HW6 資訊113 F74094075 張庭菀

6.20 The weights of a large number of miniature poodles are approximately normally distributed with a mean of 8 kilograms and a standard deviation of 0.9 kilogram. If measurements are recorded to the nearest tenth of a kilogram, find the fraction of these poodles with weights

(a) over 9.5 kilograms;

(b) of at most 8.6 kilograms;

(c) between 7.3 and 9.1 kilograms inclusive.

$\mu = 8 \quad , \sigma = 0.9$

(a) $z = \dfrac{9.5-8}{0.9} \doteqdot 1.67$

$P(z > 1.67) = 1 - P(z < 1.67)$

$= 1 - 0.9525$

$= 0.0475$ #

(b) $z = \dfrac{8.6-8}{0.9} = 0.67$

$P(z \le 0.67) = 0.7486$ #

(c)

$Z_{7.3} = \dfrac{7.3-8}{0.9} = -0.78$ $\qquad P(Z \le 1.22) - P(z \le -0.78)$

$Z_{9.1} = \dfrac{9.1-8}{0.9} = 1.22$ $\qquad = P(z \le 1.22) - P(z \ge 0.78)$

$= 0.8888 - (1 - 0.7823) = 0.6711$ #

6.28 As part of the research on "the role of English as a gateway to knowledge", a survey is conducted among 1000 college students, in which 72% of the students agree with the statement. If 100 students are picked at random, what is the probability that

(a) at least 80 of them agree with the statement?

(b) at most 68 of them agree with the statement?

$n = 100$, $p = 0.72$, $\mu = 72$, $\sigma = \sqrt{20.16} \doteq 4.49$

(a)

$$z = \frac{79.5 - 72}{4.49} = 1.67$$

$$P(z > 1.67) = 1 - P(z < 1.67)$$
$$= 1 - 0.9525 = 0.0475 \ \#$$

(b)

$$\frac{68.5 - 72}{4.49} = -0.78$$

$$(x < -0.78) = 1 - 0.7823 = 0.2177$$

#

6.58 The number of automobiles that arrive at a certain intersection per minute has a Poisson distribution with a mean of 5. Interest centers around the time that elapses before 10 automobiles appear at the intersection.

(a) What is the probability that more than 10 automobiles appear at the intersection during any given minute of time?

(b) What is the probability that more than 2 minutes elapse before 10 cars arrive?

$$\mu = 5 \Rightarrow \lambda = 5 , \ t = 1$$

(a)

$$P(X > 10) = 1 - \sum_{x=0}^{10} p(x, 5) = 1 - 0.9863$$
$$= 0.0137 \ \#$$

(b)

$$\beta = \frac{1}{5} , \ \alpha = 10$$

$$f(x) = \frac{1}{\beta^{\alpha} \cdot \Gamma(\alpha)} x^{\alpha-1} e^{-\frac{x}{\beta}}$$

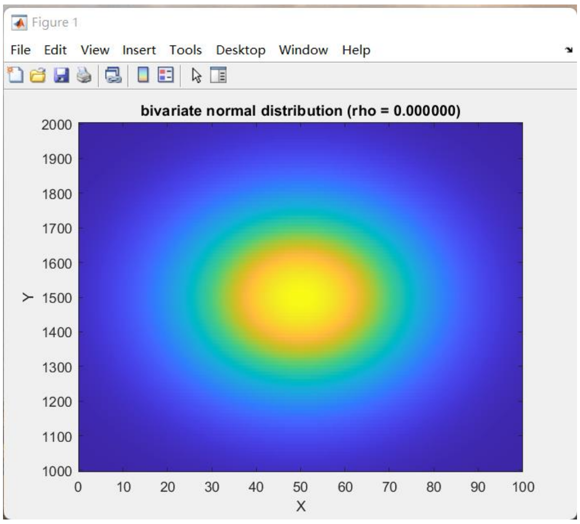
$$P(T \le 2) = \frac{5^{10}}{9!} \int_0^2 x^9 \cdot e^{-\frac{x}{\beta}} \, dT$$

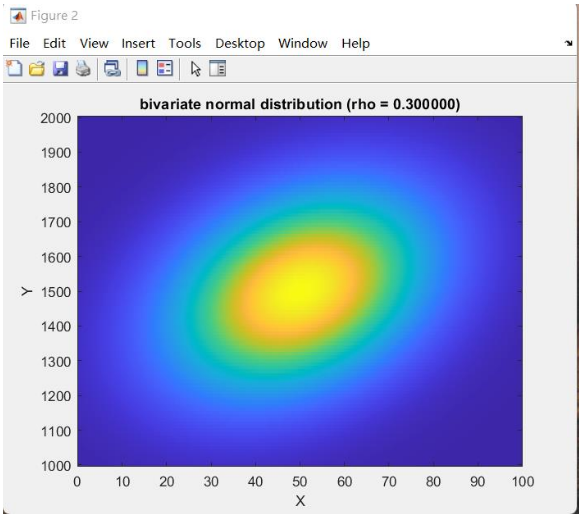
$$= 0.542$$

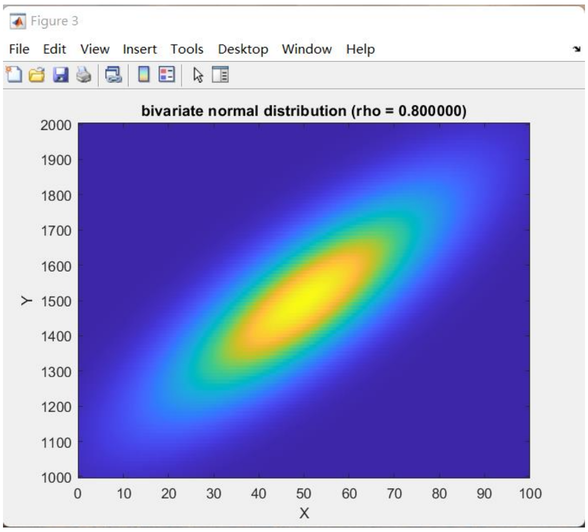
$$1 - 0.542 = 0.458 \ \#$$

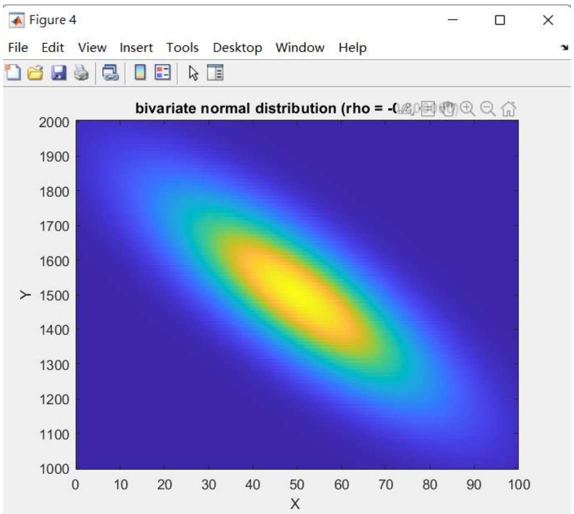
Matlab

1a









圖片 1 ~ 4 分別為 Distribution 1 ~-4

1b

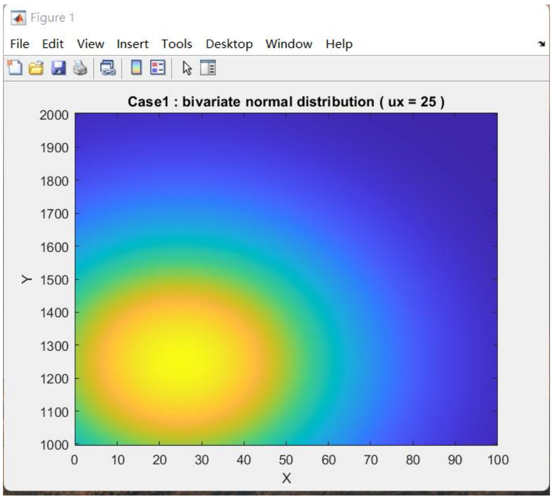
隨著 rho 的變化 圖形呈現不同分布

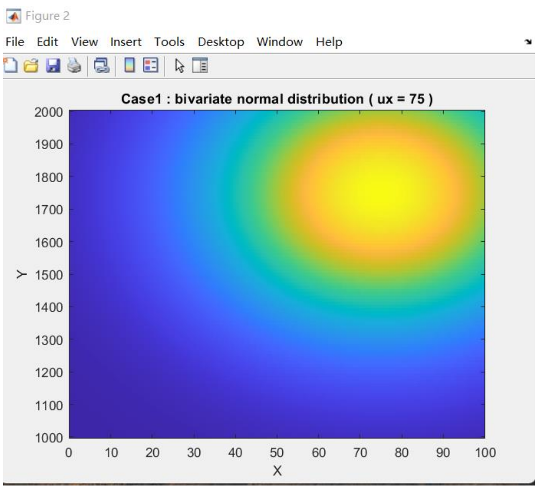
Rho 越大 -> 圖形分布越靠近左下及右上

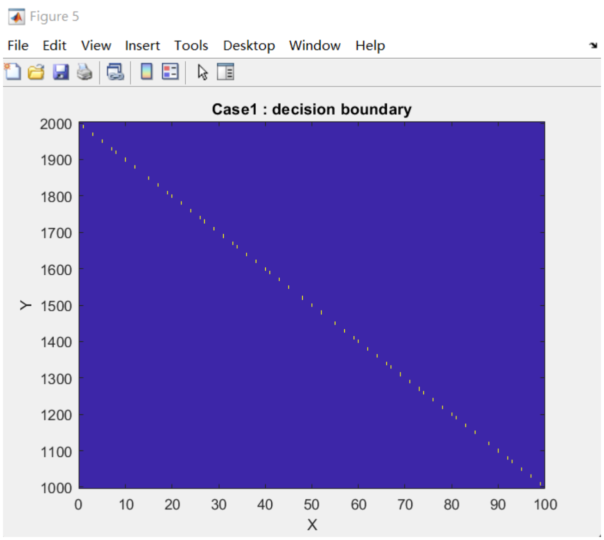
Rho 為 0 -> 圖形在中心呈現圓形

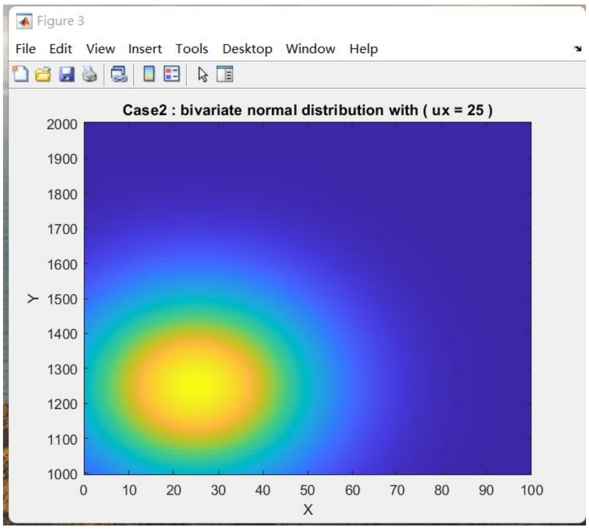
Rho 越小 -> 圖形分布越靠近左上及右下

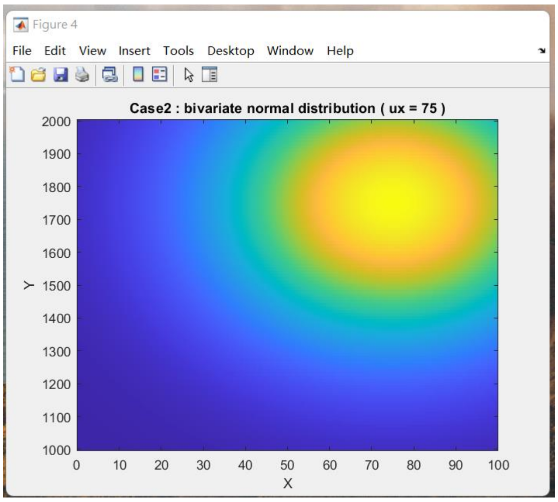
2a

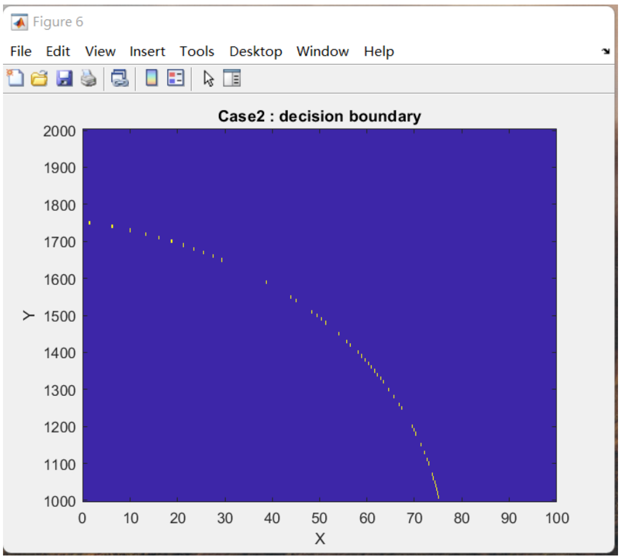












2b

根據觀察，2a 的兩個 case 只有 standard deviation x 跟 standard deviation y 有不同，所以在接下來的實驗中，我分別調整 Distribution1 的 standard deviation 去觀察圖形變化 ，過程中固定 Distribution2 的值

圖 1 的 standard deviation x 為 10 standard deviation y 為 100

每次分別增加 5、50 總共做 10 次

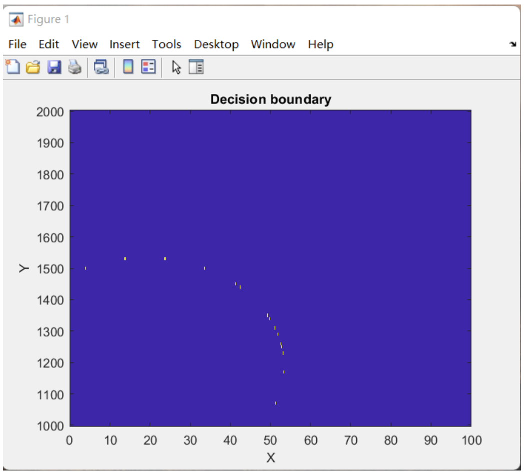


Figure 1
File Edit View Insert Tools Desktop Window Help
Decision boundary
Y
X

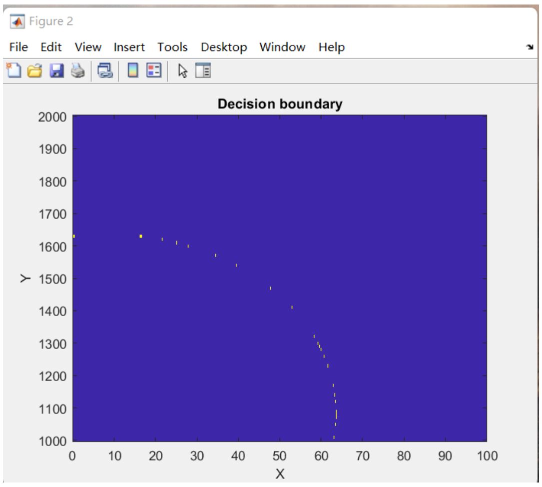


Figure 2
File Edit View Insert Tools Desktop Window Help
Decision boundary
Y
X

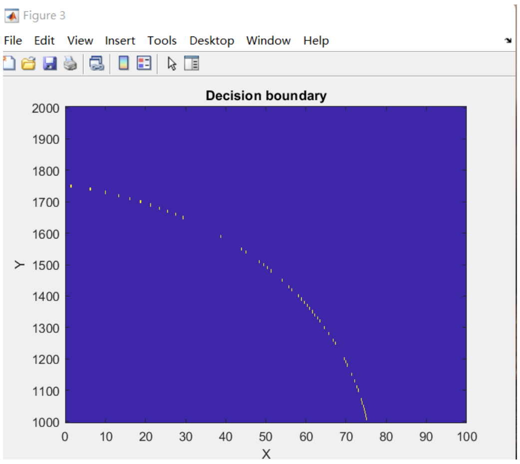


Figure 3
File Edit View Insert Tools Desktop Window Help
Decision boundary
Y
X

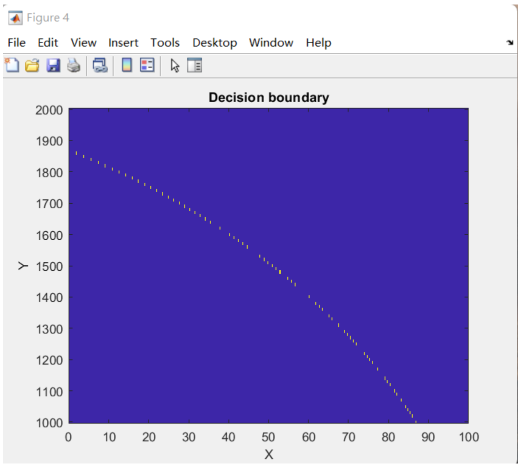


Figure 4
File Edit View Insert Tools Desktop Window Help
Decision boundary
Y
X

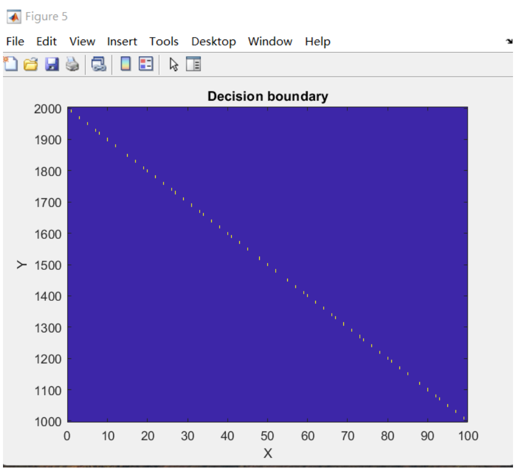


Figure 5
File Edit View Insert Tools Desktop Window Help
Decision boundary
Y
X

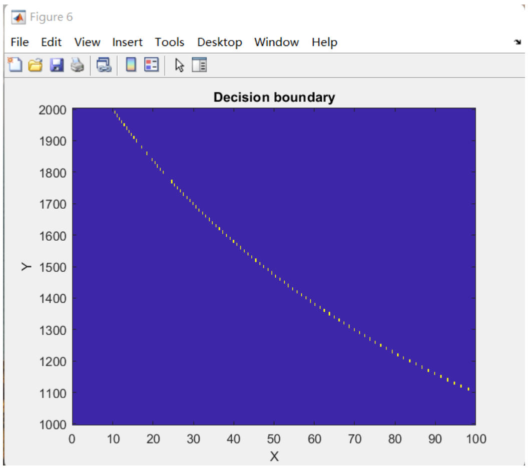
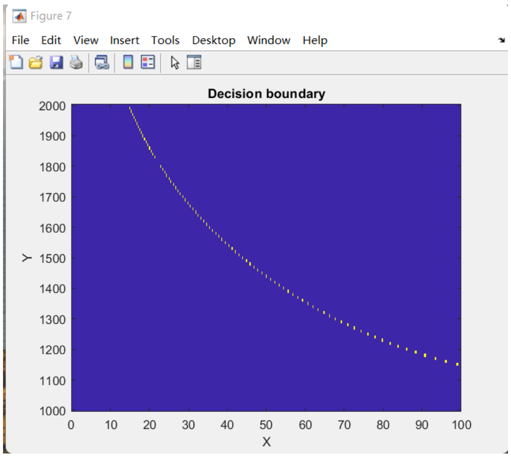
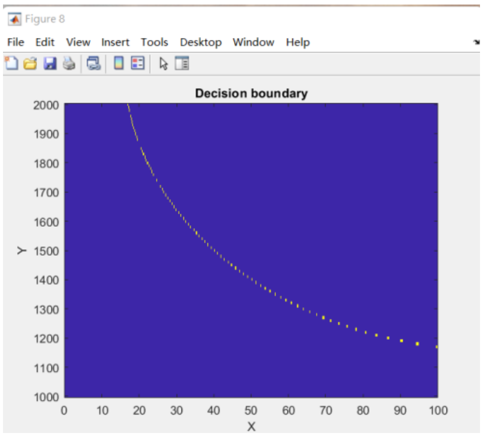
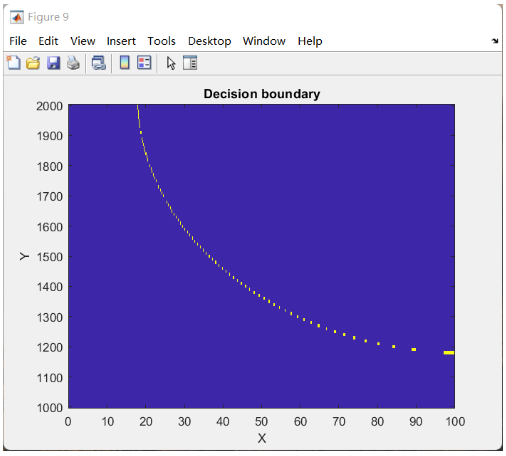
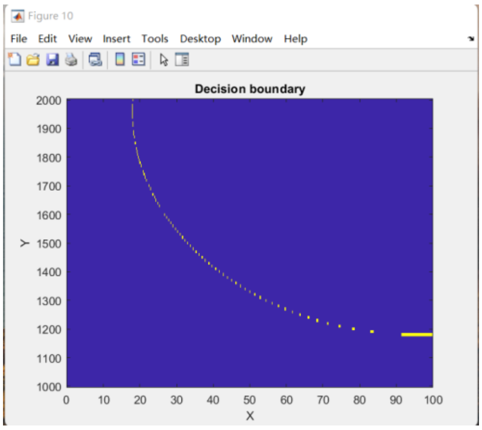


Figure 6
File Edit View Insert Tools Desktop Window Help
Decision boundary
Y
X









根據以上圖片我麼得出以下結論

當 distribution1 的 standard deviation x 、 standard deviation y 小於 distribution2 時，decision boundary 的曲線凹口朝左下，並且越小彎曲程度越大

當 distribution1 的 standard deviation x 、 standard deviation y 等於 distribution2 時，decision boundary 的呈現協直線，並且兩端分別在正左上及正右下，剛好呈現對角線

當 distribution1 的 standard deviation x 、 standard deviation y 大於 distribution2 時 decision boundary 的曲線凹口朝右下，並且越大彎曲程度越大

3a

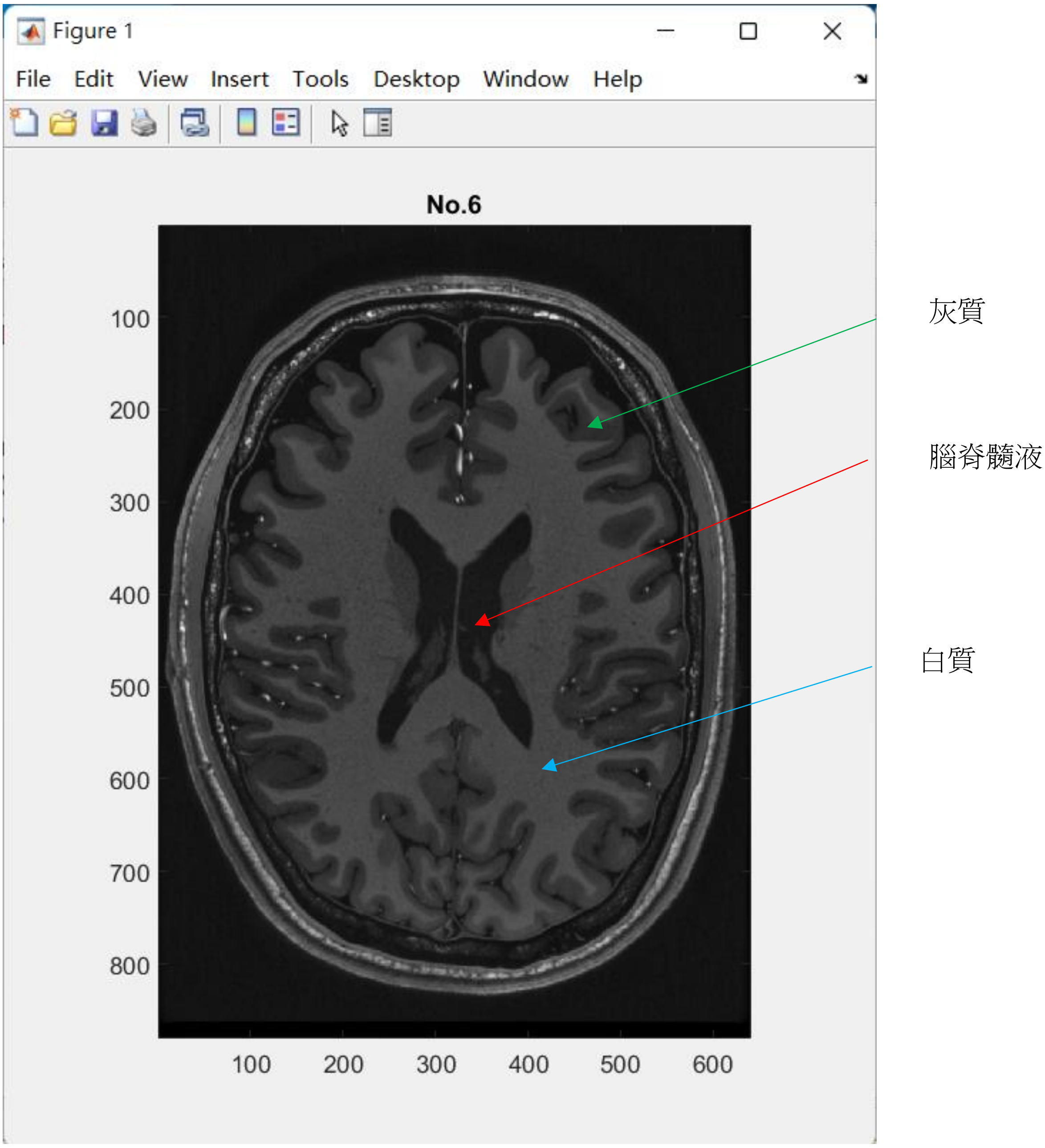
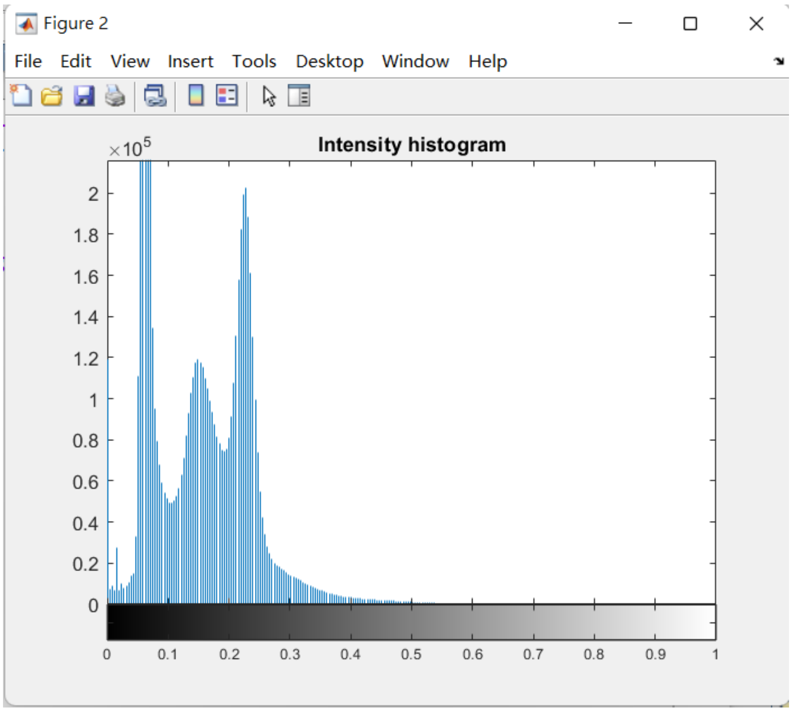


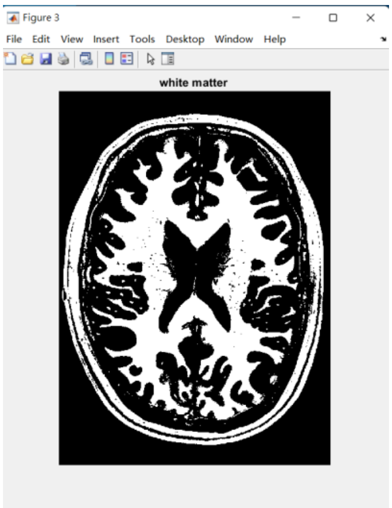
Figure 1
File Edit View Insert Tools Desktop Window Help
No.6
100
200
300
400
500
600
700
800
100 200 300 400 500 600
灰質
腦脊髓液
白質

挑選第 6 張圖片

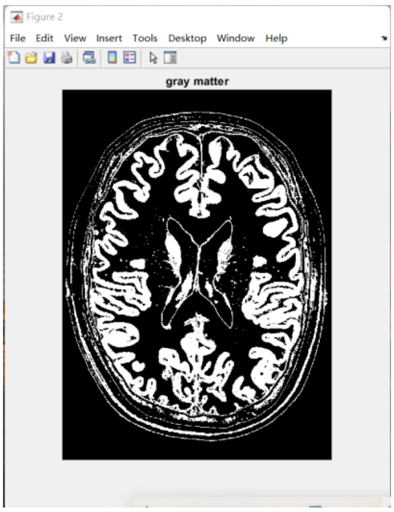
3b



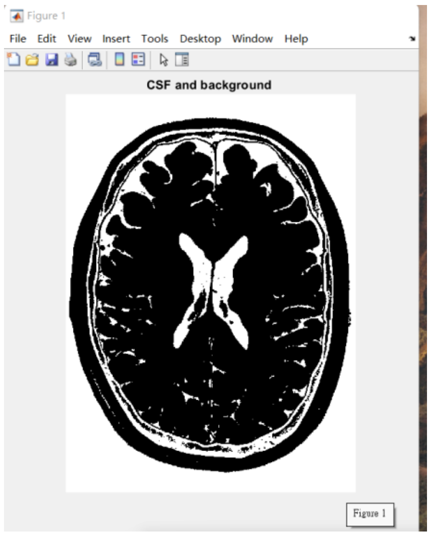
3c



白質



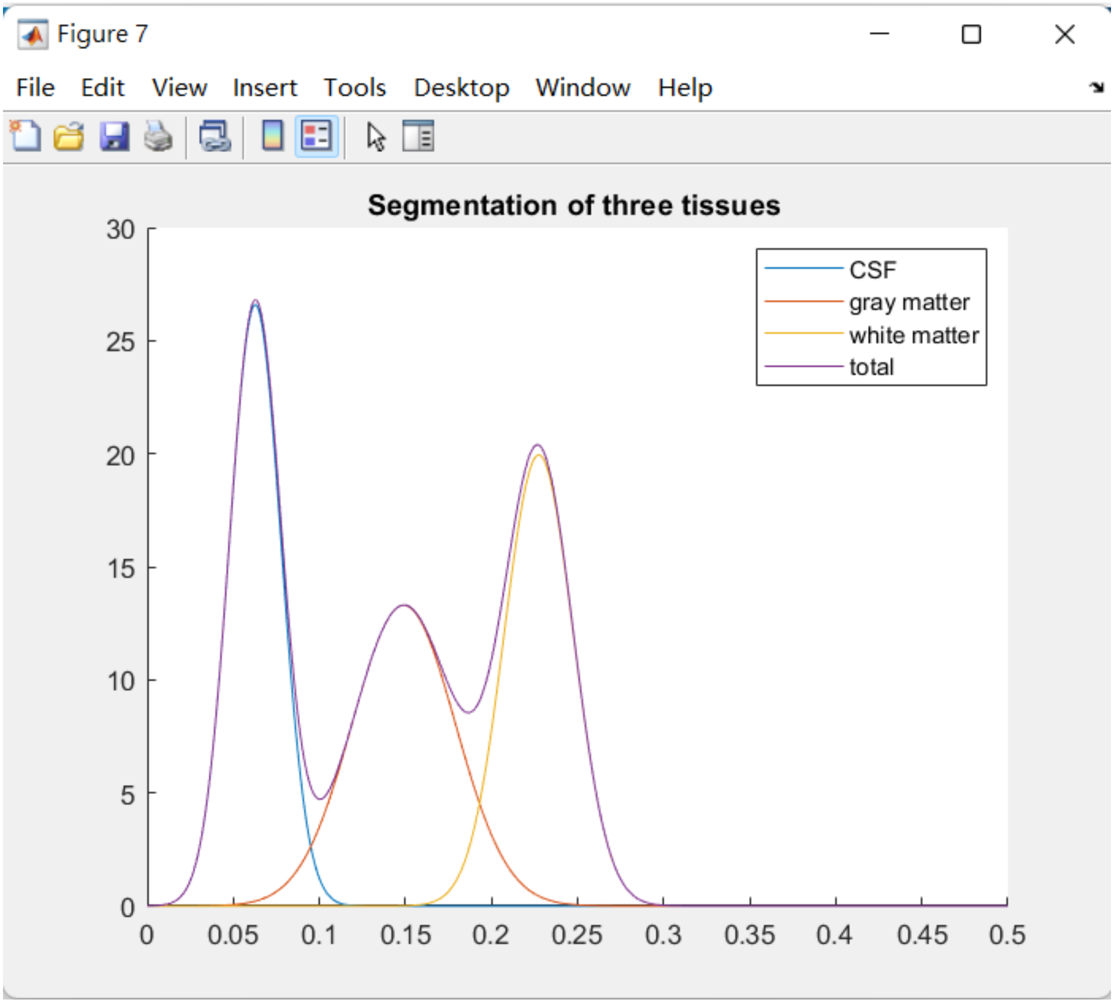
灰質



腦脊髓液

白色部分為選取部分

3d



與 3b 看起來沒有差很多

本次作業與 F74096116 曾瑜華討論