

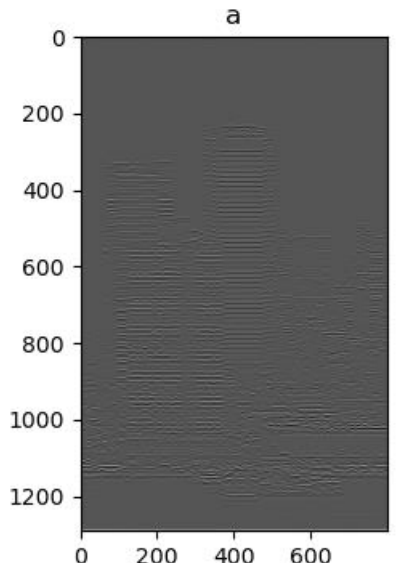
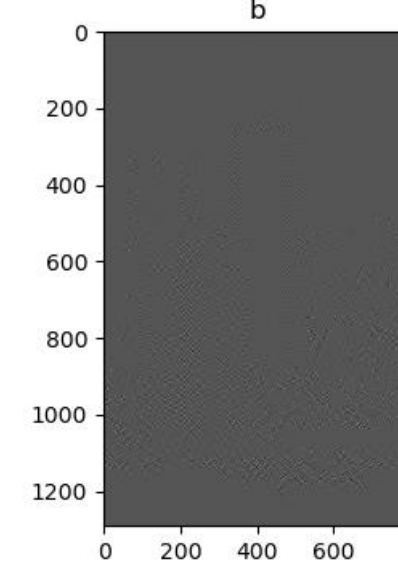
Lab 07

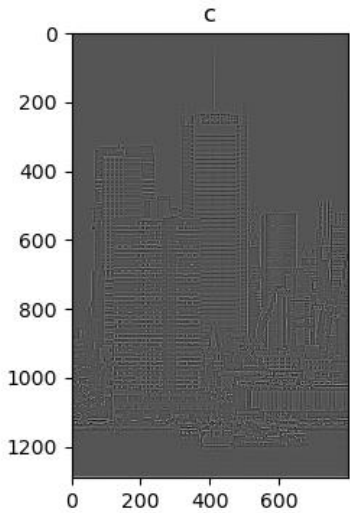
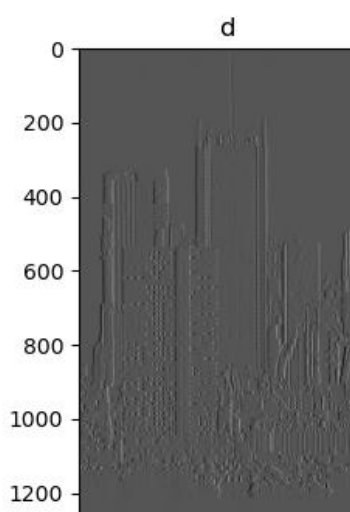
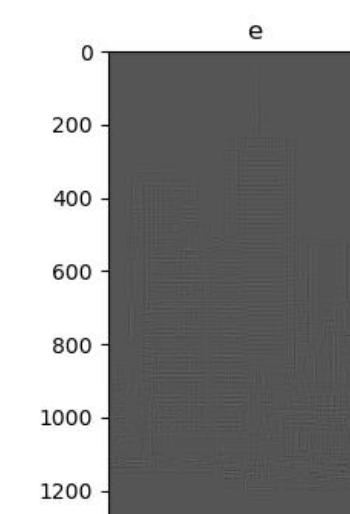
Name: 白騏瑞
 Student ID: B08611027
 Total Score: _____

Note:

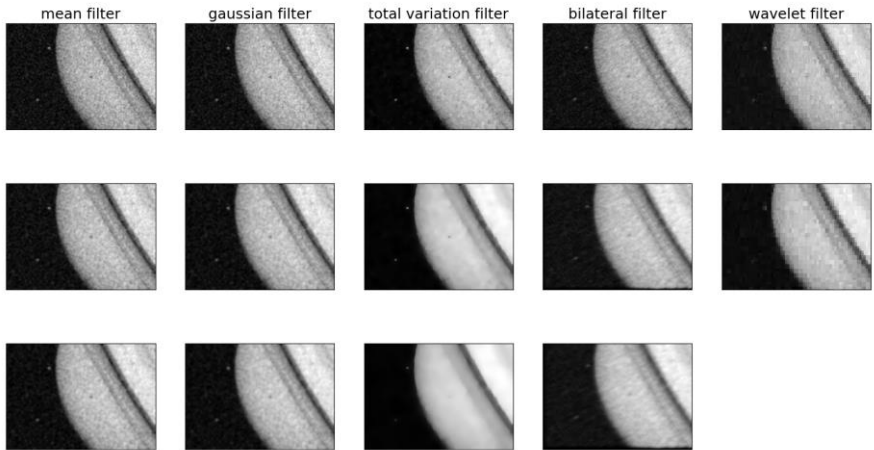
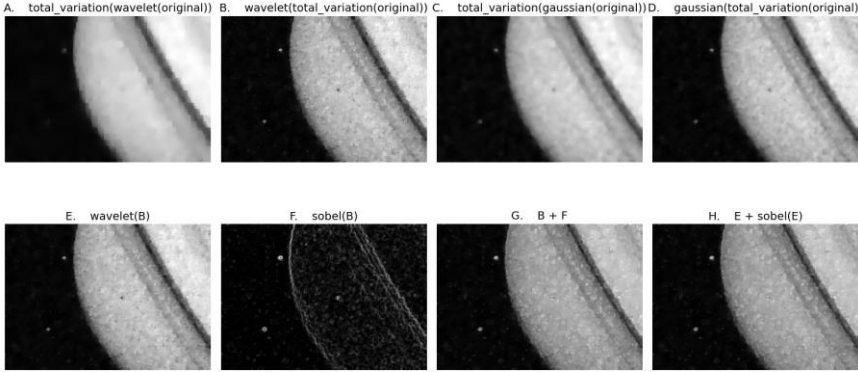
Most of the explanations in this lab is mandatory, However, giving reasonable explanations to your answer or programs will earn you partial credits when your answer is incorrect.

A. Filters and Convolution (25 points, 5 points each question)

#		Description	Score
a		由圖可看出此 filter 可以過濾出水平線	
b		由圖可看出此 filter 可以過濾出45°的線	

c	 <p>A grayscale image showing the result of a Laplacian filter applied to a cityscape. The image highlights edges and features, with a dark background and bright, thin lines representing the boundaries of buildings and structures. The x-axis is labeled from 0 to 600, and the y-axis is labeled from 0 to 1200.</p>	<p>拉普拉斯濾波器，強調的是影像中灰度的突變</p>	
d	 <p>A grayscale image showing the result of a Vertical Sobel filter applied to a cityscape. The image highlights vertical edges, with a dark background and bright, thin lines representing the boundaries of buildings and structures. The x-axis is labeled from 0 to 600, and the y-axis is labeled from 0 to 1200.</p>	<p>Vertical Sobel filter，可以過濾出垂直的線</p>	
e	 <p>A grayscale image showing the result of a Sobel filter applied to a cityscape, highlighting edges at 45 and 135 degrees. The image shows a dark background with bright, thin lines representing the boundaries of buildings and structures. The x-axis is labeled from 0 to 600, and the y-axis is labeled from 0 to 1200.</p>	<ol style="list-style-type: none"> 1.透過這個濾波器，45°跟 135°的線會被過濾掉 2.水平的線會變清楚 3.垂直的線會變不清楚 	

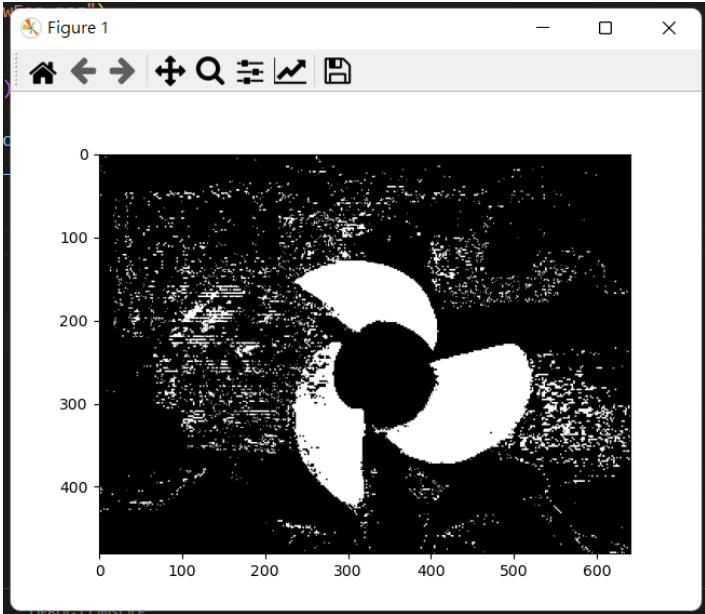
B. Denoising a Picture (15 points)

#	Description	Score
1	<p>有參考以下網址： https://www.twblogs.net/a/5d5f0f93bd9eee5327fde3f2</p>  <p>連續做三次 filter</p>  <p>A~D 是做 total variation filter, wavelet filter and gaussian filter 三取二，而看起來是 B 效果最好。 F~G 是對 B 做銳化，G 的結果看起來最好。</p>	

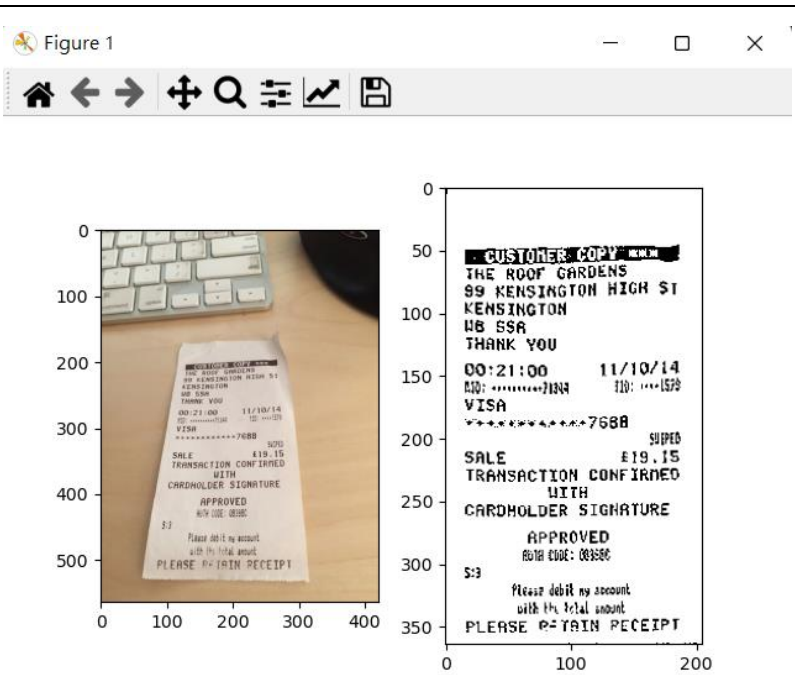
C. Properties of Convolution (20 points)

#	Description	Score
1	<p>1. (a) $f(x) * g(x) = g(x) * f(x)$.</p> <p>Let f and g, both 2π-periodic function on $[-\pi, \pi]$</p> $\Rightarrow f(x) * g(x) = \int_{-\pi}^{\pi} f(x-y)g(y)dy = \int_{-\pi}^{\pi} f(z)g(x-z)dz$ $= \int_{-\pi}^{\pi} g(x-z)f(z)dz = g(x) * f(x) \quad \#$ <p>(b) $(f * g) * h(t)$. Let $(f * g)(t) = \int_0^t f(s)g(t-s)ds$</p> $= \int_0^t (f * g)(s)h(t-s)ds$ $= \int_0^t \int_0^s f(u)g(s-u)h(t-s)dsdu$ $= \int_0^t \int_0^s f(u)g(s-u)h(t-s)dsdu$ $= \int_0^t f(u) \left(\int_0^{t-u} g(s)h(t-s)ds \right) du$ $= \int_0^t f(u)(g * h)(t-u)du$ $= (f * (g * h)) \quad \#$ <p>(c) $f * (g + h) = \int_{-\pi}^{\pi} f(x-t)[g(t) + h(t)]dt$</p> $= \int_{-\pi}^{\pi} f(x-t)g(t)dt + \int_{-\pi}^{\pi} f(x-t)h(t)dt$ $= f * g + f * h \quad \#$	
2	The median filter is the one type of nonlinear filters. It is very effective at removing impulse noise, the “salt and pepper” noise, in the image.	

D. Image Segmentation and Color Space (20 points)

#	Description		Score
-		HSV 找出黃色的部分	

E. Document Scanner (20 points)

#	Description	Score
-	 <p>Figure 1</p> <p>THE ROOF GARDENS 99 KENSINGTON HIGH ST KENSINGTON W8 5SA THANK YOU 00:21:00 11/10/14 00: *****7688 VISA SALE £19.15 TRANSACTION CONFIRMED WITH CARDHOLDER SIGNATURE APPROVED AUTH CODE: 003886 PLEASE DEBIT MY ACCOUNT WITH THE TOTAL AMOUNT PLEASE RETAIN RECEIPT</p>	