```
%Andrew Katz
%Homework 3
%Problem 8
function P8()
%Clean up
clc;
clear all;
close all;

%Hawaii
load ('hawaii.mat');
figure;
imshow(hawaii_m, []);
title('Original Hawaii');
showDiffMap(firstOrderLTR(hawaii_m));
title('Left to right');
showDiffMap(firstOrderTTB(hawaii_m));
title('Top to bottom');
showDiffMap(firstOrderDiag(hawaii_m));
title('Top left to bottom right gradient');

%BAC
bac = rgb2gray(imread('bac.jpg'));
figure;
imshow(bac, []);
title('Original BAC.jpg');
figure
imshow(firstOrderLTR(bac));
title('Left to right (BAC, imshow)');
figure
imshow(firstOrderTTB(bac));
title('Top to bottom (BAC, imshow)');
figure
imshow(firstOrderDiag(bac));
title('Top left to bottom right gradient (BAC, gradient)');
showDiffMap(firstOrderLTR(bac));
title('Left to right (BAC, gradient)');
showDiffMap(firstOrderTTB(bac));
title('Top to bottom (BAC, gradient)');
showDiffMap(firstOrderDiag(bac));
title('Top left to bottom right gradient (BAC, gradient)');
end

%First order difference, from top to bottom
function imgOut = firstOrderTTB(imgIn)
imgOut(1,:) = 0;
for col = 2:size(imgIn,1)
    for row = 1:size(imgIn,2)
        imgOut(col,row) = imgIn(col,row) - imgIn((col - 1),row);
    end
end
end
```

```
%First order difference, from left to right
function imgOut = firstOrderLTR(imgIn)
imgOut(:,1) = 0;
for col = 1:size(imgIn,1)
    for row = 2:size(imgIn,2)
        imgOut(col,row) = imgIn(col,row) - imgIn(col,(row - 1));
    end
end
end

%First order difference, from top to bottom
function imgOut = firstOrderDiag(imgIn)
imgOut(:,1) = 0;
imgOut(1,:) = 0;
for col = 2:size(imgIn,1)
    for row = 2:size(imgIn,2)
        imgOut(col,row) = imgIn(col,row) - imgIn((col - 1),(row - 1));
    end
end
end

%Use special function to show image nicer
function fig = showDiffMap(img)
fig = figure;
imshow(img, [mean(img(:)) - 2.5 * std(img(:)), ...
             mean(img(:)) + 2.5 * std(img(:))]);
end
```

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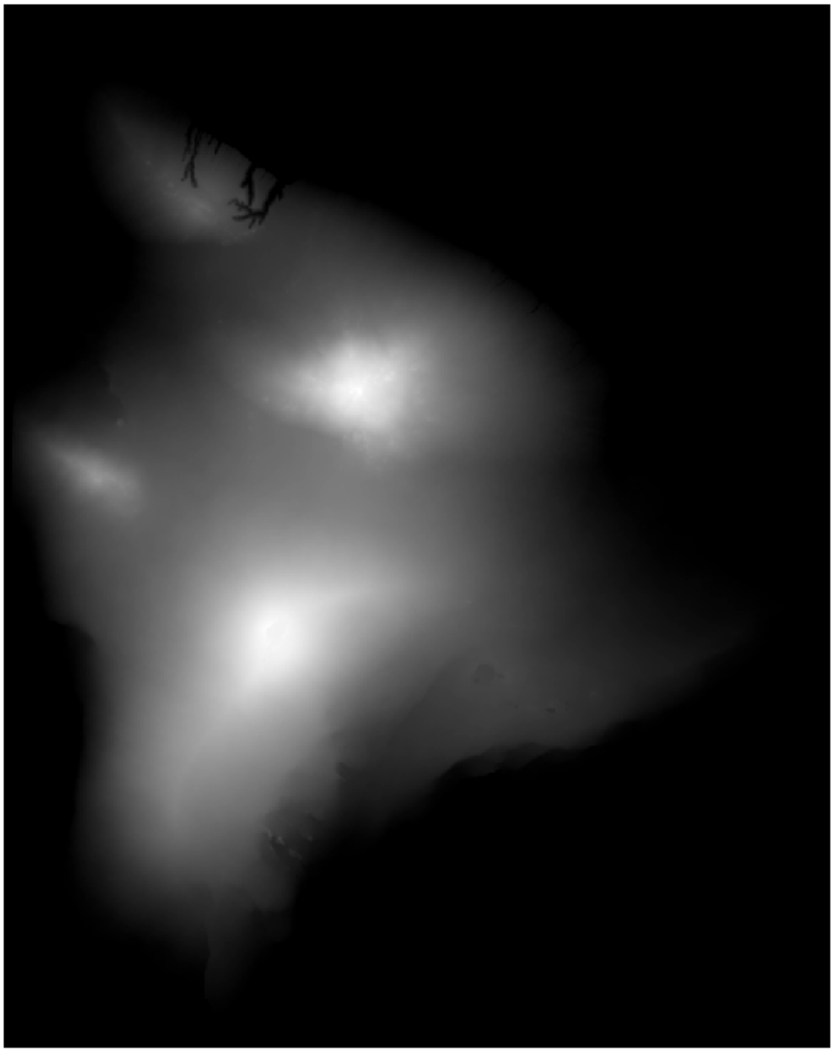
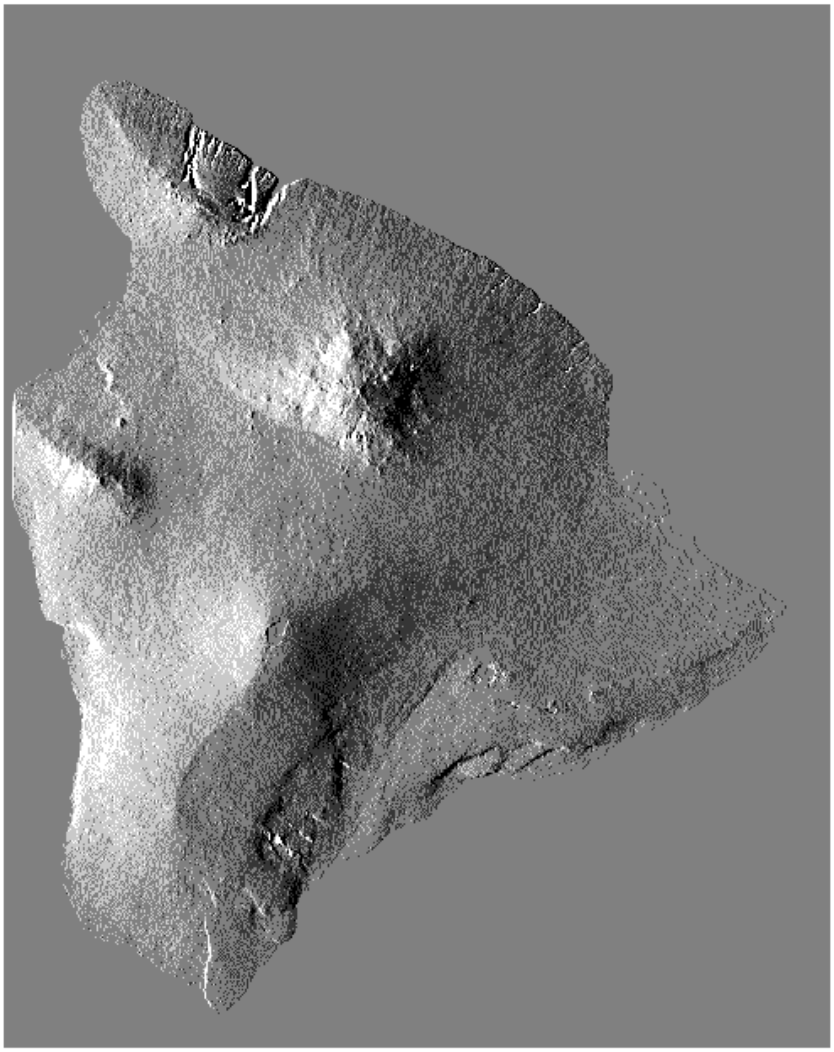
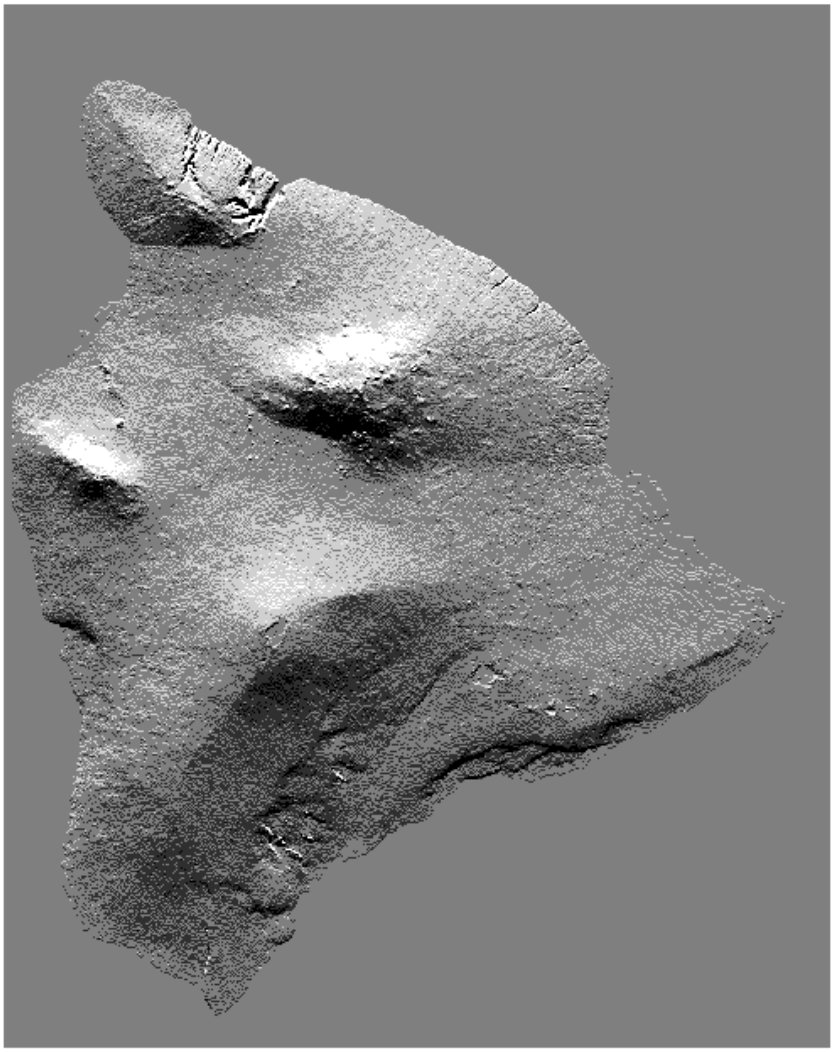
Original Hawaii



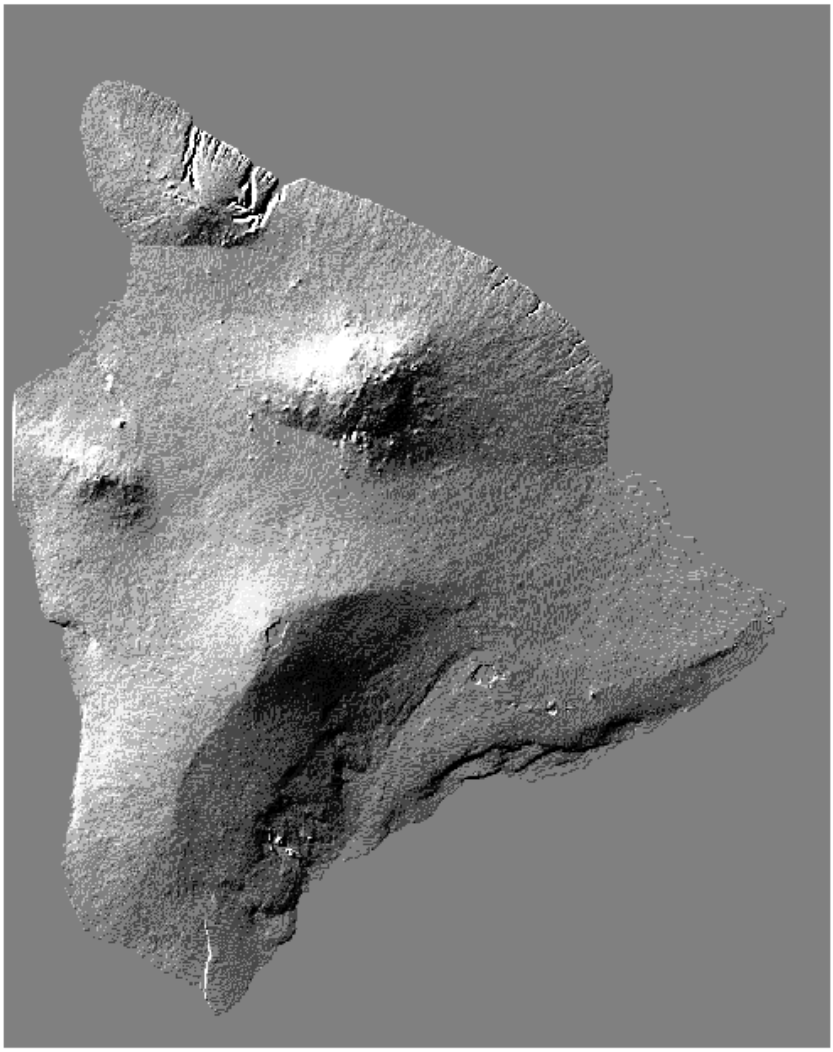
Left to right



Top to bottom

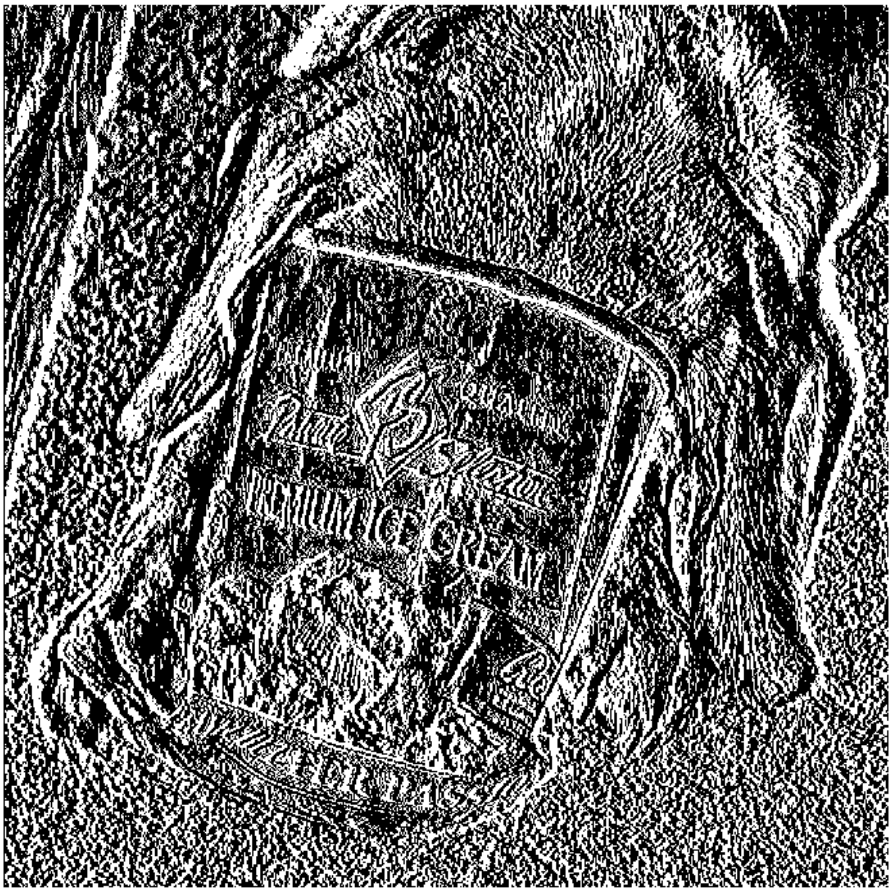


Top left to bottom right gradient



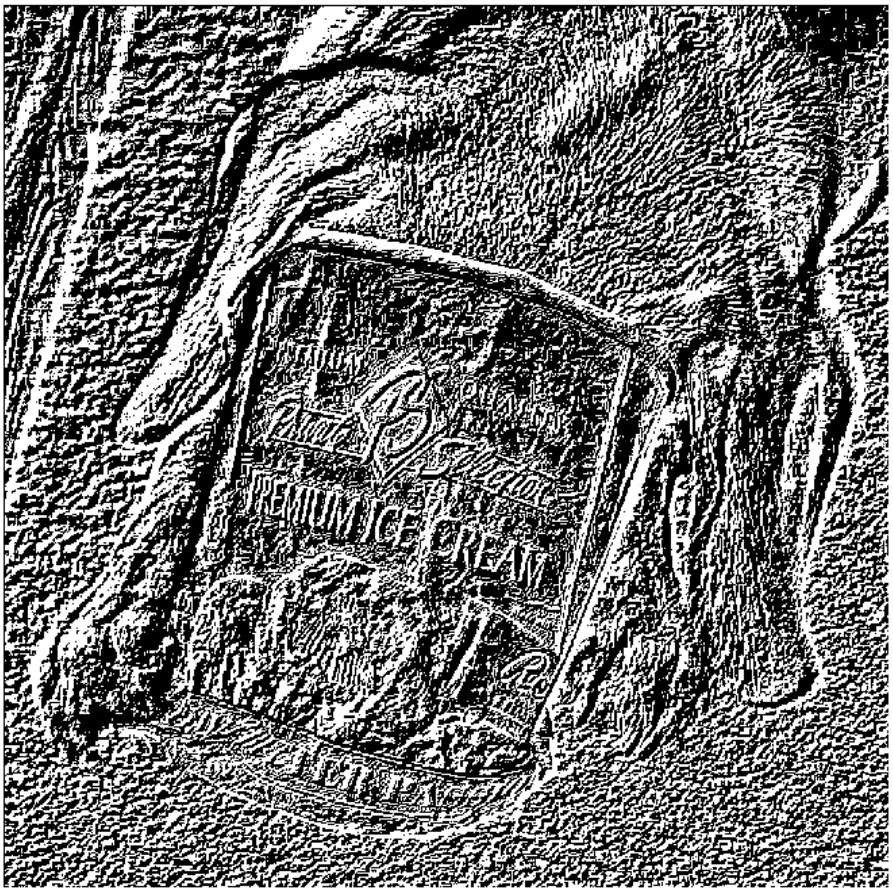
Original BAC.jpg

Left to right (BAC, imshow)



Top to bottom (BAC, imshow)

Top left to bottom right gradient (BAC, gradient)



Left to right (BAC, gradient)

Top to bottom (BAC, gradient)

Top left to bottom right gradient (BAC, gradient)

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