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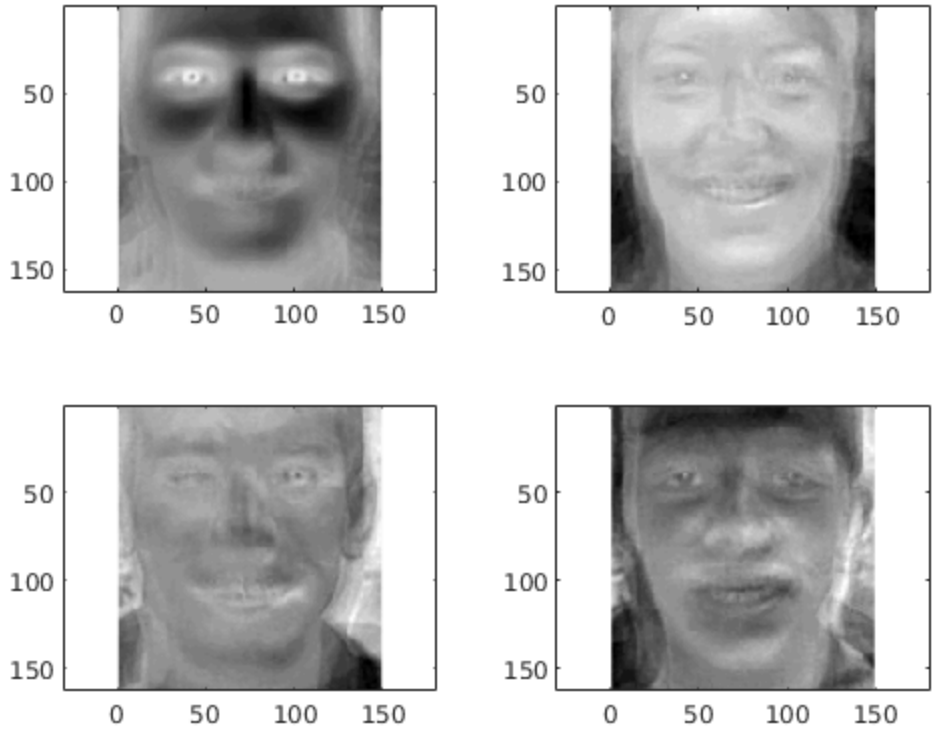
Final Exam Problem 1

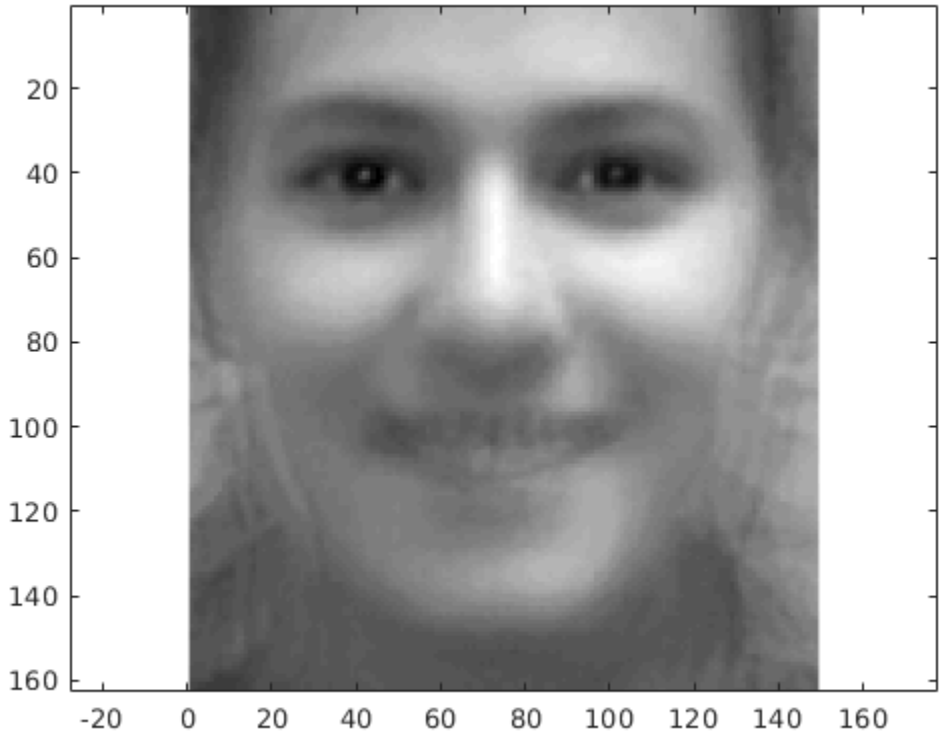
Bryn Louise

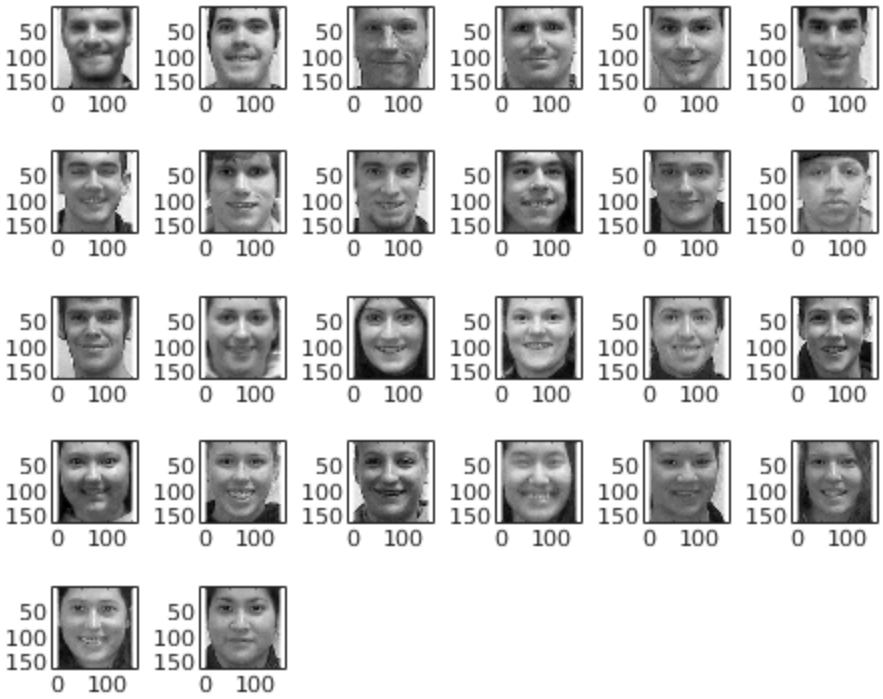
```
% Load Data
X = load('Photos01.mat');
X = X.X;
Xm = X - mean(X,2);
```

1)

```
% Compute SVD
[u,s,v] = svd(X, 'econ');
% Find Best basis in R4
basis = [u(:,1), u(:,2), u(:,3), u(:,4)];

% Visualize Basis Vectors
figure(1)
for j=1:4
subplot(2,2,j)
imagesc(reshape(basis(:,j),162,149));
axis equal; colormap(gray)
end

% Visualize Mean
figure(2)
meanimage = mean(X,2);
imagesc(reshape(meanimage, 162, 149));
axis equal; colormap(gray)

%Plot 26 photos
figure(3)
for j=1:26
subplot(5, 6, j)
imagesc(reshape(X(:,j), 162, 149));
axis equal; colormap(gray)
end
```

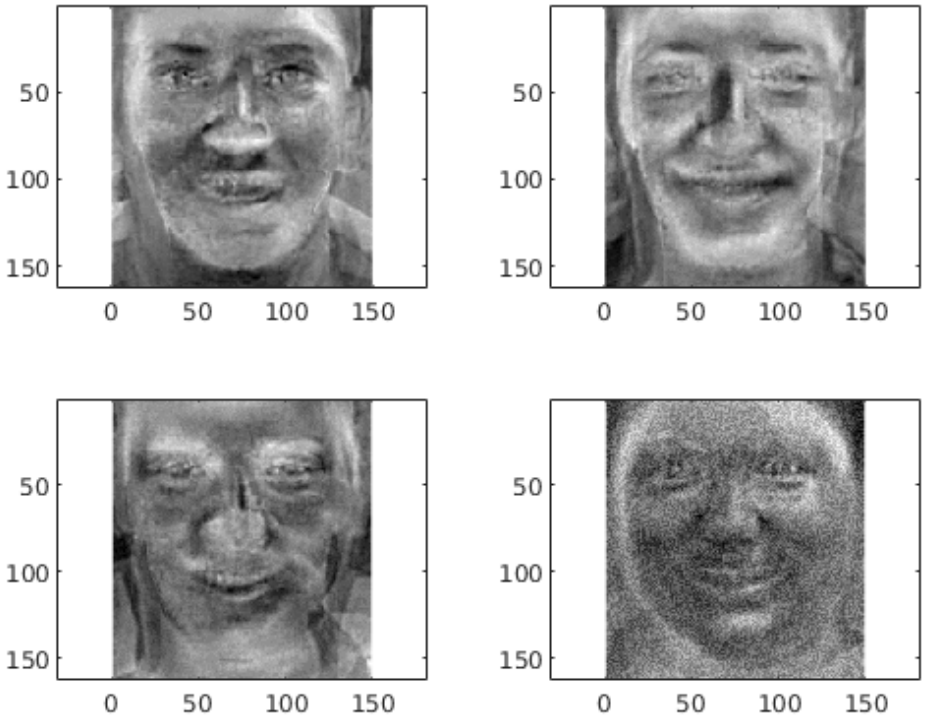

50
100
150
0
50
100
150


20
40
60
80
100
120
140
160
-20
0
20
40
60
80
100
120
140
160



2)

```
% Convert matrix into cell array
Xcell = cell(1,26);
for i = 1:26
    Xcell{i} = reshape(X(:, i), 162, 149);
end


% Train an autoencoder with a hidden layer containing 4 neurons
hiddenSize = 4;
autoenc = trainAutoencoder(Xcell, hiddenSize,...
    'L2WeightRegularization',0.004,...
    'SparsityRegularization', 4,...
    'SparsityProportion', 0.15);

W=autoenc.EncoderWeights;

% Visualize rows of Weights
figure(4)
for i = 1:4
    subplot(2,2,i)
    imagesc(reshape(W(i, :), 162, 149));
    axis equal; colormap(gray);
end
```



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