%perceptron

function [w]=perceptron(sample)

sample\_num=size(sample,1);

feature=size(sample,2);

w=ones(1,feature);

flag=1;

count=1;

while count<=10

flag=0;

for k=1:sample\_num

m=sample(k,:)\*w';

if m<=0

w=w+sample(k,:);

flag=1;

end

end

count=count+1;

end

disp(count);

%zip\_train\_0\_2

D=importdata('wine\_uci\_train.txt');

num=size(D,1);

D1=D;

D2=D;

D3=D;

for i=1:num

if D1(i,1)==1

D1(i,1)=1;

else

D1(i,1)=1;

D1(i,:)=-D1(i,:);

end

if D2(i,1)==2

D2(i,1)=1;

else

D2(i,1)=1;

D2(i,:)=-D2(i,:);

end

if D3(i,1)==3

D3(i,1)=1;

else

D3(i,1)=1;

D3(i,:)=-D3(i,:);

end

end

T=importdata('wine\_uci\_test.txt');

numt=size(T,1);

T1=T;

T2=T;

T3=T;

numc1=0;

numc2=0;

numc3=0;

for i=1:numt

if T1(i,1)==1

T1(i,1)=1;

else

T1(i,1)=1;

T1(i,:)=-T1(i,:);

end

if T2(i,1)==2

T2(i,1)=1;

else

T2(i,1)=1;

T2(i,:)=-T2(i,:);

end

if T3(i,1)==3

T3(i,1)=1;

else

T3(i,1)=1;

T3(i,:)=-T3(i,:);

end

end

% batch\_relaxation

function [w]=batch\_relaxation(sample)

b0=1;

eta=0.1;

sample\_num=size(sample,1);

feature=size(sample,2);

w=ones(1,feature);

flag=1;

count=1;

while count<=10000

flag=0;

sk=[];

for k=1:sample\_num

m=sample(k,:)\*w';

if m<=b0

flag=1;

yk=((b0-m)/(norm(sample(k,:))^2)).\*sample(k,:);

sk=[sk;yk];

end

end

if (isempty(sk))

break;

end

w=w+eta\*sum(sk);

count=count+1;

end

disp(count);

%perceptron two-class

%training

w1=perceptron(D1);

w2=perceptron(D2);

w3=perceptron(D3);

%testing

w=w2;

Tk=T;

count=0;

for i=1:numt

Tk(i,1)=1;

m=Tk(i,:)\*w';

if m>=0

Tk(i,1)=1;

else

Tk(i,1)=-1;

end

if T2(i,1)==Tk(i,1)

count=count+1;

end

end

accuracy=count/numt;

% batch\_relaxation two-class

D=importdata('wine\_uci\_train.txt');

num=size(D,1);

D1=D;

D2=D;

D3=D;

for i=1:num

if D1(i,1)==1

D1(i,1)=1;

else

D1(i,1)=1;

D1(i,:)=-D1(i,:);

end

if D2(i,1)==2

D2(i,1)=1;

else

D2(i,1)=1;

D2(i,:)=-D2(i,:);

end

if D3(i,1)==3

D3(i,1)=1;

else

D3(i,1)=1;

D3(i,:)=-D3(i,:);

end

end

T=importdata('wine\_uci\_test.txt');

numt=size(T,1);

T1=T;

T2=T;

T3=T;

numc1=0;

numc2=0;

numc3=0;

for i=1:numt

if T1(i,1)==1

T1(i,1)=1;

else

T1(i,1)=1;

T1(i,:)=-T1(i,:);

end

if T2(i,1)==2

T2(i,1)=1;

else

T2(i,1)=1;

T2(i,:)=-T2(i,:);

end

if T3(i,1)==3

T3(i,1)=1;

else

T3(i,1)=1;

T3(i,:)=-T3(i,:);

end

end

%training

w1=batch\_relaxation(D1);

w2=batch\_relaxation(D2);

w3=batch\_relaxation(D3);

%testing

w=w1;

Tk=T;

count=0;

for i=1:numt

Tk(i,1)=1;

m=Tk(i,:)\*w';

if m>=0

Tk(i,1)=1;

else

Tk(i,1)=-1;

end

if T1(i,1)==Tk(i,1)

count=count+1;

end

end

accuracy=count/numt;

D=importdata('wine\_uci\_train.txt');

%one against rest

num=size(D,1);

D1=D;

D2=D;

D3=D;

for i=1:num

if D1(i,1)==1

D1(i,1)=1;

else

D1(i,1)=1;

D1(i,:)=-D1(i,:);

end

if D2(i,1)==2

D2(i,1)=1;

else

D2(i,1)=1;

D2(i,:)=-D2(i,:);

end

if D3(i,1)==3

D3(i,1)=1;

else

D3(i,1)=1;

D3(i,:)=-D3(i,:);

end

end

T=importdata('wine\_uci\_test.txt');

numt=size(T,1);

T1=T;

T2=T;

T3=T;

for i=1:numt

if T1(i,1)==1

T1(i,1)=1;

else

T1(i,1)=1;

T1(i,:)=-T1(i,:);

end

if T2(i,1)==2

T2(i,1)=1;

else

T2(i,1)=1;

T2(i,:)=-T2(i,:);

end

if T3(i,1)==3

T3(i,1)=1;

else

T3(i,1)=1;

T3(i,:)=-T3(i,:);

end

end

tic

%training

w1=batch\_relaxation(D1);

w2=batch\_relaxation(D2);

w3=batch\_relaxation(D3);

Tk=T;

count=0;

for i=1:numt

Tk(i,1)=1;

g1=Tk(i,:)\*w1';

g2=Tk(i,:)\*w2';

g3=Tk(i,:)\*w3';

g=max([g1,g2,g3]);

if g==g1

Tk(i,1)=0;

elseif g==g2

Tk(i,1)=1;

elseif g==g3

Tk(i,1)=2;

end

if Tk(i,1)==T(i,1)

count=count+1;

end

end

accuracy=count/numt;

toc

one against other

D=importdata('wine\_uci\_train.txt');

num=size(D,1);

D1=D;

D2=D;

D3=D;

Dk1=[];

Dk2=[];

Dk3=[];

for i=1:num

if D1(i,1)==1

D1(i,1)=1;

Dk1=[Dk1;D1(i,:)];

elseif D1(i,1)==2

D1(i,1)=1;

D1(i,:)=-D1(i,:);

Dk1=[Dk1;D1(i,:)];

end

if D2(i,1)==1

D2(i,1)=1;

Dk2=[Dk2;D2(i,:)];

elseif D2(i,1)==3

D2(i,1)=1;

D2(i,:)=-D2(i,:);

Dk2=[Dk2;D2(i,:)];

end

if D3(i,1)==2

D3(i,1)=1;

Dk3=[Dk3;D3(i,:)];

elseif D3(i,1)==3

D3(i,1)=1;

D3(i,:)=-D3(i,:);

Dk3=[Dk3;D3(i,:)];

end

end

%T=importdata('zip\_test\_0\_2\_small.txt');

T=importdata('wine\_uci\_test.txt');

tic

w1=batch\_relaxation(Dk1);

w2=batch\_relaxation(Dk2);

w3=batch\_relaxation(Dk3);

numt=size(T,1);

Tk=T;

count=0;

for i=1:numt

m1=T(i,:)\*w1';

if m1>=0

c1=1;

else

c1=2;

end

m2=T(i,:)\*w2';

if m2>=0

c2=1;

else

c2=3;

end

m3=T(i,:)\*w3';

if m3>=0

c3=2;

else

c3=3;

end

if (c1~=c2)&&(c1~=c3)&&(c2~=c3)

c=4;

else

A=[c1 c2 c3];

c=mode(A);

end

Tk(i,1)=c;

if c==T(i,1)

count=count+1;

end

end

accuracy=count/numt;

toc