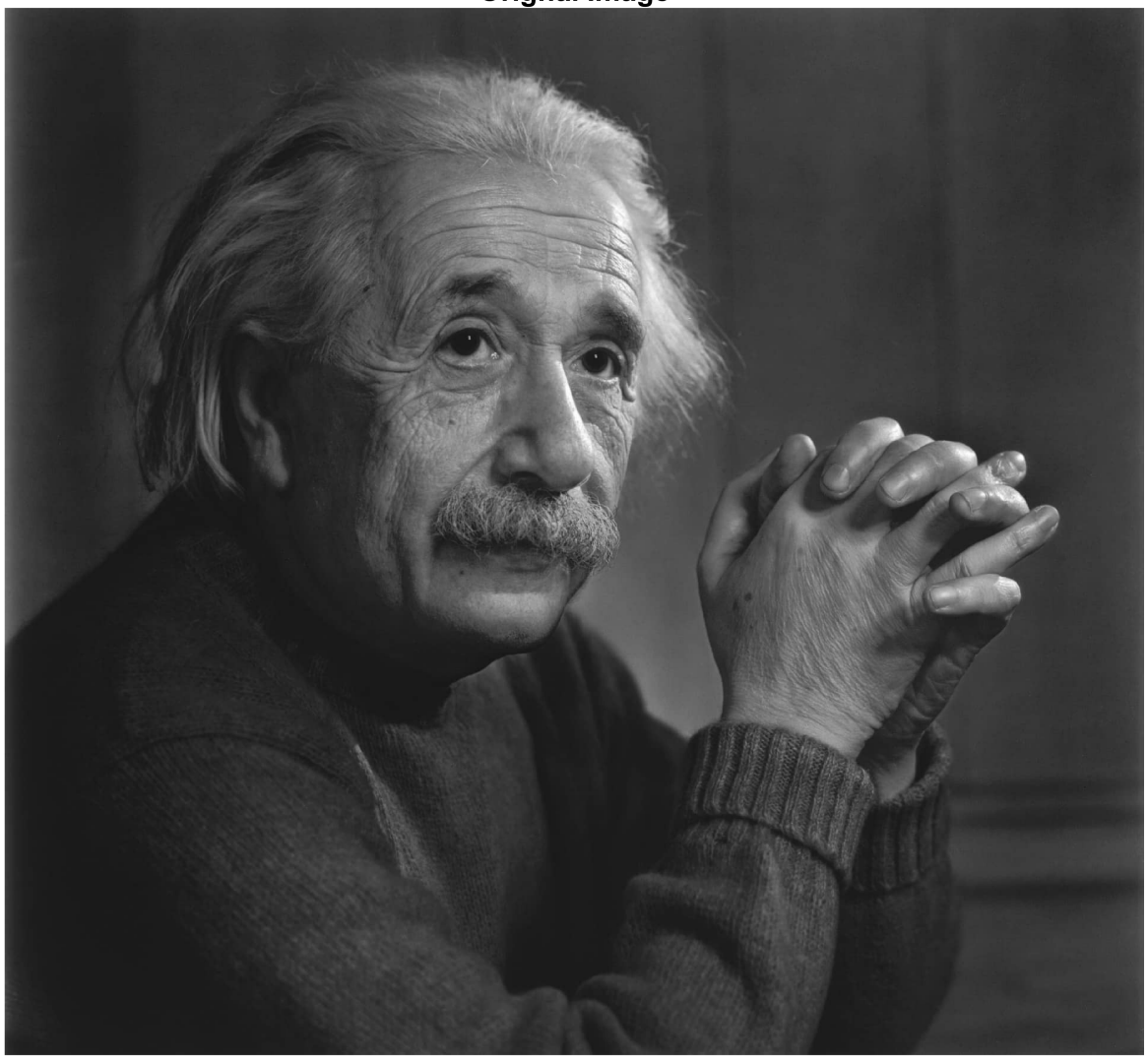
```
% Floyd-Steinberg Dithering Function
function y = fs(x, k)

    [height, width] = size(x);

    % Error diffusion matrix
    ed = [0 0 0 7 0;
          0 3 5 1 0;
          0 0 0 0 0] / 16;

    % Output image
    y = zeros(height, width);

    % Image extension with border of zeros
    z = zeros(height + 4, width + 4);
    z(3:height+2, 3:width+2) = double(x);

    % Application of Floyd-Steinberg dithering
    for i = 3:height+2
        for j = 3:width+2

            quant = floor(255/(k-1)) * floor(z(i,j) * k / 256);
            y(i-2, j-2) = quant;

            % Calculation of quantization error
            e = z(i, j) - quant;

            % Distribution of error to neighboring pixels
            z(i:i+2, j-2:j+2) = z(i:i+2, j-2:j+2) + e * ed;
        end
    end


    y = uint8(y);
end

% Jarvis-Judice-Ninke Dithering Function
function out = jjn(im)

    [height, width] = size(im);

    % Error diffusion matrix
    ed = [0 0 0 7 5;
          3 5 7 5 3;
          1 3 5 3 1] / 48;

    % Output image
    out = zeros(size(im));

    % Extend the image with a border of zeros
```

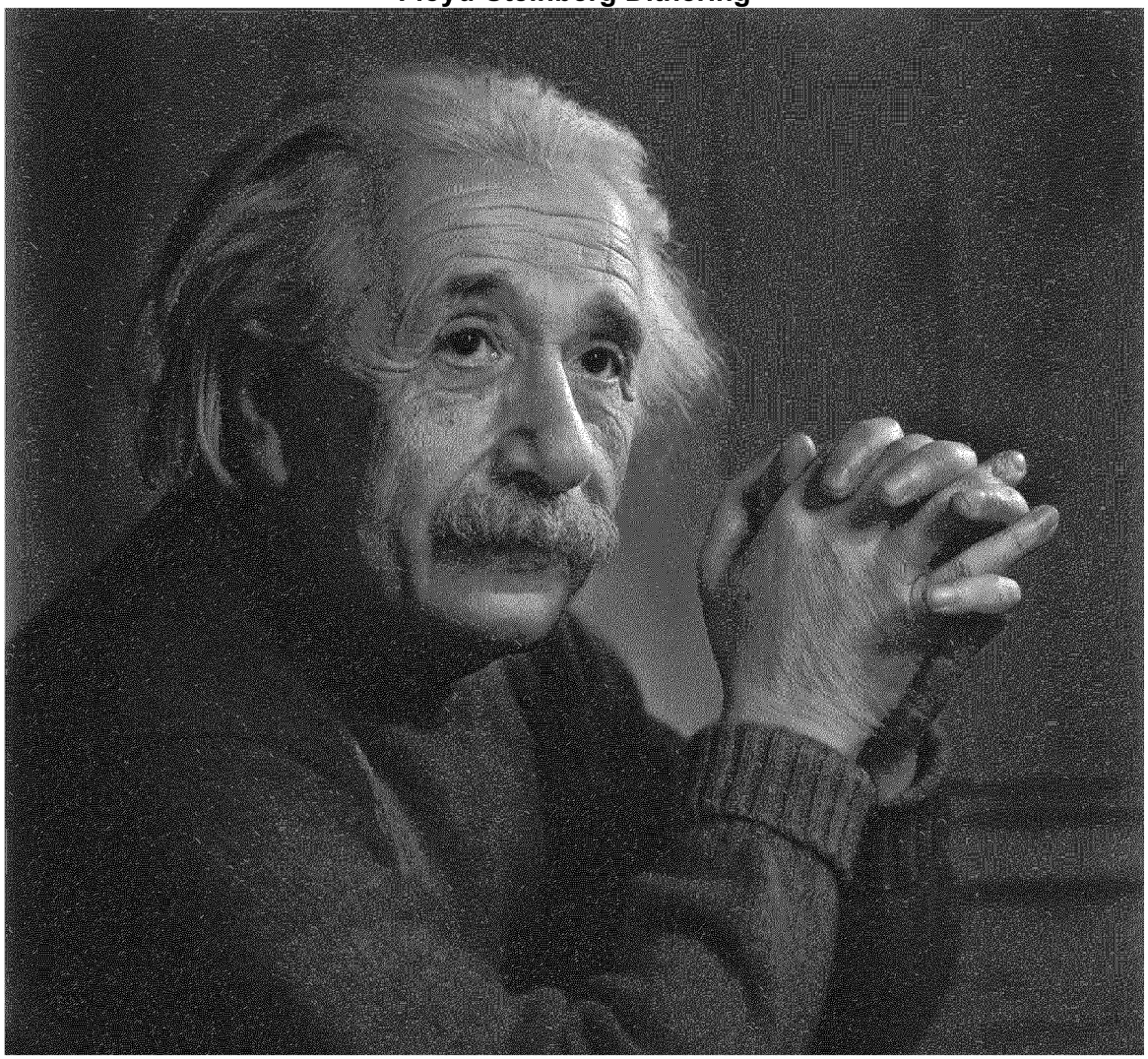
```
    z = zeros(height + 4, width + 4);
    z(3:height+2, 3:width+2) = double(im);  % Ensure im is double for calculations

    % Apply Jarvis-Judice-Ninke dithering
    for i = 3:height+2
        for j = 3:width+2
            % Quantization of pixel value (thresholding at 128 for binary dithering)
            quant = 255 * (z(i,j) >= 128);
            out(i-2, j-2) = quant;

            %  Quantization error
            e = z(i, j) - quant;

            % Distribute of error to neighboring pixels based on JJN matrix
            z(i:i+2, j-2:j+2) = z(i:i+2, j-2:j+2) + e * ed;
        end
    end


    out = uint8(out);
end


img = imread('image.jpg');
gray_img = rgb2gray(img);

% Orignal Image
figure, imshow(img, []), title('Orignal Image');
```

Orignal Image



```
% Floyd-Steinberg dithering
dithered_img_Floyd = fs(gray_img, 2);

% Jarvis-Judice-Ninke dithering
dithered_img_Jarvis = jjn(gray_img);

figure, imshow(dithered_img_Floyd, []), title('Floyd-Steinberg Dithering');
```

Floyd-Steinberg Dithering



```
figure, imshow(dithered_img_Jarvis, []), title('Jarvis-Judice-Ninke Dithering');
```

Jarvis-Judice-Ninke Dithering