SVD for Image Compression

% application of the SVD to image compression
% p. 114, "Applied Numerical Linear Algebra", J. Demmel (SIAM)
load clown.mat;
[U,S,V]=svd(X);
% X is a matrix of pixels of dimension 200 by 320
colormap(gray);  % try colormap(map);
subplot(2,2,1);
image(X); title('original image');

k=3; subplot(2,2,2);
image(U(:,1:k)*S(1:k,1:k)*V(:,1:k)'); title('k=3');

k=10; subplot(2,2,3);
image(U(:,1:k)*S(1:k,1:k)*V(:,1:k)'); title('k=10');

k=20; subplot(2,2,4);
image(U(:,1:k)*S(1:k,1:k)*V(:,1:k)'); title('k=20');

About MATLAB indexed image (.mat)
In an indexed image, the image matrix values do not determine the pixel colors directly. Instead, MATLAB uses the
matrix values as indices for looking up colors in the figure’s colormap. For example, the MATLAB file clown.mat
contains the following indexed image.

load clown
whos
>>
Name            Size      Bytes    Class          Attributes
X               200x320   512000   double array
caption         2x1       4        char array
map             81x3      1944     double array

Grand total is 64245 elements using 513948 bytes. The variable X contains the lookup table indices, while map
contains the associated colormap. Both must be used to display the image correctly. To determine the color of the
(5,5) pixel, we must first determine what X(5,5) is:

X(5,5)
an =
   61

Then we incorporate that value as a row index into the colormap matrix, map:

map(61,:)
an =
   0.9961  0.5781  0.1250

The (5,5) pixel has a lot of red, some green, and a little blue. Displaying the image requires two MATLAB commands,
one to create the image and one to set the figure’s colormap: