Contents

==========%%

Author : Deepak R, Abhishek Vasant Nayak Date : 1 September 2015 Institute : M S Ramaiah Institute Of Technology Purpose : Ear Detection using Snakes (Active Contour Model)

```
%%==========%%
close all;
clear all;
global i j length perFolder hit counter;
```

========== Initilisations ==========%%

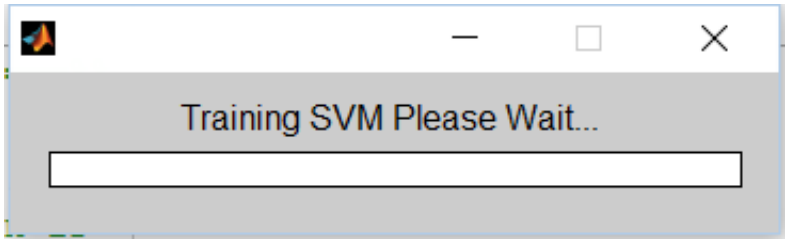
```
i = 1;
j = 1;
hit = 0;                                        % Counter to count successful ear localization rate
counter = 0;                                    % Counter to count total number of images tested
FileReadPath = 'Database\Snakes_Pie2\s';        % File location of output from Snake Based Background
 Removal
length = 30;
perFolder = 13;
file = zeros(390,4);
lookFlag = 0;
SBRrunFlag = 0;
```

========== User Inputs and GUI ==========%%

```
choice = questdlg('Would you like to run Snake-based Background Removal (it will take 6 and a Half
minuted to run SBR)?', ...
        'Yes', ...
        'No');
```

```
switch choice
    case 'Yes'
        SBRrunFlag = 1;
    case 'No'
        disp('Skipping SBR and using Precompiled SBR Database');

end

choice = questdlg('Would you like to look at the detected Images?', ...
        'Yes', ...
        'No');

switch choice
    case 'Yes'
        lookFlag = 1;
    case 'No'
        disp('Not Showing Detected Images');

end

h = waitbar(0,'Training SVM Please Wait...');
```

```
Skipping SBR and using Precompiled SBR Database
Not Showing Detected Images
```



========== Path Additions ==========%%

```
addpath('SnakeFunctions');              % Adds snake functions to path
addpath('SvmFunctions');                % Adds SVM functions to path
addpath('Database');                    % Adds Databases to path
```

========== Run SBR ==========%%

```
if(SBRrunFlag == 1)
    disp('Running SBR');
    addpath('CustomDatabaseCreater');     % Adds CMU Cropping data to path used in display
    run CreateCmpuSnake;
    FileReadPath = 'Database\Snakes_Pie\s';
end
```

========== Read Crop Data ==========%%

```
if(lookFlag == 1)
```

```
    addpath('CMUCropData');
    addpath('DisplayFunction');
    temp = textread('CMUCropData.txt', '%d' ,'delimiter', '\n');
    for i = 1:4
        file(:,i) = (temp((390*(i-1))+1:(390*i)))';
    end
end


i = 1;
```

========== Train SVM ==========%%

```
SVM = svmTrain();
```

========== Body ==========%%

```
while  i<=length

   while j<=perFolder
```

========== Preprocessing ==========%%

```
        I = imread(strcat(FileReadPath,num2str(i),'\',num2str(j),'.jpg'));
        I = im2double(I);
        I = imresize(I,[size(I,1)*3,size(I,2)*3]);
```

========== Set Snake At Centre ==========%%

```
        [n,m] = size(I);
        r = n/2;
        c = m/2;
        siz = 40;
        x = [ n/2+5,n/2,n/2-5,n/2];
        y = [ m/2,m/2-5,m/2,m/2+5];
        P=[x(:) y(:)];                          % Make an array with the coordinates
```

========== Call Snake ==========%%

```
        Options=struct;
        Options.Verbose=true;
        Options.Iterations=70;
        [O,J]=Snake2D(I,P,Options);             % Call the Snake to Detect the ear
```

========== Feedback ==========%%

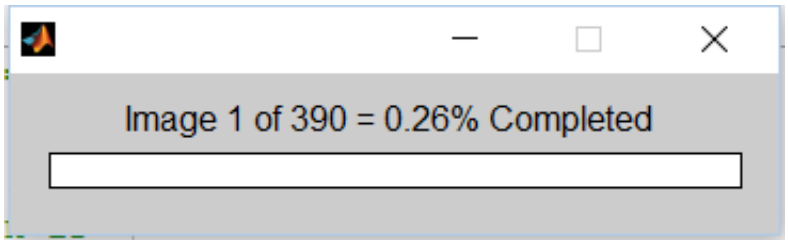
```
    %First reiteration
        res = svmEvaluate(SVM,imcrop(I,[min(O(:,2))-35,min(O(:,1))-80,55,100]));
```

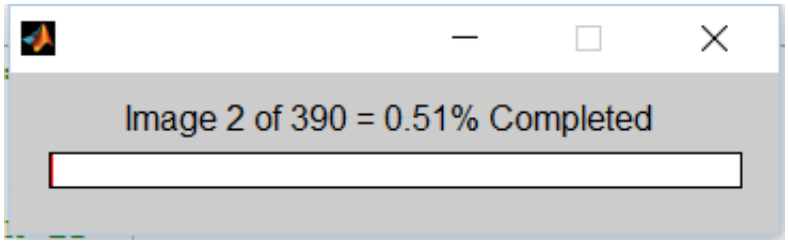
```
        % Test if the ear detected by the Snake-based Ear Localization is
        % an Ear or not.


        if(res == 0)
            x = [ n/2+5,n/2,n/2-5,n/2];
            y = [ m/2+60,m/2+55,m/2+60,m/2+55];
            P=[x(:) y(:)];
            Options = struct;
            Options.Verbose = true;
            Options.Iterations = 70;
            [O,J]=Snake2D(I,P,Options);
        end

   %Second reiteration
        res = svmEvaluate(SVM,imcrop(I,[min(O(:,2))-35,min(O(:,1))-80,55,100]));

        if(res == 0)
            x = [ n/2-25,n/2-30,n/2-35,n/2-30];
            y = [ m/2,m/2,m/2,m/2];
            P=[x(:) y(:)];
            Options = struct;
            Options.Verbose = true;
            Options.Iterations = 70;
            [O,J]=Snake2D(I,P,Options);
        end

        % Used for display purpose
        if(lookFlag == 1)
                I3 = imcrop(imread(strcat('F:\Database\Pie Mixed\s',num2str(i),'\',num2str(j),'.jpg
')),[9 12 631 474]);
                imshow(I3);
                hold on;
                [posi,rcor] = getCor(file,i,j,[min(O(:,2))-35,min(O(:,1))-50,55,80]);
                % gets coordinates from rescaled version for the original
                rectangle('Position',posi,'EdgeColor','y','LineWidth',1);
                hold off;
                waitforbuttonpress;
        end
```

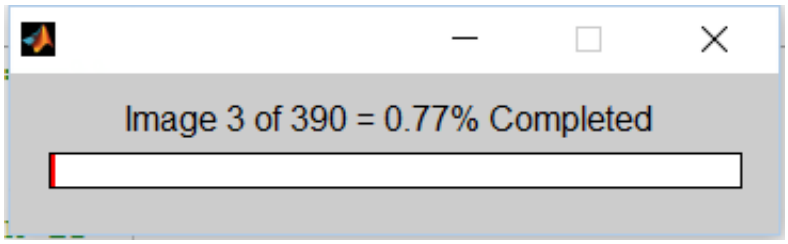
========== Calculate SLR ==========%%

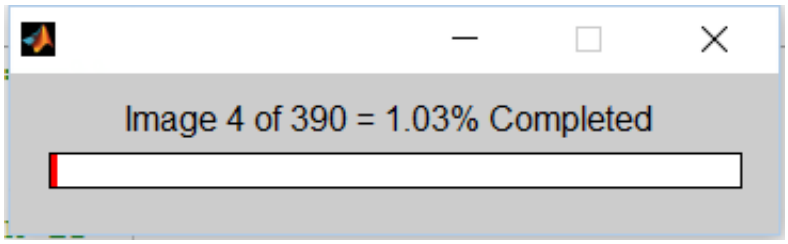
```
        e1 = (imcrop(I,[min(O(:,2))-35,min(O(:,1))-50,55,100]));
        ee = entropy(e1);

% Thresholding to find SLR Refer Madan R.G., Rahul K., Manikantan K, Ramachandran S,
% Entropy based binary swarm optimization and classification for ear detection,
% Eng.Appl. Artif. Intelli., 27, pp. 115-128, 2013. Here a different
% threshold was found and the upper limit 6.8 is because the background in
% CMU-PIE face database is falsely accepted when this upper limit is not
% set.
        if( ee >= 4.7 && ee < 6.8)
            hit = hit+1;
        end
        counter = counter+1;
        j = j+1;
```

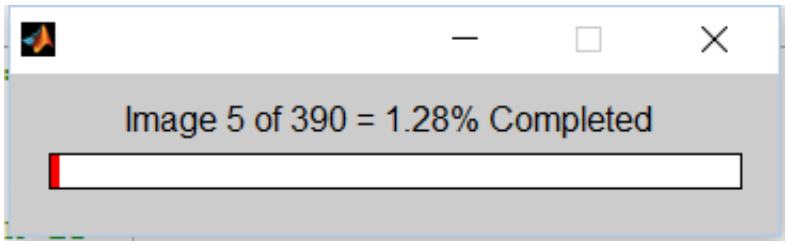
```
        perc = ((i-1)*13+j-1)/390;
        waitbar(perc,h,sprintf('Image %d of 390 = %3.2f%% Completed',((i-1)*13+j-1),perc.*100));
```

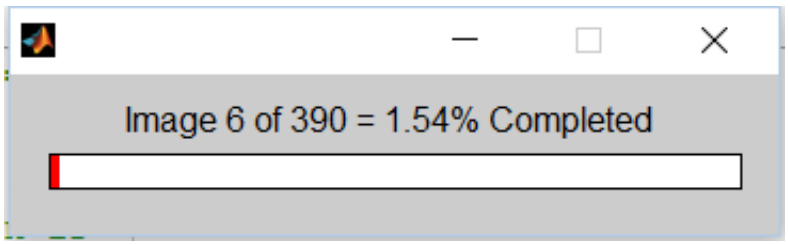


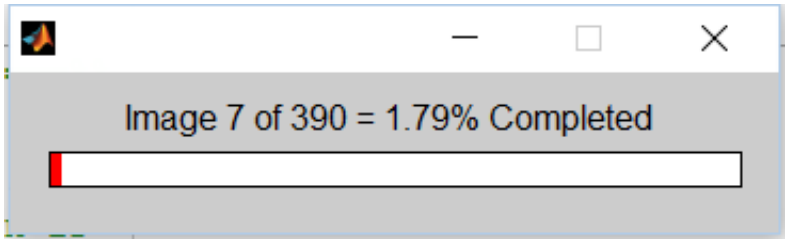








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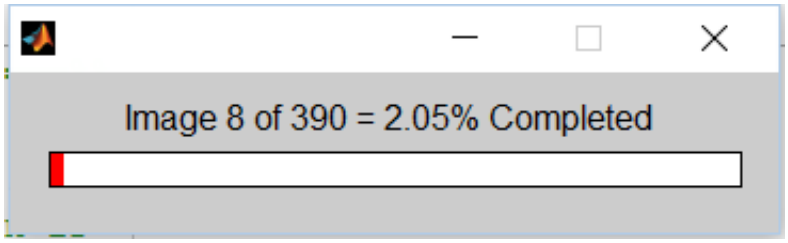
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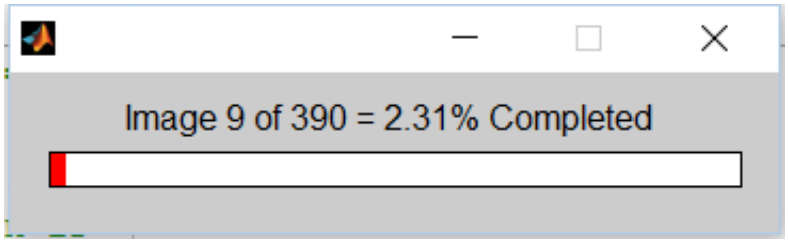
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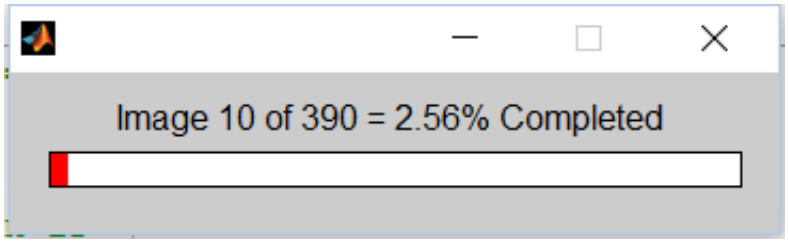
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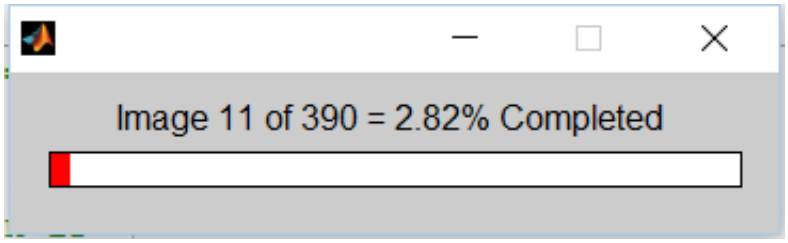
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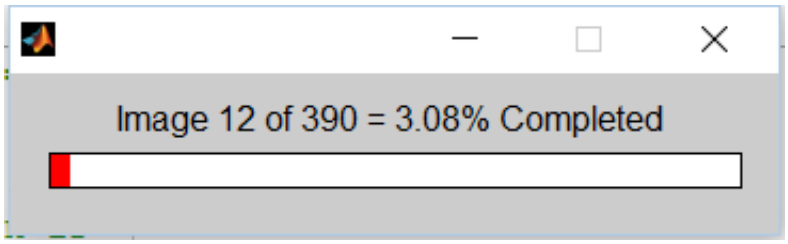
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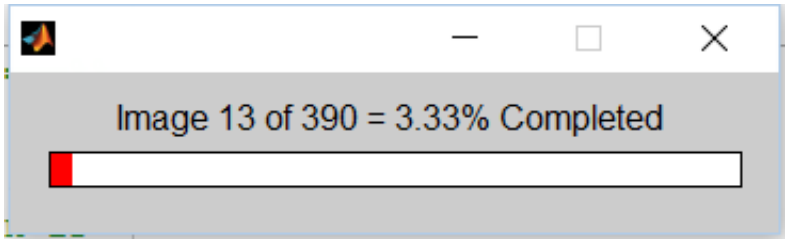
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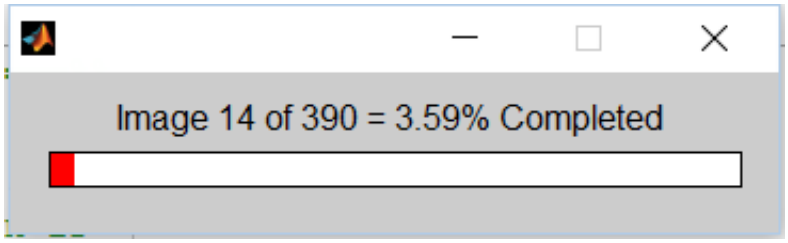
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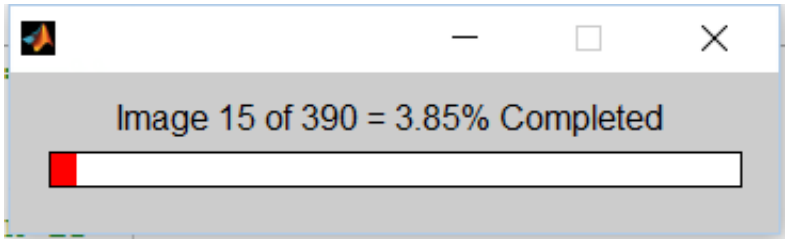
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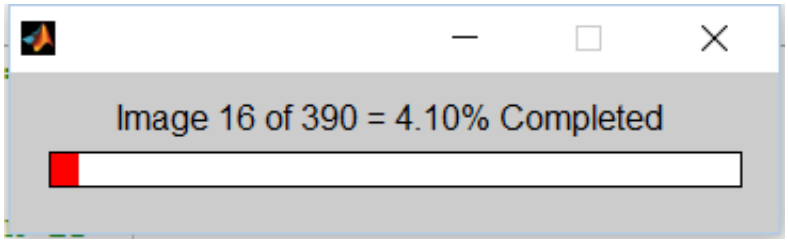
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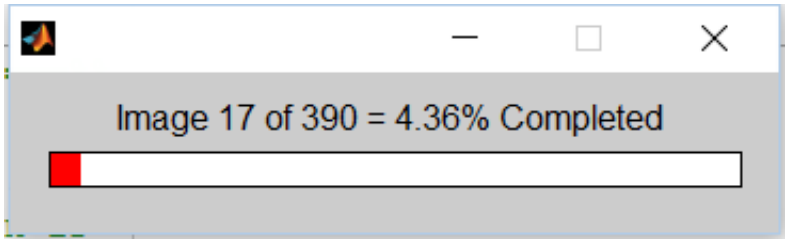
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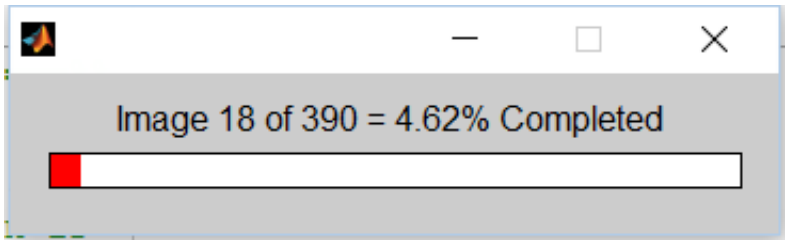
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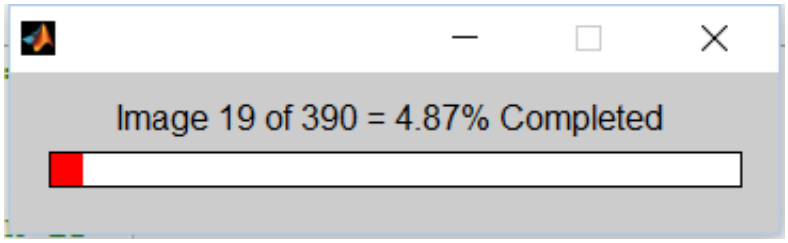
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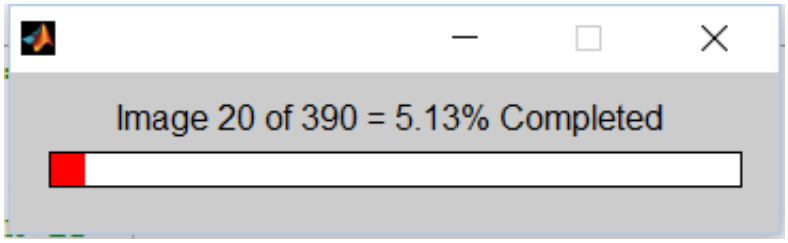
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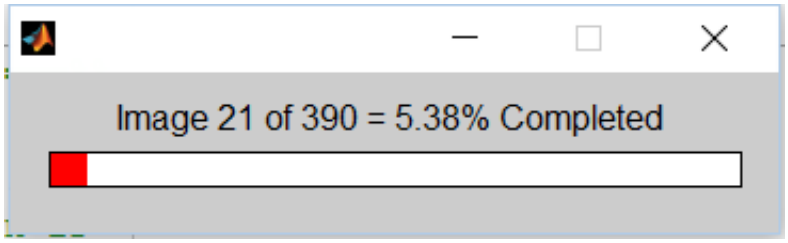
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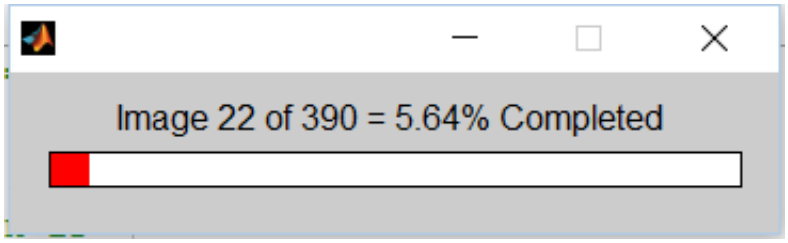
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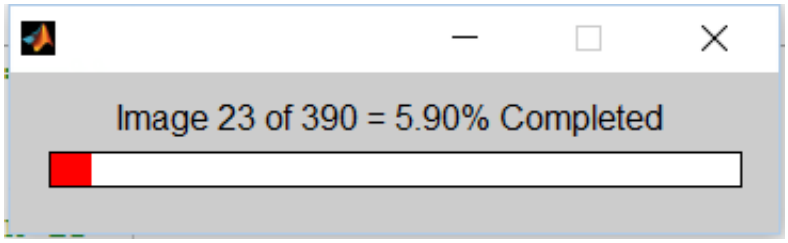
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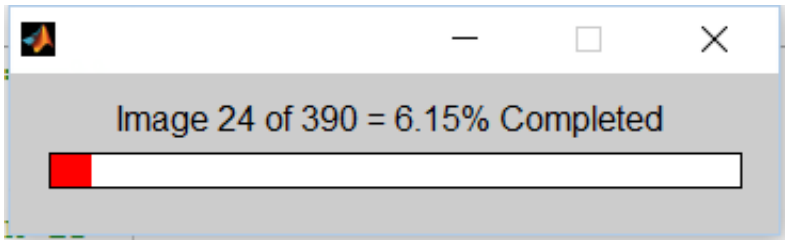
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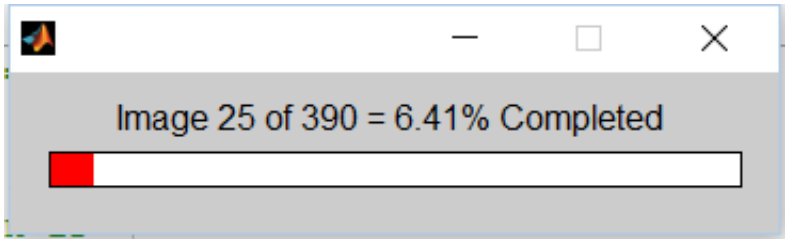
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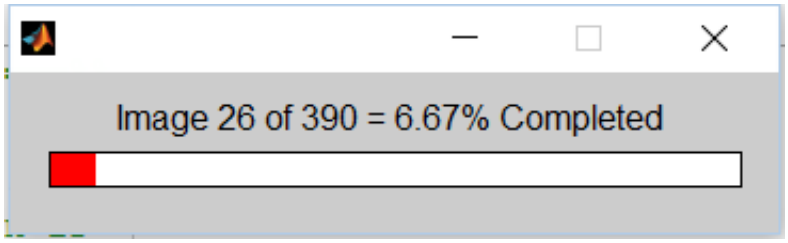
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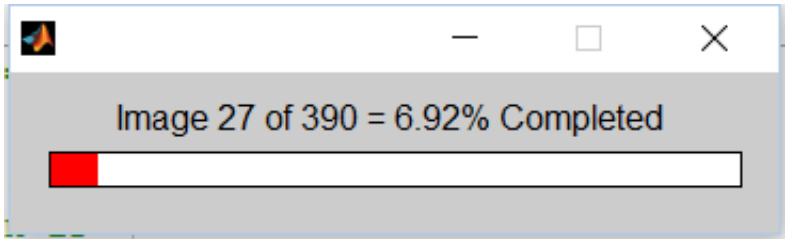
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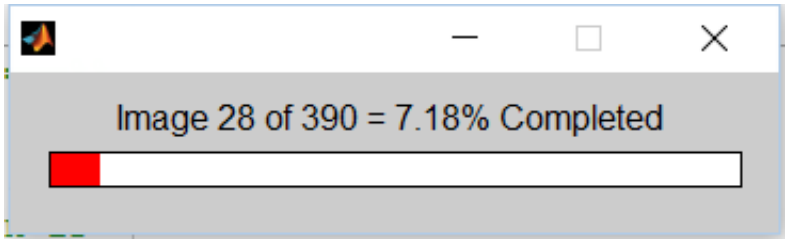
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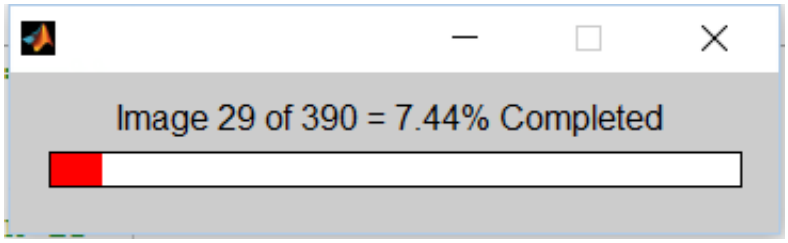
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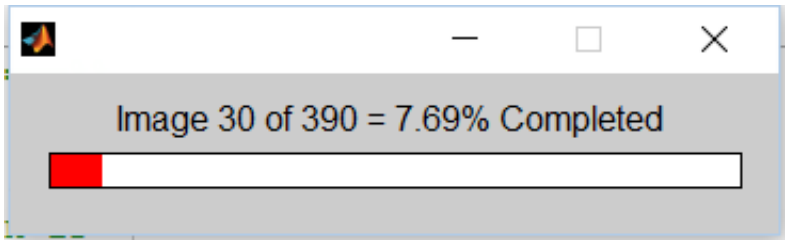
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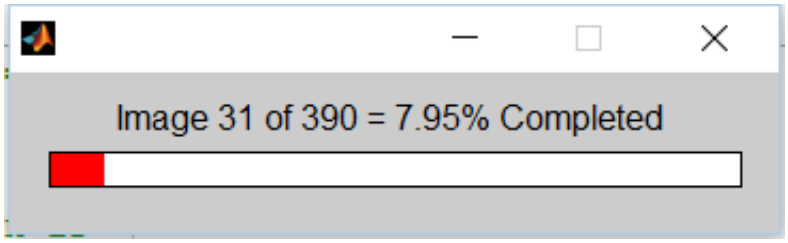
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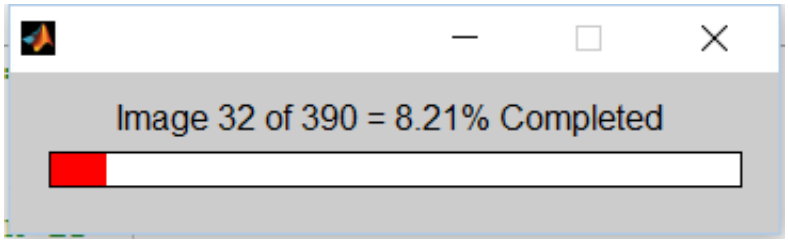
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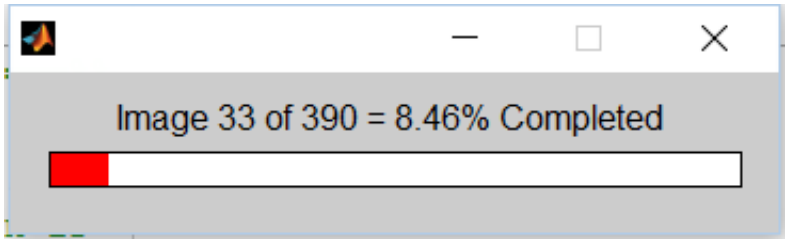
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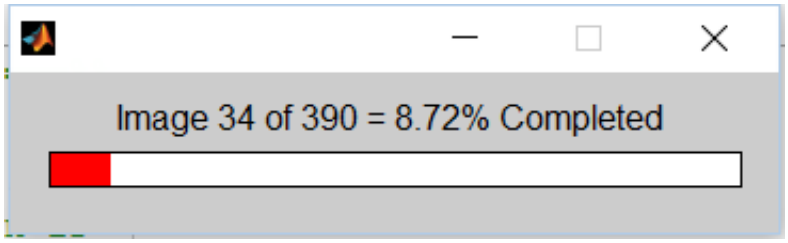
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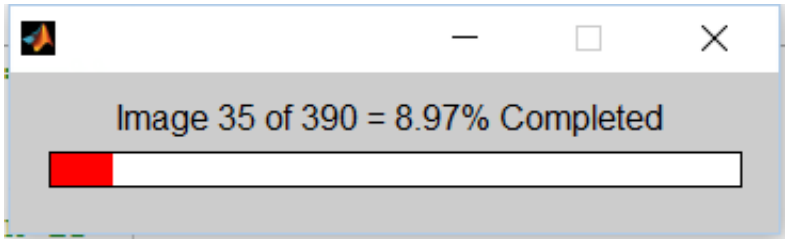
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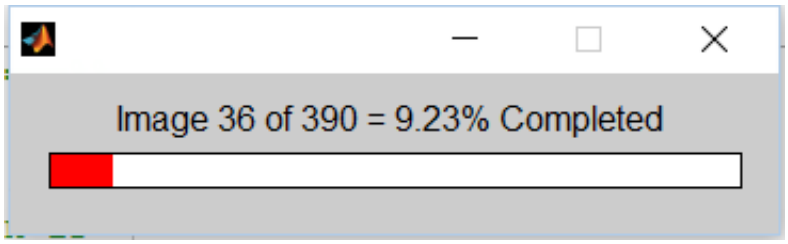
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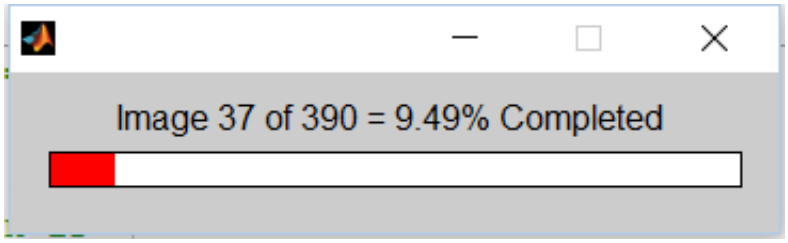
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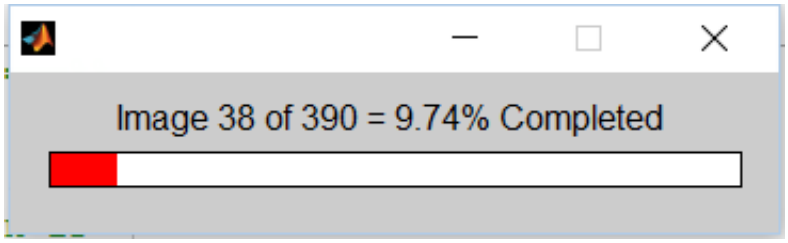
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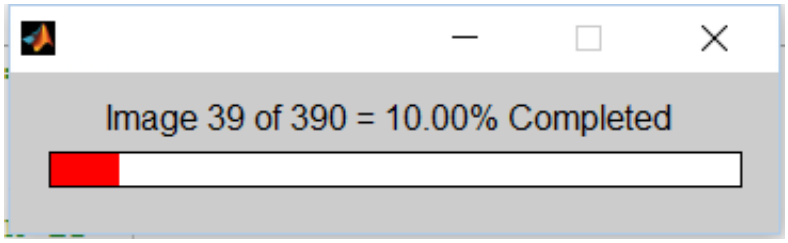
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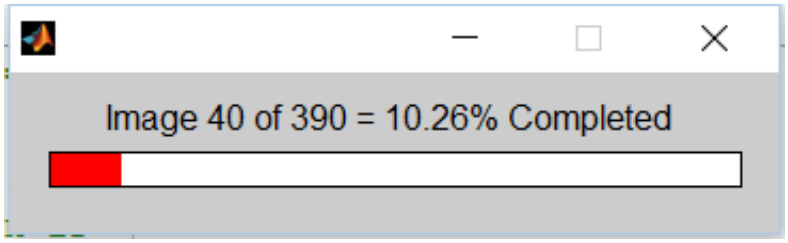
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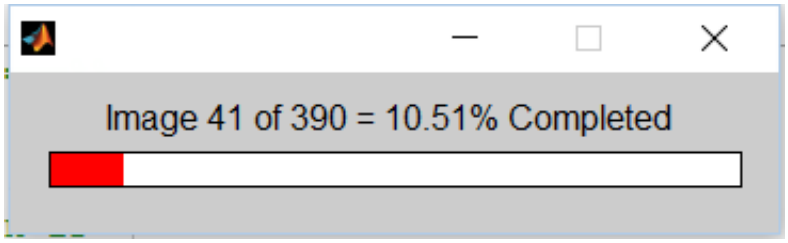
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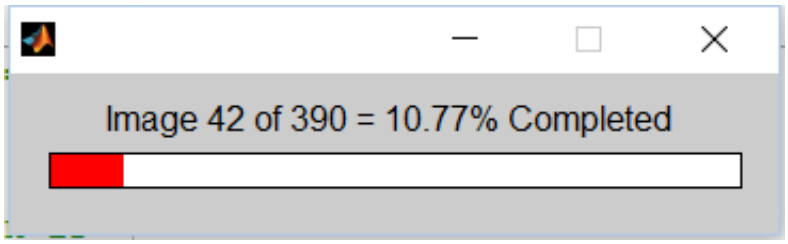
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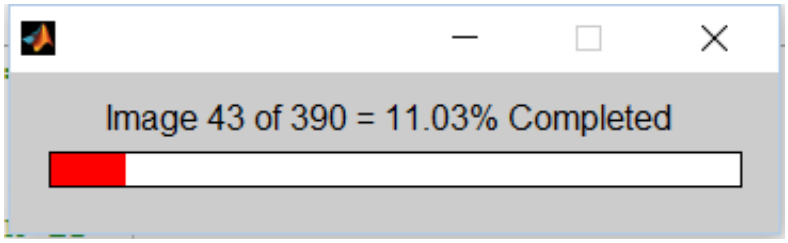
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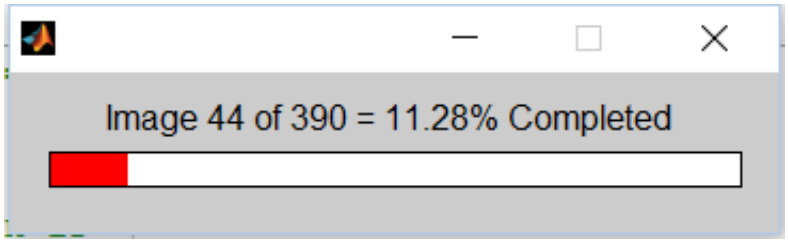
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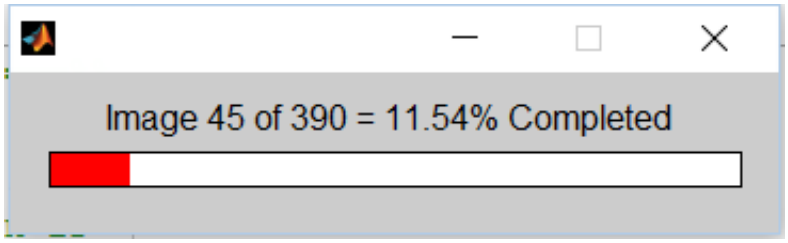
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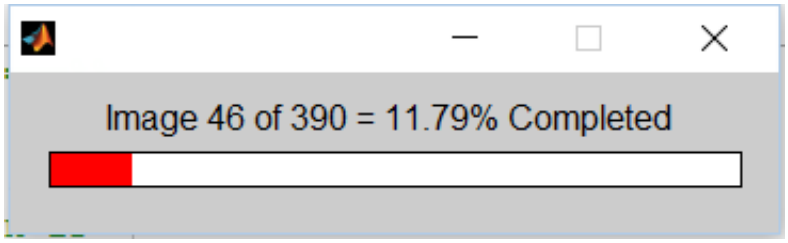
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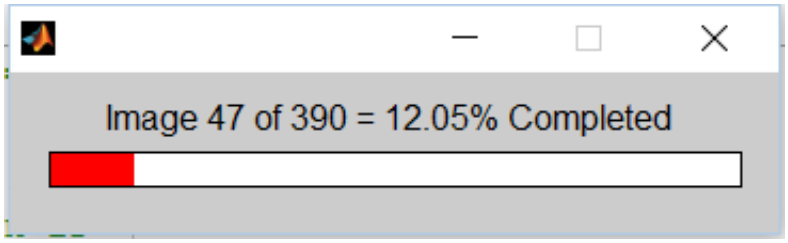
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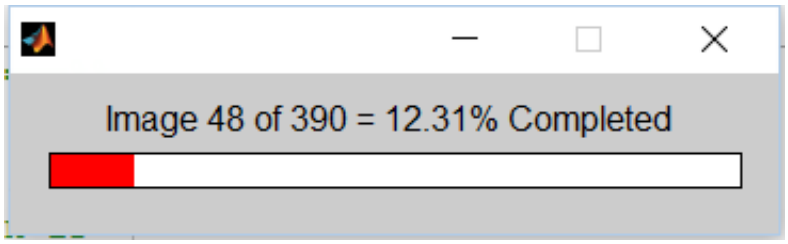
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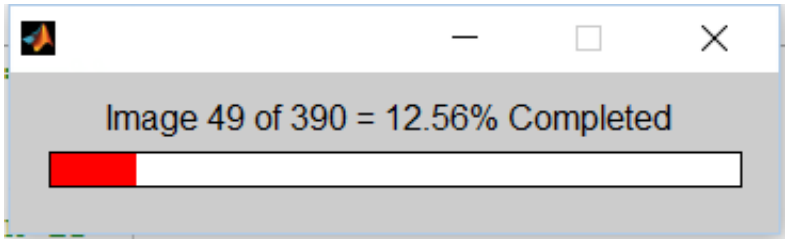
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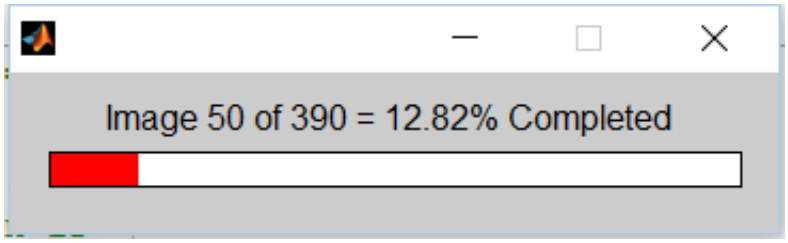
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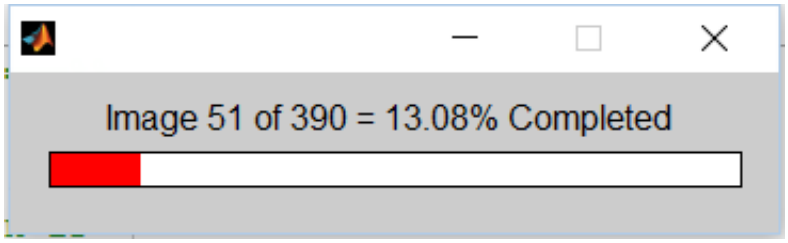
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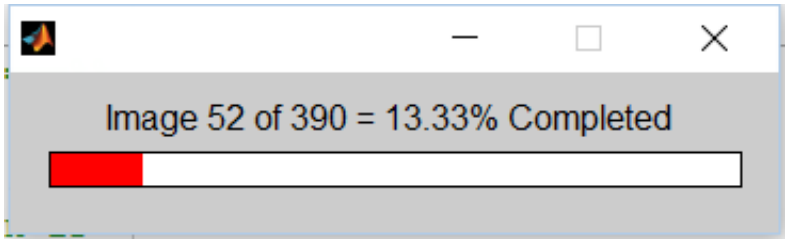
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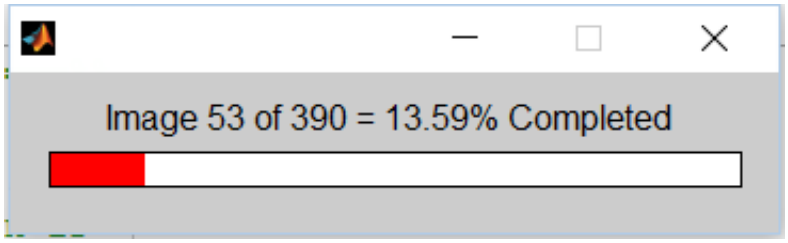
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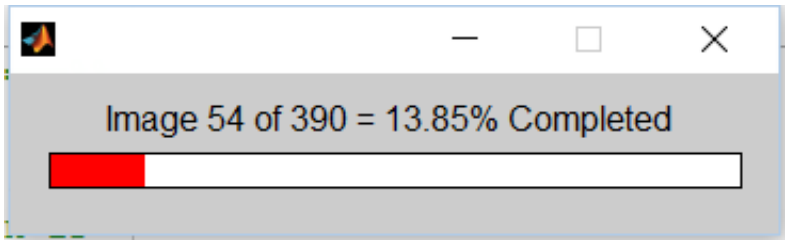
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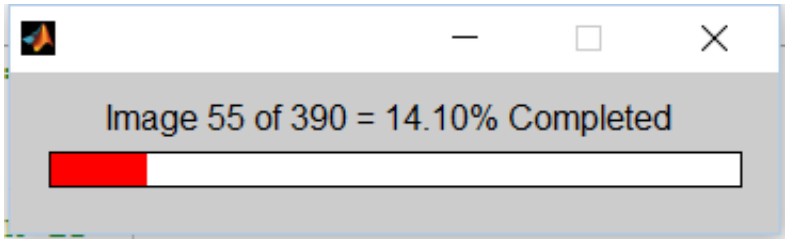
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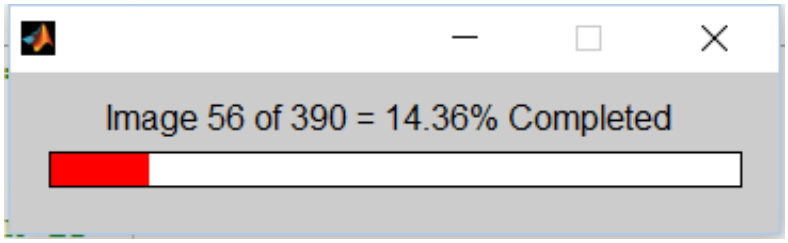
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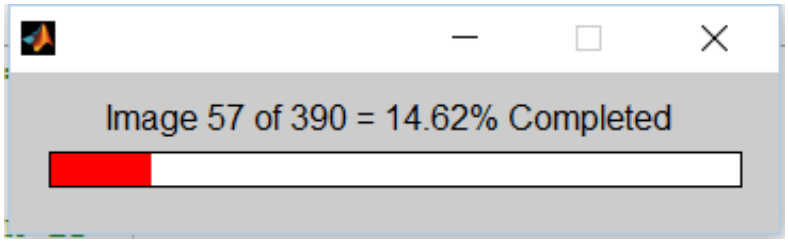
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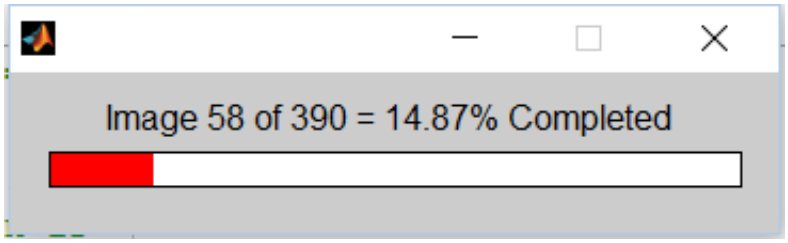
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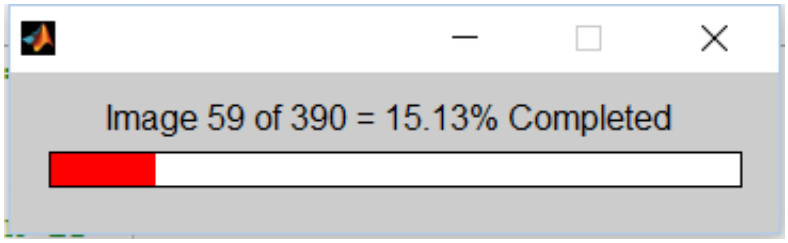
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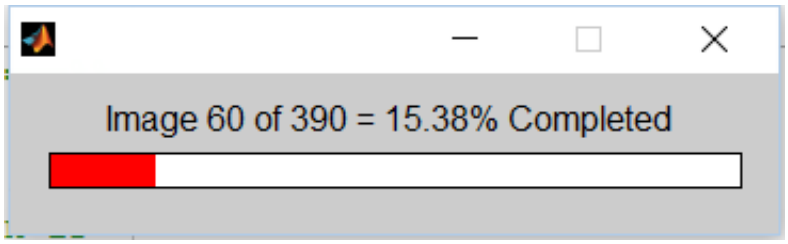
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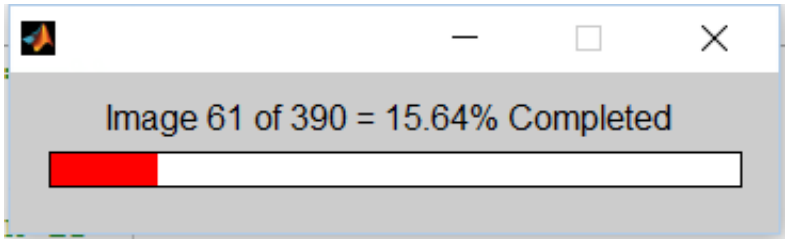
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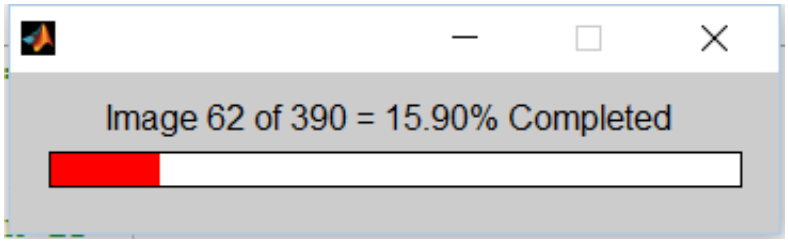
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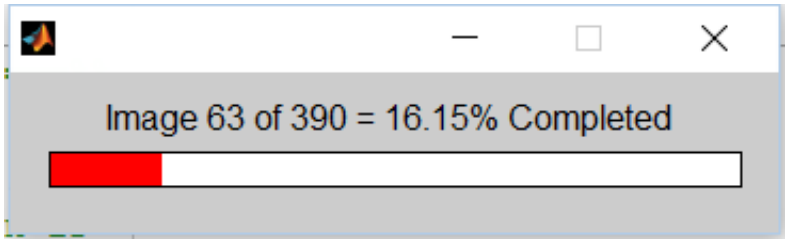
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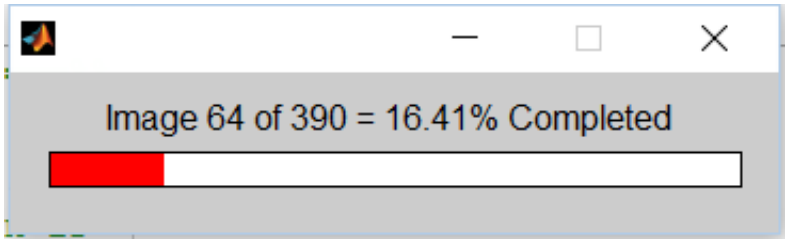
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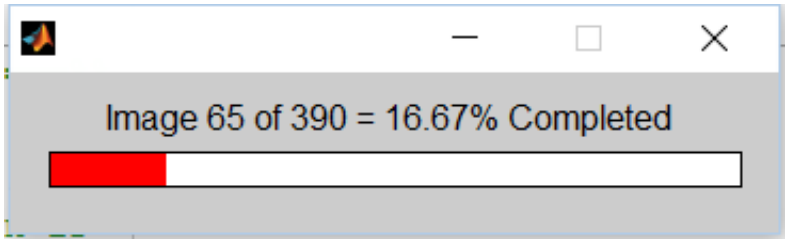
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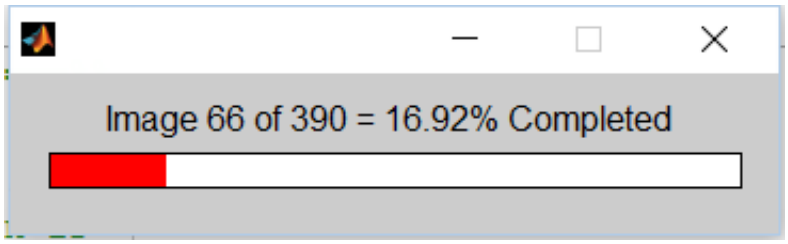
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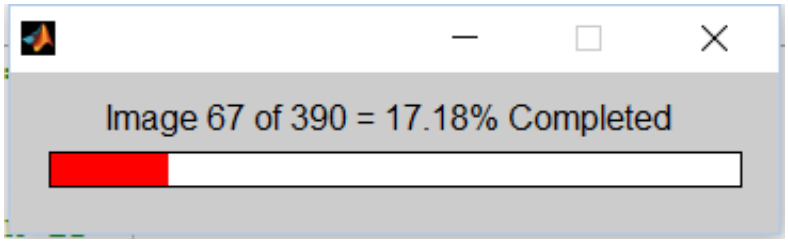
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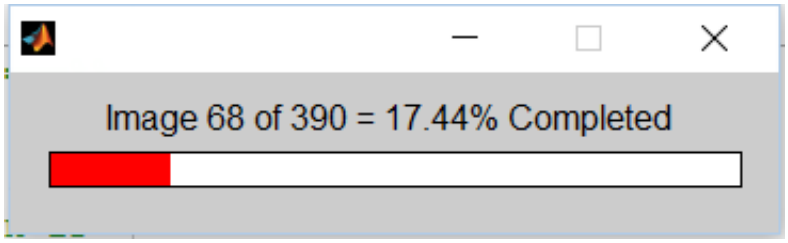
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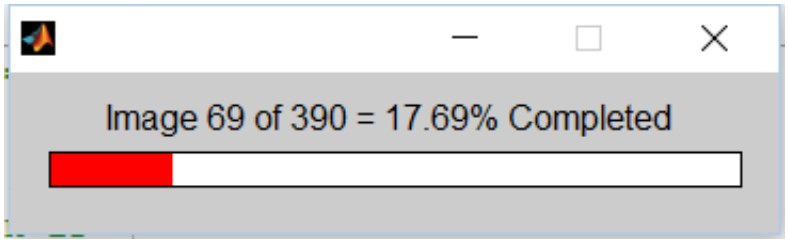
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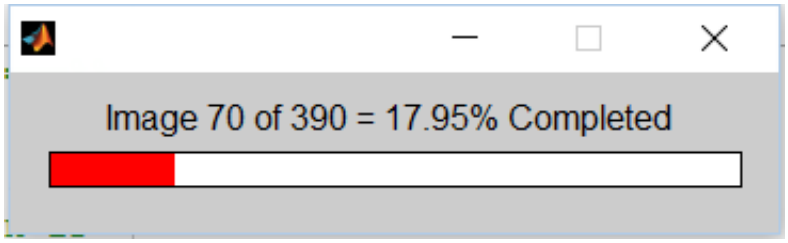
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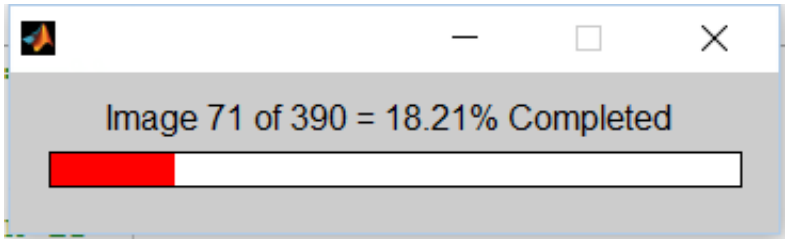
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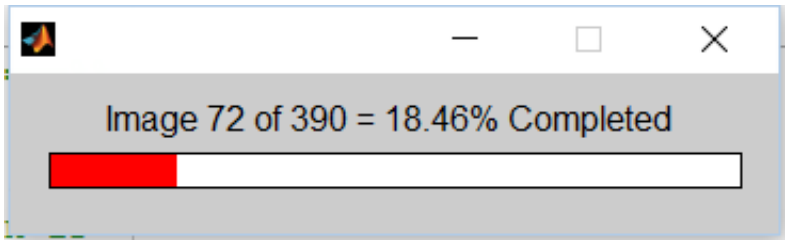
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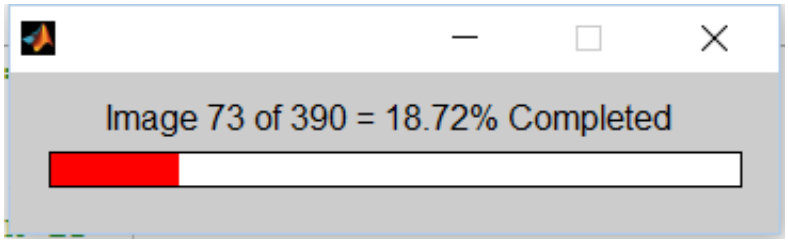
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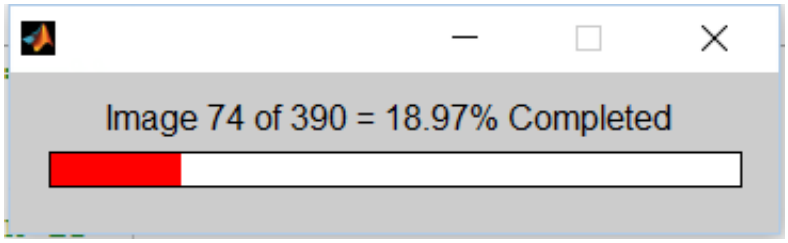
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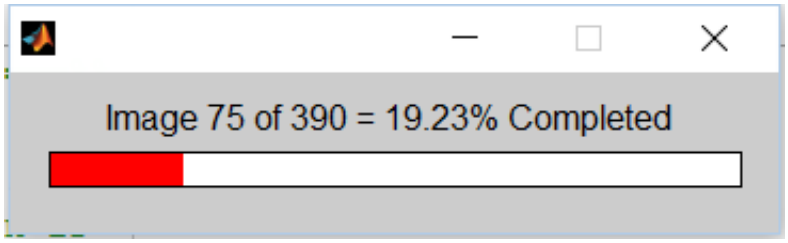
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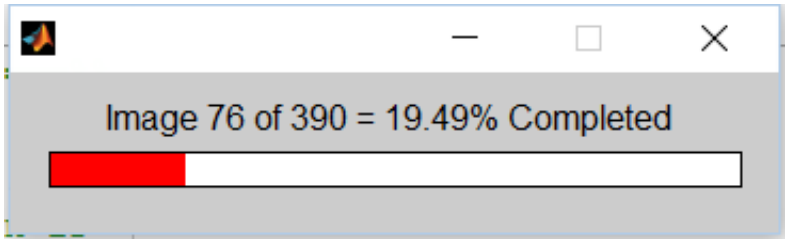
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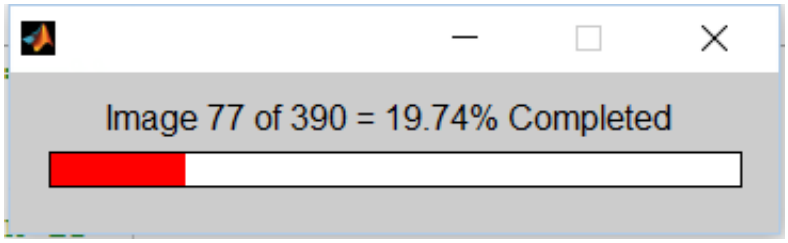
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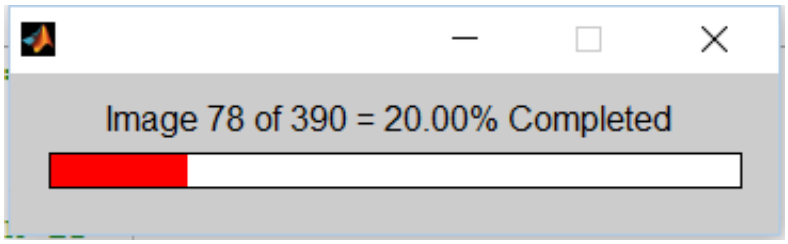
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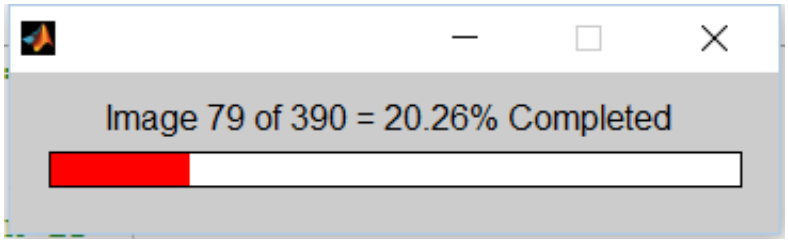
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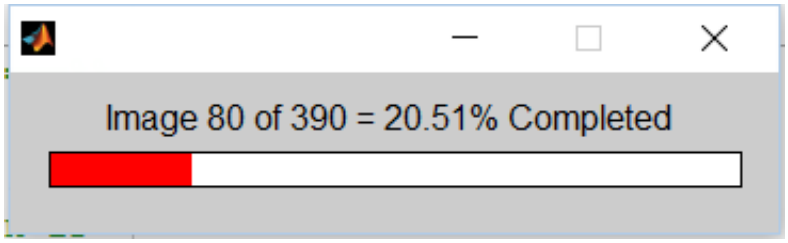
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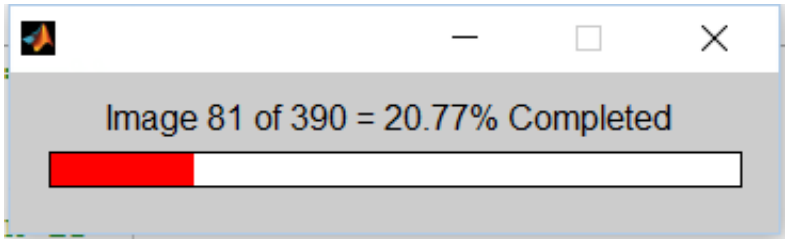
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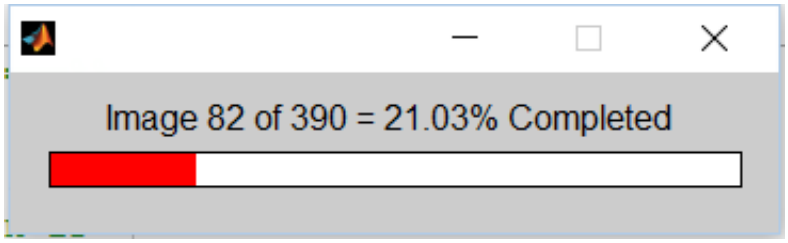
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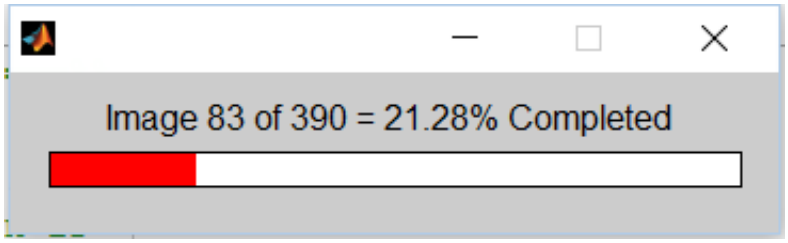
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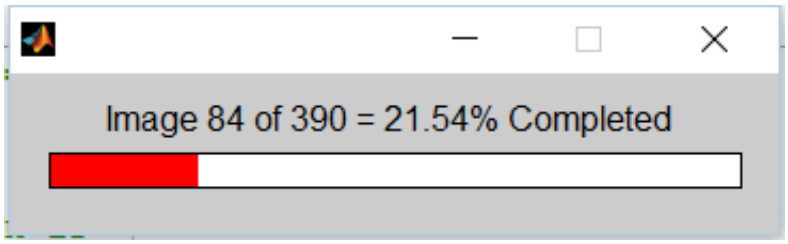
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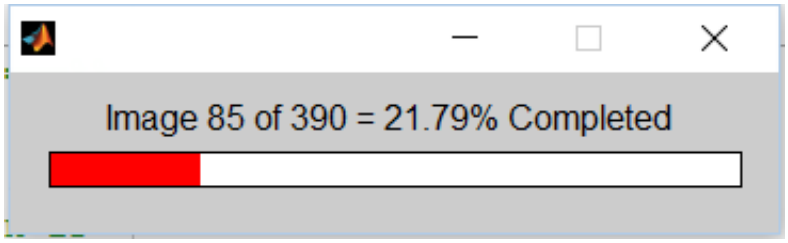
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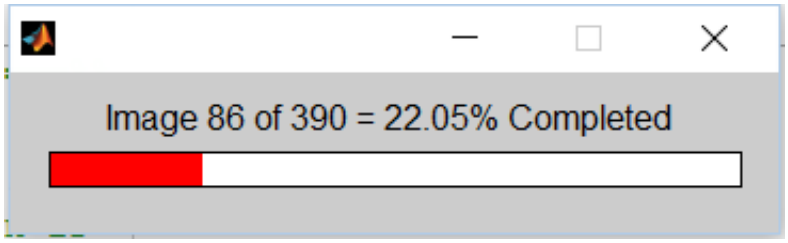
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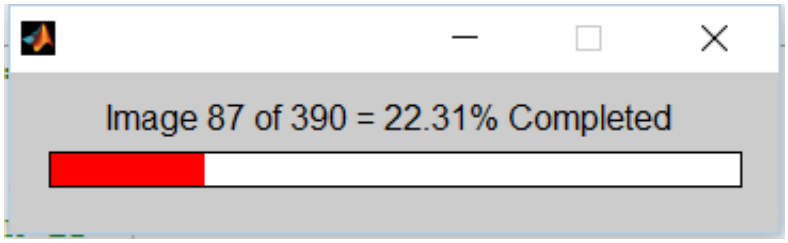
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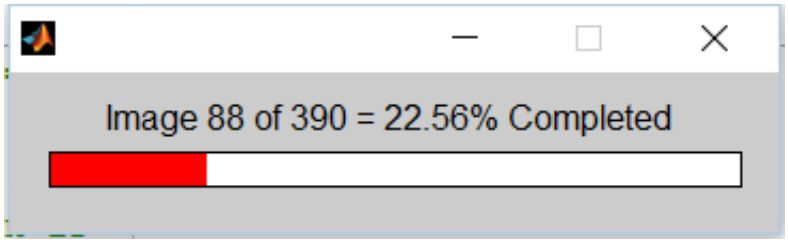
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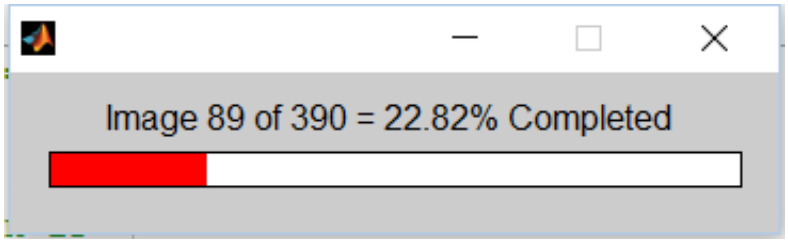
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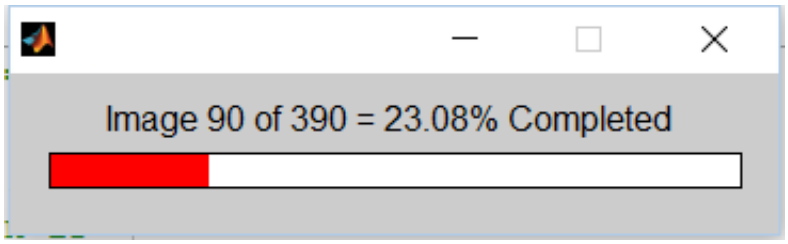
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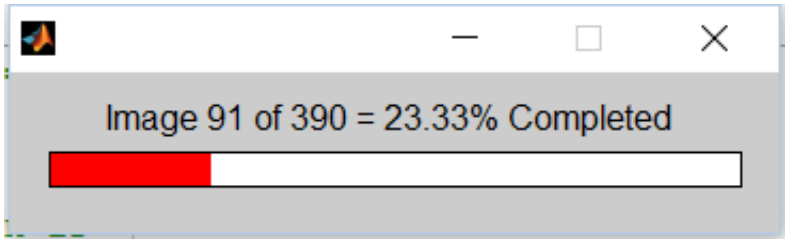
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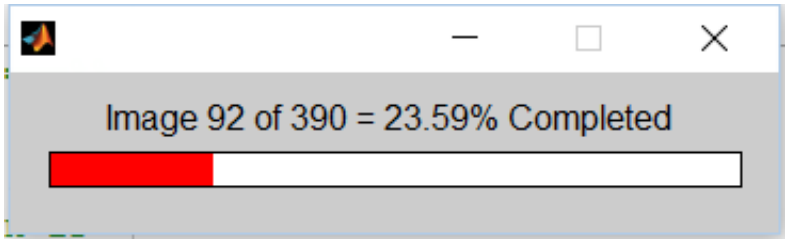
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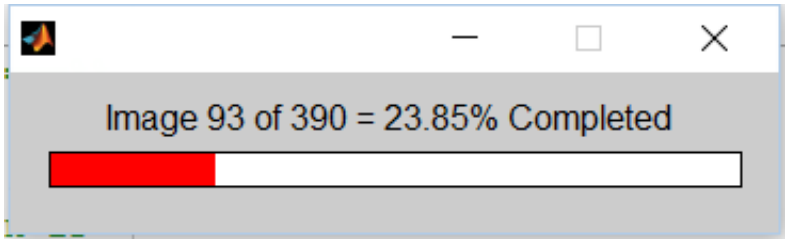
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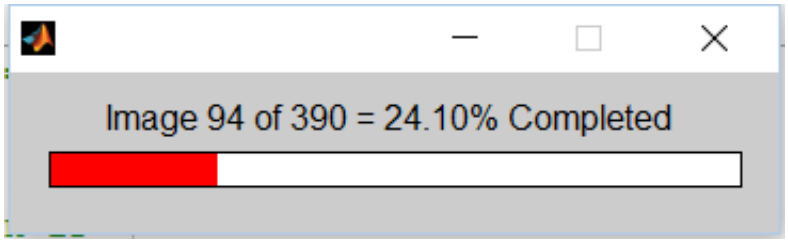
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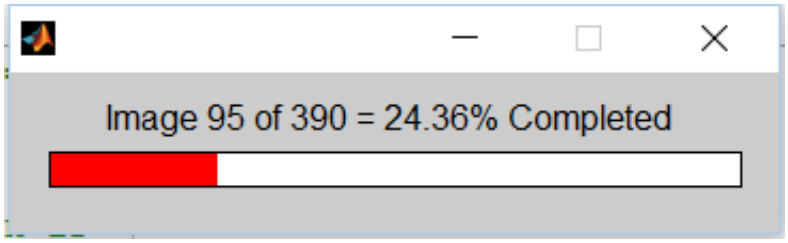
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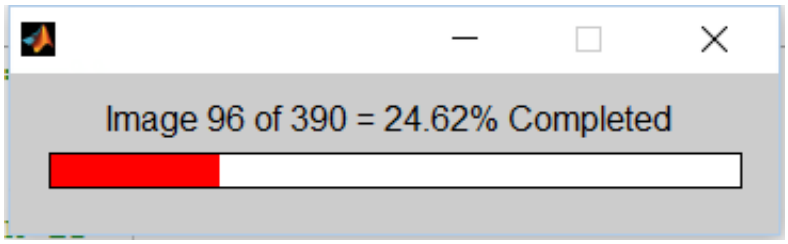
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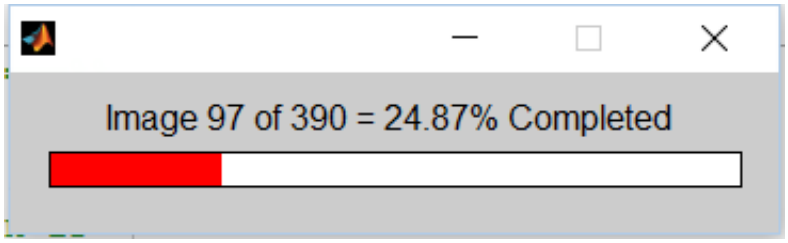
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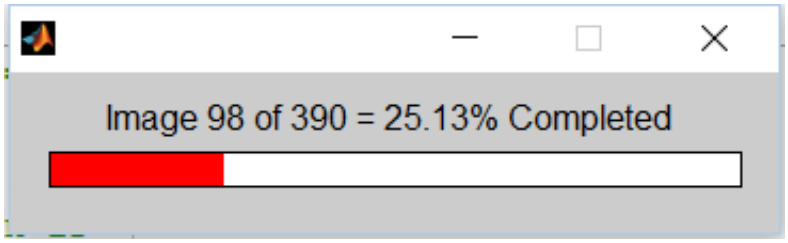
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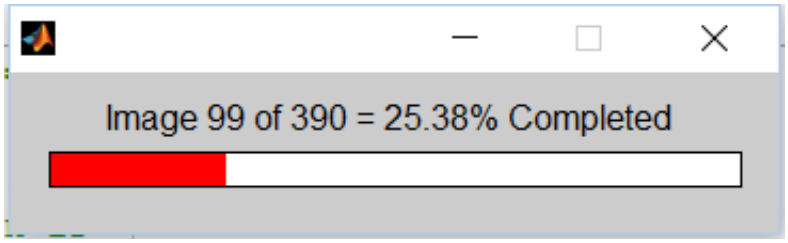
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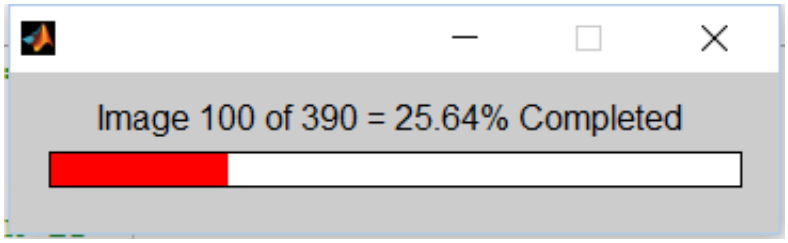
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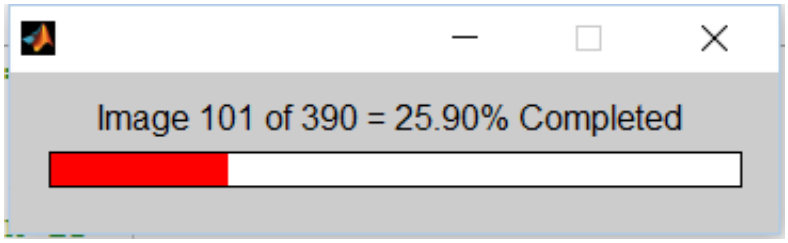
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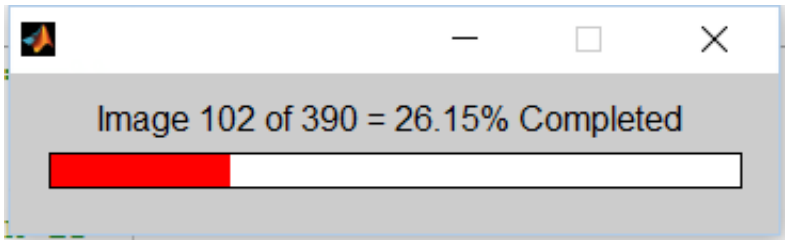
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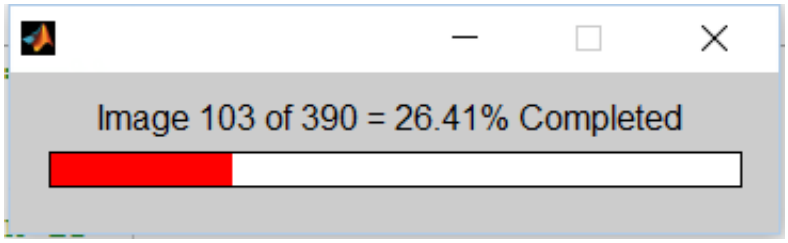
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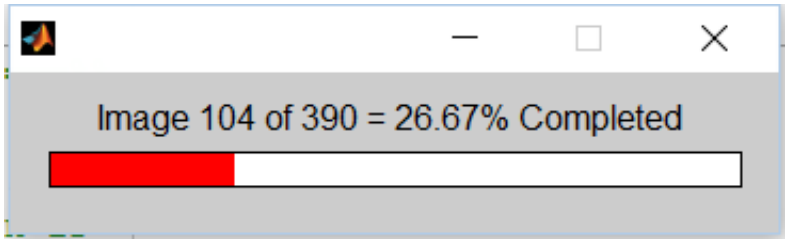
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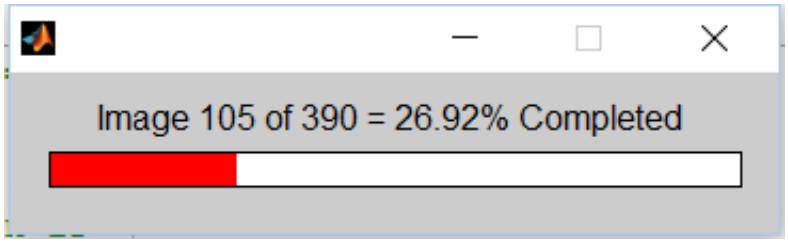
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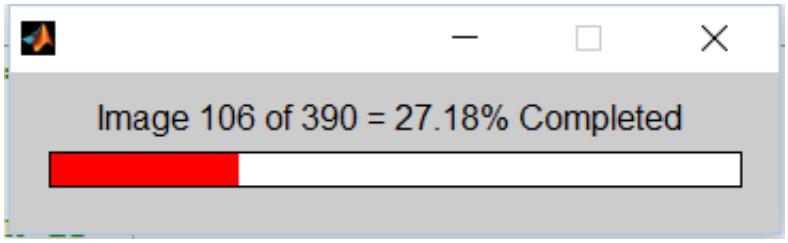
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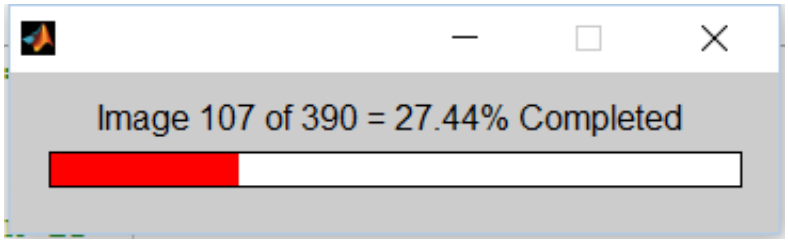
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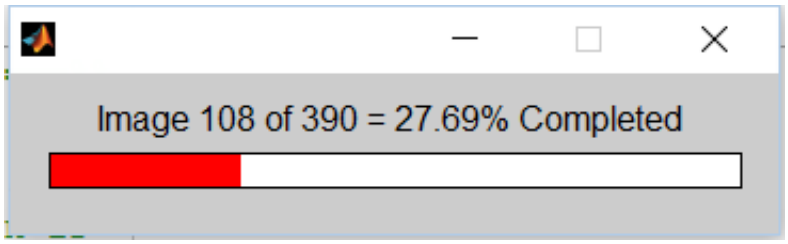
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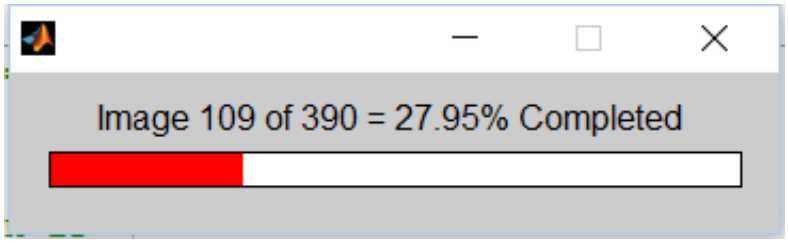
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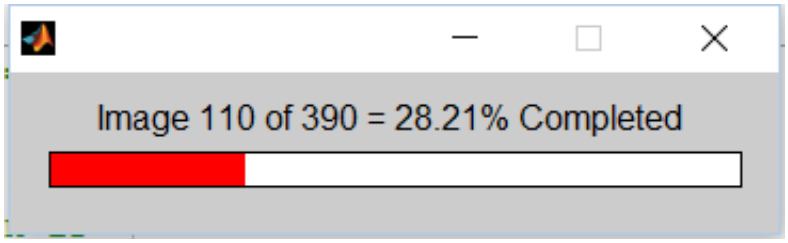
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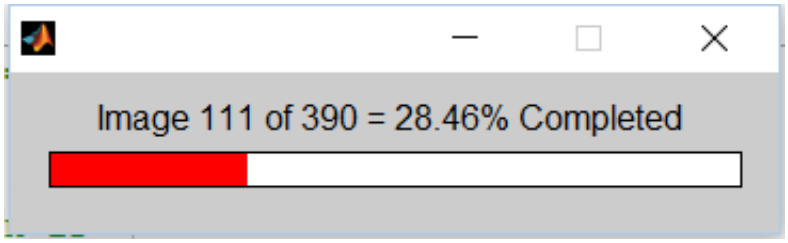
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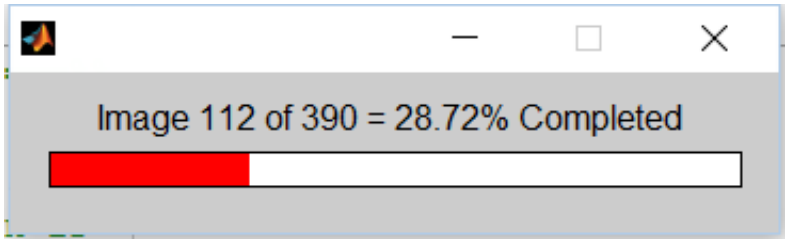
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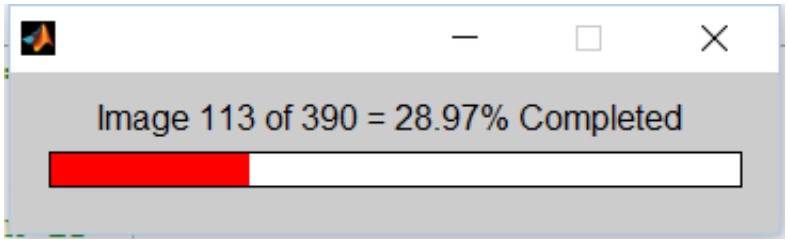
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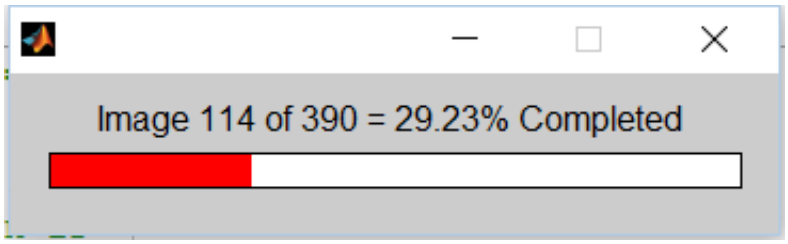
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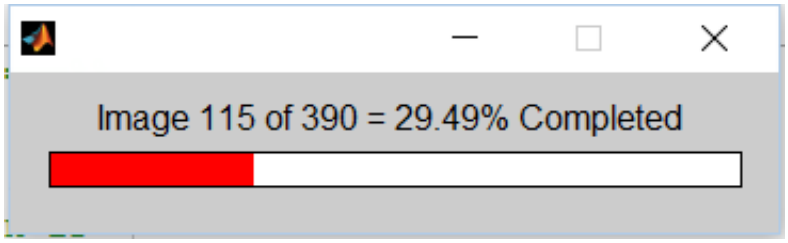
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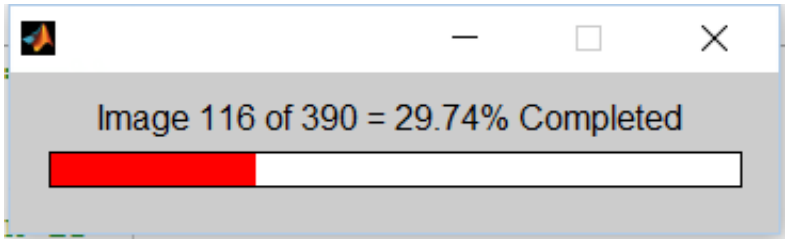
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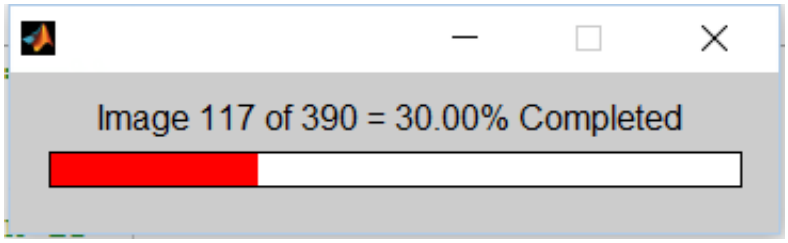
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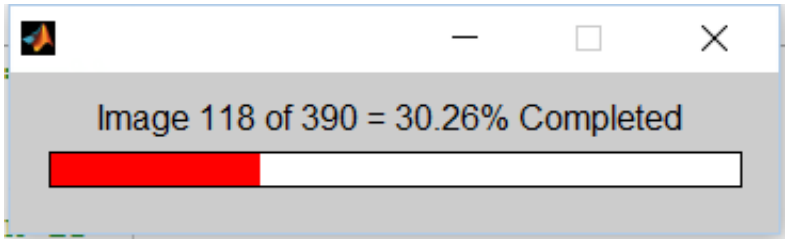
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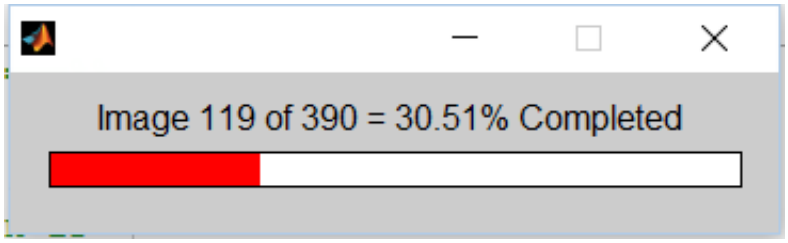
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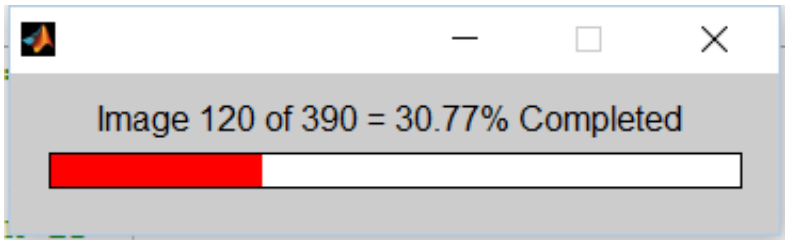
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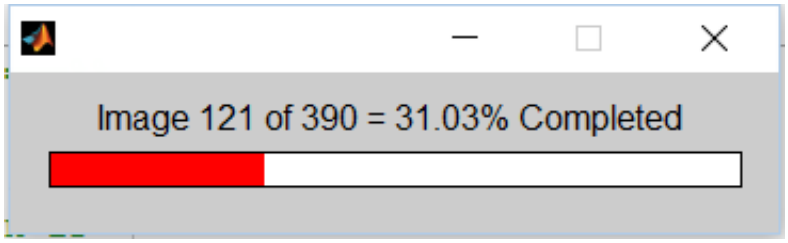
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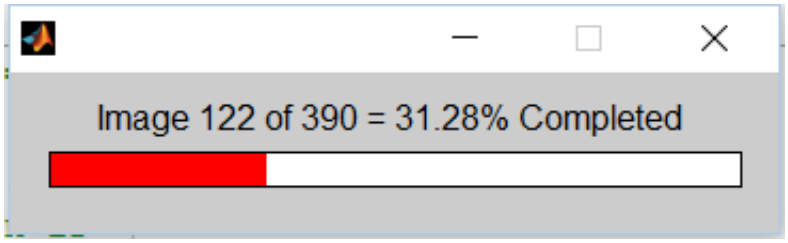
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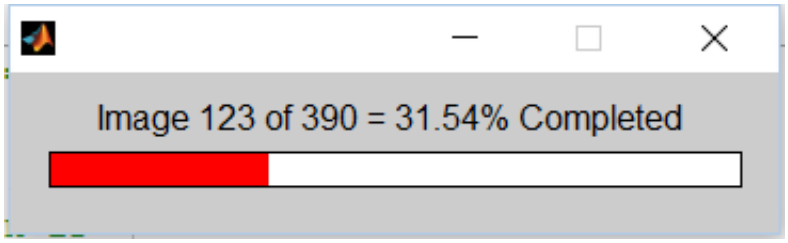
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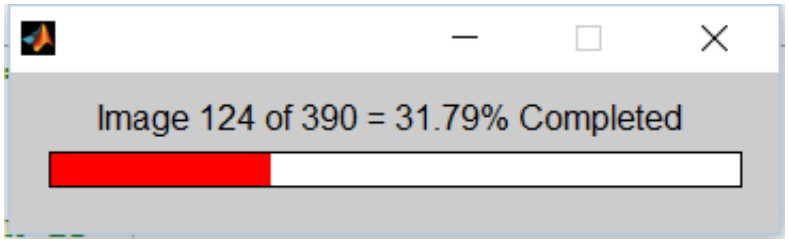
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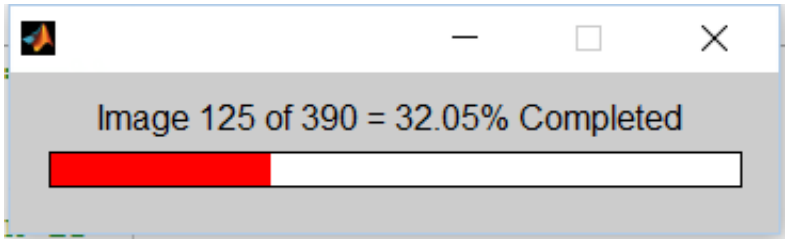
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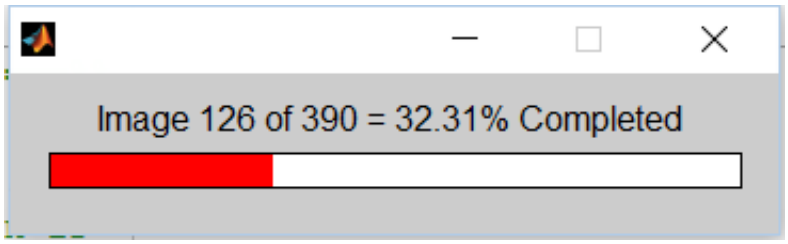
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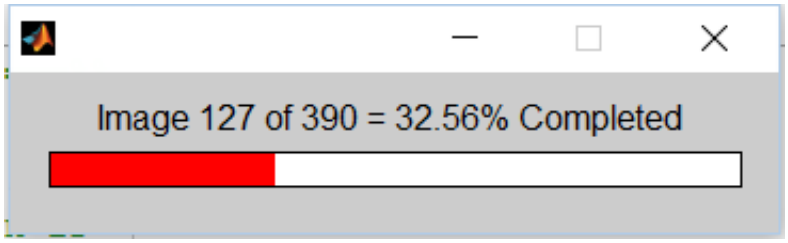
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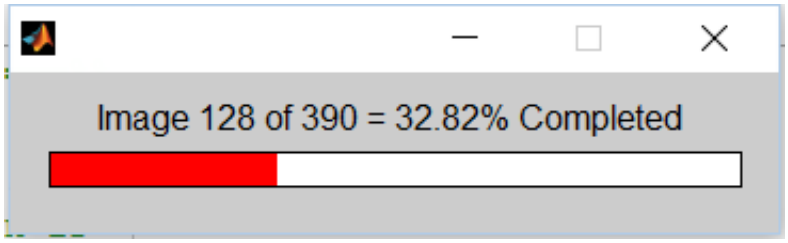
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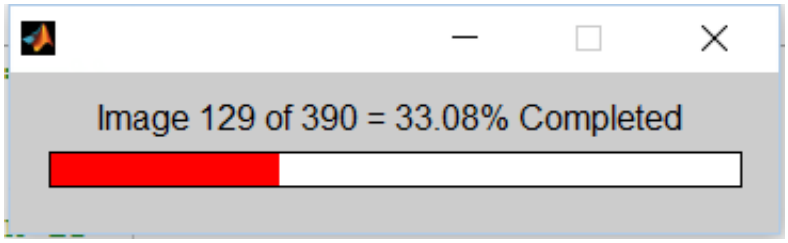
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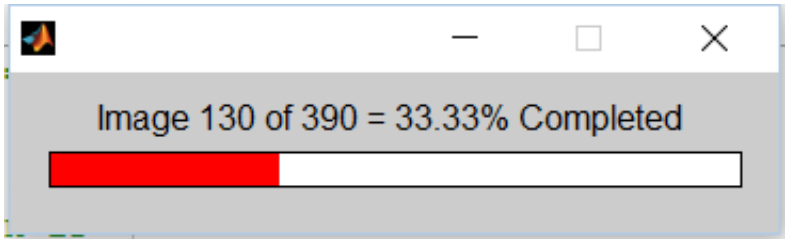
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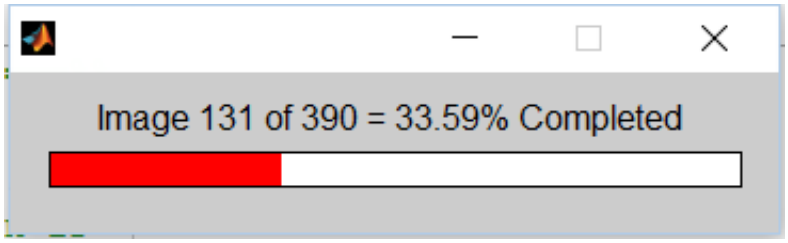
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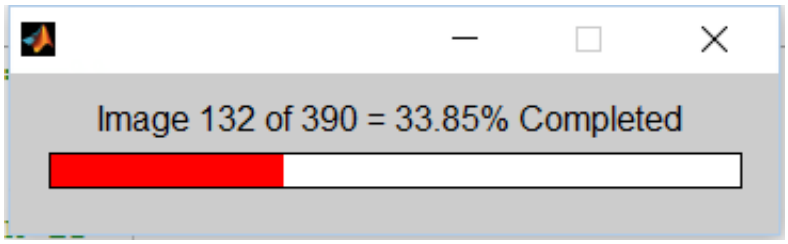
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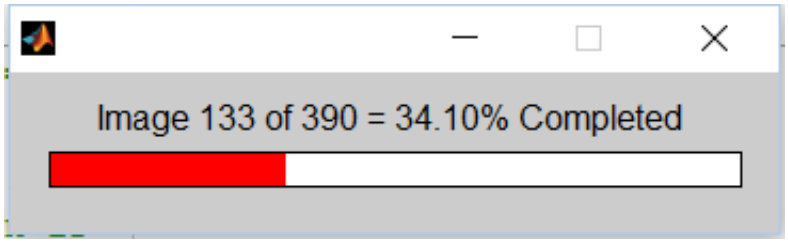
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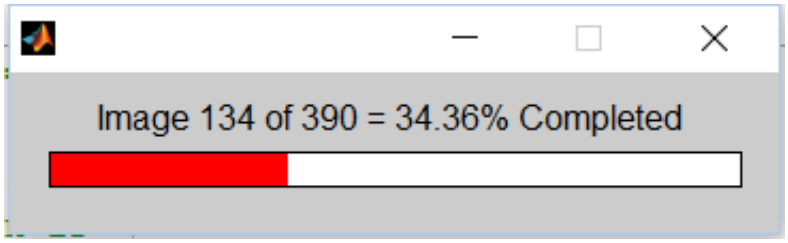
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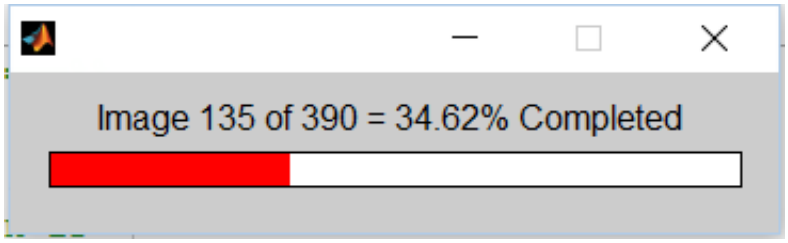
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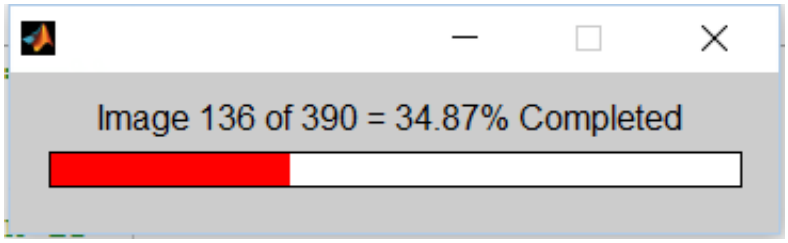
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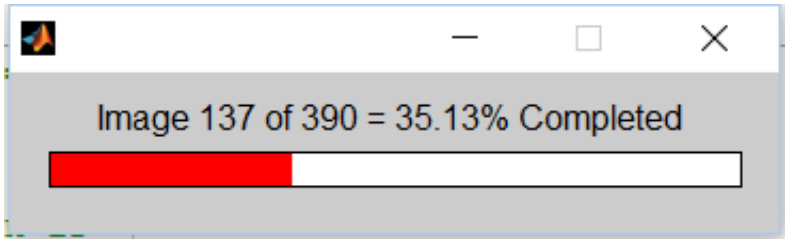
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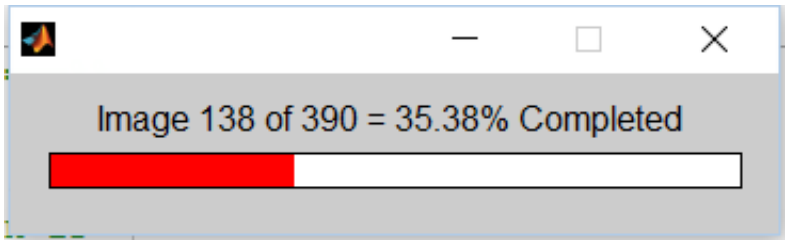
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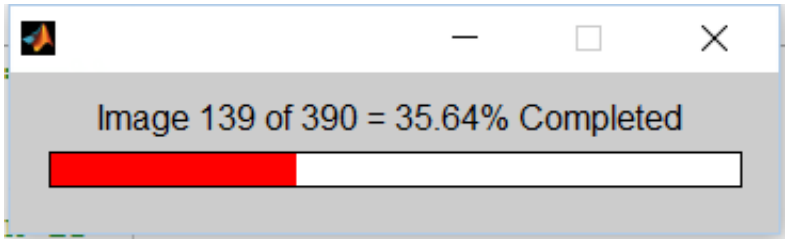
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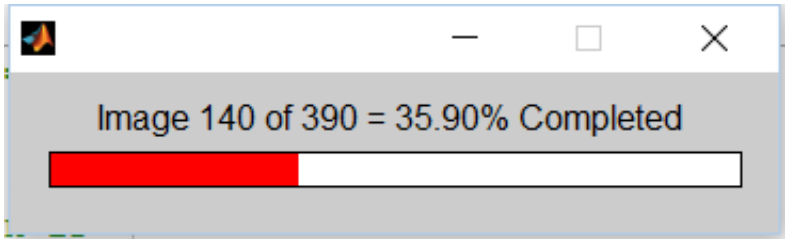
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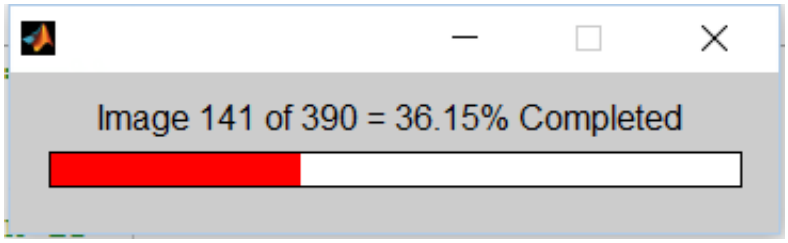
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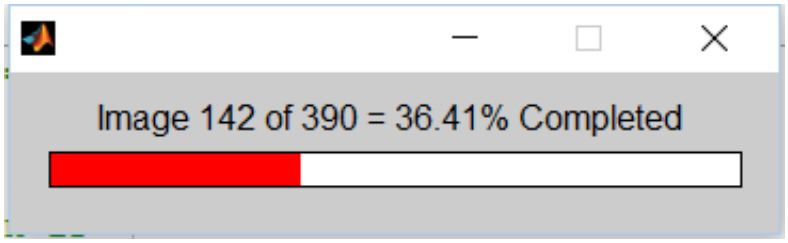
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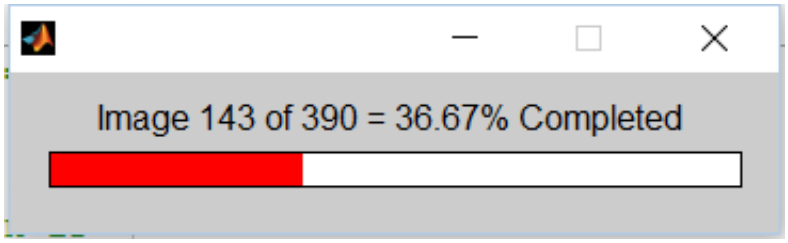
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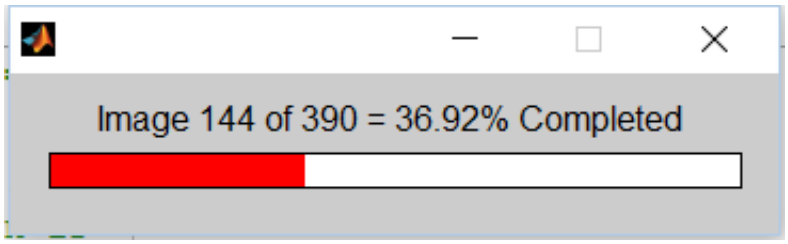
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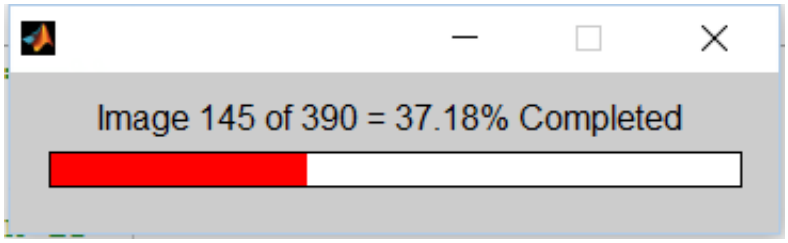
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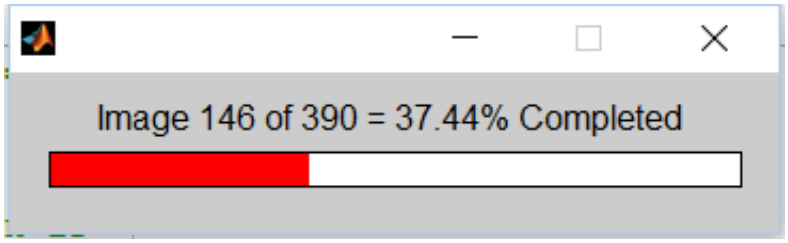
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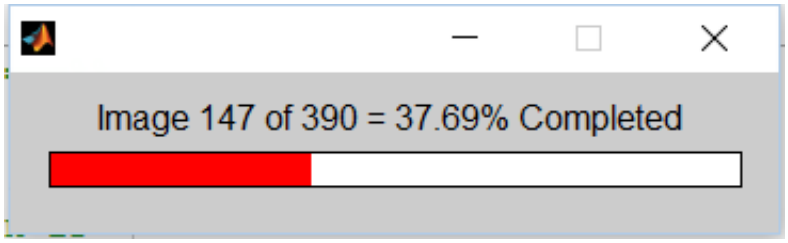
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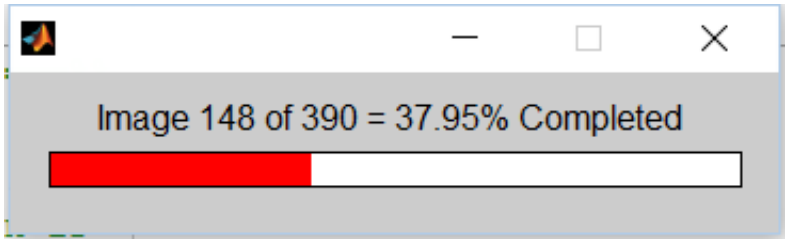
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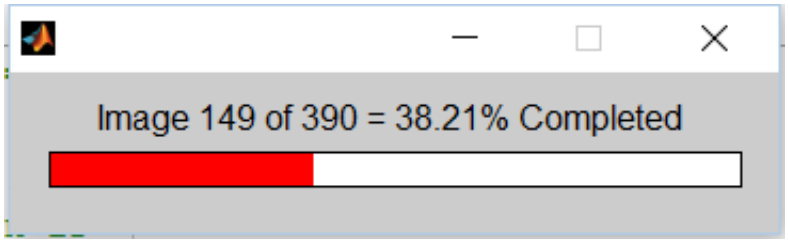
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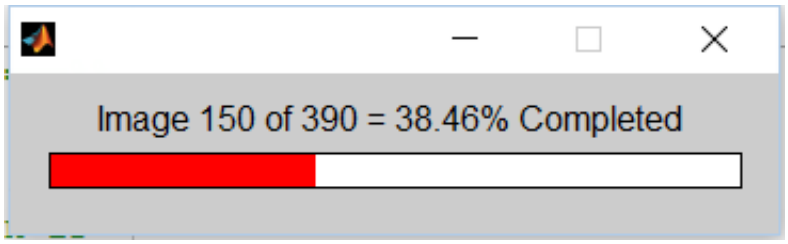
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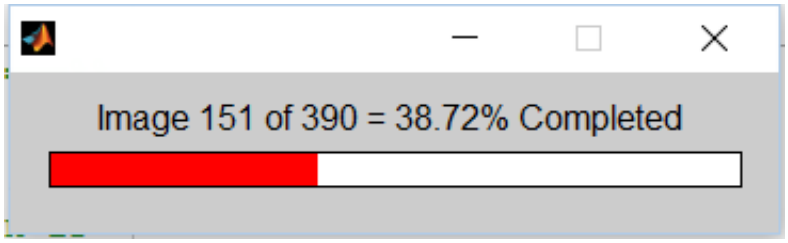
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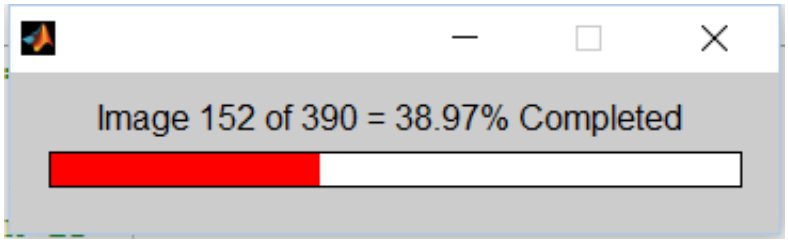
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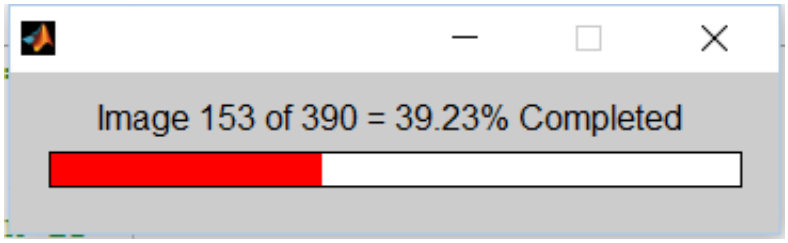
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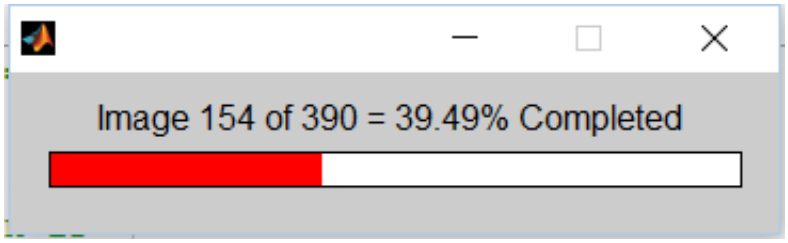
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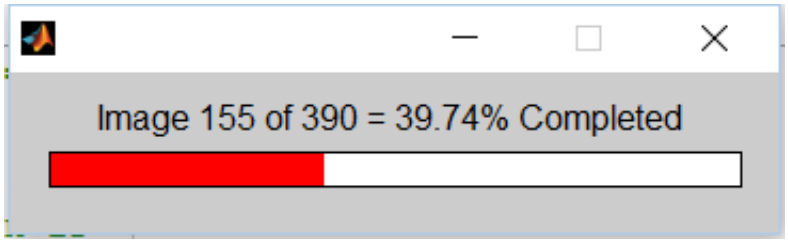
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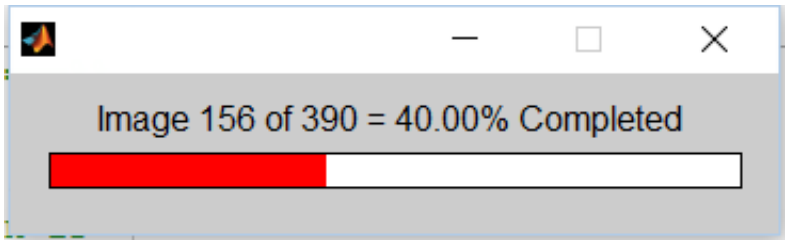
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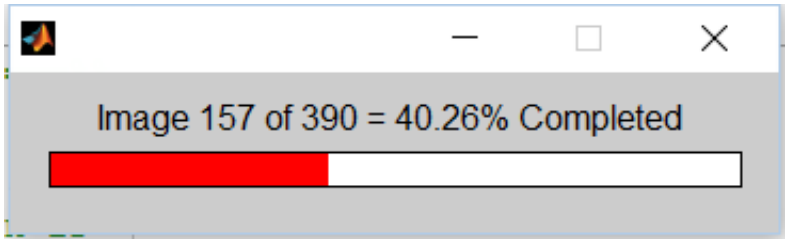
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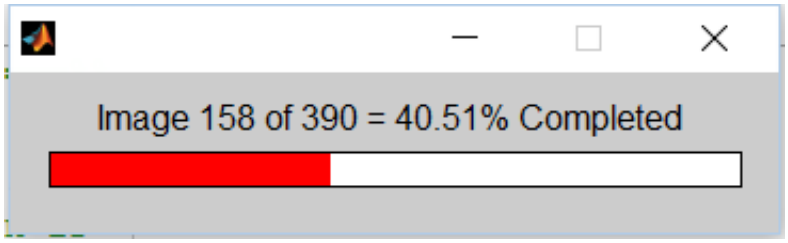
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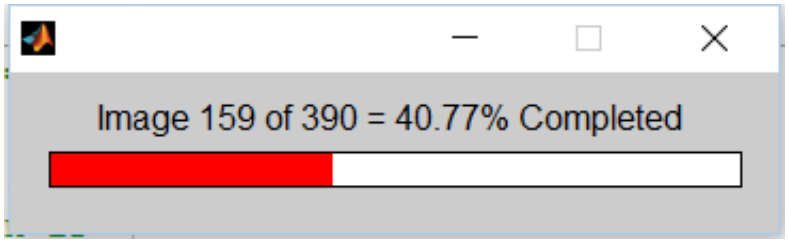
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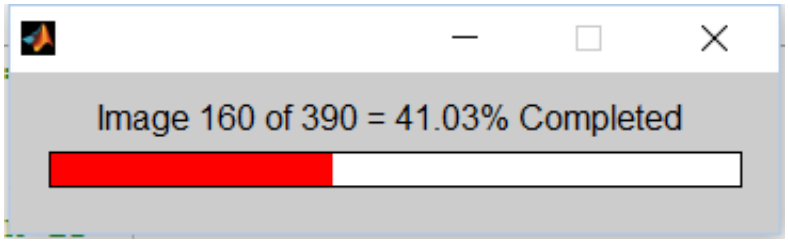
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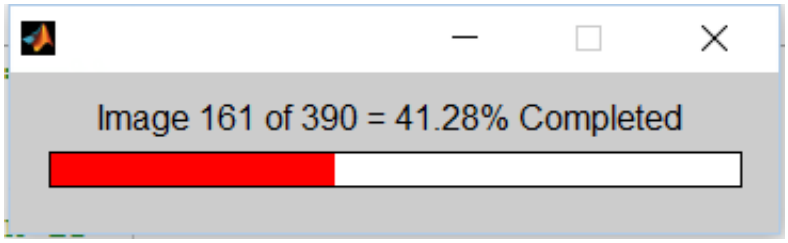
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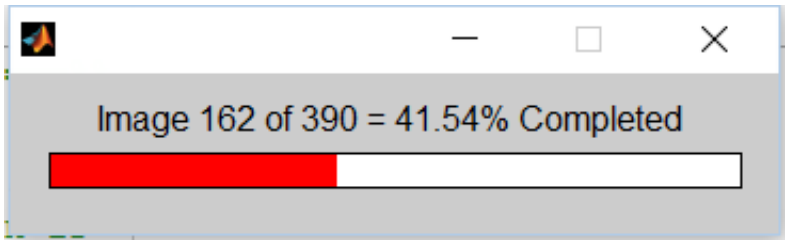
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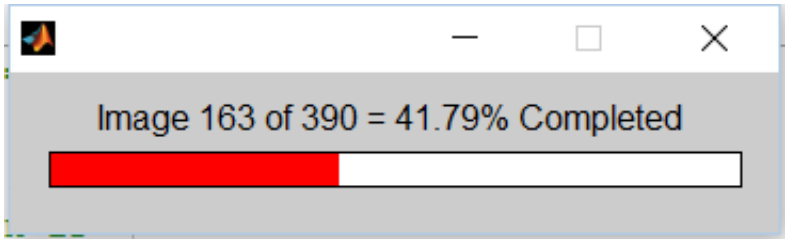
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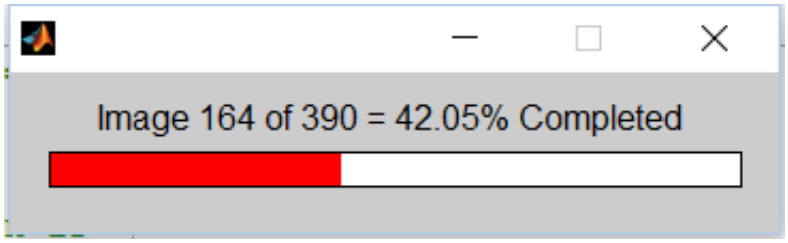
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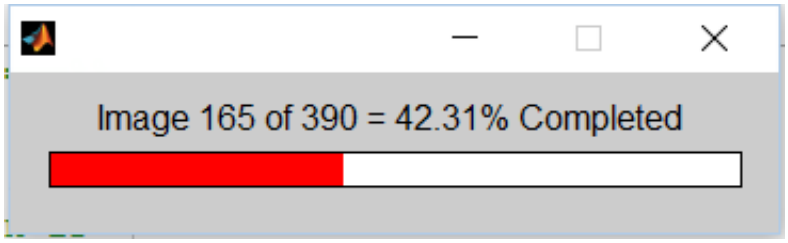
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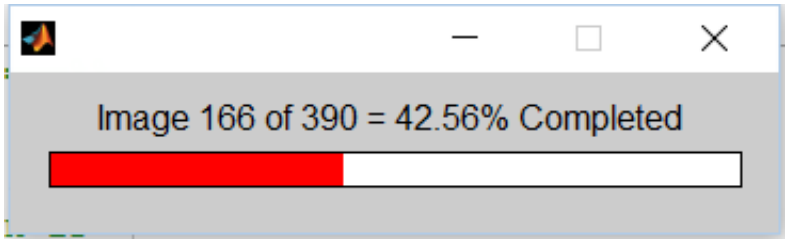
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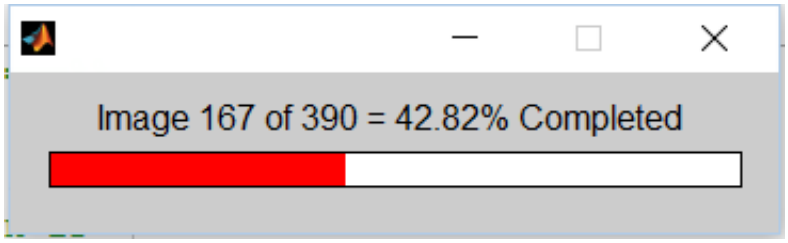
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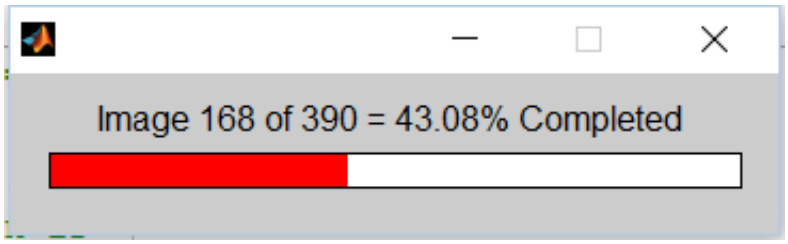
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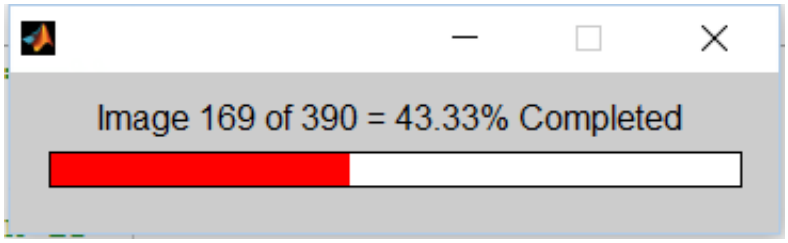
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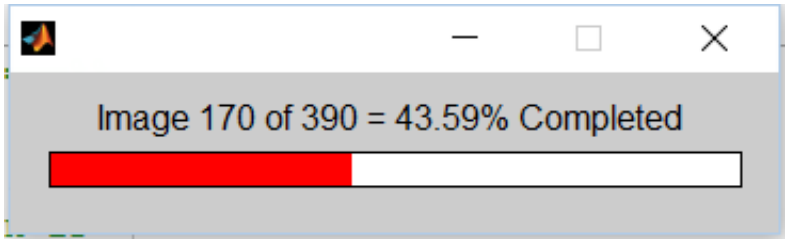
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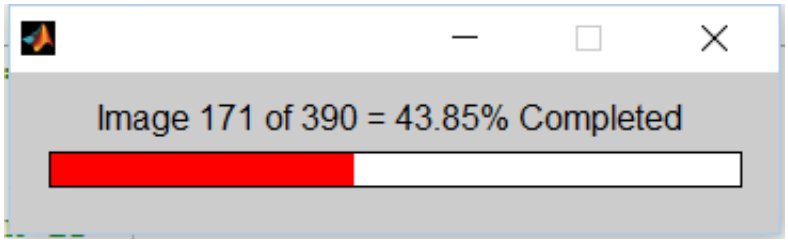
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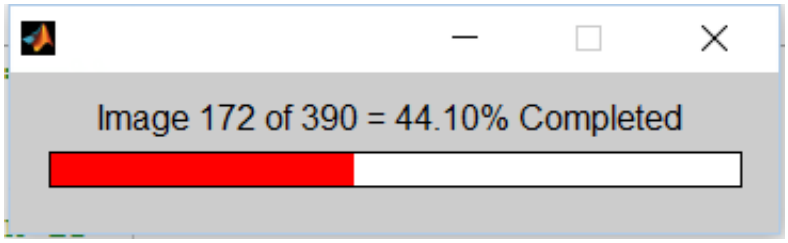
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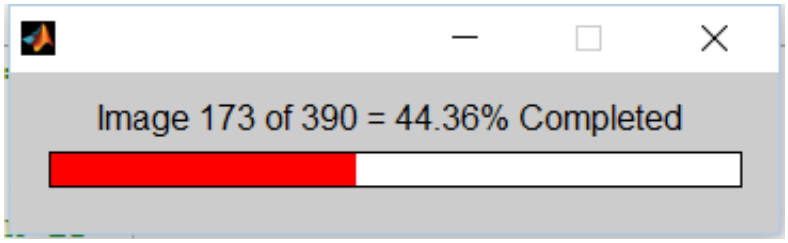
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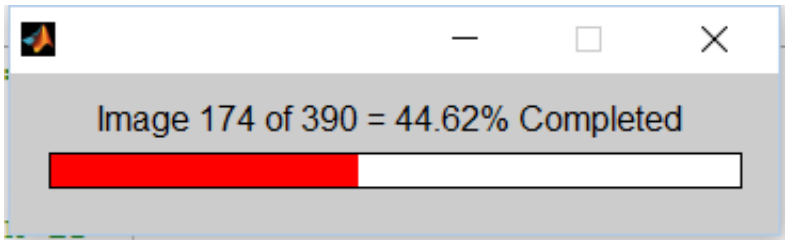
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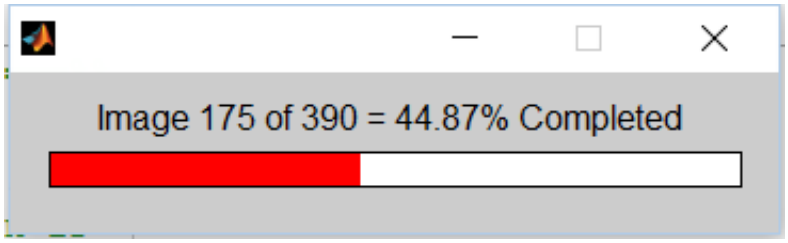
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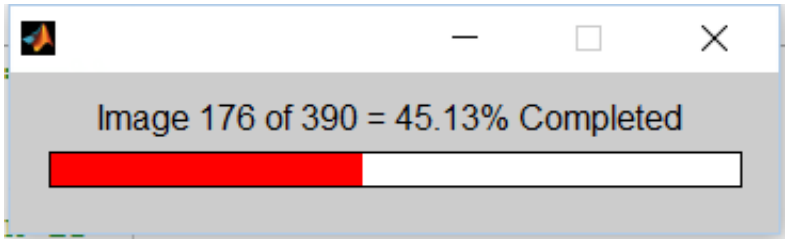
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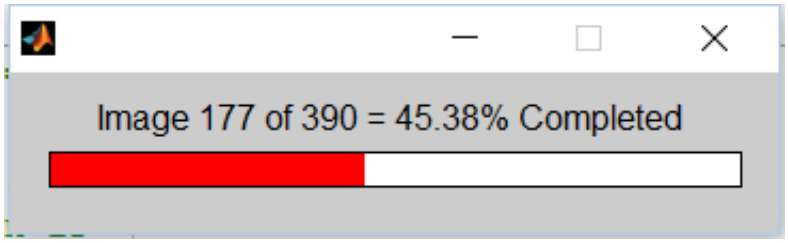
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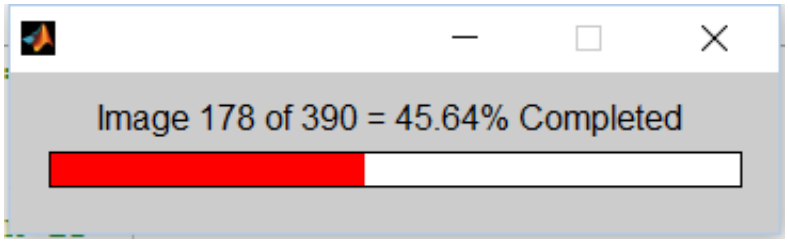
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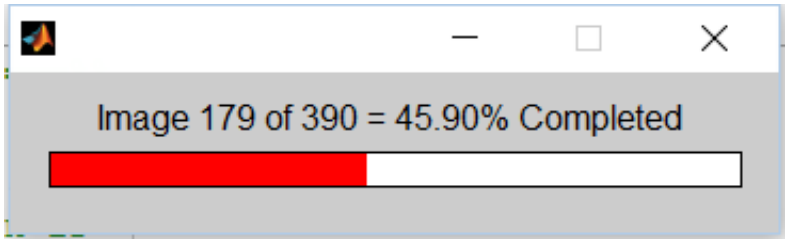
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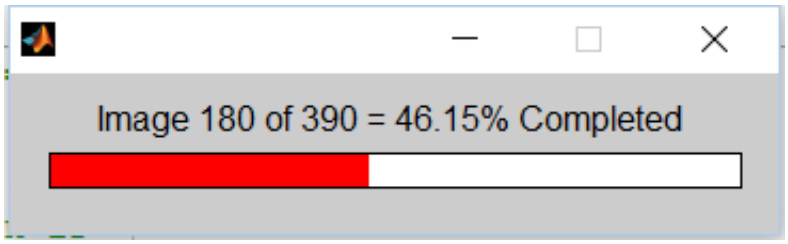
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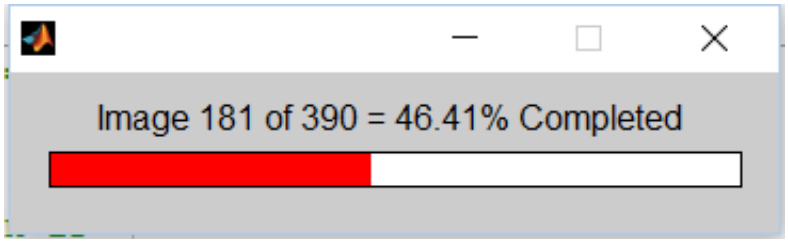
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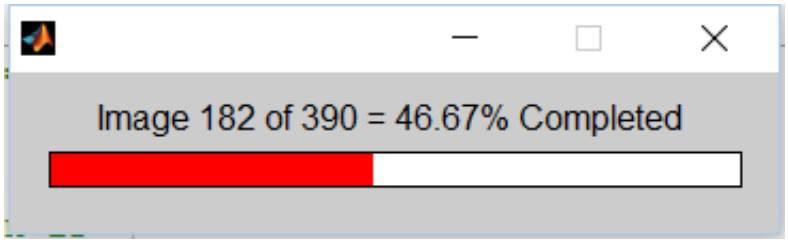
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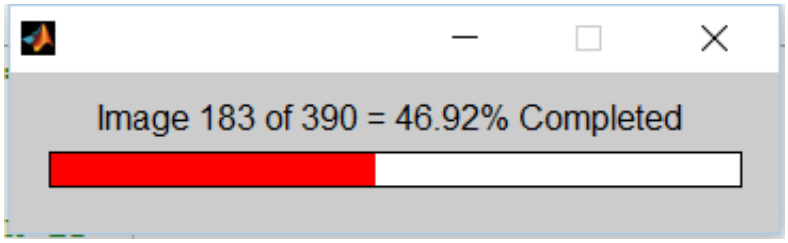
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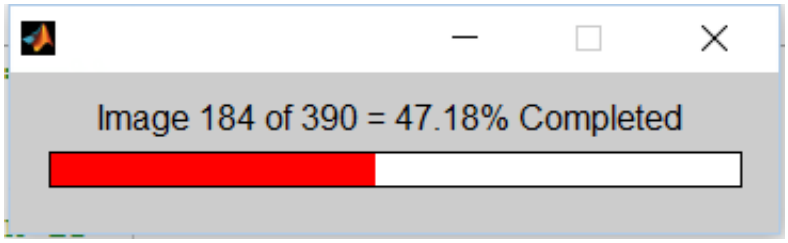
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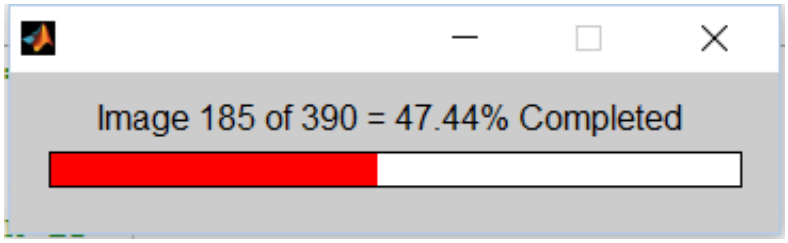
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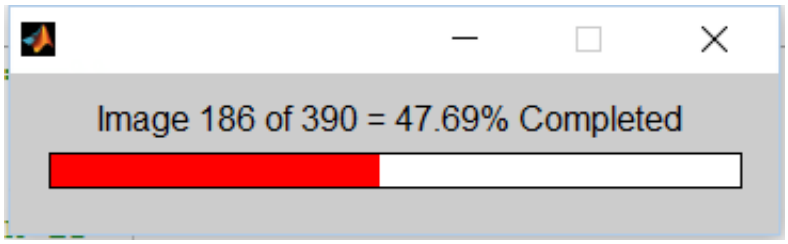
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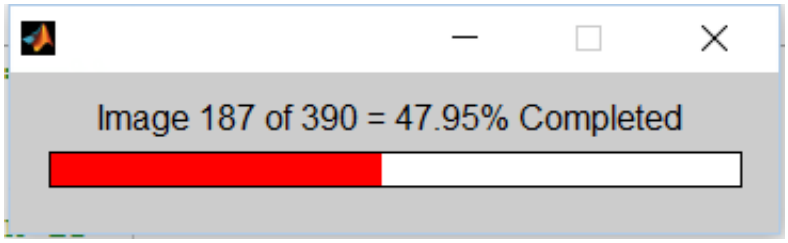
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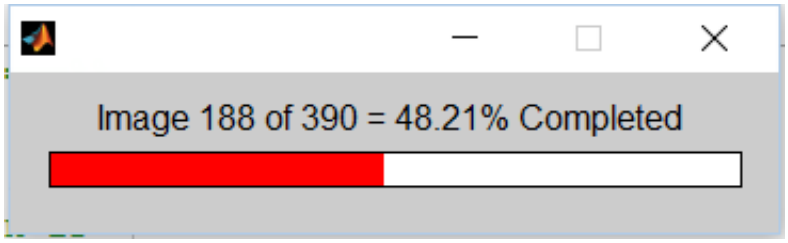
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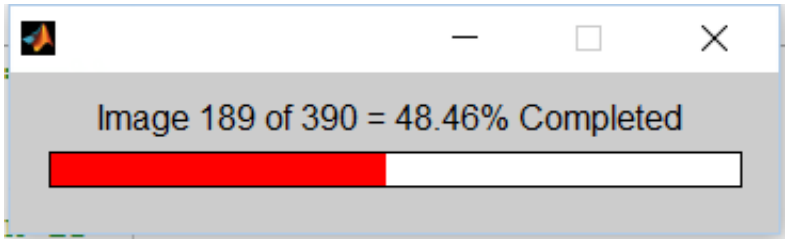
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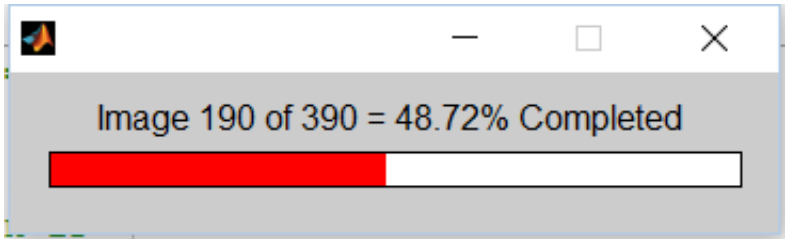
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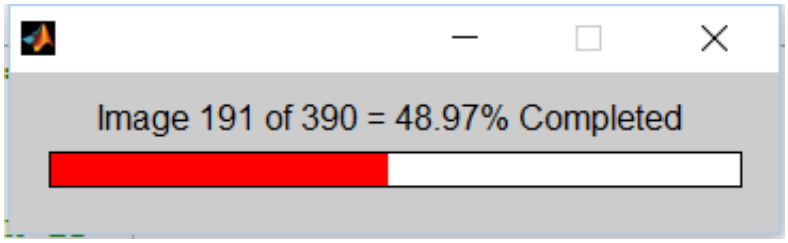
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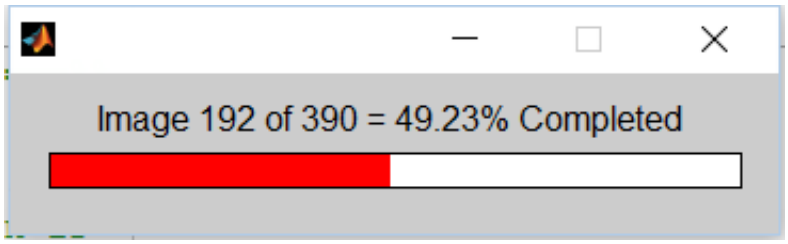
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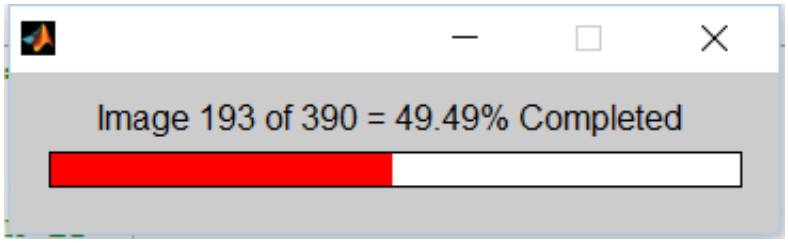
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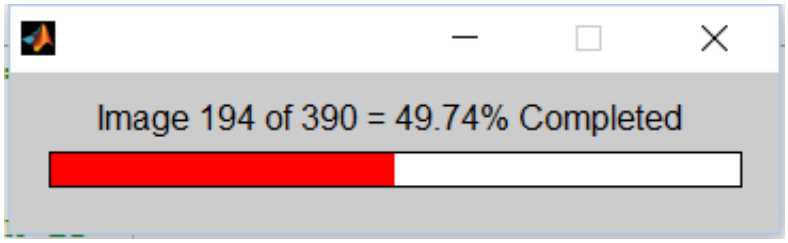
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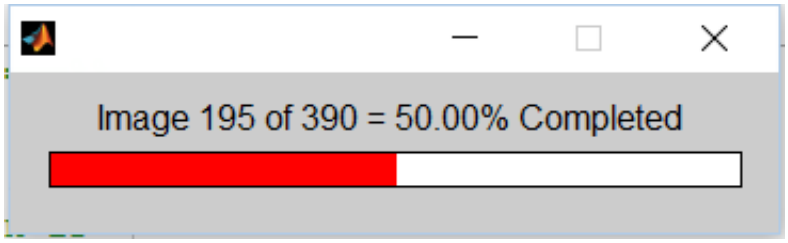
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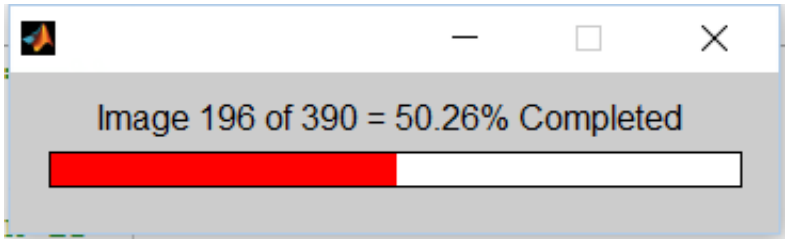
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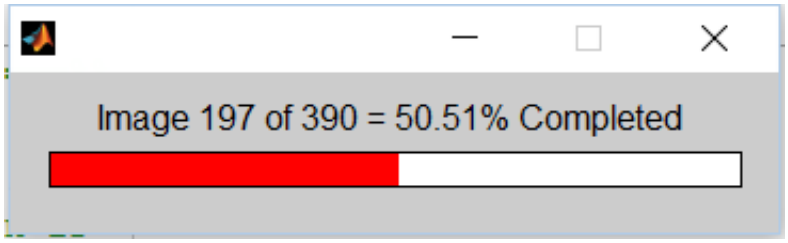
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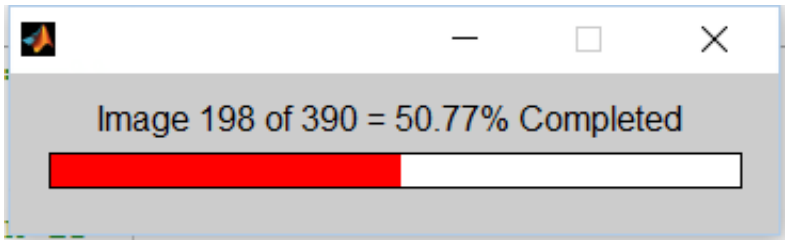
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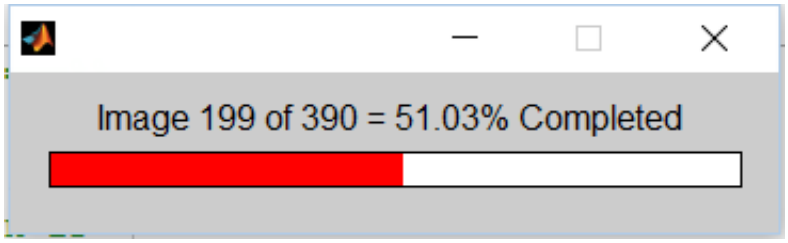
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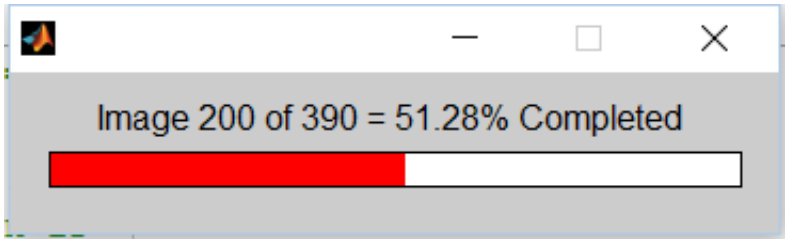
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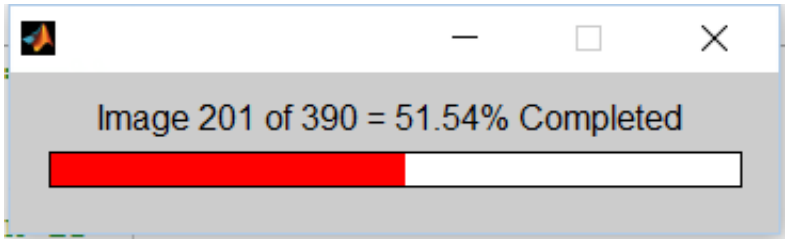
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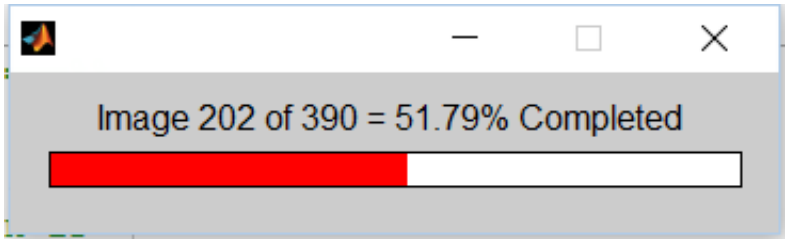
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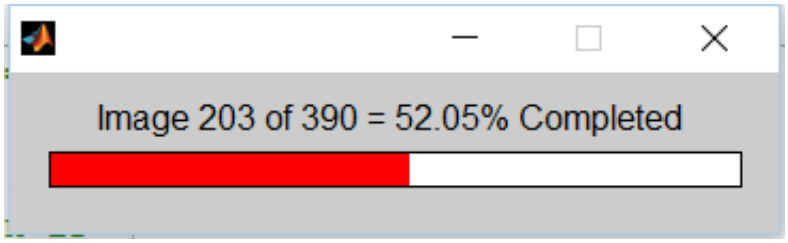
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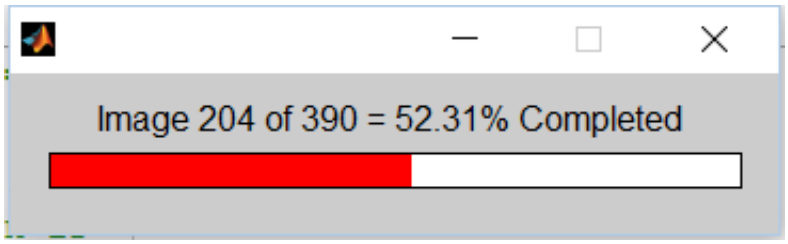
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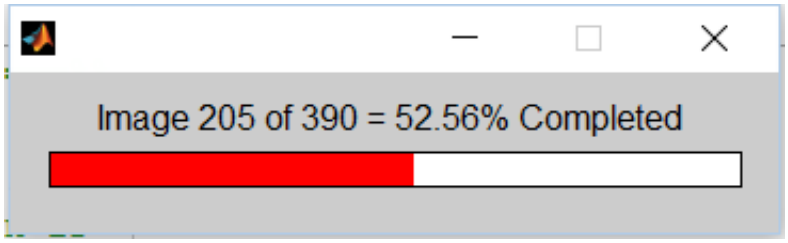
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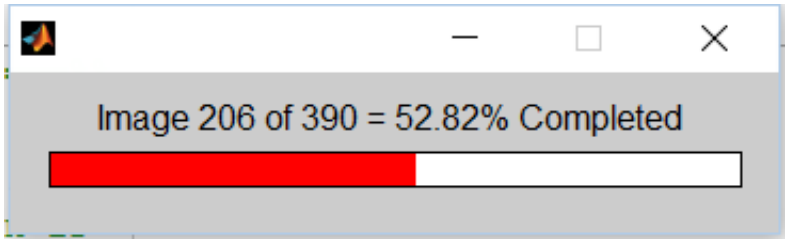
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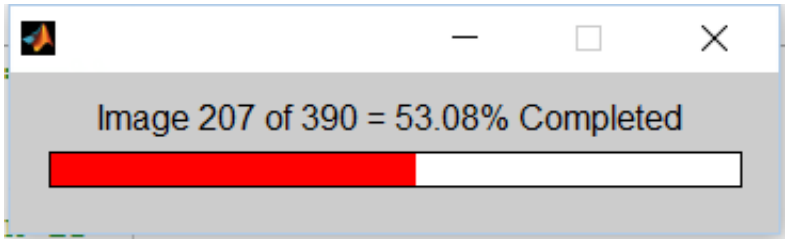
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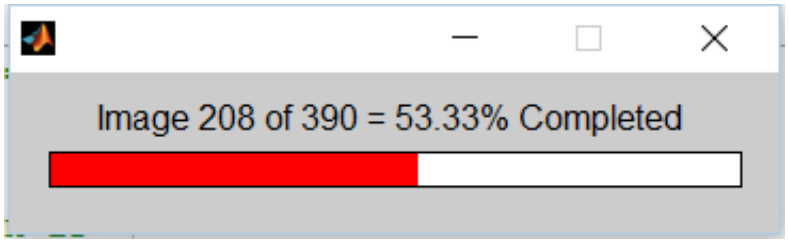
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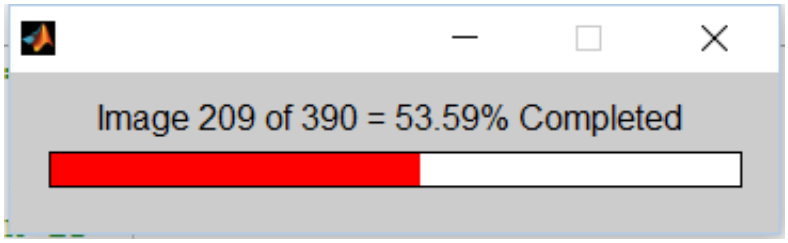
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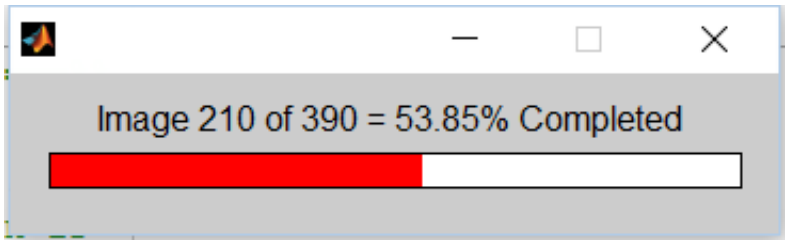
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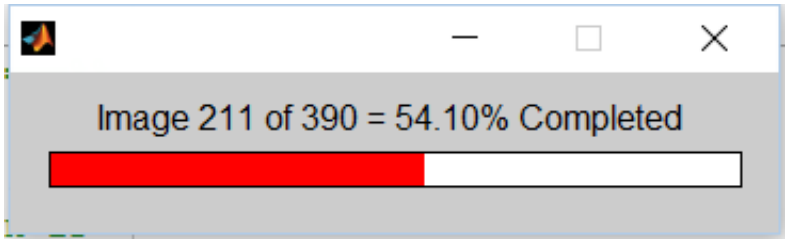
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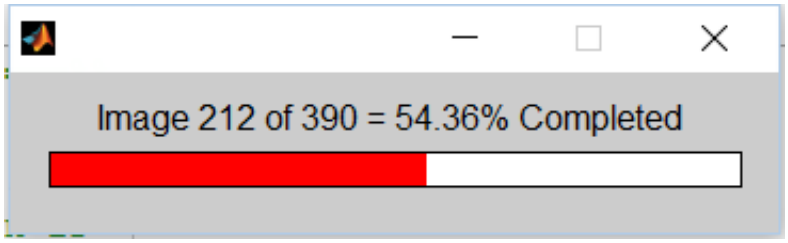
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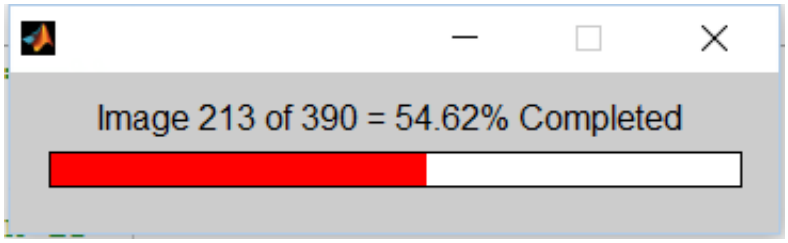
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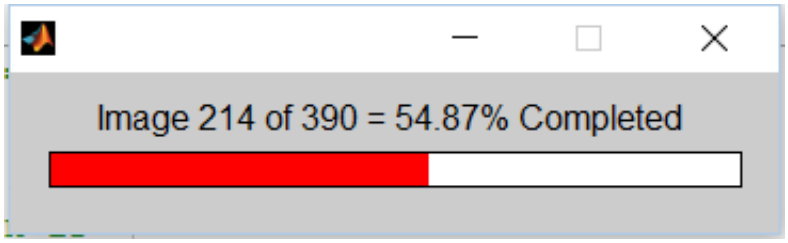
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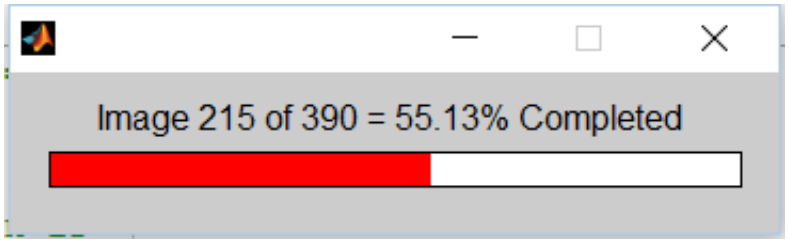
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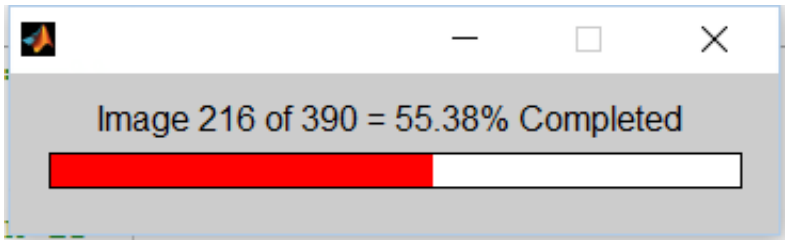
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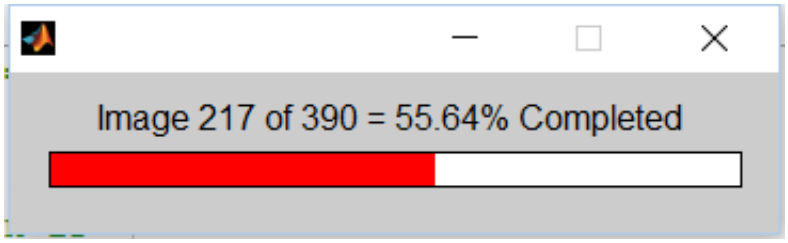
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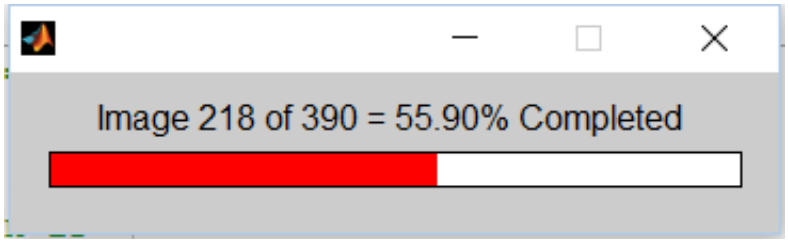
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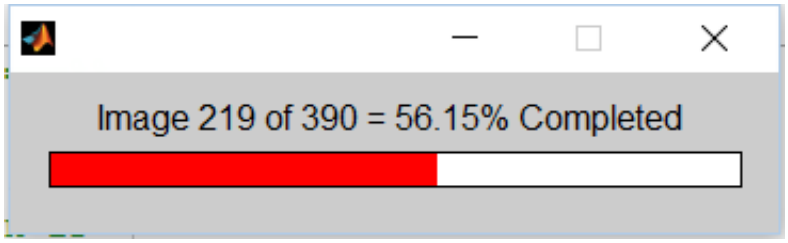
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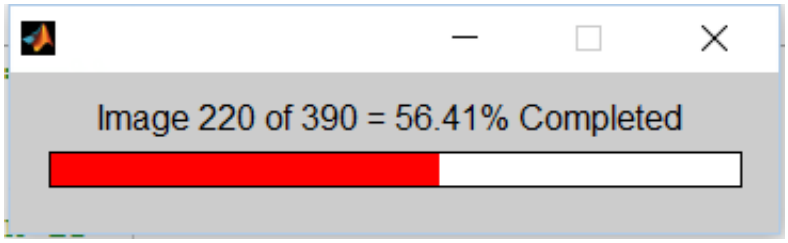
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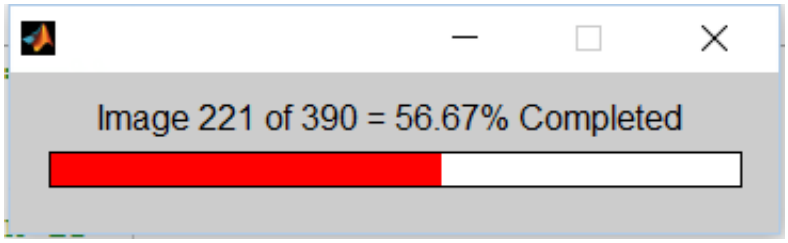
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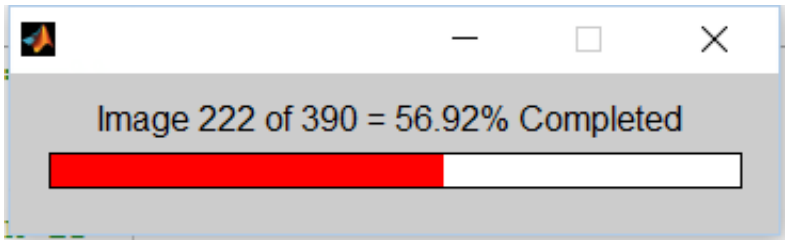
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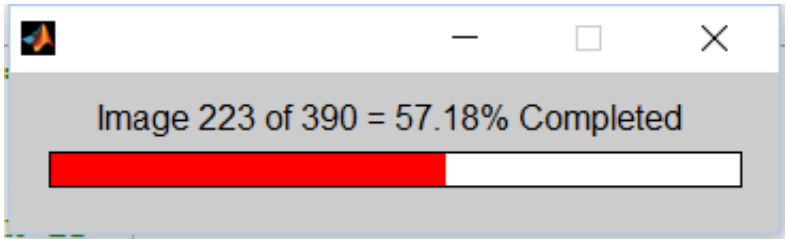
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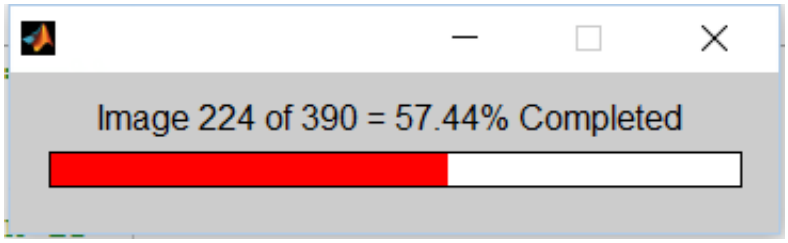
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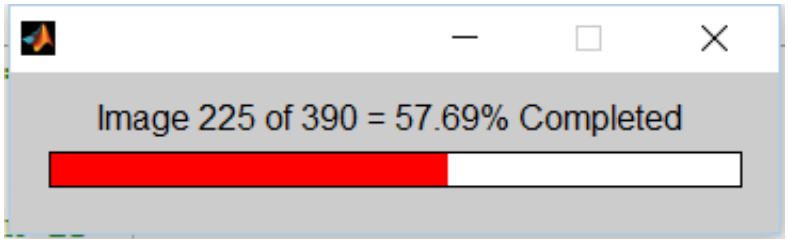
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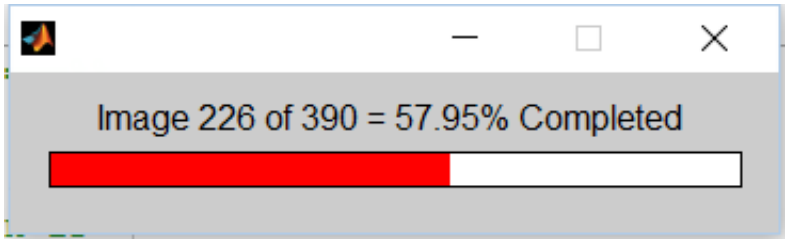
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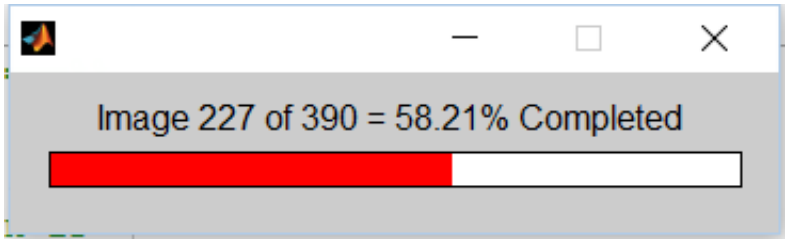
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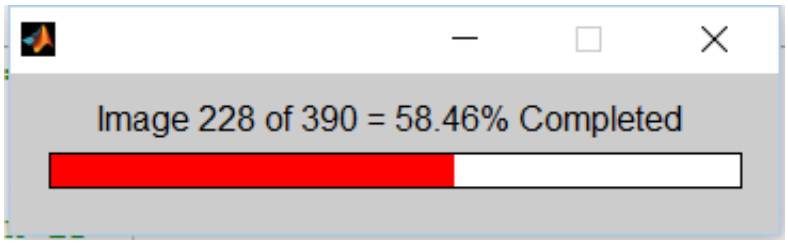
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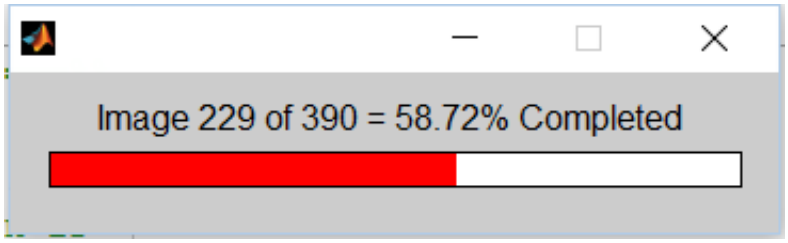
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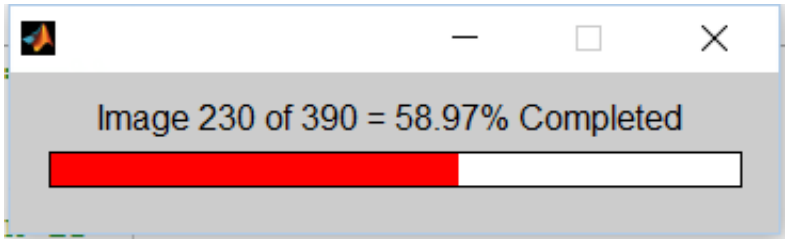
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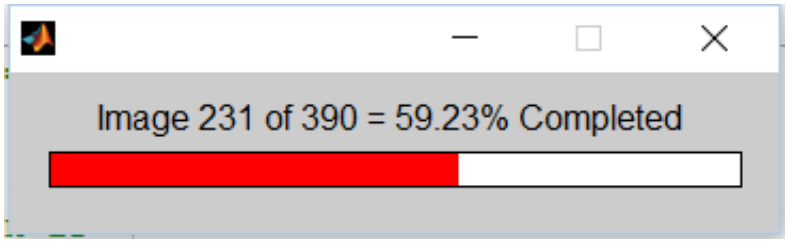
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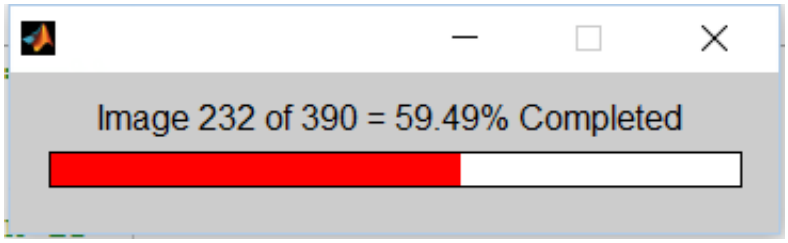
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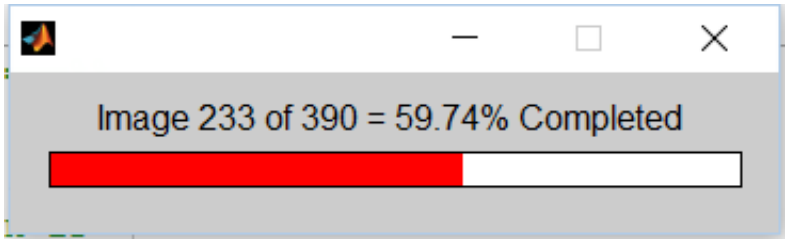
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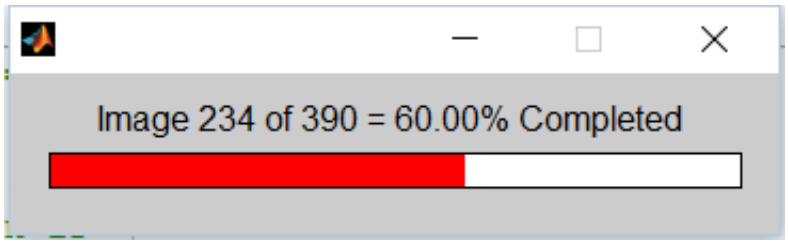
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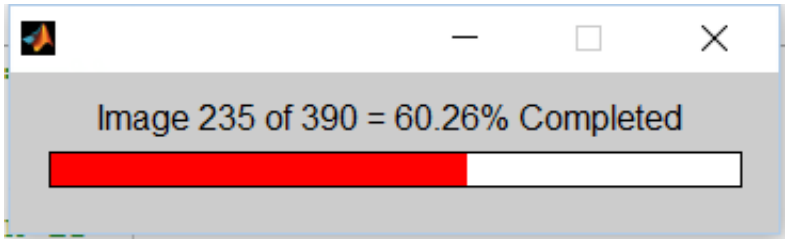
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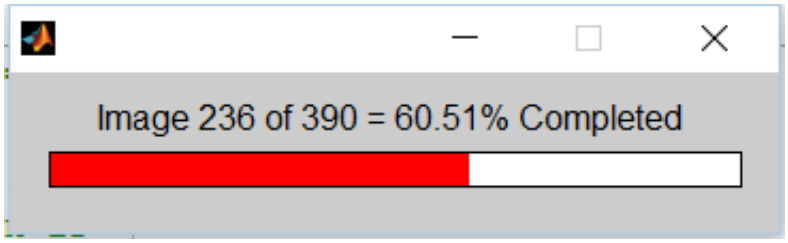
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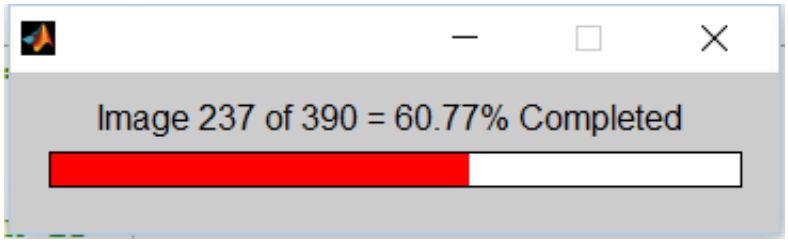
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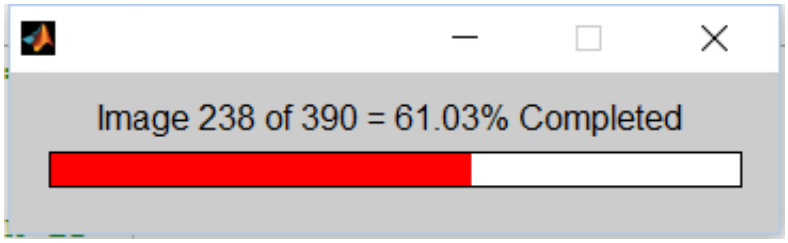
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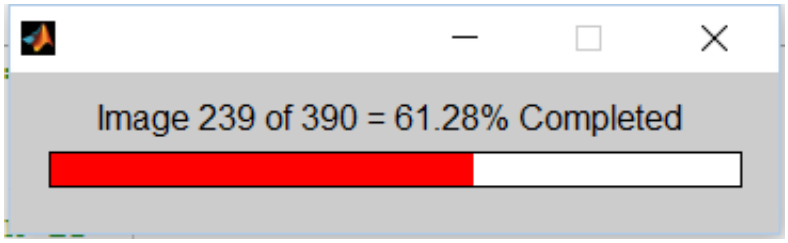
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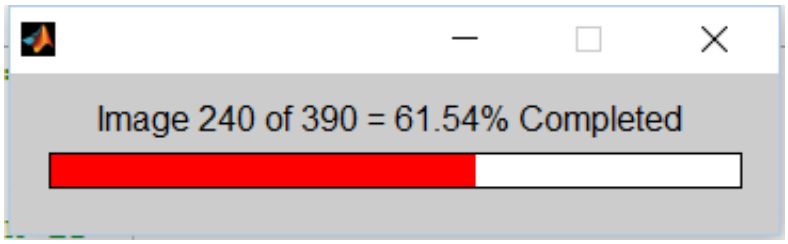
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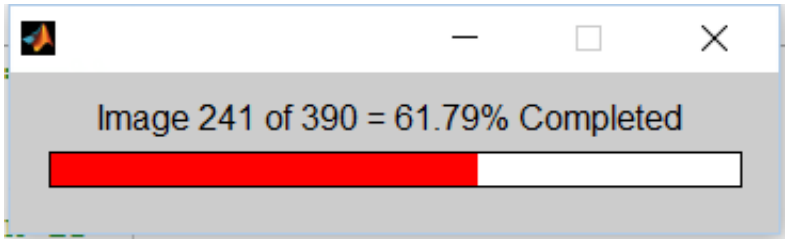
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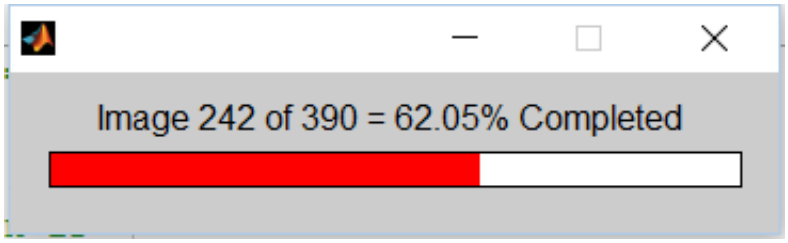
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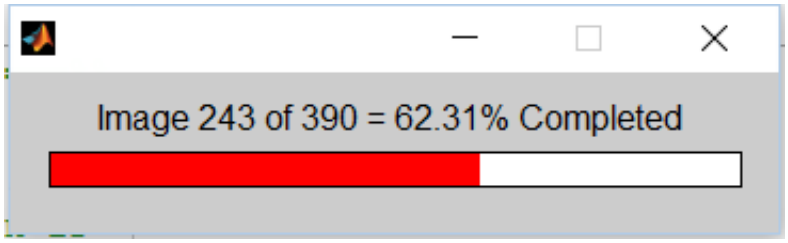
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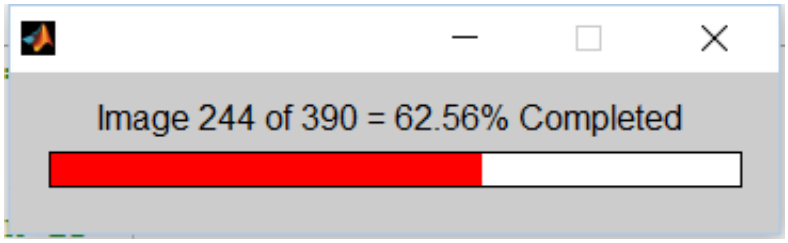
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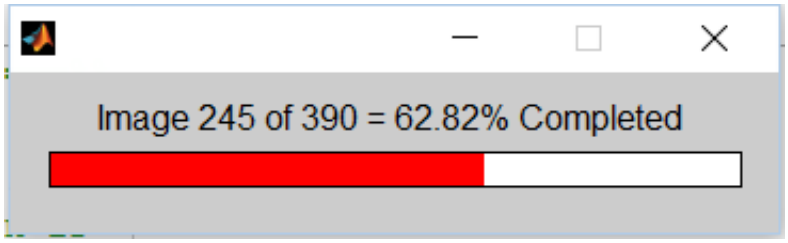
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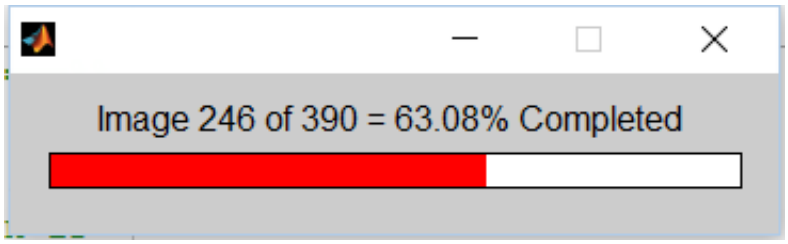
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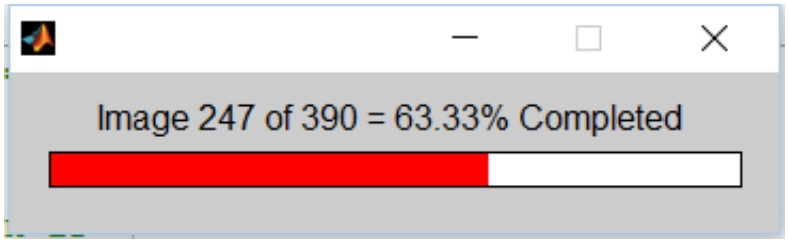
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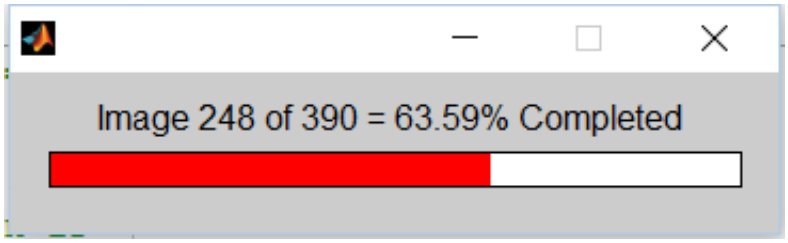
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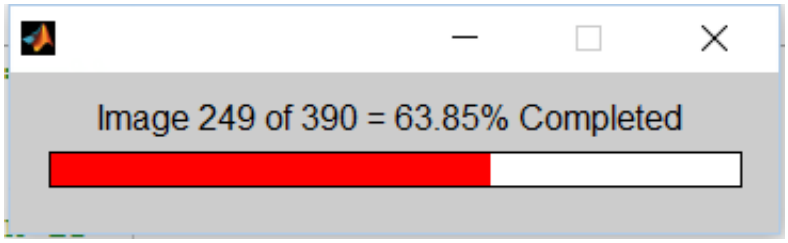
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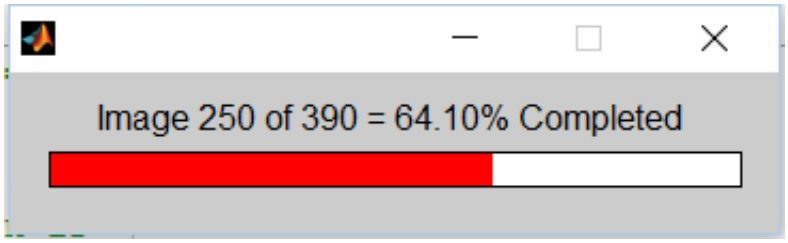
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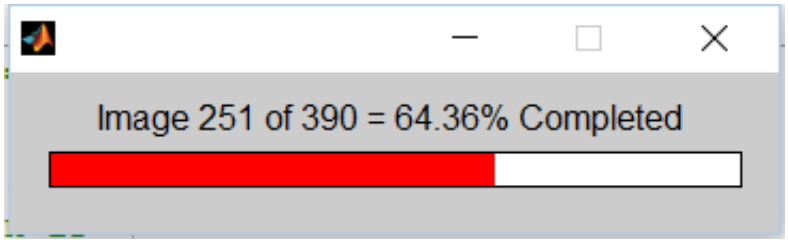
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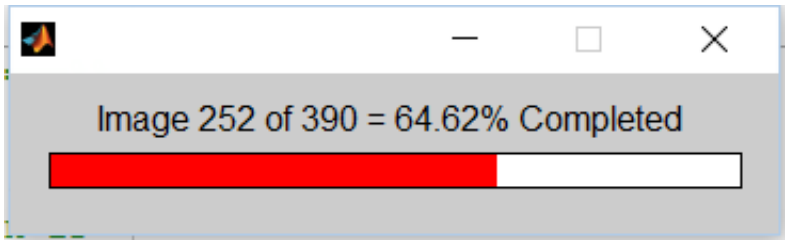
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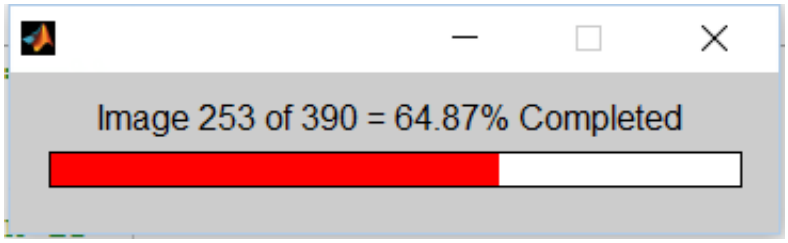
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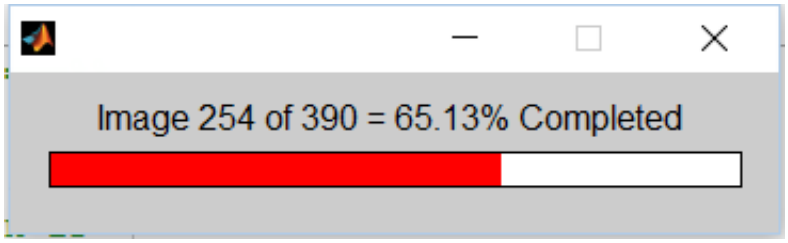
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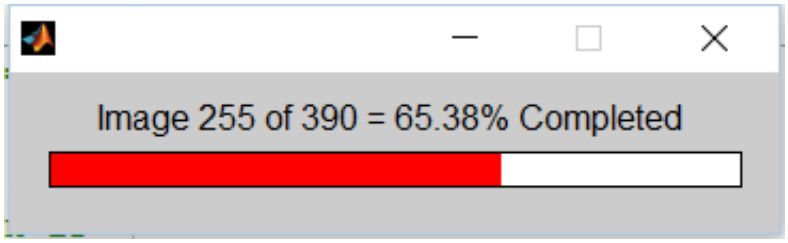
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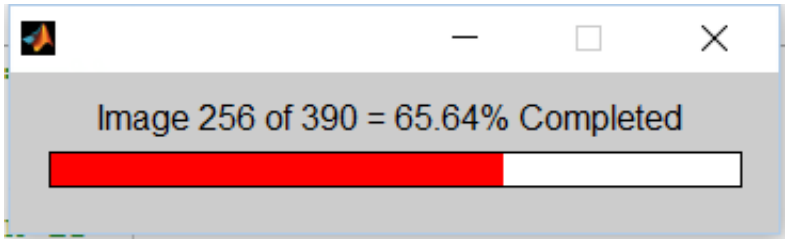
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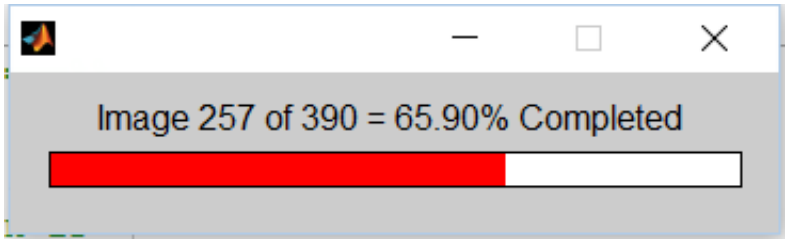
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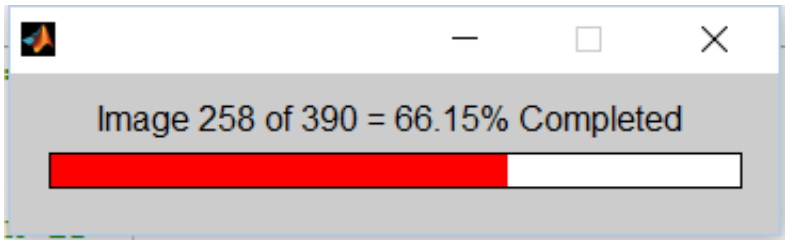
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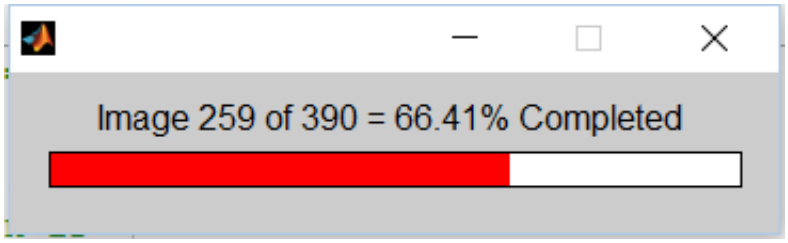
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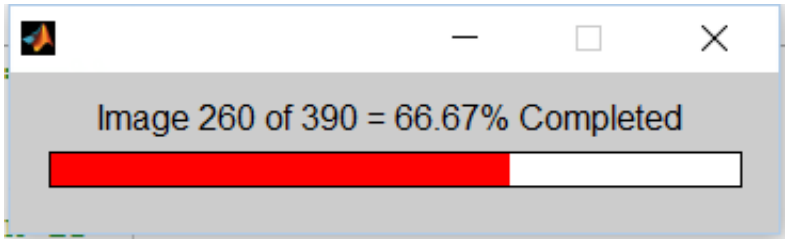
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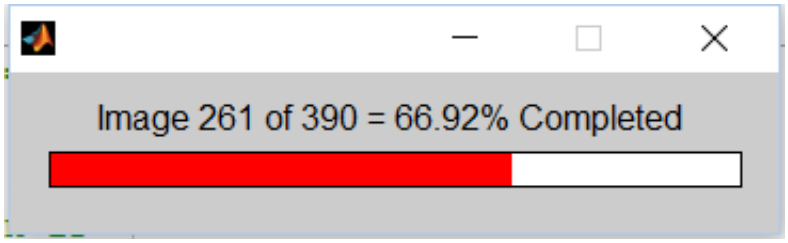
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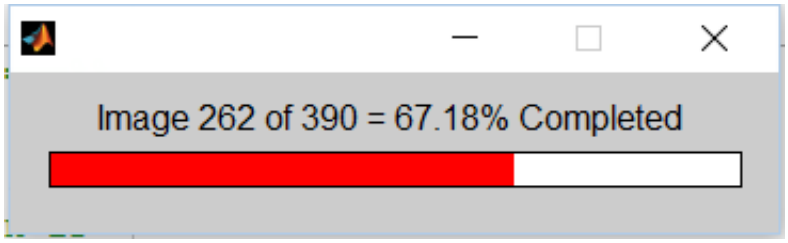
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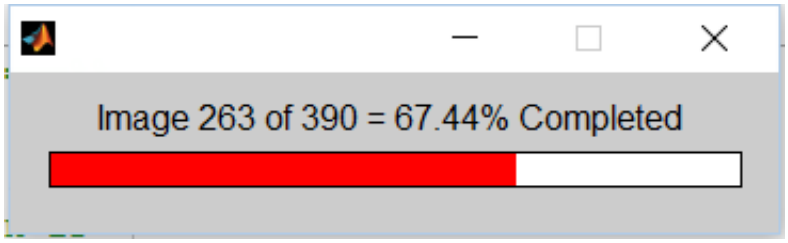
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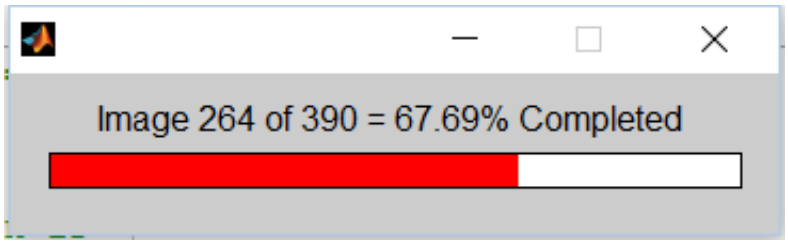
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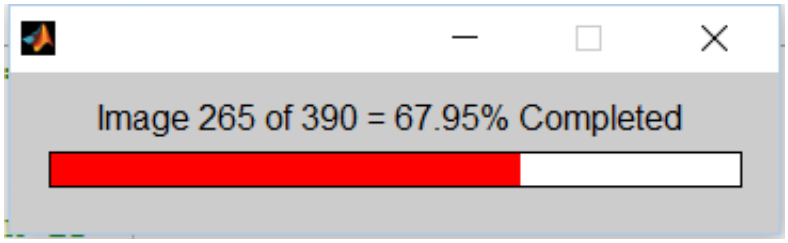
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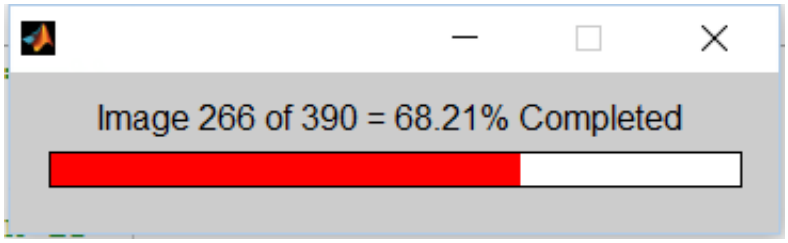
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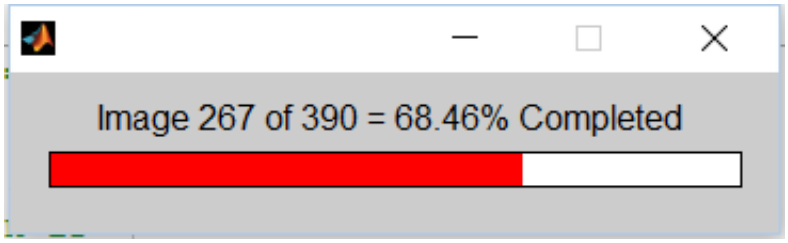
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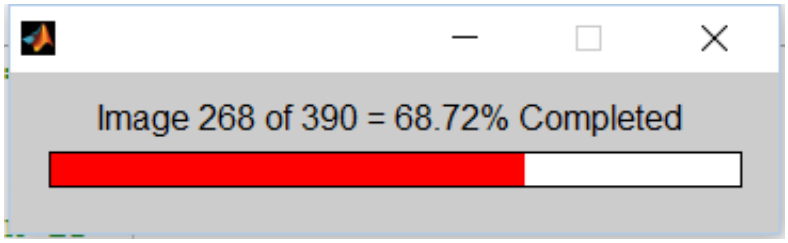
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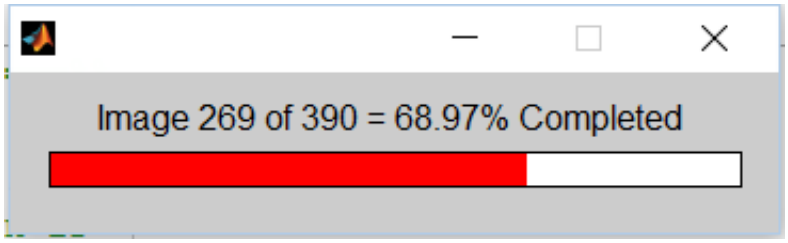
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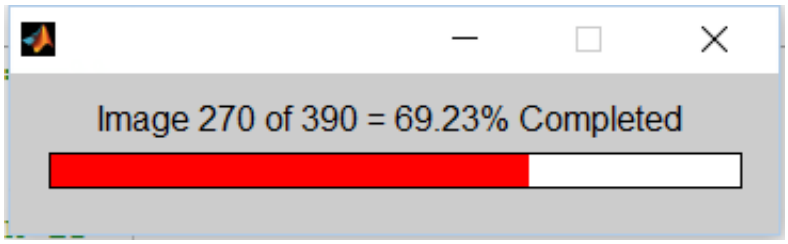
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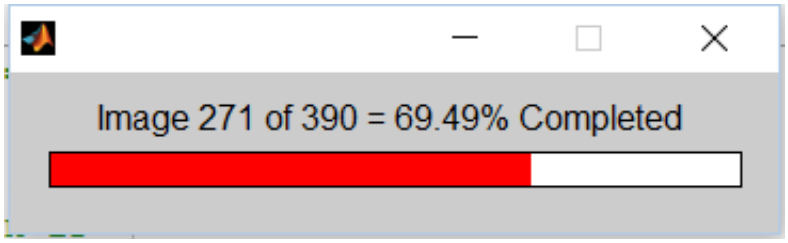
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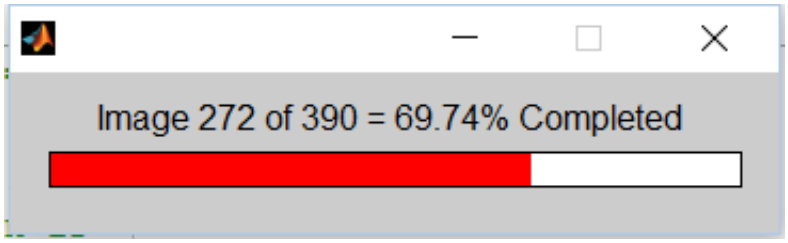
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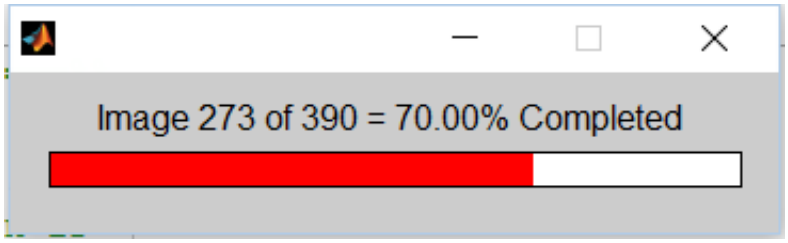
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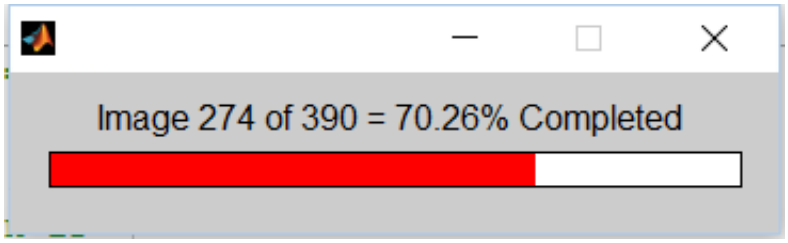
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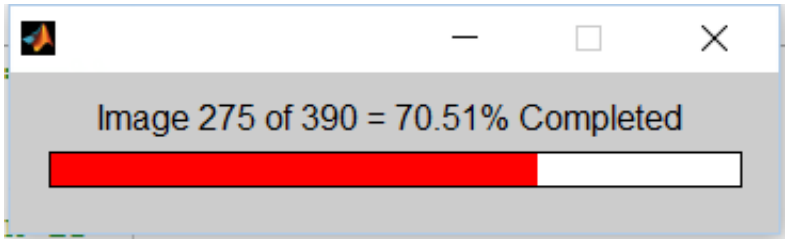
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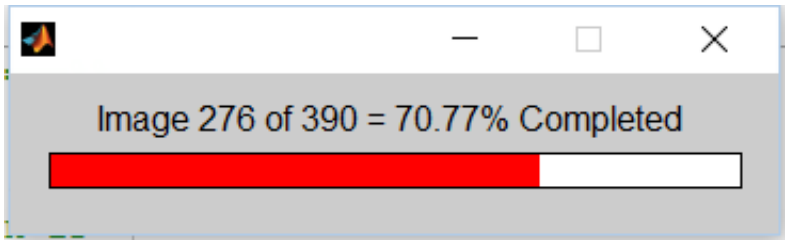
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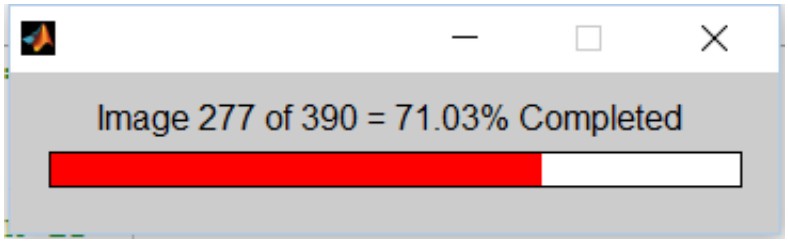
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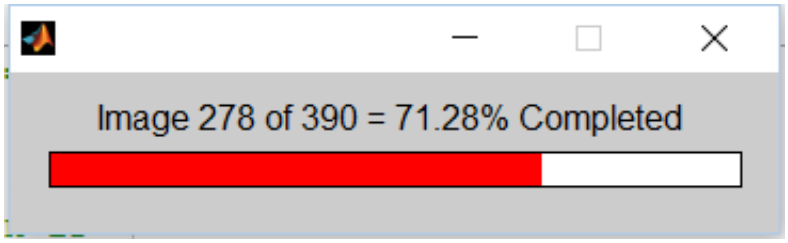
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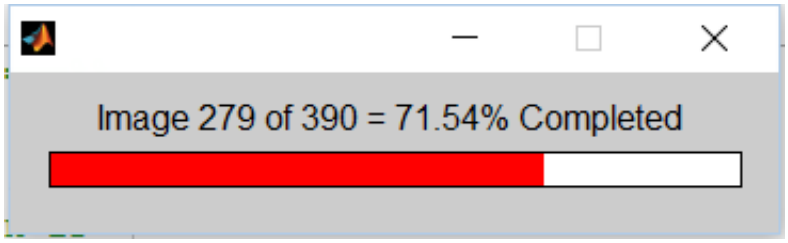
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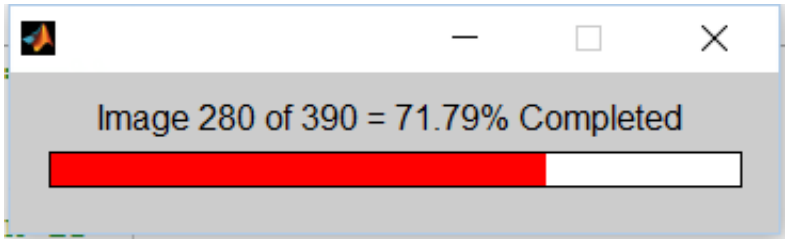
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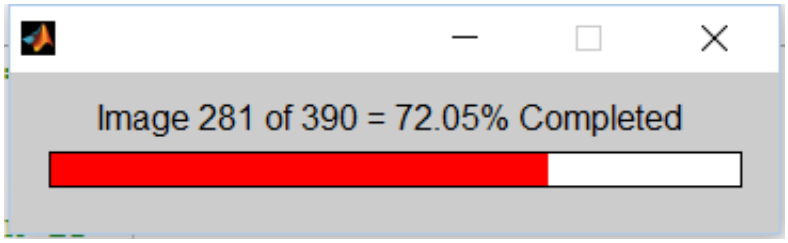
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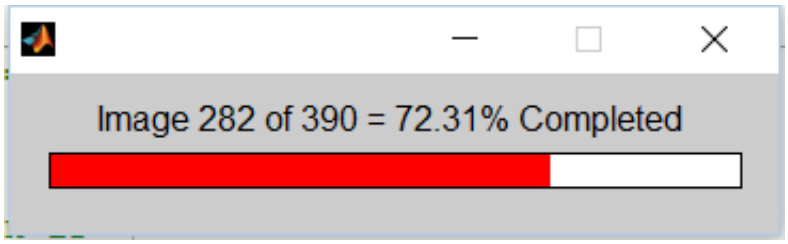
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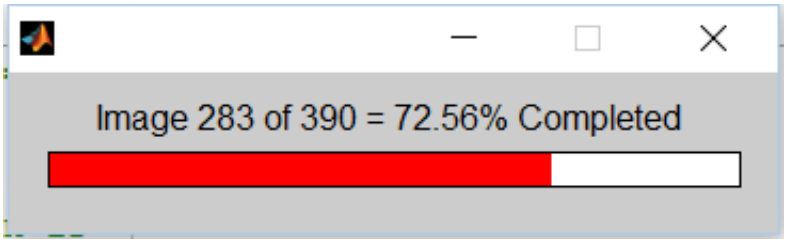
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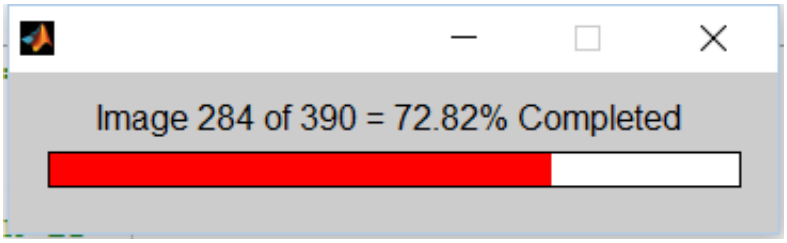
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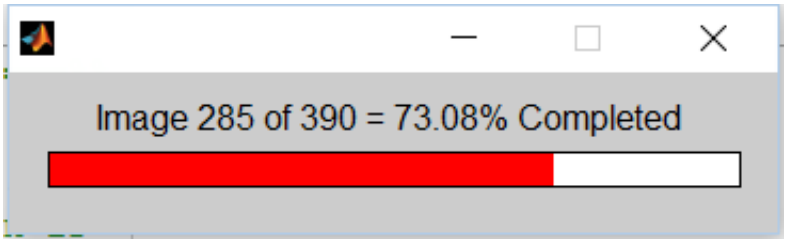
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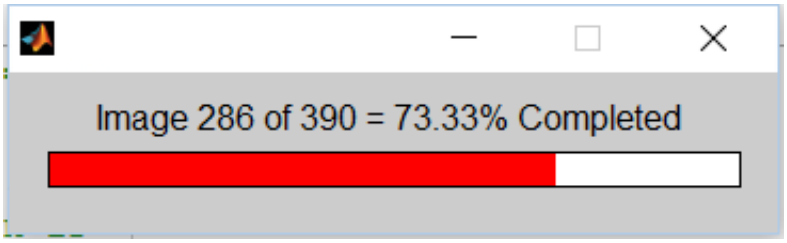
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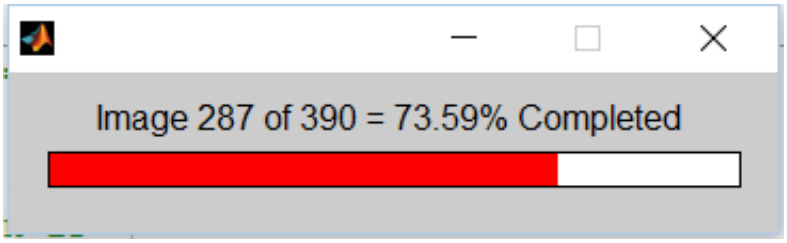
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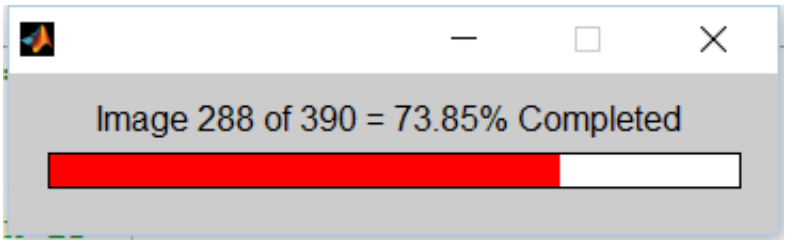
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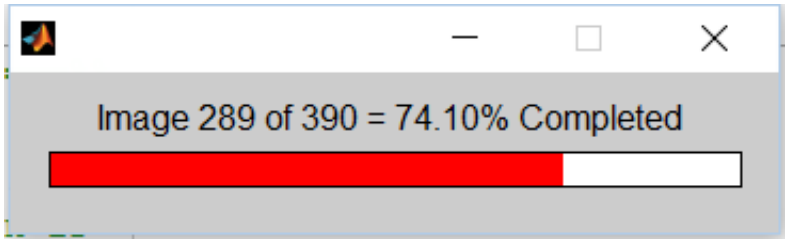
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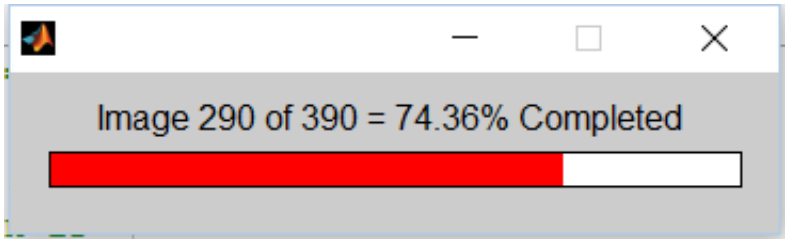
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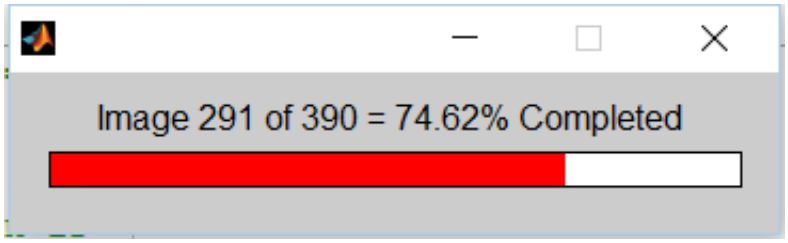
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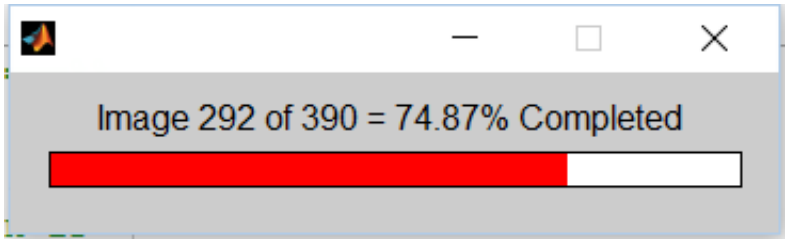
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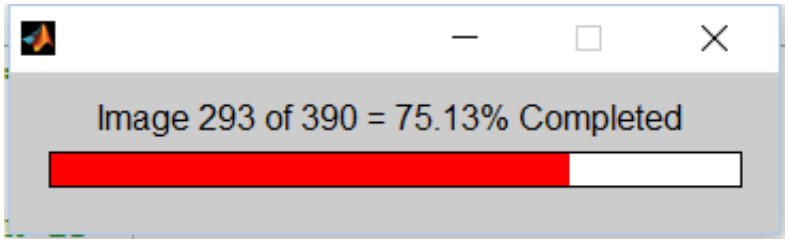
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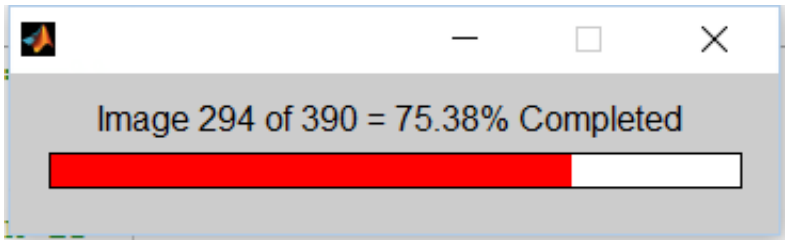
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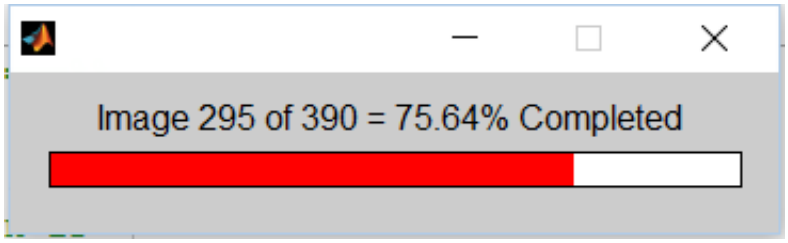
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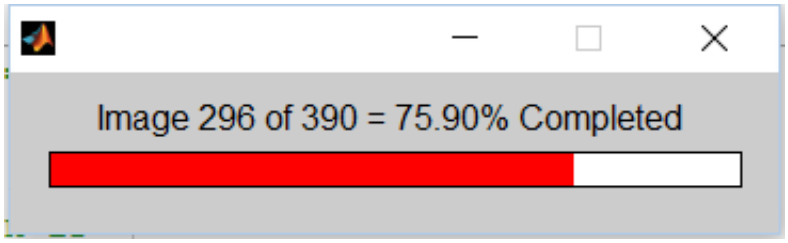
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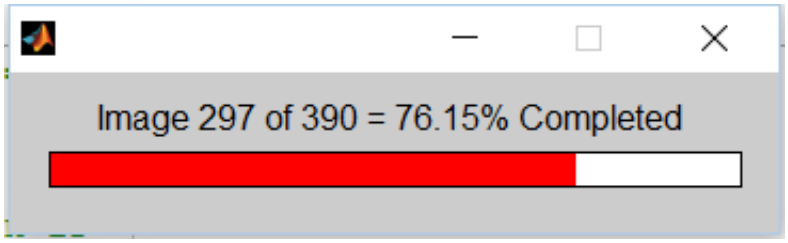
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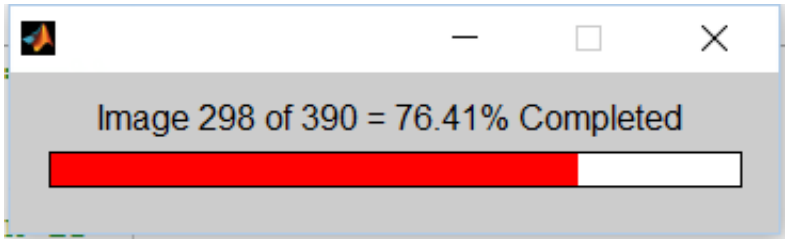
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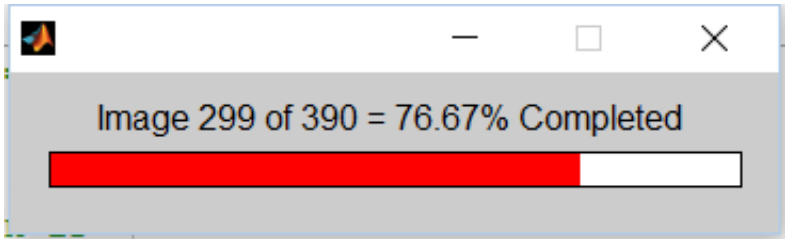
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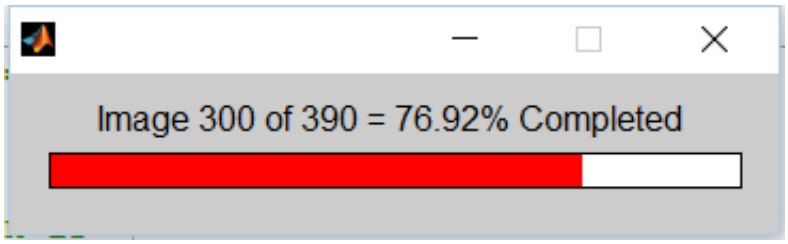
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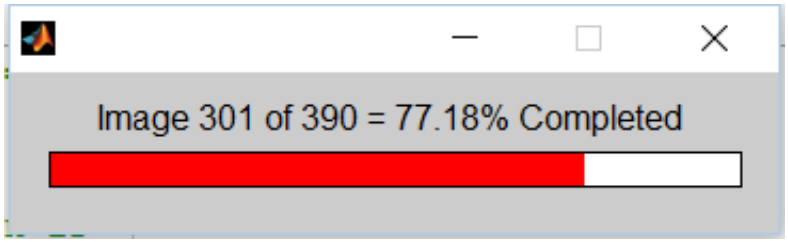
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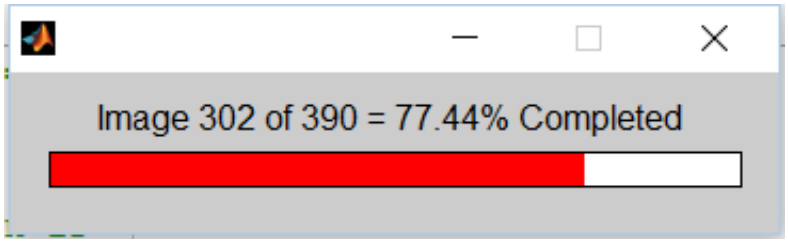
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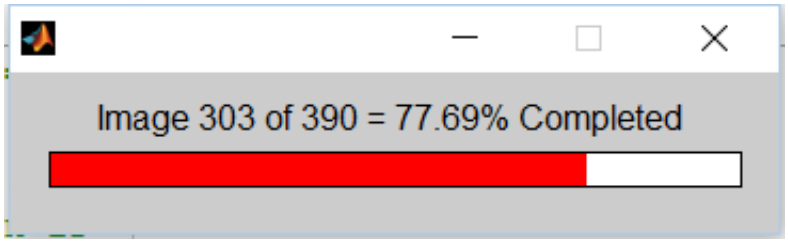
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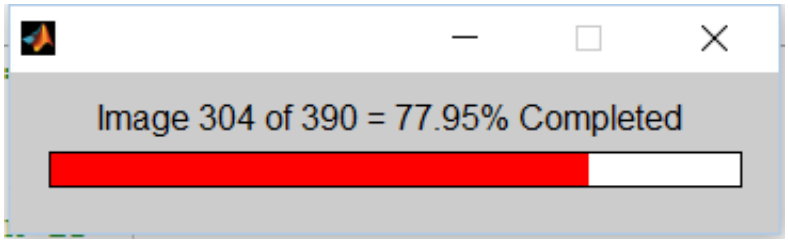
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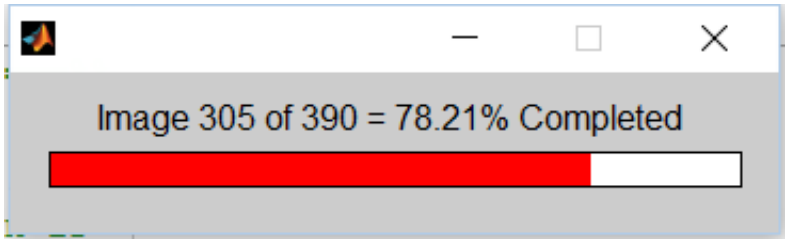
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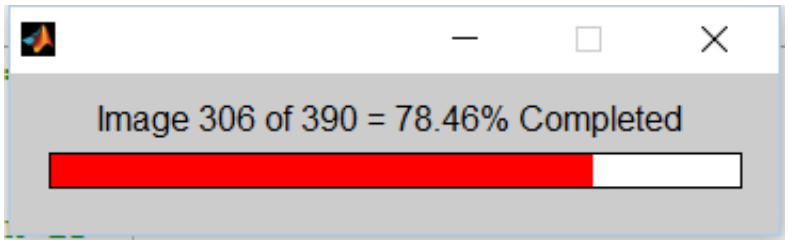
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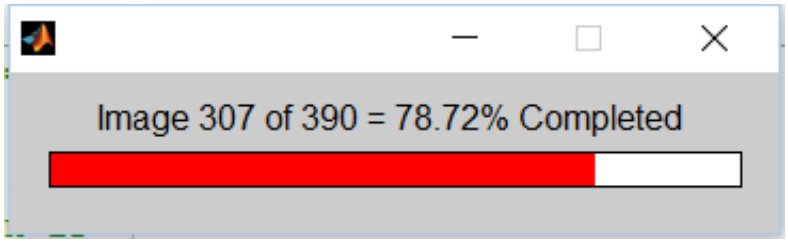
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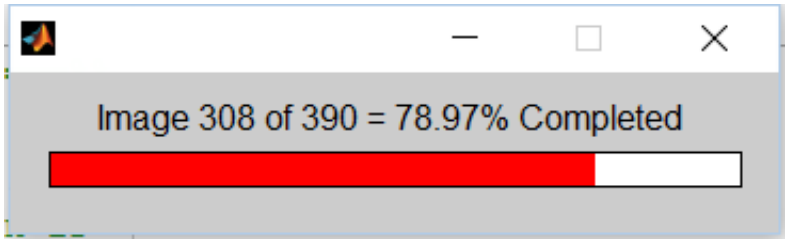
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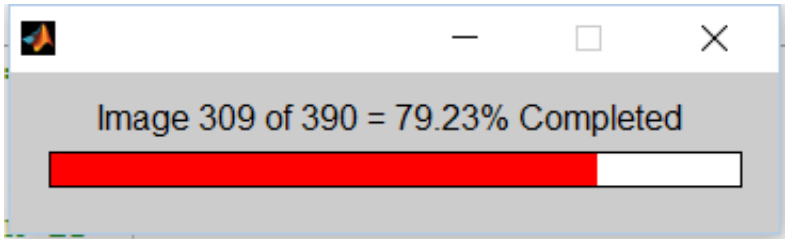
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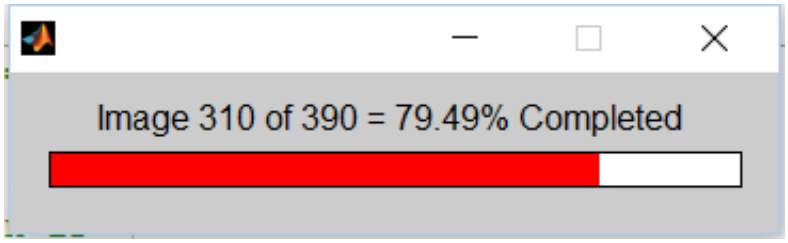
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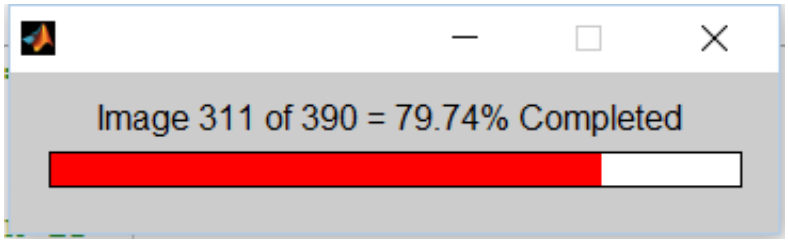
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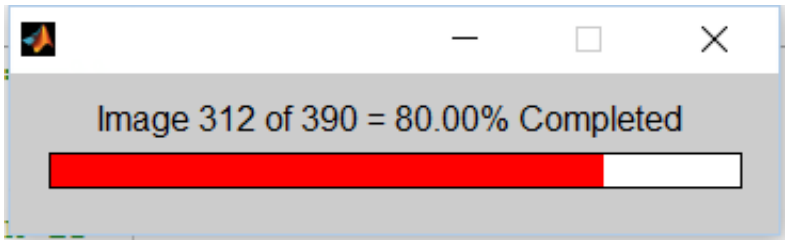
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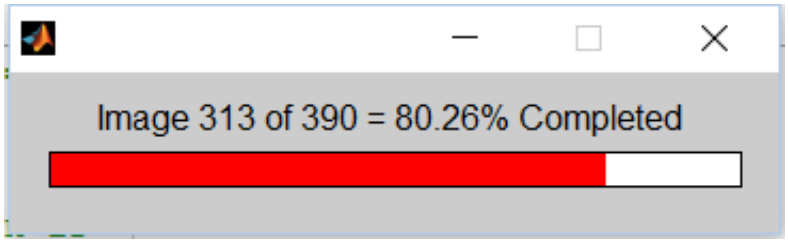
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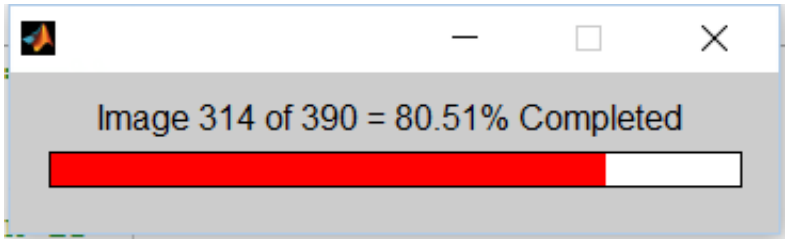
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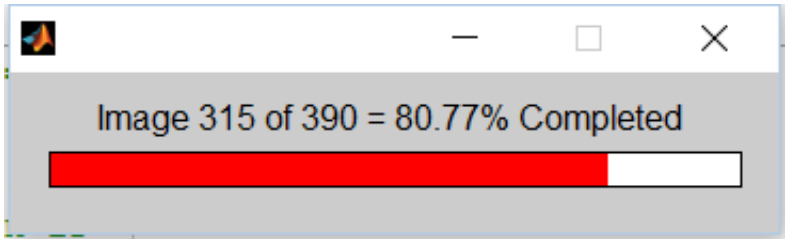
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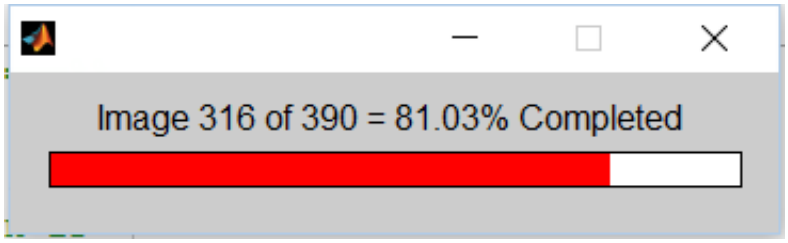
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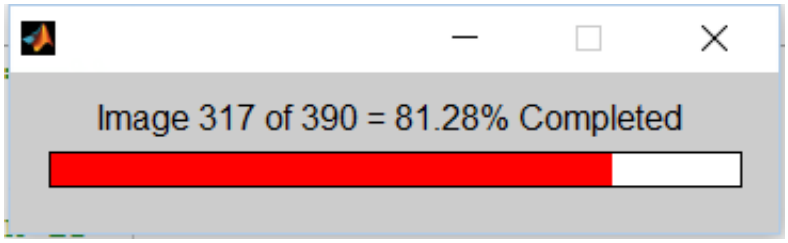
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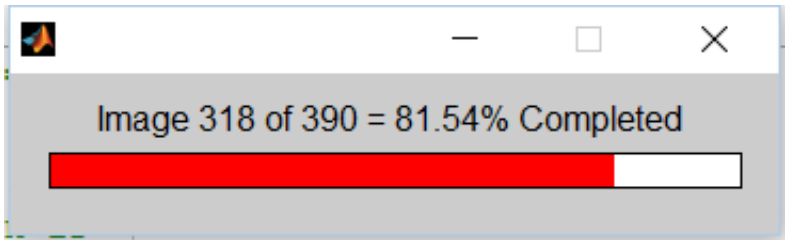
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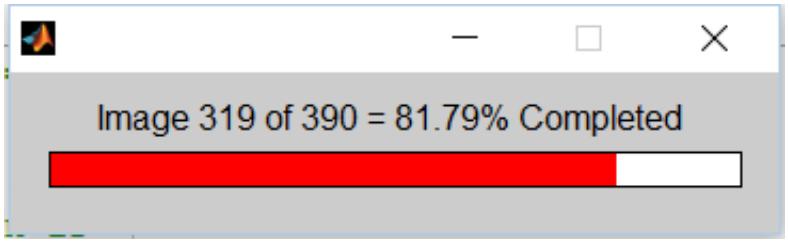
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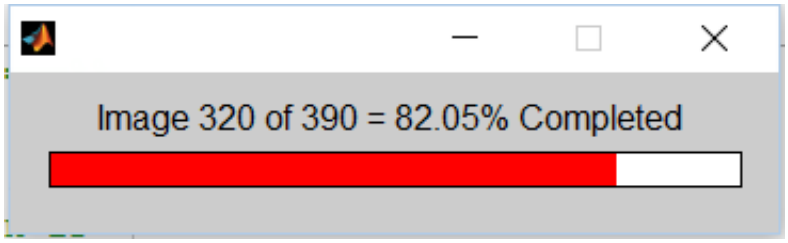
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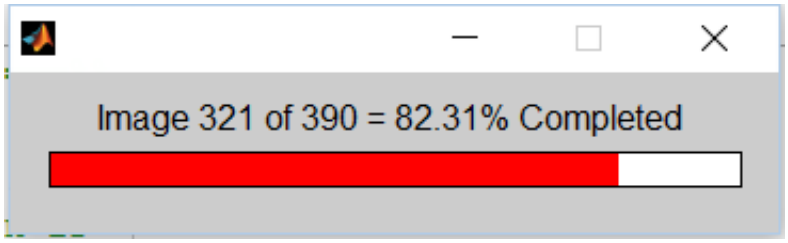
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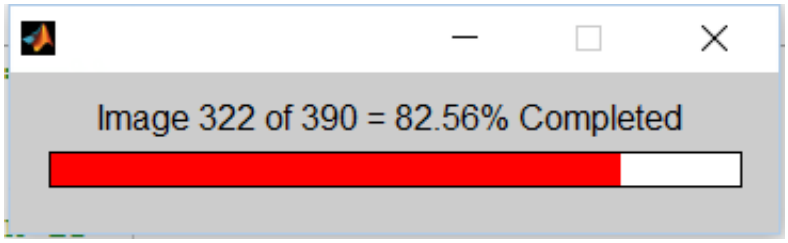
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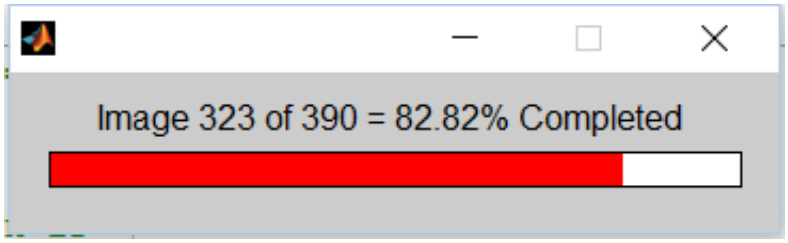
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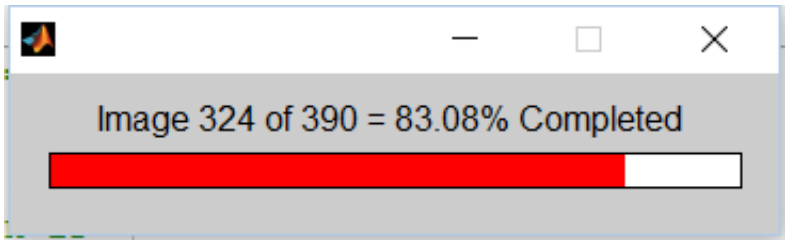
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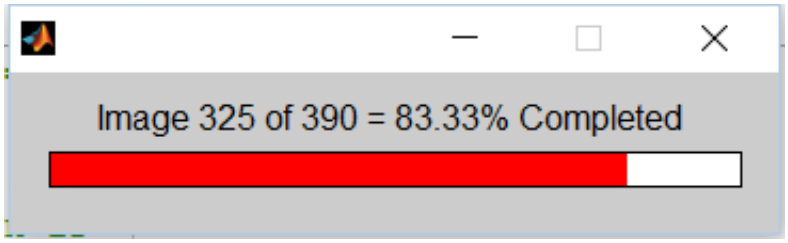
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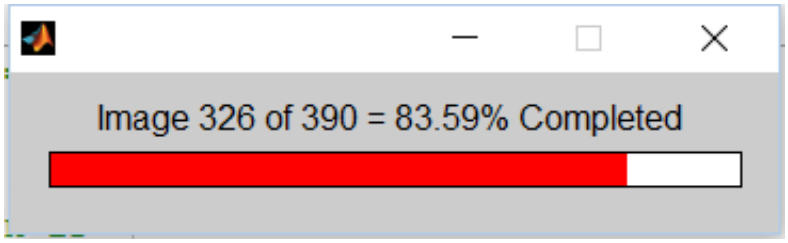
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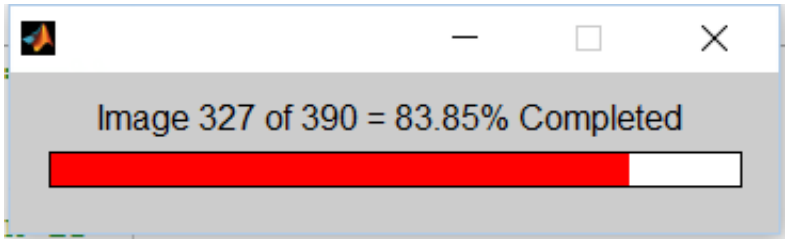
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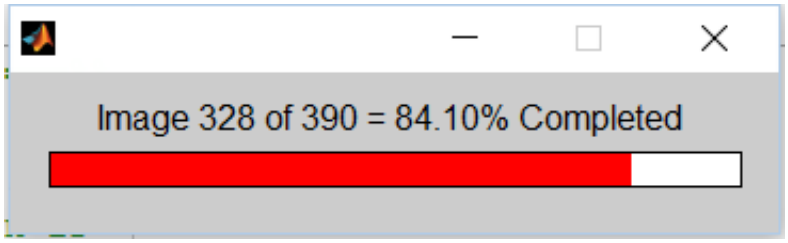
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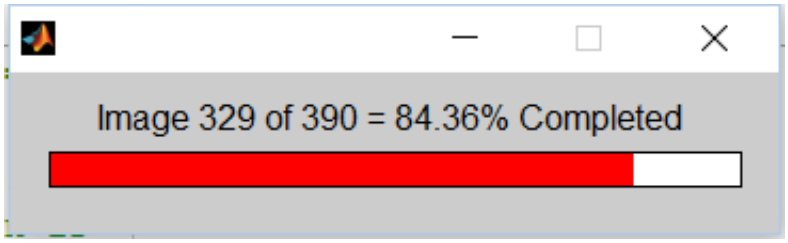
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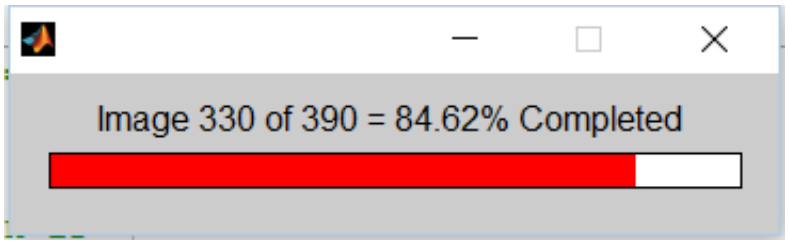
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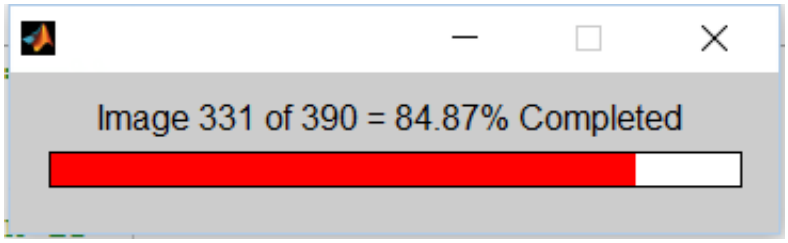
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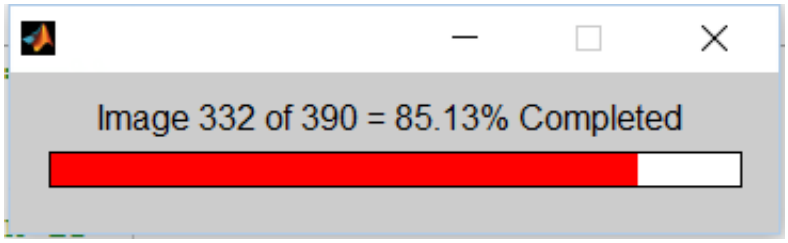
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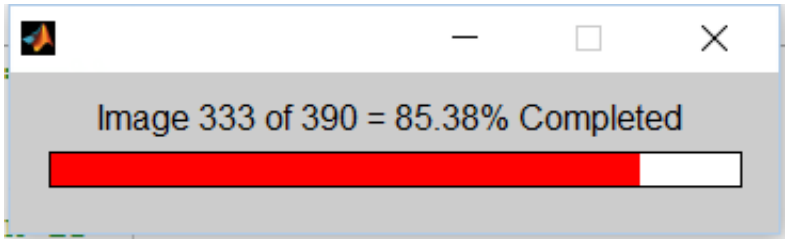
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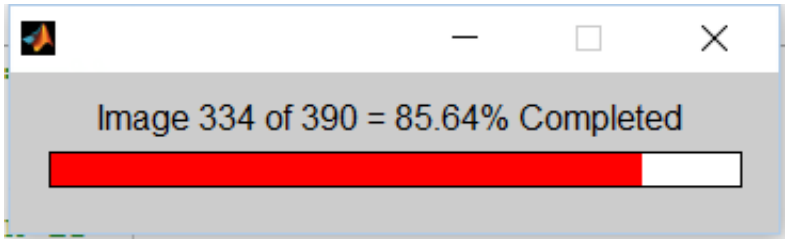
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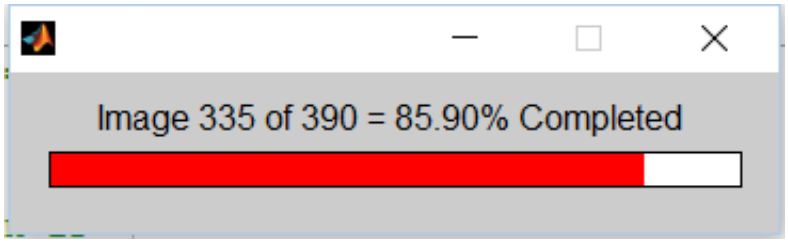
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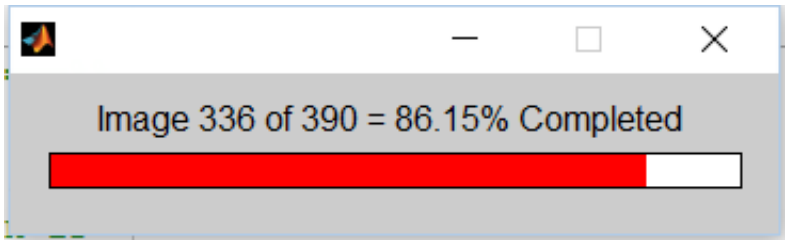
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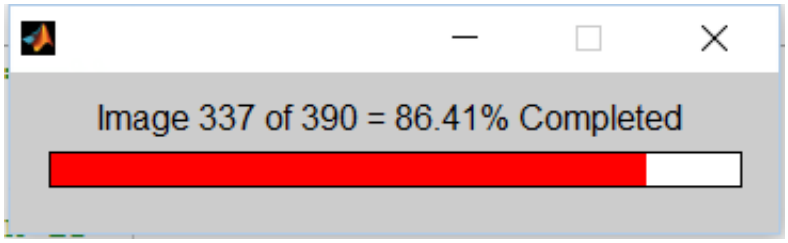
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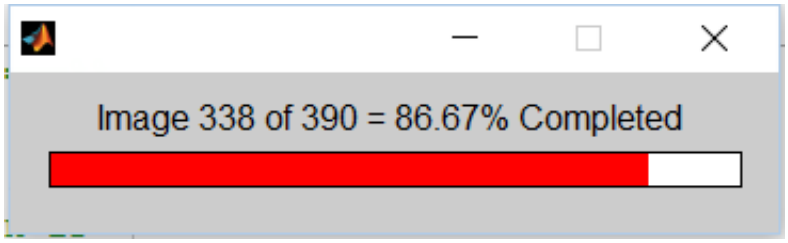
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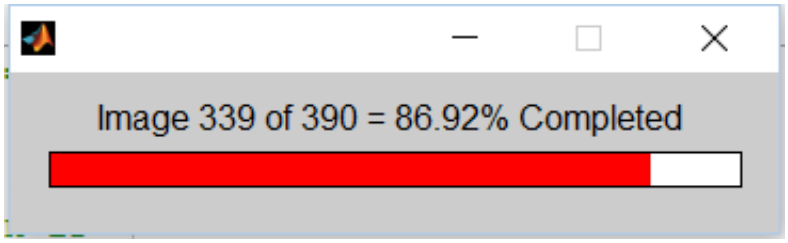
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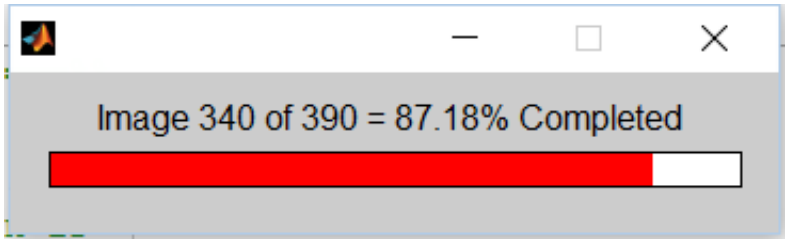
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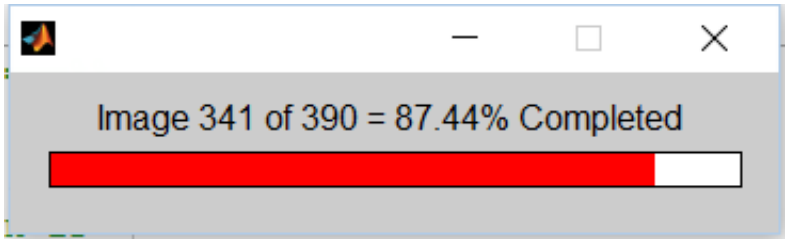
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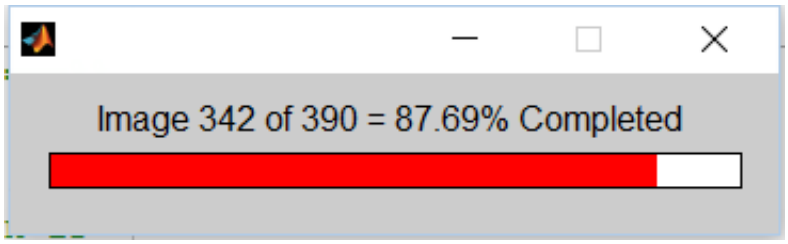
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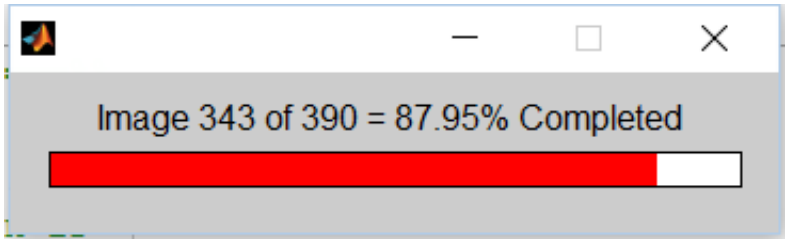
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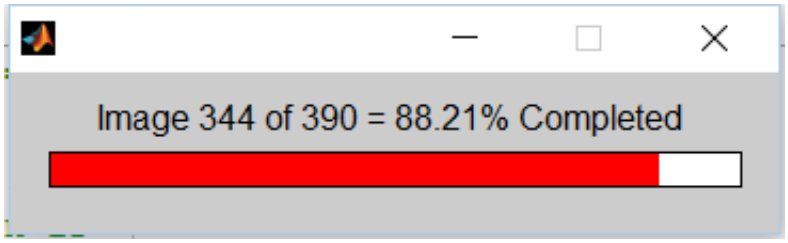
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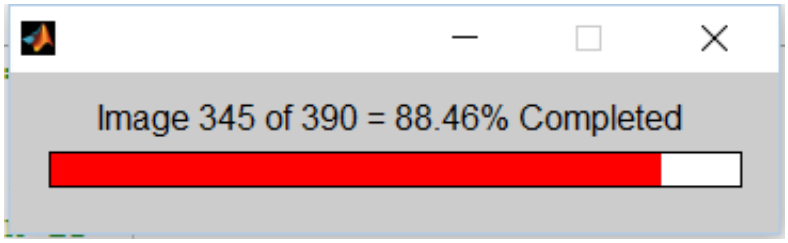
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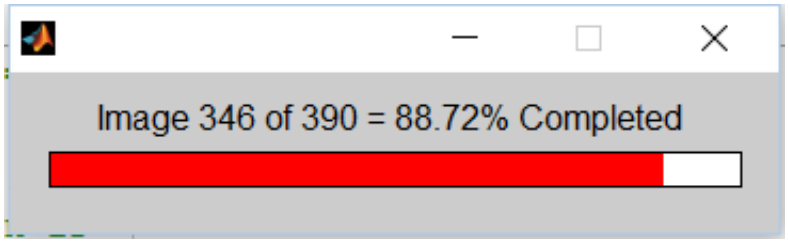
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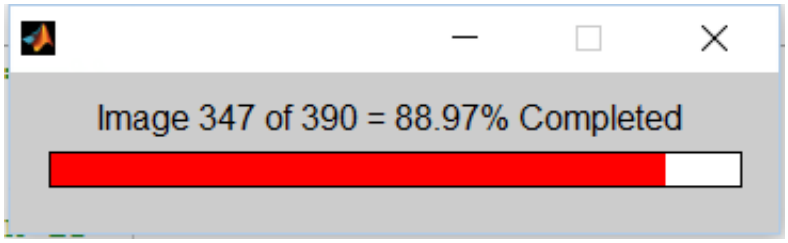
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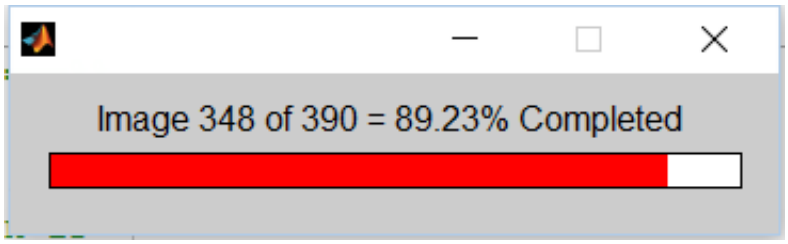
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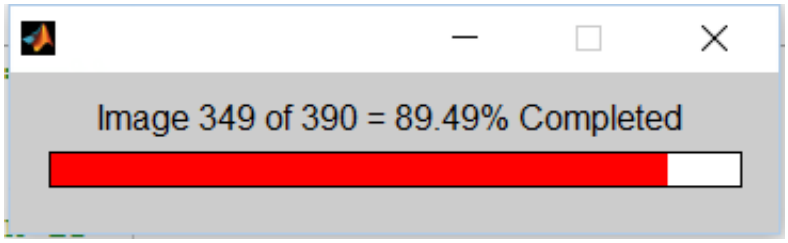
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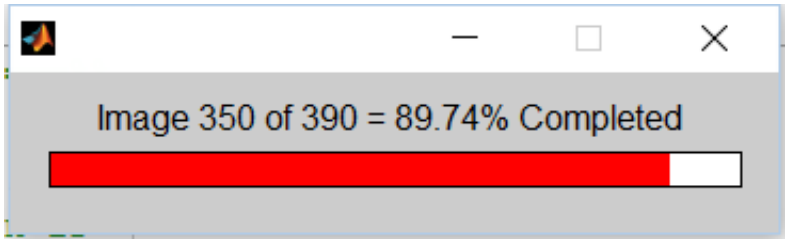
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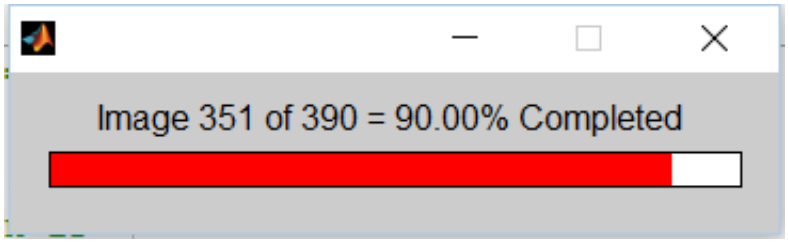
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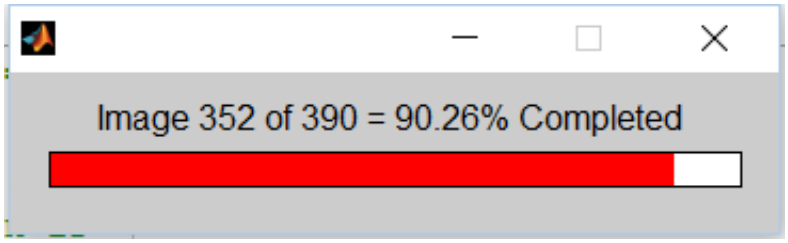
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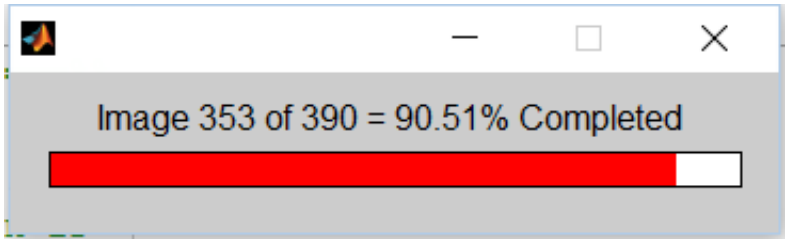
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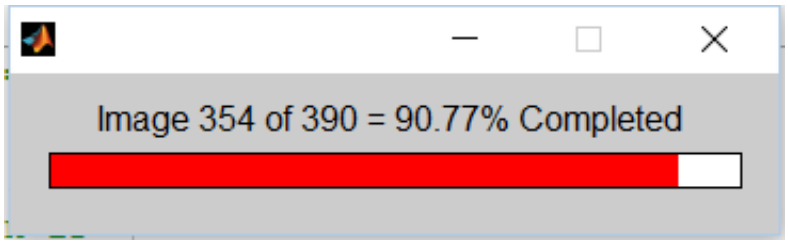
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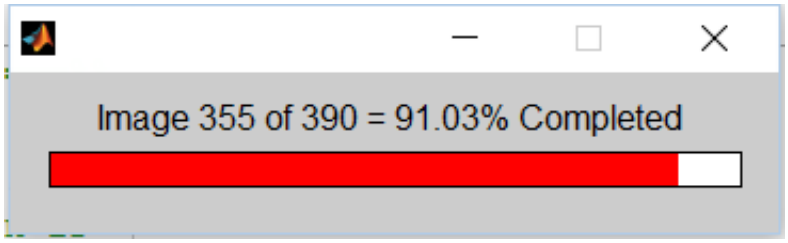
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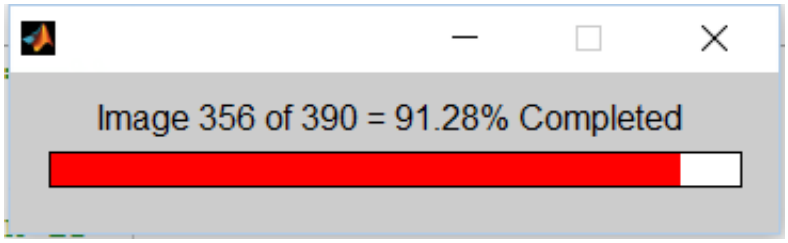
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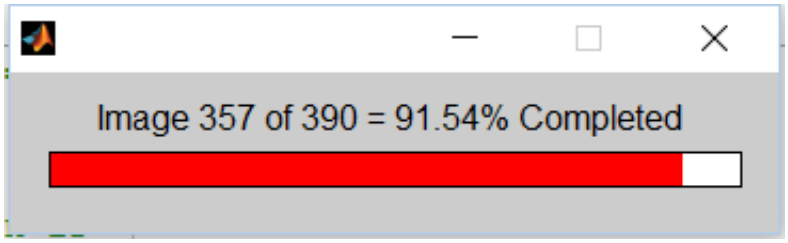
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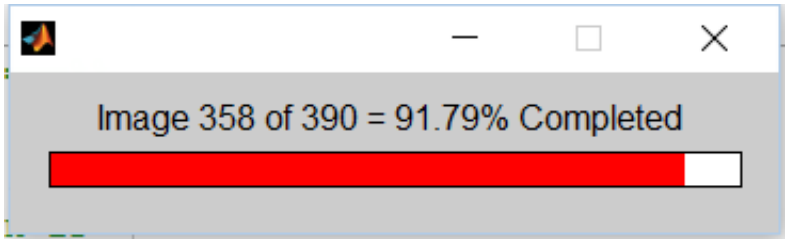
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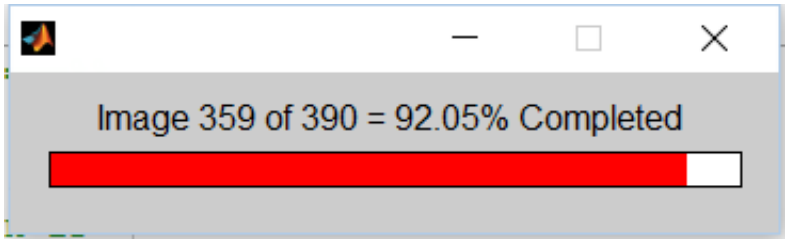
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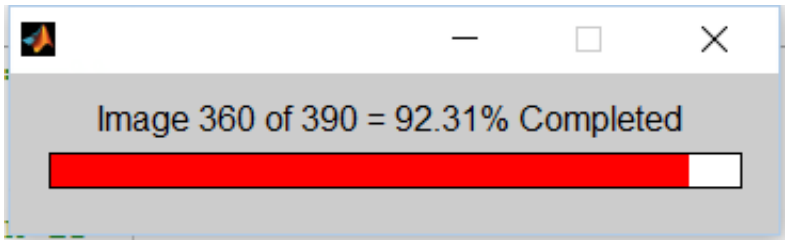
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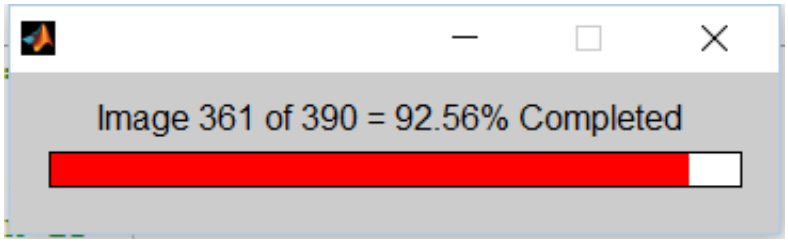
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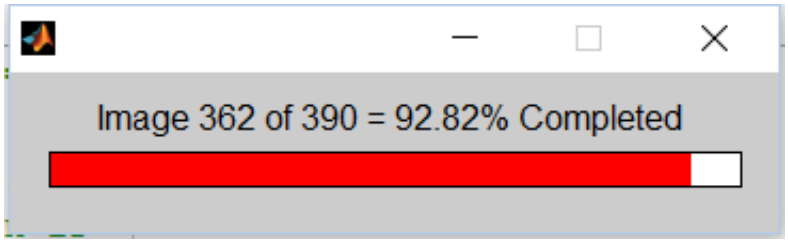
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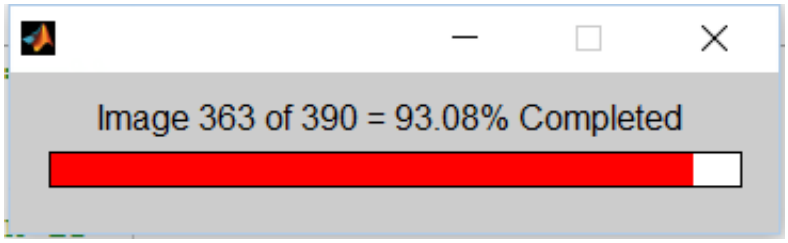
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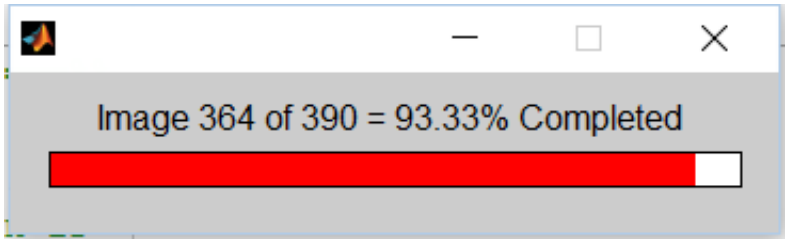
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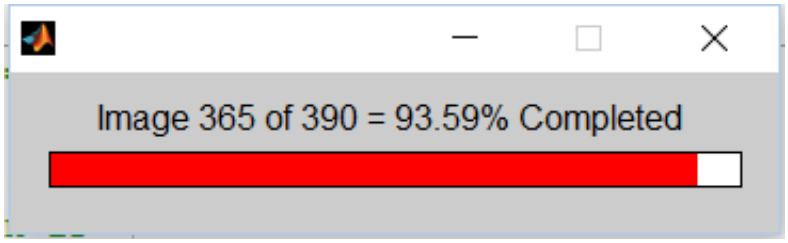
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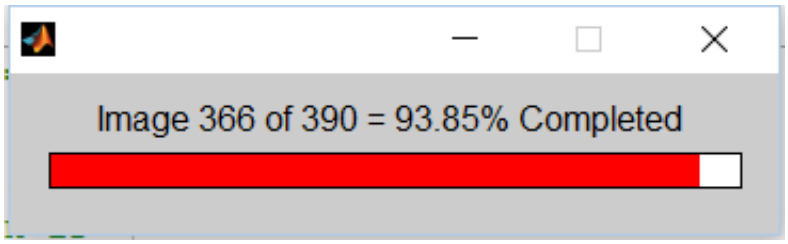
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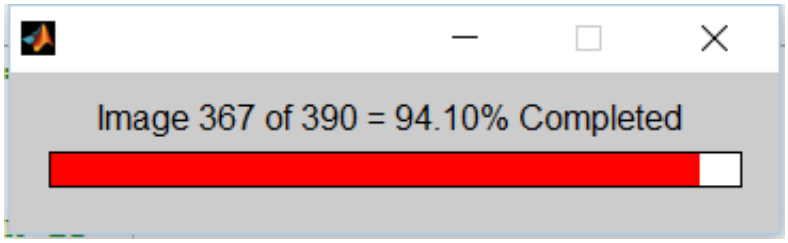
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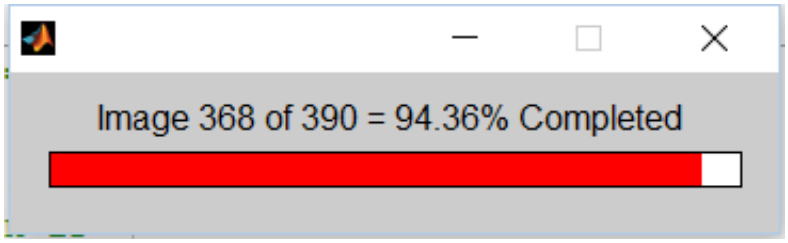
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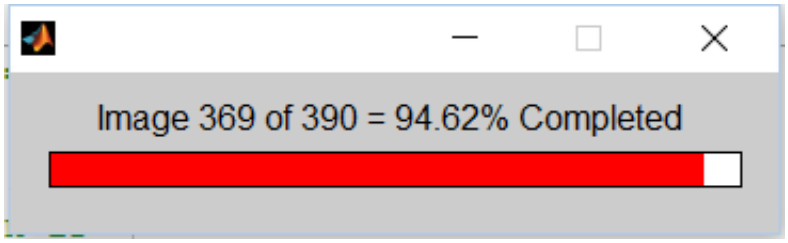
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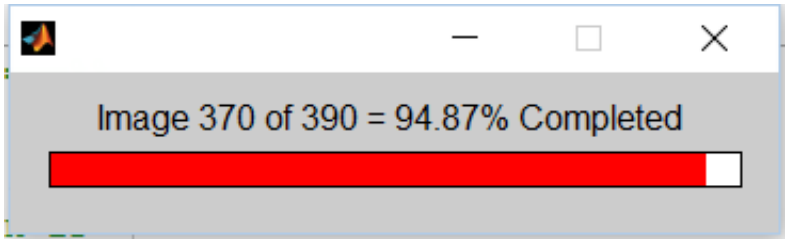
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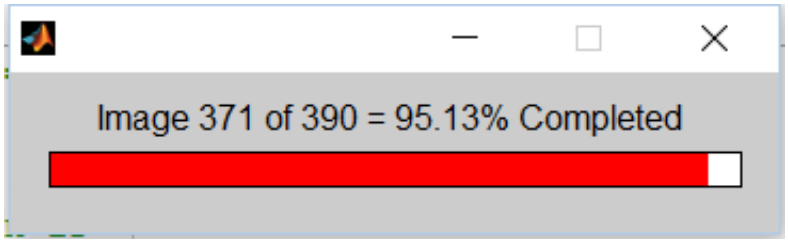
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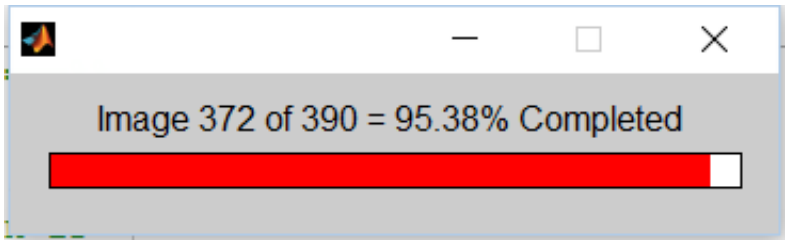
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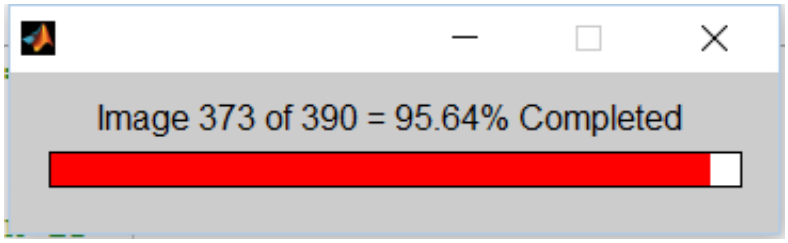
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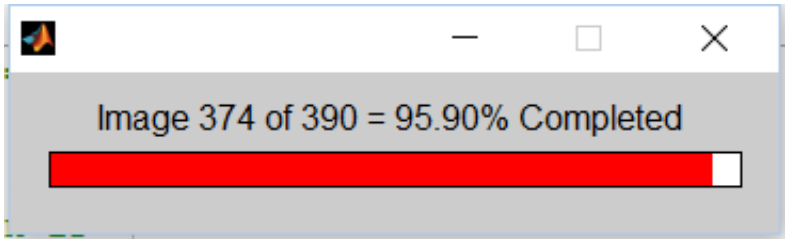
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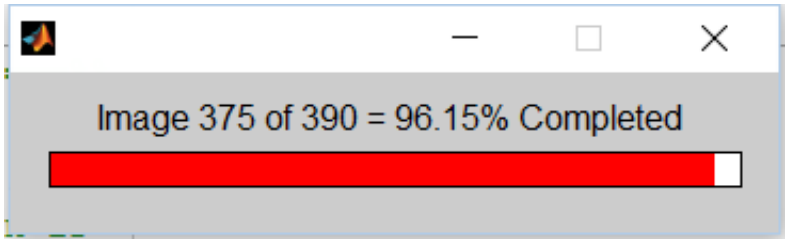
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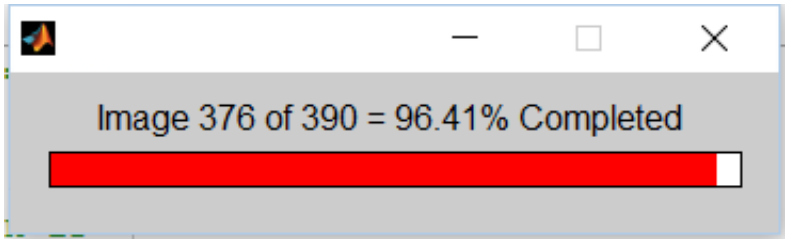
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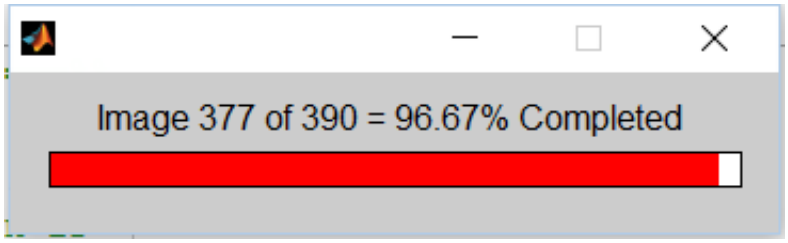
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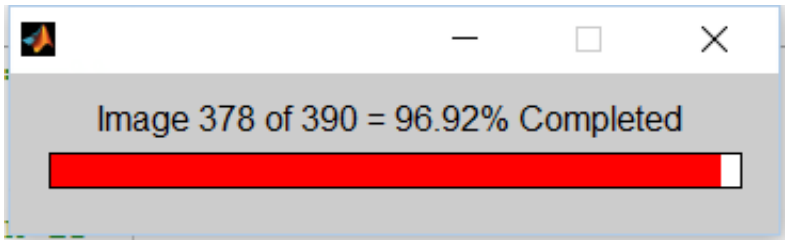
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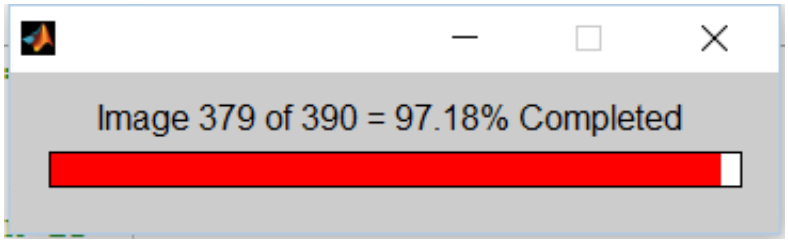
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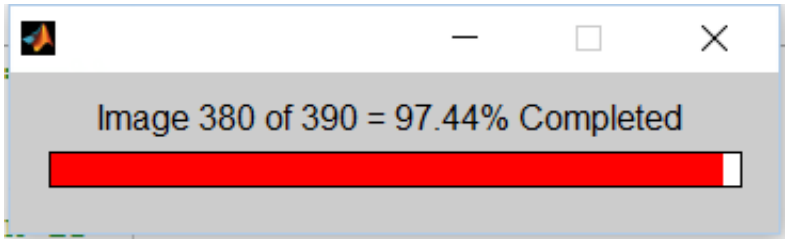
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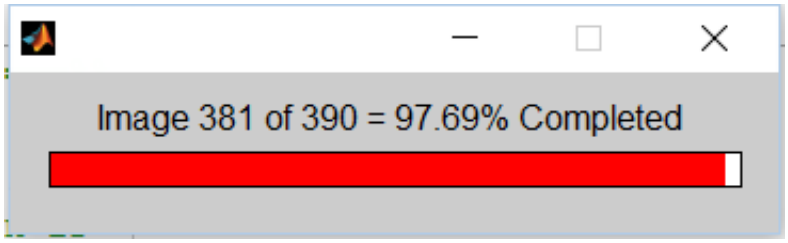
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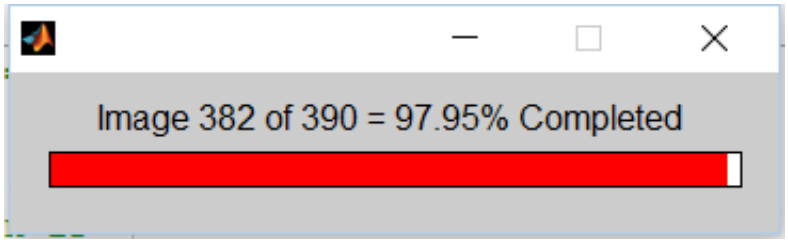
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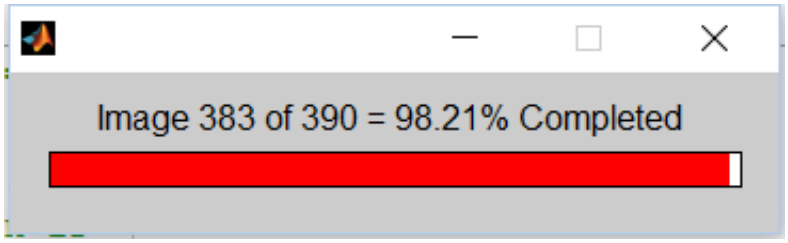
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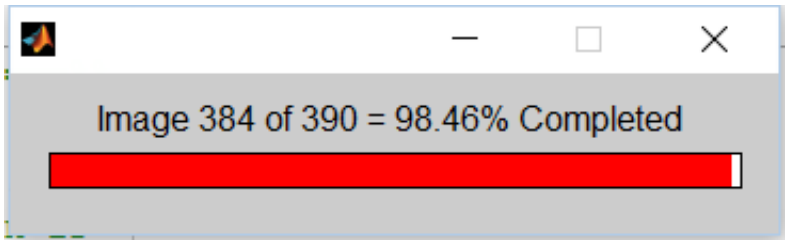
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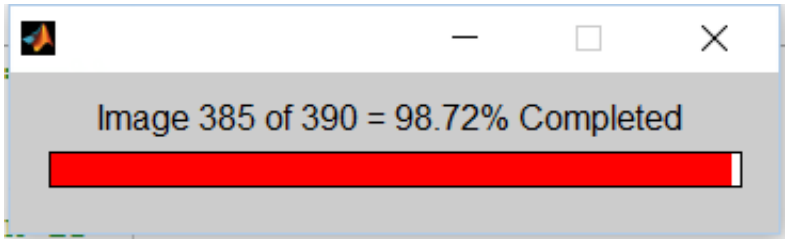
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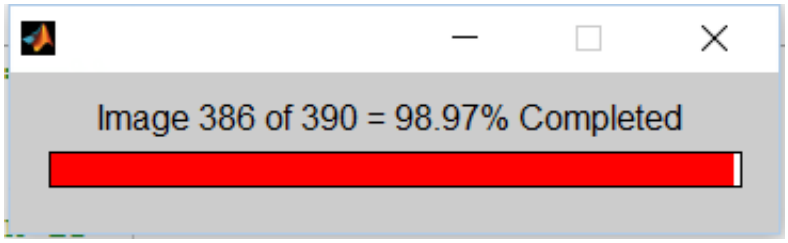
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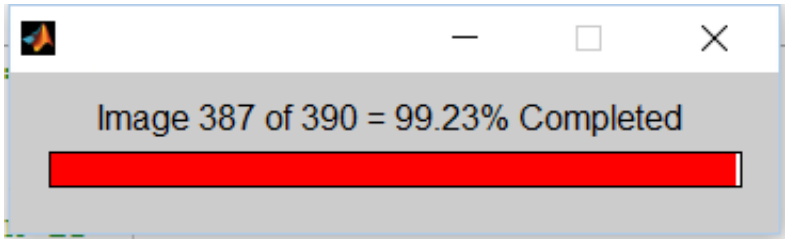
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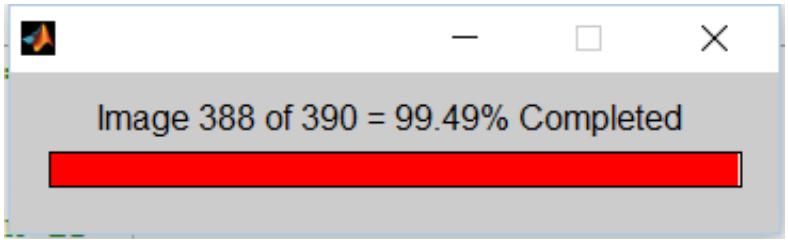
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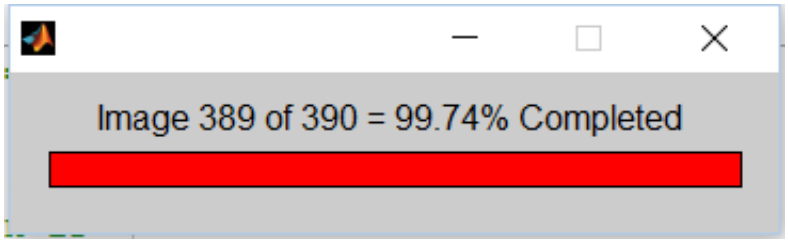
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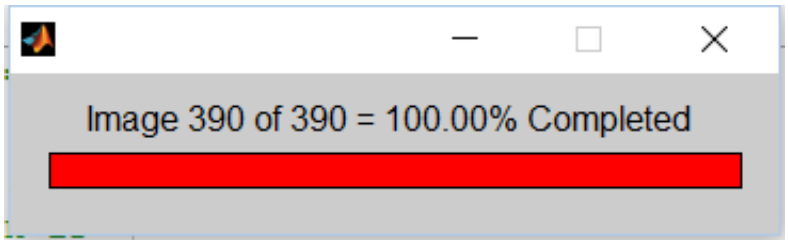
Image 390 of 390 = 100.00% Completed

```
end

i = i+1;
j = 1;
```

```
end


rate = (hit/counter)*100;
str = ['Detection Rate is ',num2str(rate),'%'];
disp(str);
```

```
Detection Rate is 83.0769%
```

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