Computer Lab Assignment

Assigned Thur/Fri, Mar 10/11 (Due Tues, March 29, 10PM), along with the iris data projection, previously assigned.

Movie Data

The data represents a short movie of 109 frames, each where each frame is $120 \times 160 = 19200$ pixels. When you type `load author`, you should get an array $Y1$ that is 19200×109.

   Goal: Compute the first two vectors for the column space of $Y1$, then project the data to it and plot the result. What is your estimate for the rank of $Y1$? Before you do the projection, we ought to mean subtract the data (given below).

Some initial comments

- To see the movie, you can type the following code:

```
for j=1:109
  A=reshape(Y1(:,j),120,160);
  imagesc(A); colormap(gray); axis equal; axis off;
  pause(0.1)
end
```

- To work with the data, you should first change the type, then mean subtract:

```
Y1=double(Y1);
[mm,nn]=size(Y1);
```

```
% Find the mean of the movie frames, which is a point in R^{19200}, and
% mean subtract.  Show the mean in Figure 1.

   meanFrame=mean(Y1,2);
   Y1=Y1-repmat(meanFrame,1,nn);
   figure(1)
   imagesc(reshape(meanFrame,120,160));
   colormap(gray); axis
```

```
% Find the Best Basis, and plot the first four basis vectors:
[U,S,V]=svd(Y1,'econ');
```

   The matrix U is 19200×109, and from that, project the mean subtracted data in $Y1$ to the space spanned by the first two columns of U.

- To find the rank, consider the "normalized" singular values, which we might compute as:

```
nsig=diag(S)./sum(diag(S));
```

- Since the first two basis vectors are also *movie frames*, visualize them as we did the mean and the sample movie frames.