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HW 9

9.1

function [avgcat avgdog] = average\_pet(X,Y)

X1=zeros(1000,4096);

X2=zeros(1000,4096);

i=1;

for j=1:2000

if Y(i)==-1

X1(i,:)=X(i,:);

i=i+1;

else

X2(i,:)=X(i,:);

i=i+1;

end

end

avgcat=mean(X1);

avgdog=mean(X2);

end

A close up of a computer

Description automatically generated

A screen shot of a computer

Description automatically generated

9.2

function yguess = closest\_average(Xtrain,ytrain,Xtest)

[m n]=size(Xtest);

yguess=zeros(m,1);

X3=zeros(814,4096);

X4=zeros(786,4096);

i=1;

j=1;

for z=1:1600

if ytrain(z,1)== -1

X3(i,:)=Xtrain(z,:);

i=i+1;

else

X4(j,:)=Xtrain(z,:);

j=j+1;

end

end

Xavgcat=mean(X3);

Xavgdog=mean(X4);

for d=1:m

if norm(Xtest(d,:)-Xavgcat) <= norm(Xtest(d,:)-Xavgdog)

yguess(d)=-1;

else

yguess(d)=1;

end

end

end

Training accuracy = 80

Testing accuracy = 76.2500

9.3

function yguess = nearest\_neighbor(Xtrain,ytrain,Xtest)

[m n]=size(Xtest);

yguess=zeros(m,1);

s=zeros(1600,1);

for d=1:m

for e=1:1600

s(e)=norm(Xtest(d,:)-Xtrain(e,:));

end

[M,I]=min(s);

yguess(d)=ytrain(I);

end

end

Training accuracy = 100

Testing accuracy = 80.5000

9.4

function yguess = linear\_regression(Xtrain,ytrain,Xtest)

[m n]=size(Xtest);

yguess=zeros(m,1);

b = pinv(Xtrain.'\*Xtrain)\*Xtrain.'\*ytrain;

yguess= sign(Xtest\*b);

end

Training accuracy = 100

Testing accuracy = 78.5000

9.5

The images represent different pets, cats and dogs. As these are the first 10 eigenvectors, these are the most “interesting” or the most valuable vectors that can be used in image compression or deciding whether the image is a cat or a dog.

Column 1

A close up of a device

Description automatically generated

Column 2

A close up of a computer screen

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Column 3

A close up of a computer

Description automatically generated

Column 4

A close up of a computer

Description automatically generated

Column 5

A screen shot of a computer

Description automatically generated

Column 6

A close up of a computer

Description automatically generated

Column 7

A close up of a computer

Description automatically generated

Column 8

A picture containing electronics

Description automatically generated

Column 9

A picture containing electronics

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Column 10

A close up of a computer

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9.6

function yguess = pca\_regression(Xtrain,ytrain,Xtest,k)

[m n]=size(Xtest);

Vt=pca(Xtrain);

Vtk=Vt(:,[1:k]);

XtrainR=Xtrain\*Vtk;

XtestR=Xtest\*Vtk;

yguess=zeros(m,1);

b = pinv(XtrainR.'\*XtrainR)\*XtrainR.'\*ytrain;

yguess= sign(XtestR\*b);

end

K=10

Training accuracy = 85.7500

Testing accuracy = 84

K=20

Training accuracy= 88.3750

Testing accuracy = 85

K=50

Training accuracy= 92

Testing accuracy = 91.2500

K=100

Training accuracy= 93.6875

Testing accuracy = 93