tc3(n)=3;
        ecnt4(n,:)=P1(me4(1),:);ecent4(me4(1))=[];tc4(n)=4;
        ecnt5(n,:)=P1(me5(1),:);ecent5(me5(1))=[];tc5(n)=5;
    end

    p2=[ecnt1;ecnt2;ecnt3;ecnt4;ecnt5];T2=[tc1,tc2,tc3,tc4,tc5];

    %统计分类结果
    Confusion_Matrix_GRNN=zeros(6,6);
    Confusion_Matrix_GRNN(1,:)=[0:5];
    Confusion_Matrix_GRNN(:,1)=[0:5]';
    for nf=1:5
        for nc=1:5
            Confusion_Matrix_GRNN(nf+1,nc+1)=length(find(a2(find(T1==nf))==nc));
        end
    end

    pre2=0;

    for n=2:6;
        pre2=pre2+max(Confusion_Matrix_GRNN(n,:));
    end

    pre2=pre2/R1*100;
```

```
end
```

结果显示

```
Confusion_Matrix_FCM

Confusion_Matrix_GRNN
```

```
web browser www.matlabsky.com
```

```
Confusion_Matrix_FCM =
  Columns 1 through 4
           0           1           2           3
           1           7           0          13
           2           0        2097           0
           3           0          95           0
           4           0           0           0
           5           0           0           0
  Columns 5 through 6
           4           5
           0        1543
           0           0
          35           0
         658           0
          52           0
Confusion_Matrix_GRNN =
  Columns 1 through 4
           0           1           2           3
           1          32           1        1330
           2           0        2097           0
           3          28          90           4
           4           0           0           3
           5          51           1           0
  Columns 5 through 6
           4           5
         115          85
           0           0
           8           0
         655           0
           0           0
```

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