

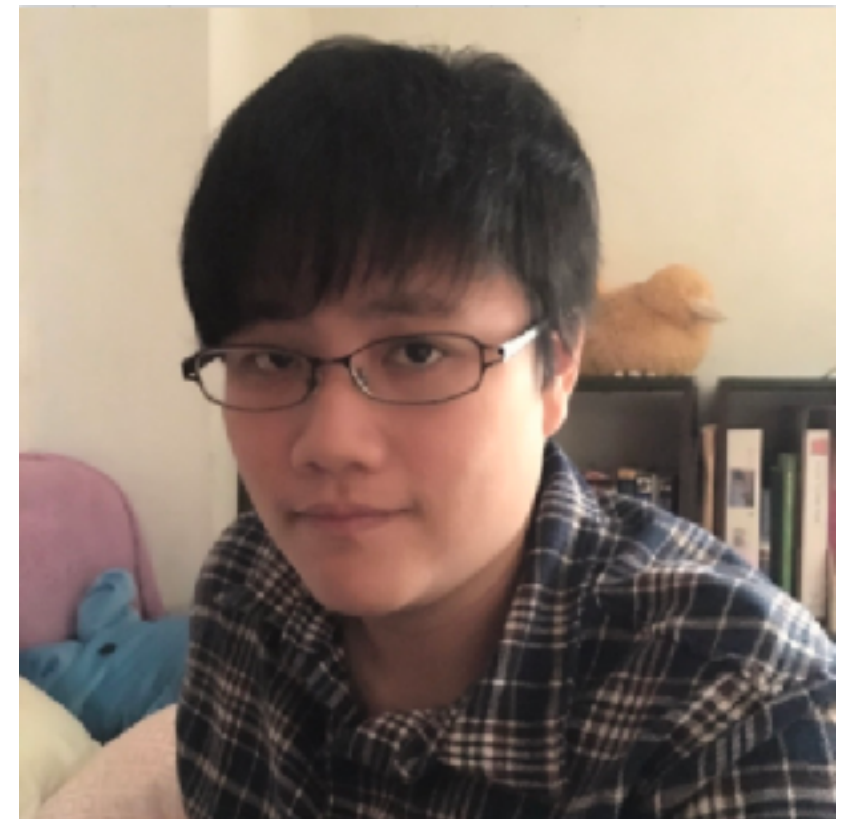
筆跡判定

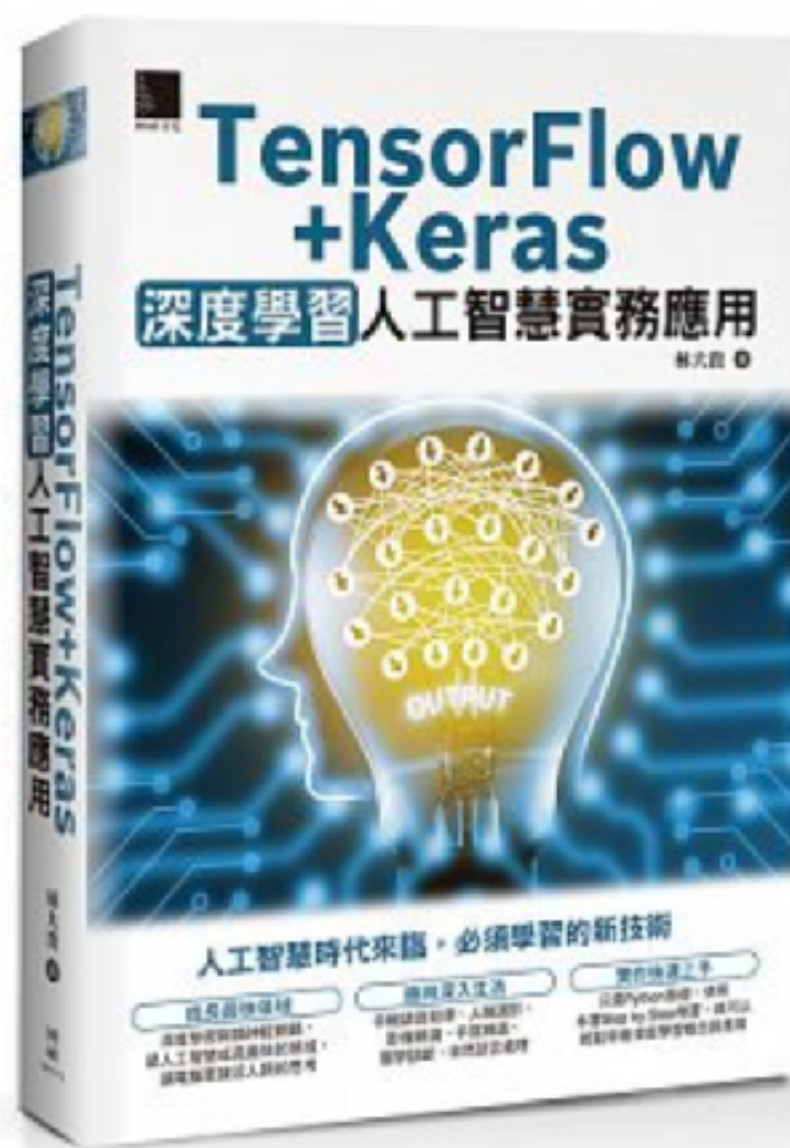
學員 陳祐嘉

簽名比對

About Me

- 政大資管所(2017.07)
- 富邦人壽



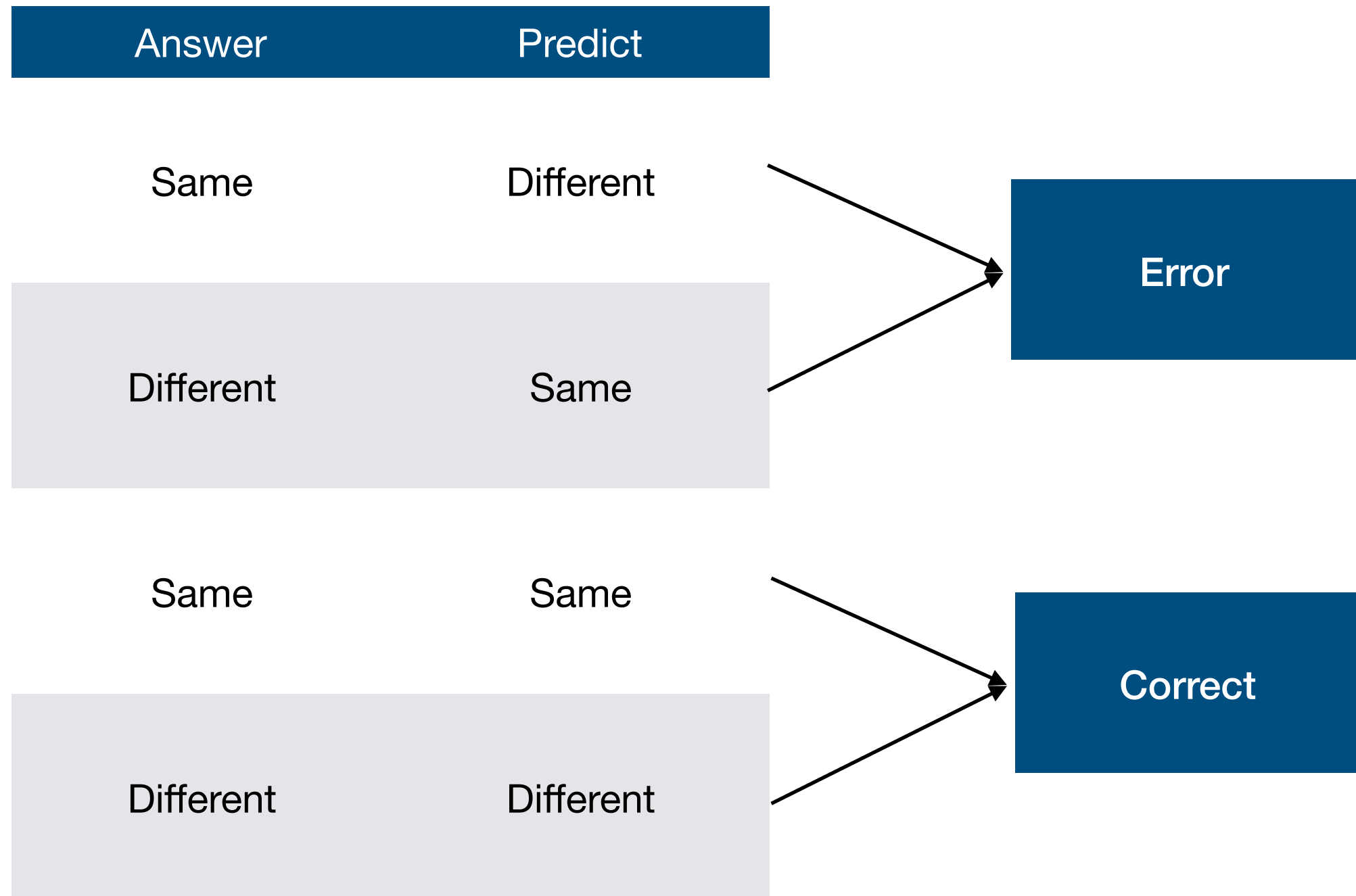


在開始之前...

- 簽名比對不是單純的「分類問題」
- 簽名有分成「線上」及「線下」簽名
- 今天針對的主要在「線下」的部分

成果？

準確率

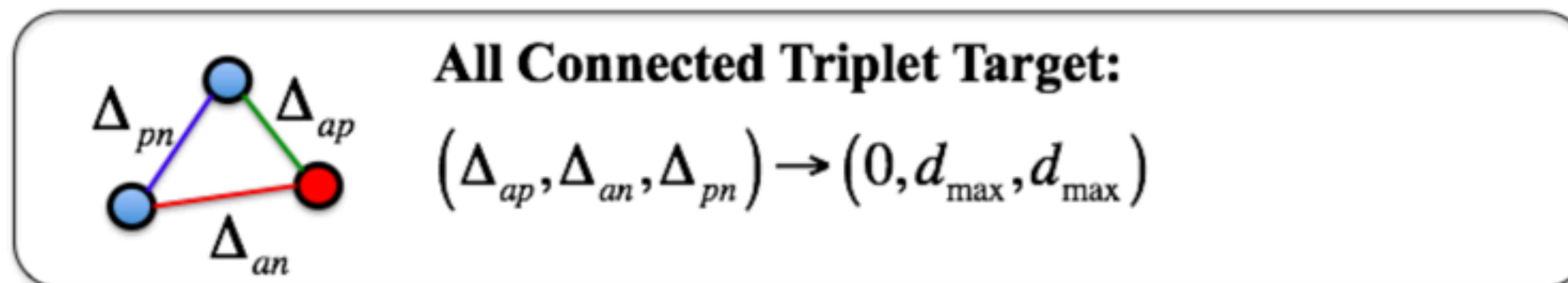
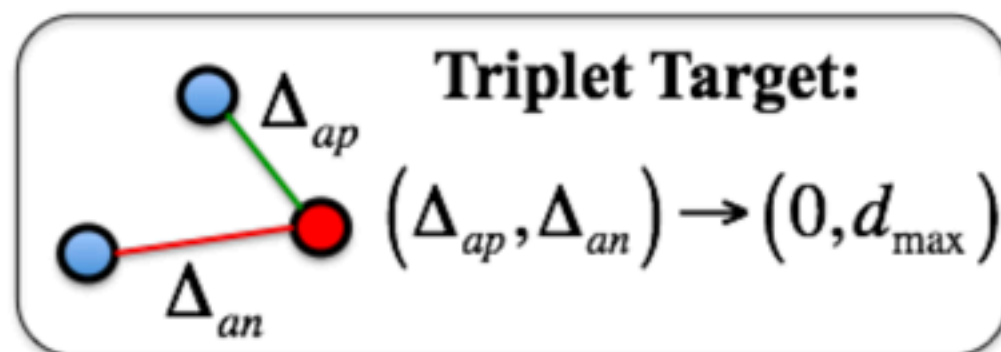
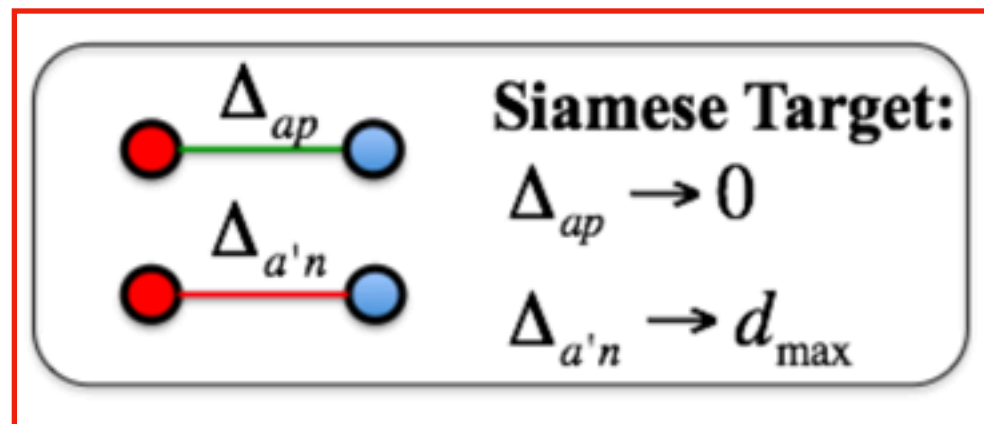


26% ~ 100%

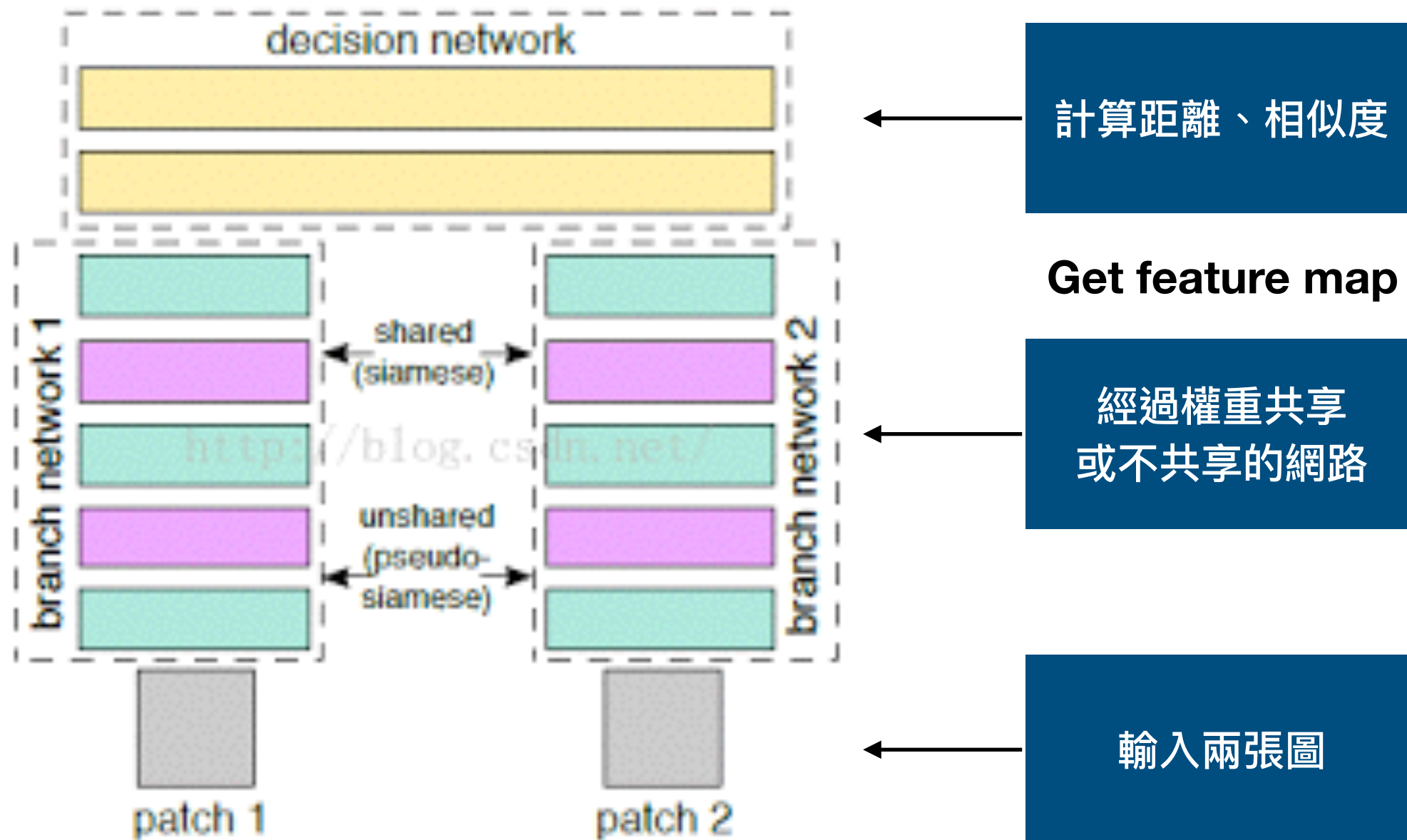
Siamese Network

事情發生在上個禮拜四...

Siamese Target and Triplet Target



Siamese Network



Siamese Network

Euclidean distance

$$\begin{aligned}d(\mathbf{p}, \mathbf{q}) &= d(\mathbf{q}, \mathbf{p}) = \sqrt{(q_1 - p_1)^2 + (q_2 - p_2)^2 + \cdots + (q_n - p_n)^2} \\&= \sqrt{\sum_{i=1}^n (q_i - p_i)^2}.\end{aligned}$$

From wikipedia

Siamese Network

Contrastive loss

$$L(F_1, F_2, Y) = \frac{1}{2}(1 - Y)D(F_1, F_2)^2 + \frac{1}{2}Y\max\{0, m - D(F_1, F_2)\}^2$$

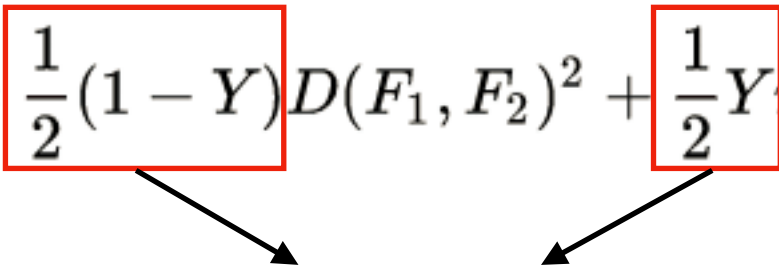
- Training data 中，我們給出成對的圖片
 - 若兩圖相似則給 label = 0
 - 若兩圖不相似則給 label = 1

Siamese Network

Contrastive loss

$$L(F_1, F_2, Y) = \frac{1}{2}(1 - Y)D(F_1, F_2)^2 + \frac{1}{2}Y \max\{0, m - D(F_1, F_2)\}^2$$

Label

The diagram shows the contrastive loss formula. Two terms in the formula are enclosed in red boxes: $\frac{1}{2}(1 - Y)$ and $\frac{1}{2}Y$. Arrows point from these two boxes down to the word "Label" centered below the equation.

- Training data 中，我們給出成對的圖片
 - 若兩圖相似則給 label = 0
 - 若兩圖不相似則給 label = 1

Siamese Network

Contrastive loss

$$L(F_1, F_2, Y) = \frac{1}{2}(1 - Y)D(F_1, F_2)^2 + \frac{1}{2}Y\max\{0, m - D(F_1, F_2)\}^2$$

- $Y = 0$ ，兩圖相似
- $D(F_1, F_2)$ 為距離，距離越小，loss 越小

Siamese Network

Contrastive loss

$$L(F_1, F_2, Y) = \frac{1}{2}(1-Y)D(F_1, F_2)^2 + \frac{1}{2}Y\max\{0, m - D(F_1, F_2)\}^2$$

- $Y = 1$ ，兩圖不相似
- $D(F_1, F_2)$ 為距離，距離越大，loss 越小

Siamese Network

Contrastive loss

$$L(F_1, F_2, Y) = \frac{1}{2}(1-Y)D(F_1, F_2)^2 + \frac{1}{2}Y\max\{0, m - D(F_1, F_2)\}^2$$

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Siamese Network

Contrastive loss

$$L(F_1, F_2, Y) = \frac{1}{2}(1-Y)D(F_1, F_2)^2 + \frac{1}{2}Y \max\{0, m - D(F_1, F_2)\}^2$$

- $Y = 1$ ，兩圖不相似
 - $D(F_1, F_2)$ 為距離，距離越大，loss 越小
 - m 為一個固定值，當 $D(F_1, F_2) < m$ 就會產生損失

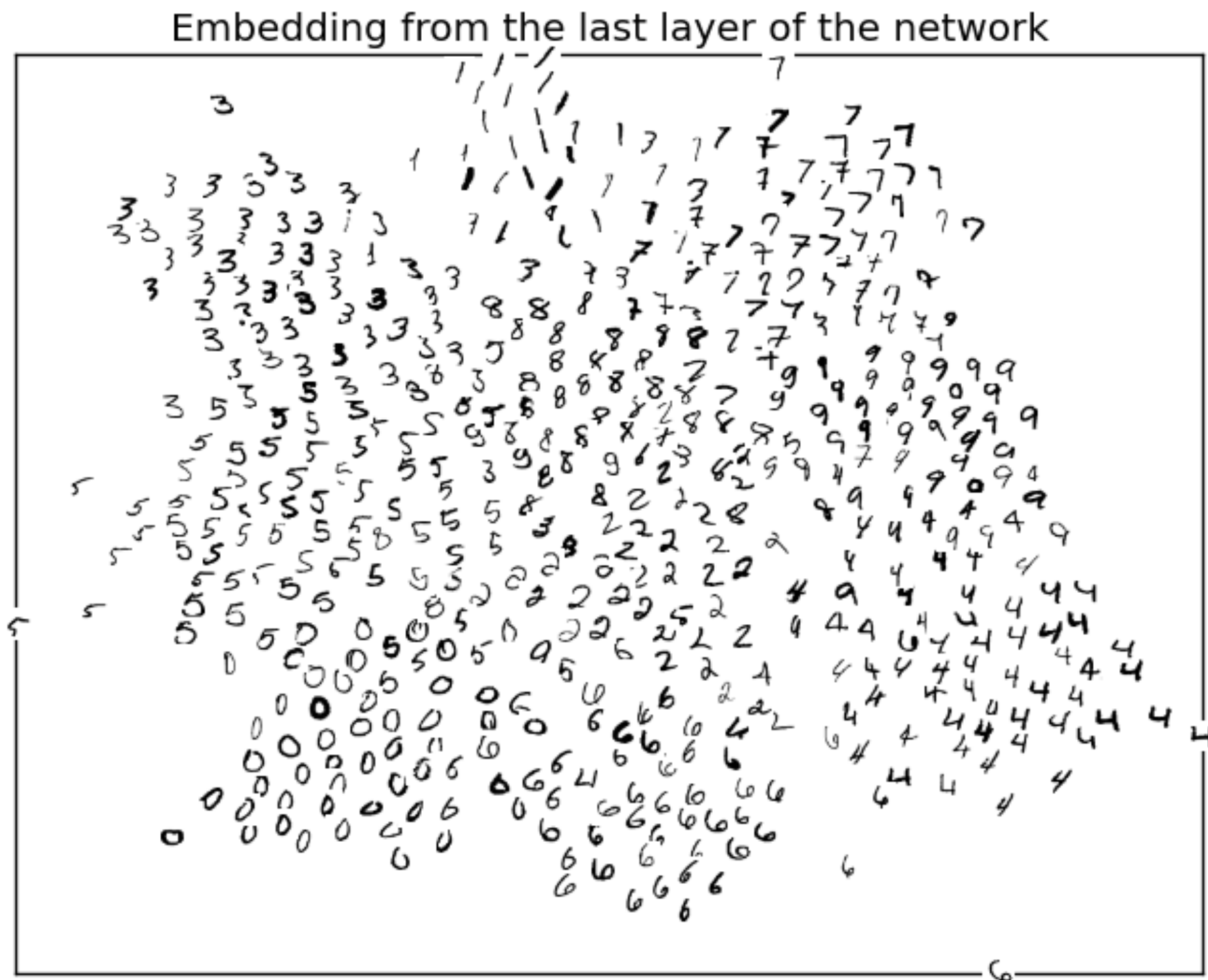
Siamese Network

Contrastive loss

$$L(F_1, F_2, Y) = \frac{1}{2}(1 - Y)D(F_1, F_2)^2 + \frac{1}{2}Y \max\{0, m - D(F_1, F_2)\}^2$$

- 這裡的 loss function 要能判別
 - 對兩張相同標籤的圖片，相似性越大，loss就越小
 - 對兩張不同標籤的圖片，相似性越小，loss就越小

Siamese Network

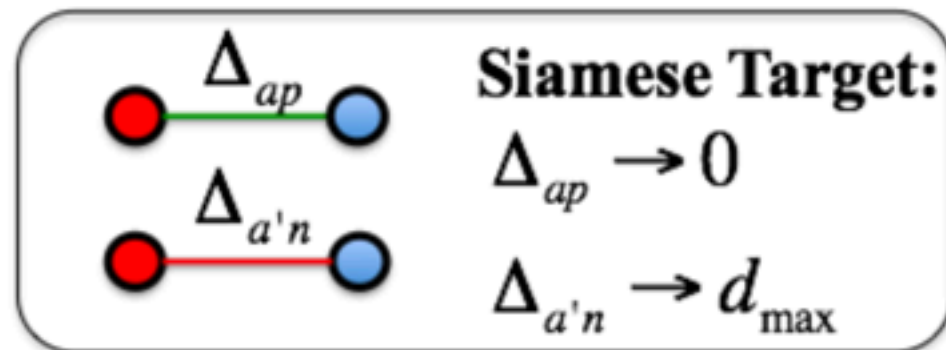


但這不是唯一的方法...

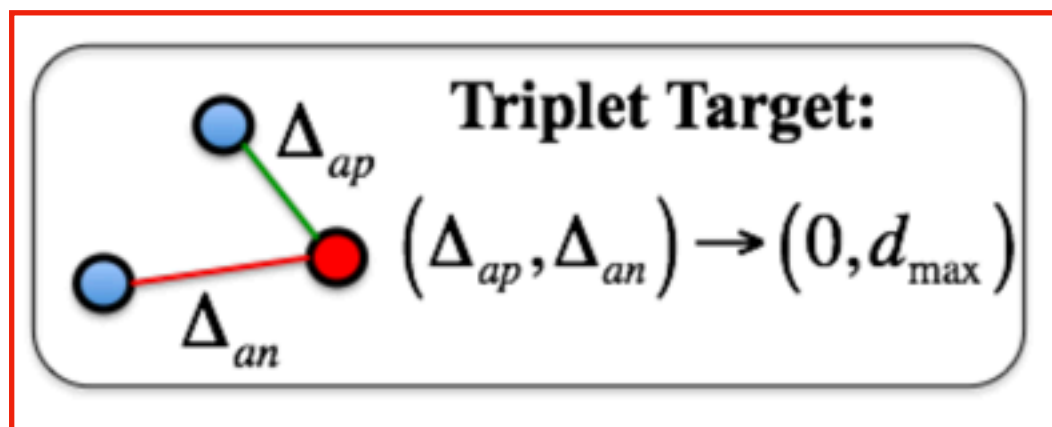
Triplet loss

還是發生在上個禮拜四...

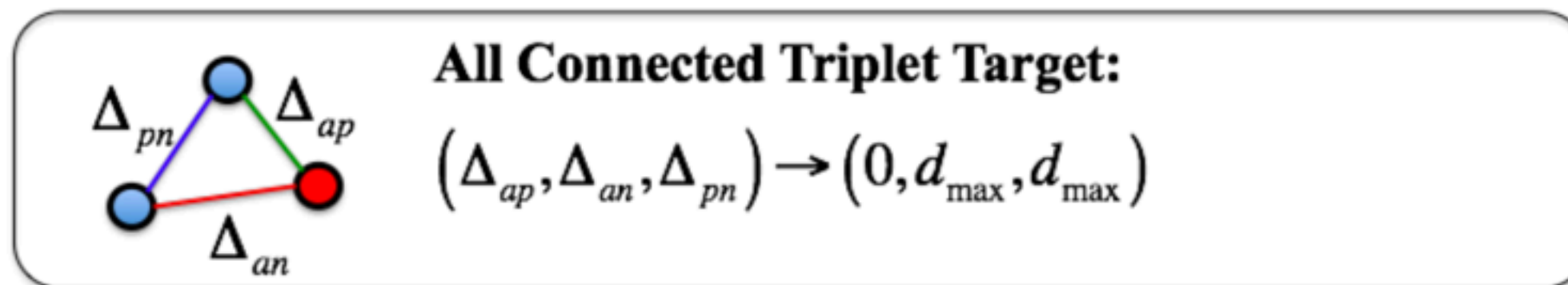
Siamese Target and Triplet Target



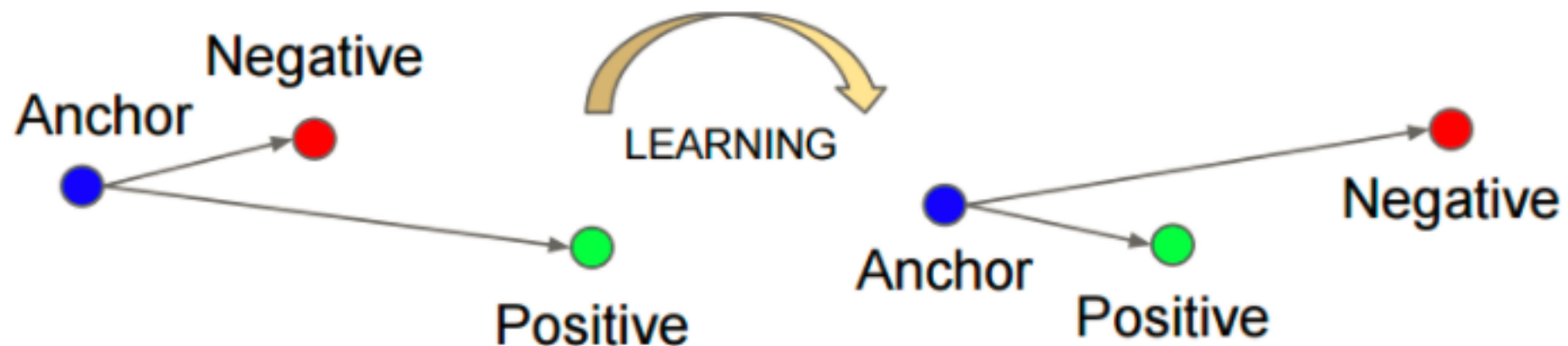
positive pair (a,p) and
negative pair (a',n) are
separated



positive pair (a,p) and
negative pair (a,n) are
linked



Triplet loss

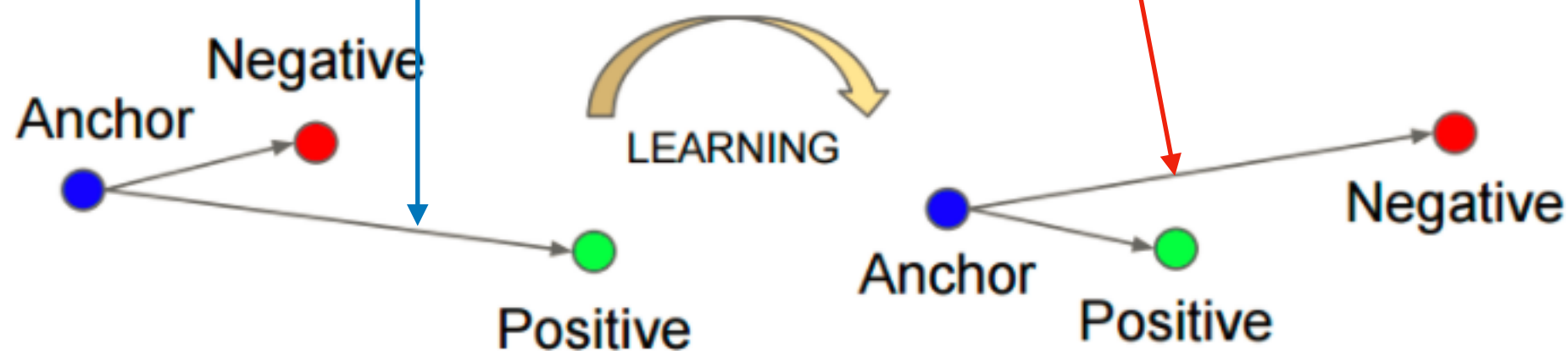


- Triplet 是一個三元組：Anchor, Negative, Positive
- 訓練一個**參數共享或者不共享**的網絡，得到三個元素的特徵表達

Triplet loss

目標函數：

$$\sum_i^N \left[\underbrace{\|f(x_i^a) - f(x_i^p)\|_2^2}_{\text{blue line}} - \underbrace{\|f(x_i^a) - f(x_i^n)\|_2^2}_{\text{red line}} + \alpha \right]_+$$

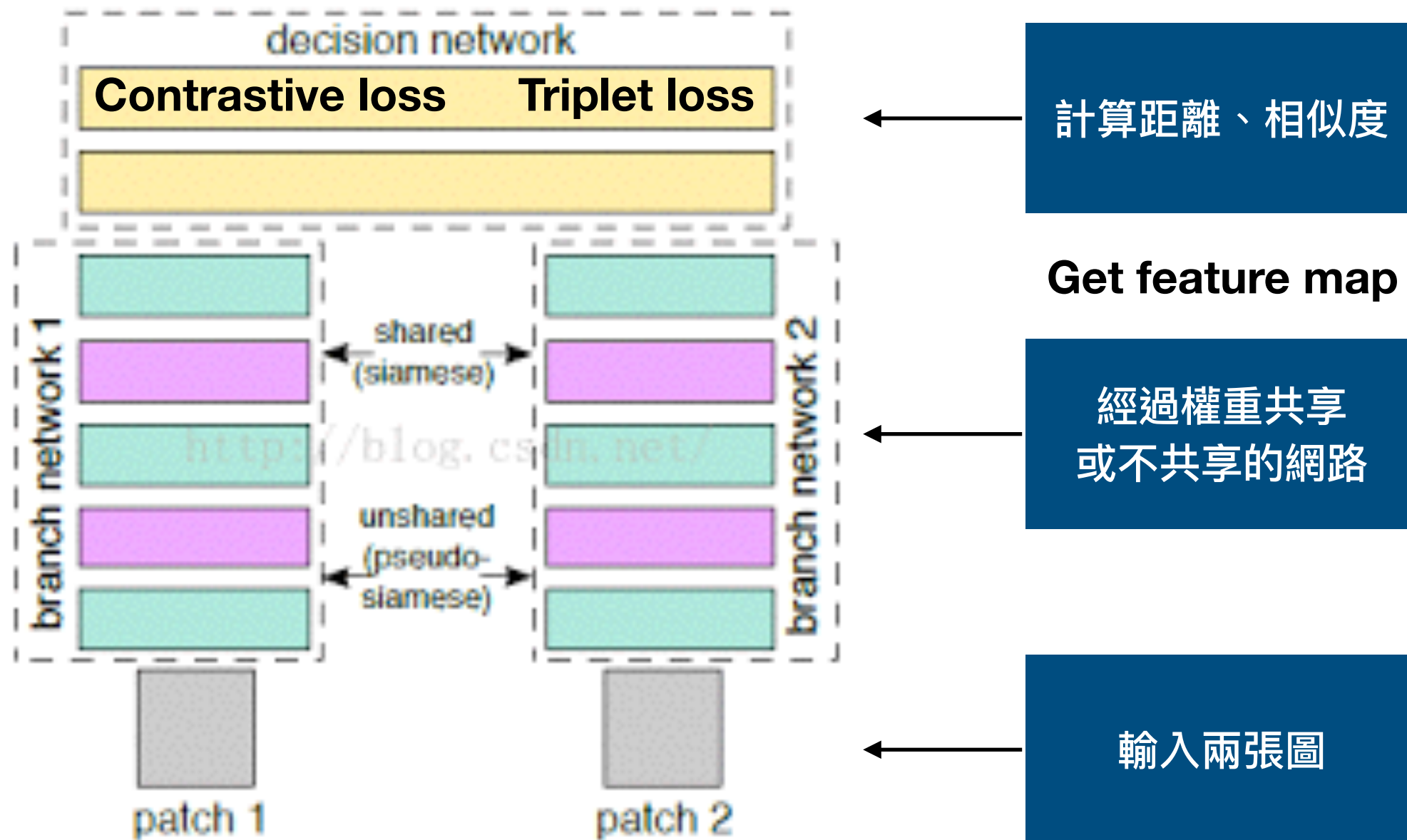


所以我說...Label 呢？



好像...真的沒有

Conclusion



有人還記得我今天的主題是筆跡判定嗎... ?

參考資料

- Siamese paper
 - <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.698.717&rep=rep1&type=pdf> (Signature Verification Using a Siamese Time Delay Neural Network)
- Contrastive loss
 - <http://yann.lecun.com/exdb/publis/pdf/hadsell-chopra-lecun-06.pdf> (Dimensionality Reduction by Learning an Invariant Mapping)
- Triplet loss
 - <http://blog.csdn.net/tangwei2014/article/details/46788025> (triplet loss 原理以及梯度推导)

你們以為結束了嗎...

敲~碗~



Q&A