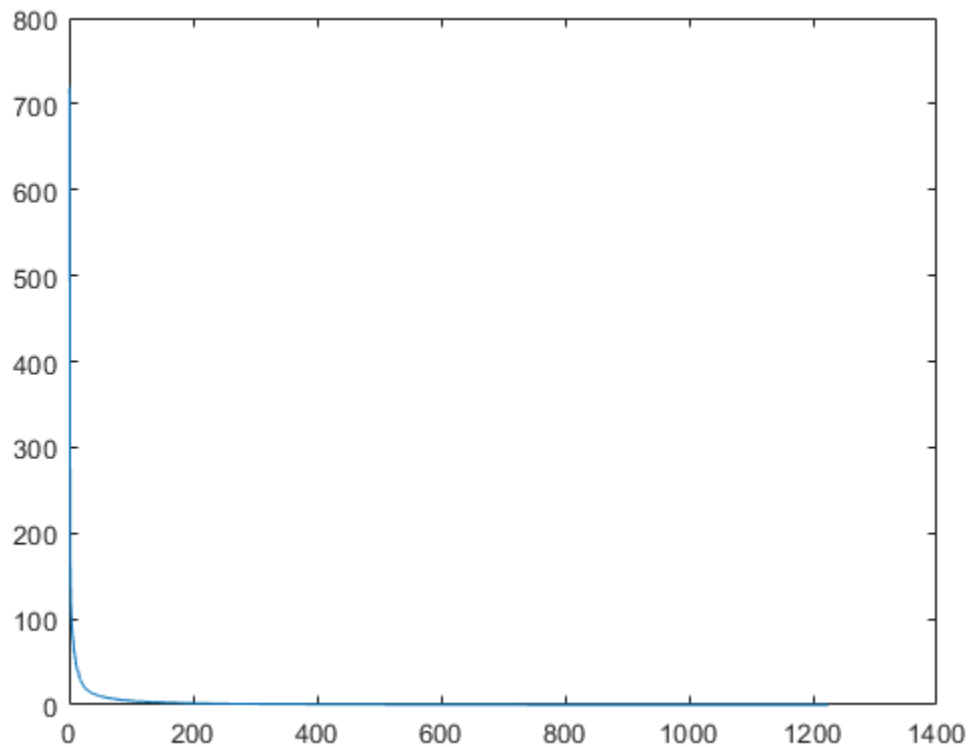

```
imdata = imread('panises.jpg'); %load the image
A = im2double(imdata); %convert from uint8 matrix to double
[U,S,V] = svd(A); %compute SVD

s = svds(A,1225); %singular values in decreasing order
plt = plot(s); %plot out all singular values of A
% The singular values of A decay extremely fast, mimicing an
  exponential
% decay
```



```
k=10
```

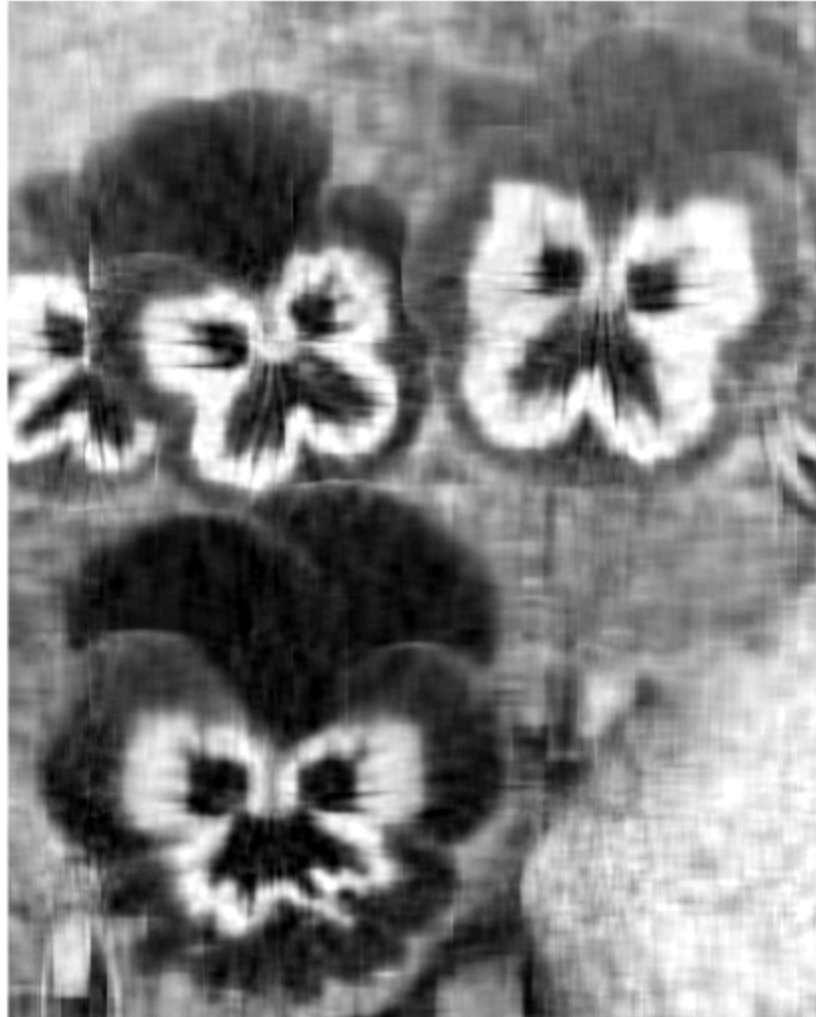
```
for N=10
    % store the singular values in a temporary variable
    C = S;
    % discard the diagonal values not required for compression
    C(N+1:end,:)=0;
    C(:,N+1:end)=0;
    % Construct an Image using the selected singular values
    Newim10=U*C*V';
    % display
    figure;
    imshow(Newim10);
end
% the image is extremely blur. While each flower can be distinguished,
  it
```

`% is difficult to identify each petal of each flower.`



```
%k=25
for N=25
    % store the singular values in a temporary variable
    C = S;
    % discard the diagonal values not required for compression
    C(N+1:end,:)=0;
    C(:,N+1:end)=0;
    % Construct an Image using the selected singular values
    Newim25=U*C*V';
    % display
    figure;
    imshow(Newim25);
end
```

```
% Compared to that using k=10, this image is slightly clearer. Lines  
for  
% parts of the petals are sharper.
```



```
%k=50  
for N=50  
    % store the singular values in a temporary variable  
    C = S;  
    % discard the diagonal values not required for compression  
    C(N+1:end,:)=0;  
    C(:,N+1:end)=0;  
    % Construct an Image using the selected singular values  
    Newim50=U*C*V';  
    % display
```

```
figure;  
imshow(Newim50);  
end
```

```
% Compared to the results k=10 and k=25, outlines for each petal are  
now  
% much clearer. However, the stems are still difficult to identify
```



```
%k=100  
for N=100  
    % store the singular values in a temporary variable  
    C = S;  
    % discard the diagonal values not required for compression  
    C(N+1:end,:) = 0;  
    C(:,N+1:end) = 0;
```

```
% Construct an Image using the selected singular values
Newim100=U*C*V';
% display
figure;
imshow(Newim100);
end

% Most clear image among all results. Both the outlines of the petals
and
% stems, little leaves on the stems can be identified. Somewhat smooth
% transition between different shades of gray too.
```

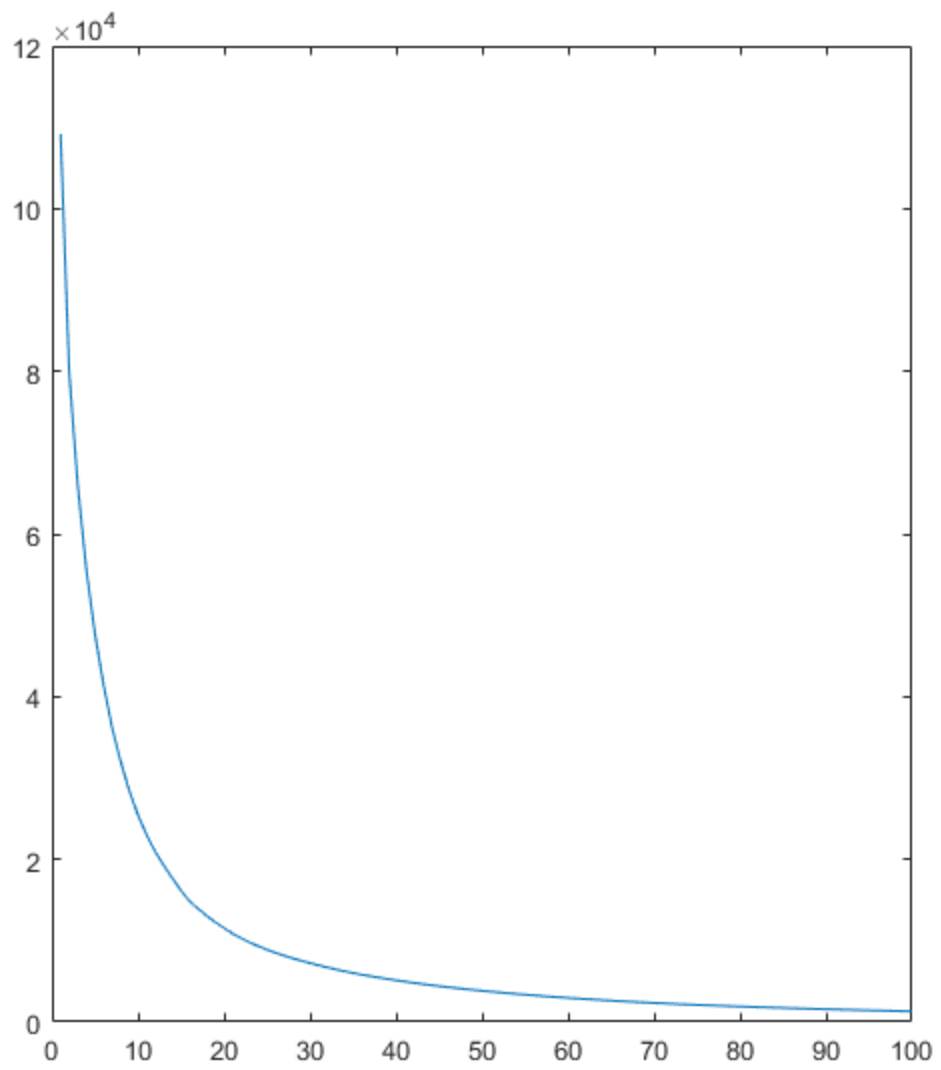


```
% One way to identify the optimal parameter k could via the
computation of
```

```
% error from the approximated matrix. As the decrease in error comes
at the
% price of increasing k (and thus increasing cost of memory and
computing
% power), we want to choose k right before it introduce a significant
drop
% in error.

% initiate an empty array to contain errors
error = zeros([1 100]);
for N=1:1:100 %check the error for k = 1: 100
    % store the singular values in a temporary variable
    C = S;
    % discard the diagonal values not required for compression
    C(N+1:end,:)=0;
    C(:,N+1:end)=0;
    % Construct an Image using the selected singular values
    ErrIm=U*C*V';
    % finding errors and add to the error array
    error(N) = sum(sum((ErrIm - A).^2));
    plterr=plot(error);
end

% from the error plot, it seems that the plot tends to have a linear
% decrease after k=40. The optimal k = 40.
```



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