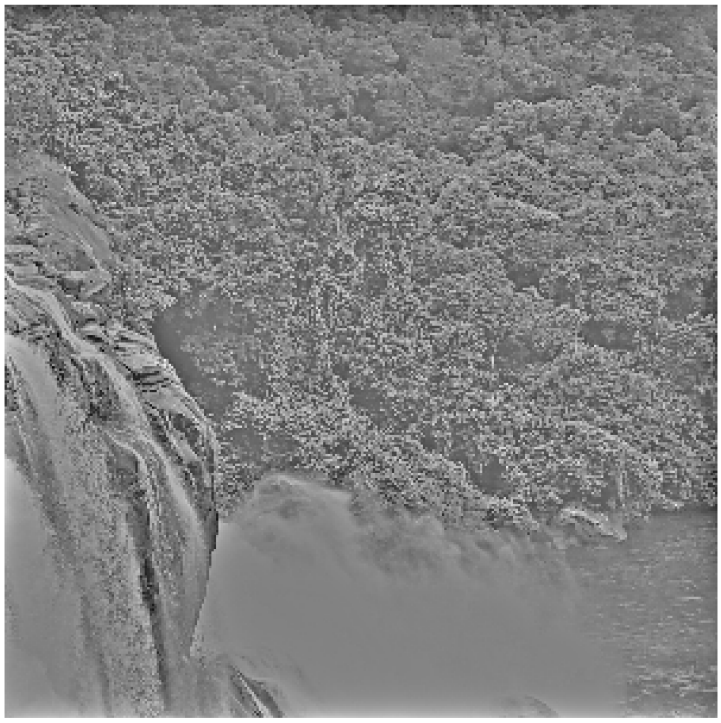
4. Apply the Fourier Transform to a image and applying filters

(b) Butterworth filters

(c) Gaussian filters

```
gray_img=rgb2gray(input_img);% convert to gray image
%fourier transform
f=fft2(double(gray_img));

fshift=fftshift(f);


%Butterworth filters
D0=10; %cutoff frequency
[nr,nc]=size(fshift);
[x,y]=meshgrid(1:nc,1:nr);
D=sqrt((x-nc/2).^2+(y-nr/2).^2);
%order 2 butterworth
hbutter=1./(1+(D0./D).^(2));
hbutter(D==0)=1;
gbutter=hbutter.*fshift;

img_butterworth=ifft2(ifftshift(gbutter));%inverse fourier transform

figure;
%Display butterworth filter results
imshow(real(img_butterworth),[]),title('Butterworth Filter');
```

Butterworth Filter



```
%Gaussian filter
h_gaussian=exp(-(D.^2)/(2*(D0^2)));
g_gaussian=h_gaussian.*fshift;
img_gaussian=ifft2(ifftshift(g_gaussian));%inverse fourier transform

figure;
%Display Gaussian filter results

imshow(real(img_gaussian),[]),title('Gaussian Filter');
```

Gaussian Filter