

Deep Learning for Computer Vision

Homework 2

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Problem 1:

$$\text{設 } X = \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} \quad \text{設 } \Phi(X) = \begin{bmatrix} P(x_1, x_2) \\ Q(x_1, x_2) \\ R(x_1, x_2) \end{bmatrix}$$

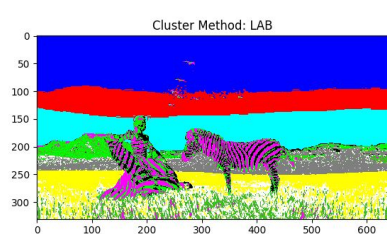
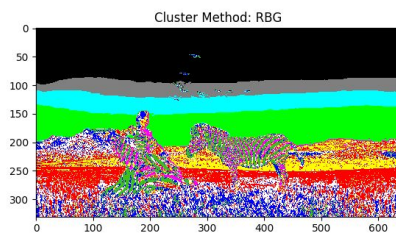
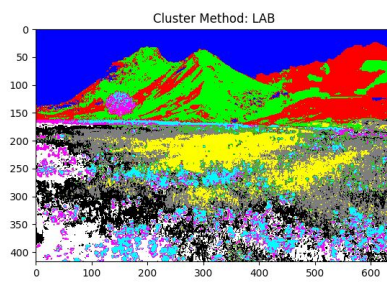
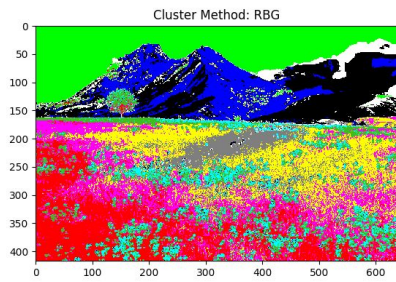
$$\Rightarrow \Phi\left(\begin{bmatrix} a \\ b \end{bmatrix}\right) \cdot \Phi\left(\begin{bmatrix} c \\ d \end{bmatrix}\right) = (ac+bd)^2 = a^2c^2 + 2abcd + b^2d^2$$
$$= P(a,b) \cdot P(c,d) + Q(a,b)Q(c,d) + R(a,b)R(c,d)$$

— 解為 $P(x_1, x_2) = x_1^2$

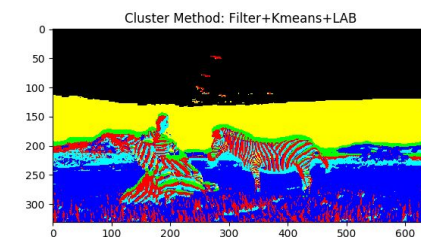
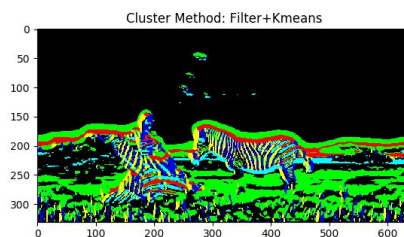
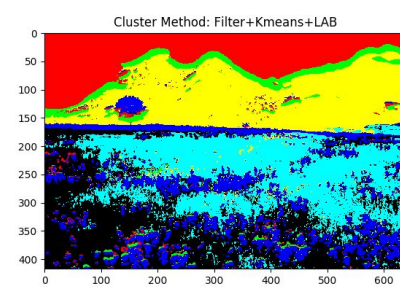
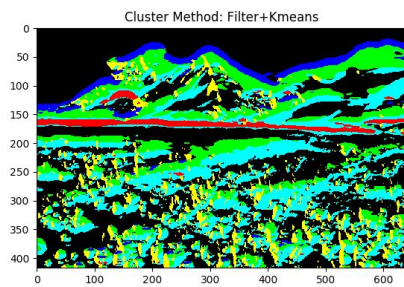
$$Q(x_1, x_2) = x_1 x_2 \times \sqrt{2}$$
$$R(x_1, x_2) = x_2^2$$

Problem 2:

problem 2.a

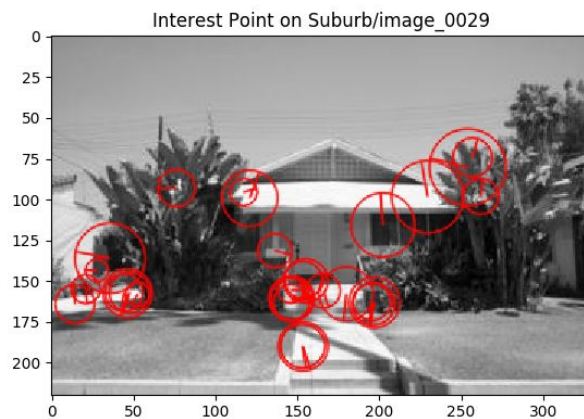


problem 2.b



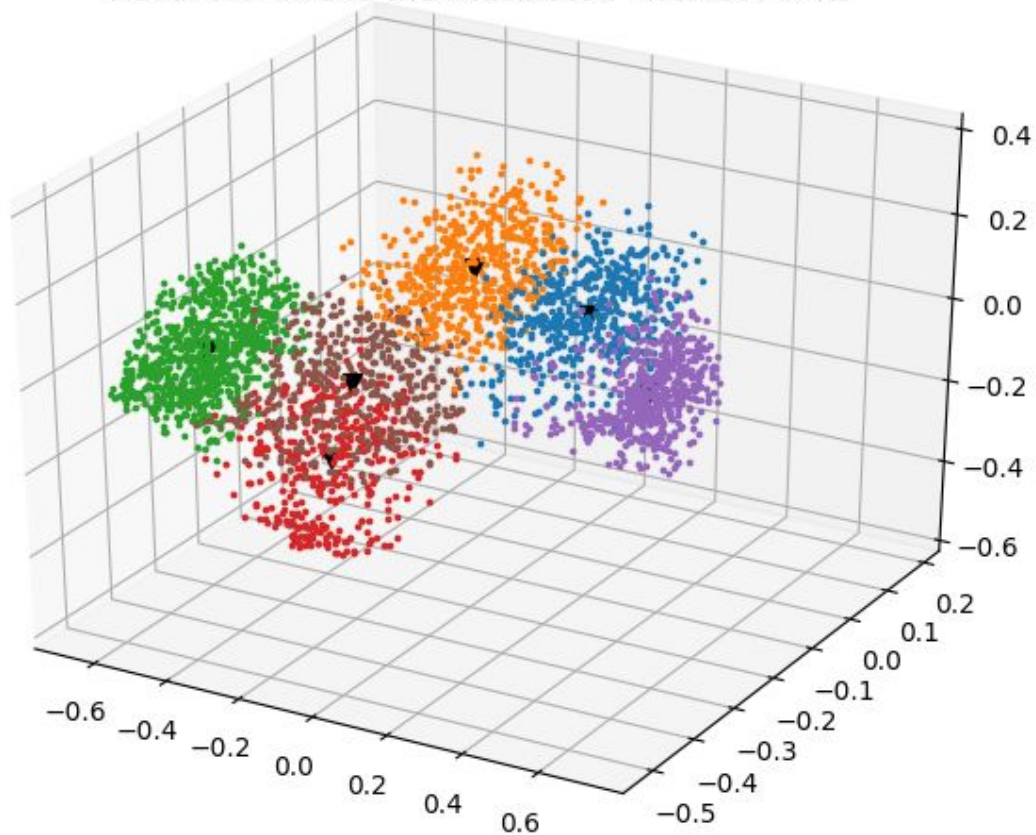
problem 3

problem 3.a



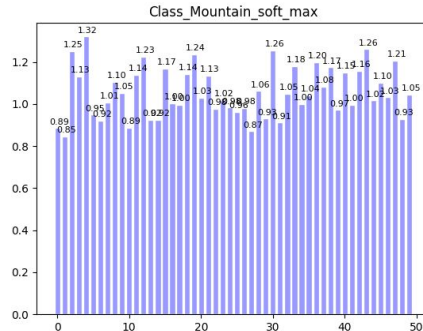
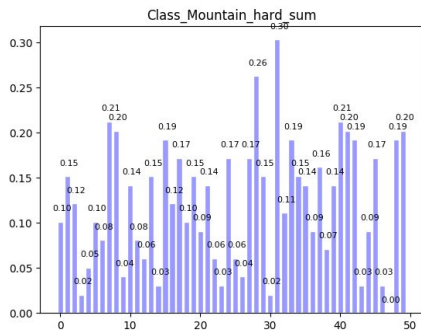
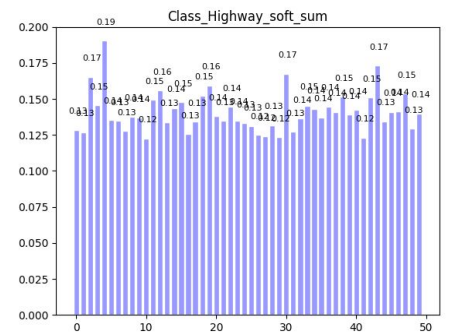
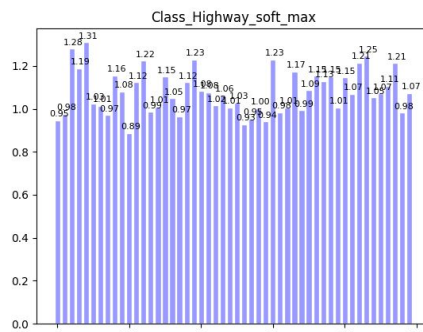
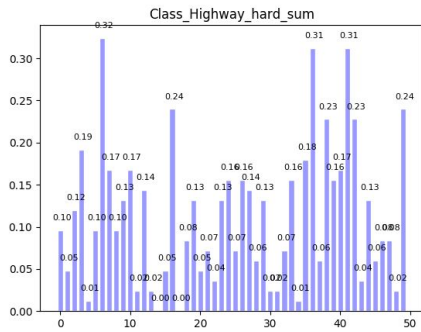
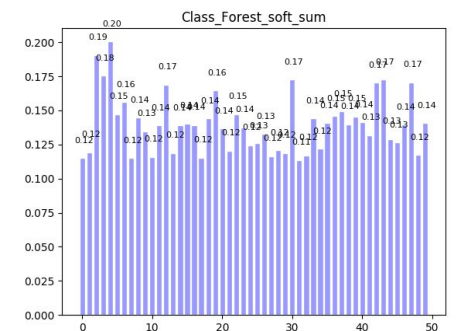
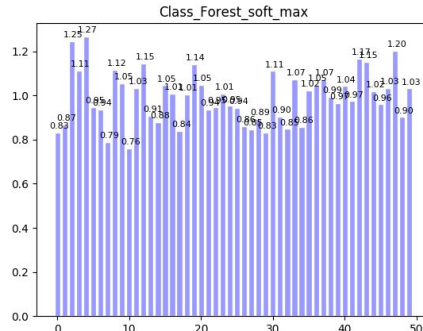
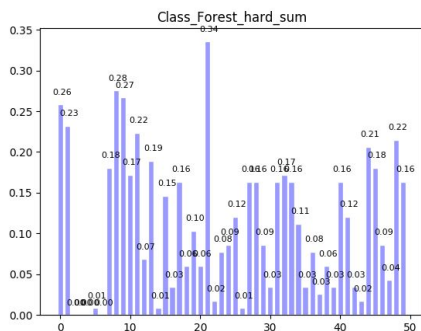
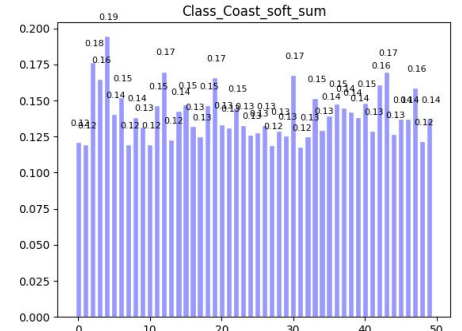
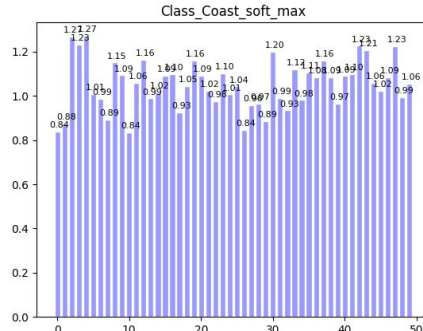
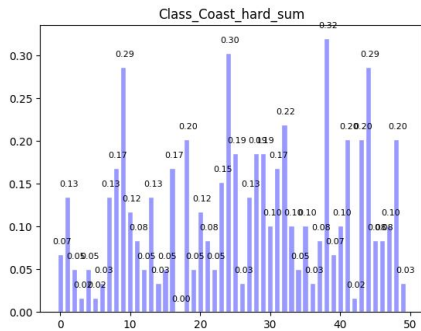
problem 3.b

Visual Words and the Associated Interest Points



黑點代表cluster中心，因為用別的颜色很容易背蓋掉，在嘗試了很多不同颜色的狀況下，我才只好選擇了黑色。

problem 3.c



看的出來 Mode=hard, sum 時，每個feature之間的差異比較大，所以我認為 hard sum 可以達到較高的準確率。

problem 3.d

(i)

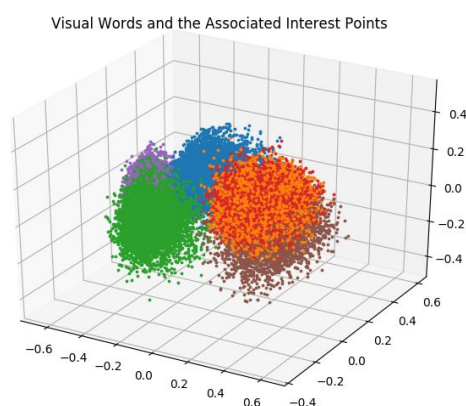
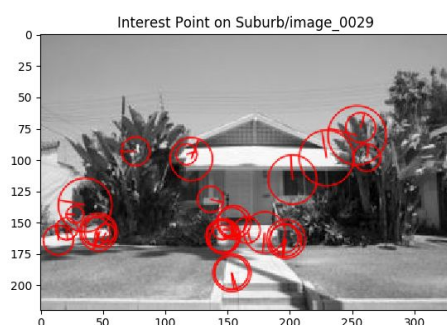
train-10 的準確率

Mode soft max	Accuracy: 47.4%
Mode hard sum	Accuracy: 60.0%
Mode soft sum	Accuracy: 52.6%

跟預期的結果相同

(ii)

train-100的圖



kmeans k=5, max_iter=5000

Knn k=5

Mode soft max	Accuracy: 51.6%
Mode hard sum	Accuracy: 73.2%
Mode soft sum	Accuracy: 64.6%

調到參數最好的狀況是

kmeans k=30, max_iter=5000

Knn k=5

Mode soft max	Accuracy: 53.6%
Mode hard sum	Accuracy: 74.0%
Mode soft sum	Accuracy: 65.4%