Raghav Aggarwal
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MAT 343 LAB

MAT 343 Laboratory 6

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%RAGHAV AGGARWAL
%MAT 343

%Problem 1
A = imread ('gauss.jpg');

%Problem 2
B = double ( A (: ,: ,1));
B = B /255;
[ U S V ] = svd ( B );
size(U)
size(S)
size(V)

C = zeros ( size ( A ));

rank1 = S(1,1)*U(:,1)*V(:,1)';

C(:,:,1) = rank1;
C(:,:,2) = rank1;
C(:,:,3) = rank1;


C = max(0,min(1,C));
image ( C ) , axis image

%problem 3
r = 0;
C1 = zeros ( size ( A ));
for i = 1:10
r = r+S(i,i)*U(:,i)*V(:,i)';
end
C1(:,:,1) = r;
C1(:,:,2) = r;
C1(:,:,3) = r;


C1 = max(0,min(1,C1));
image ( C1 ) , axis image

%problem 4
%rank 20
C2 = zeros ( size ( A ));
r = 0;
for i = 1:20
r = r+S(i,i)*U(:,i)*V(:,i)';
end
C2(:,:,1) = r;
C2(:,:,2) = r;
```

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C2(:,:,3) = r;


C2 = max(0,min(1,C2));
image ( C2 ) , axis image

%rank 30
r = 0;
C3 = zeros ( size ( A ));
for i = 1:30
r = r+S(i,i)*U(:,i)*V(:,i)';
end
C3(:,:,1) = r;
C3(:,:,2) = r;
C3(:,:,3) = r;


C3 = max(0,min(1,C3));
image ( C3 ) , axis image

%rank 40
r = 0;
C4 = zeros ( size ( A ));
for i = 1:40
r = r+S(i,i)*U(:,i)*V(:,i)';
end
C4(:,:,1) = r;
C4(:,:,2) = r;
C4(:,:,3) = r;


C4 = max(0,min(1,C4));
image ( C4 ) , axis image

%Problem 5
%What rank-r approximation exactly reproduces the original picture?
% rank = 255

%Problem 6
%Part i
%rank-k approximation -
S(1,1)*U(:,1)*V(:,1)'+S(2,2)*U(:,2)*V(:,2)'+......+S(k,k)*U(:,k)*V(:,k)';
%Part ii
%ratio =
%
(S(1,1)*U(:,1)*V(:,1)'+S(2,2)*U(:,2)*V(:,2)'+......+S(k,k)*U(:,k)*V(:,k)')/22
5

%What does the compression rate represent?
% The compression rate represent that the percentage the image have been
% compressed in comparision to the original image.
```

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% percentage = 100%
%how this percentage relates to the amount of data of the original
approximation
% when you collect all the data the picture become complete and thats when
% you will have the complete picture.

%Problem 7
%(S(1,1)*U(:,1)*V(:,1)'+S(2,2)*U(:,2)*V(:,2)'+.....+S(k,k)*U(:,k)*V(:,k)')/2
25
% k = 85
Size U
ans =

  565  565

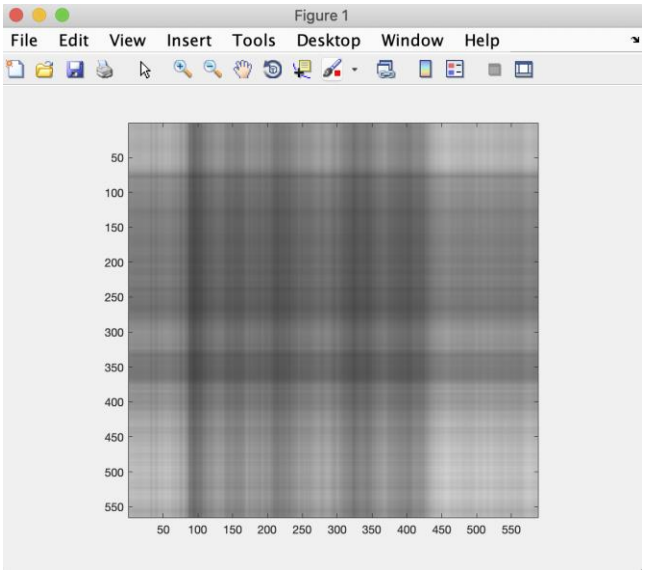
Size S
ans =

  565  588

Size V
ans =

  588  588
```

Rank 1:



Rank 10:

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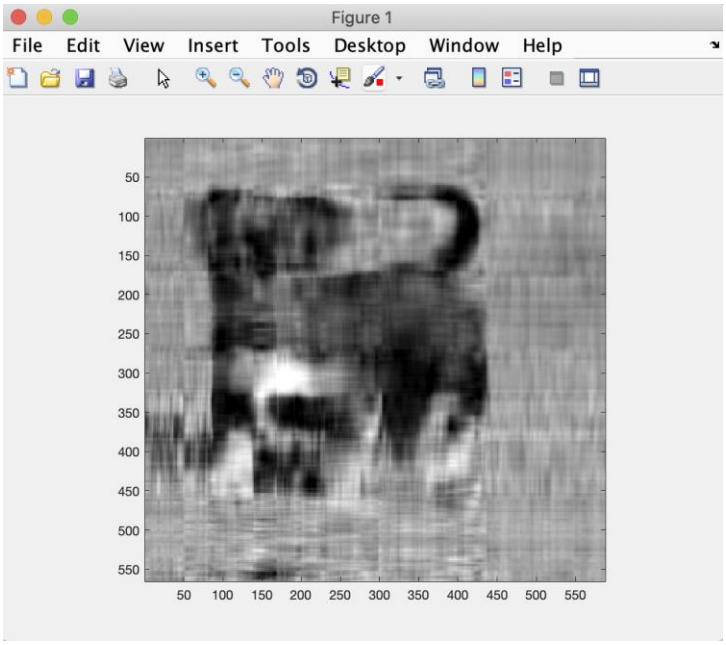
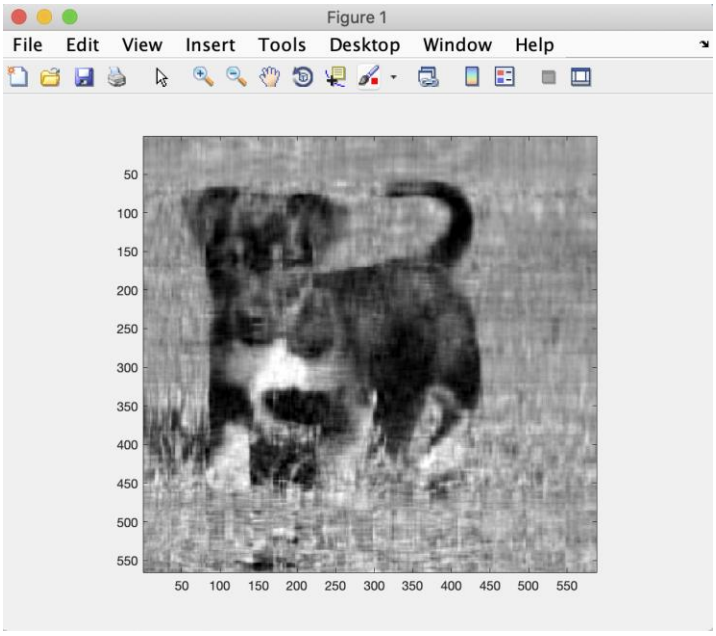


Rank 20:



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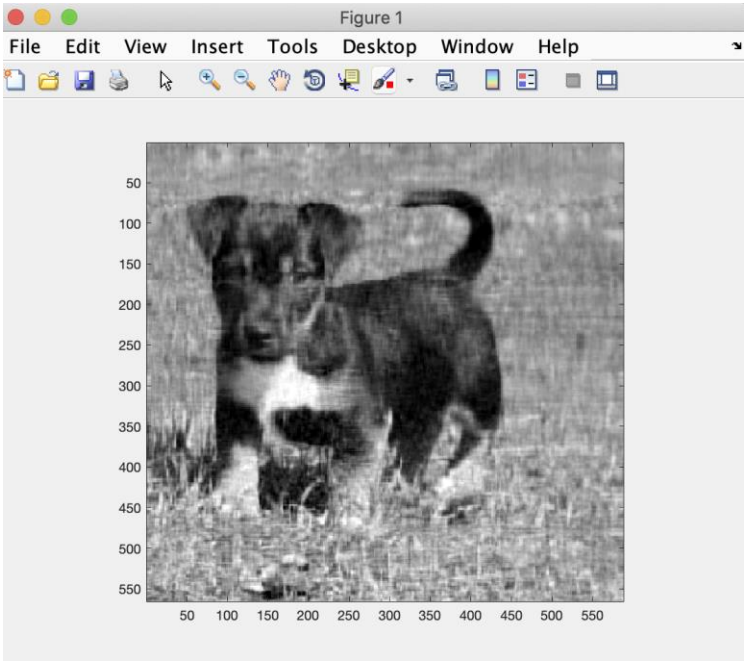
Rank 30:



Rank 40: