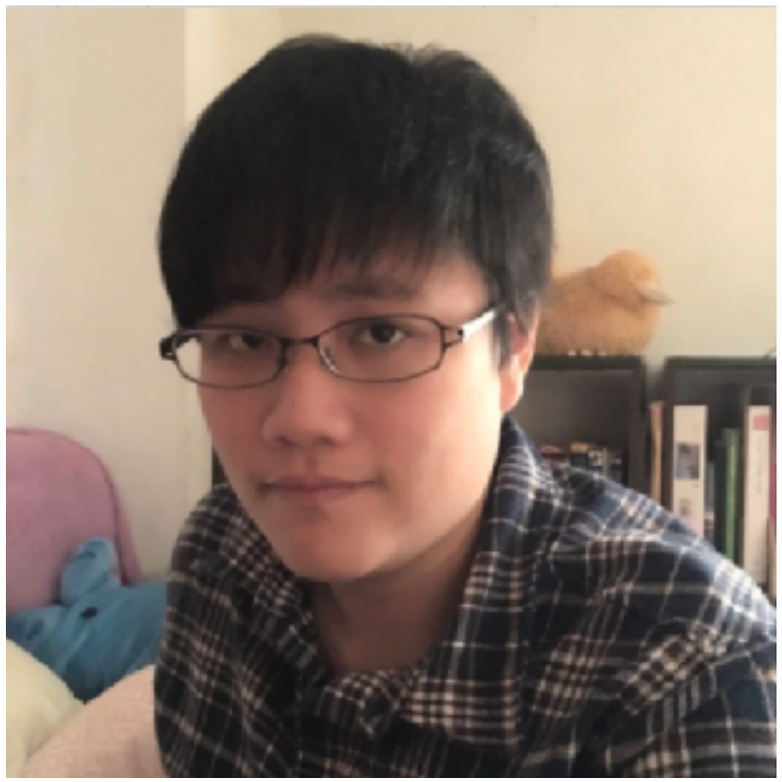
筆跡判定

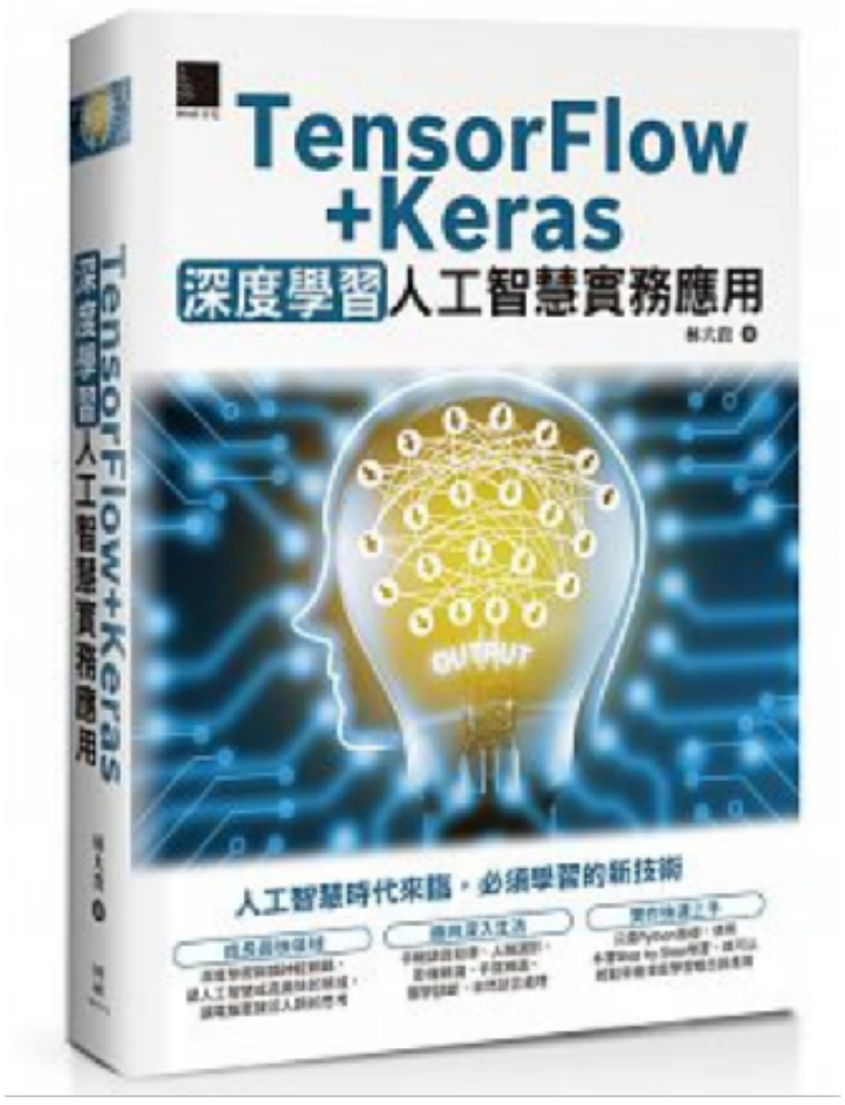
學員 陳祐嘉

簽名比對

About Me

- 政大資管所(2017.07)
- 富邦人壽




TensorFlow
+Keras
深度學習人工智慧實務應用
OUTPUT
人工智慧時代來臨，必須學習的新技術

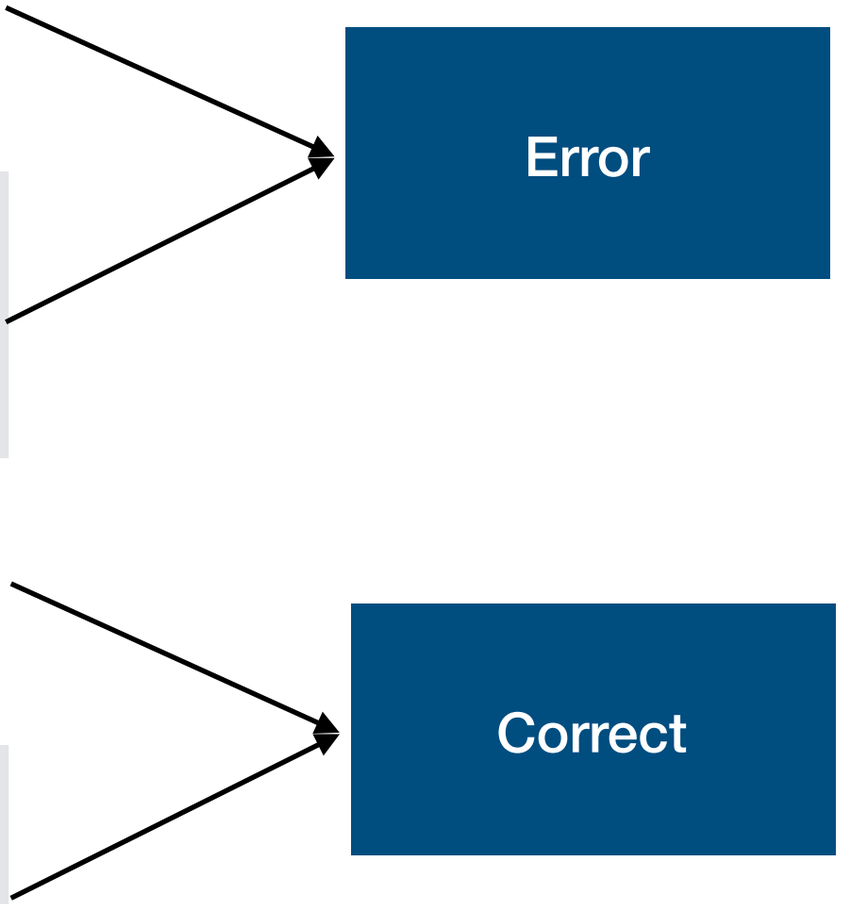
在開始之前...

- 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

Answer	Predict
Same	Different
Different	Same
Same	Same
Different	Different



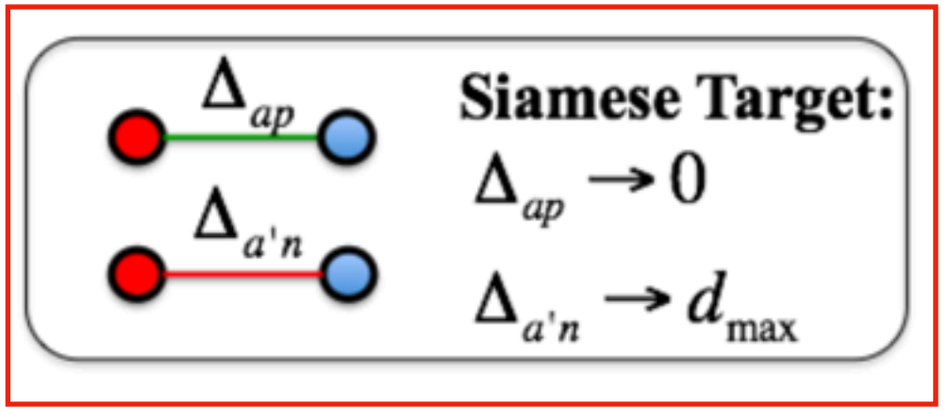
87%

26%~100%

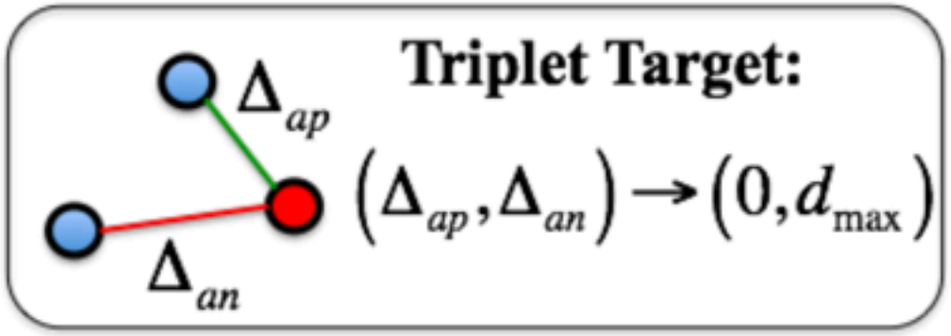
Siamese Network

事情發生在上個禮拜四...

Siamese Target and Triplet Target



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



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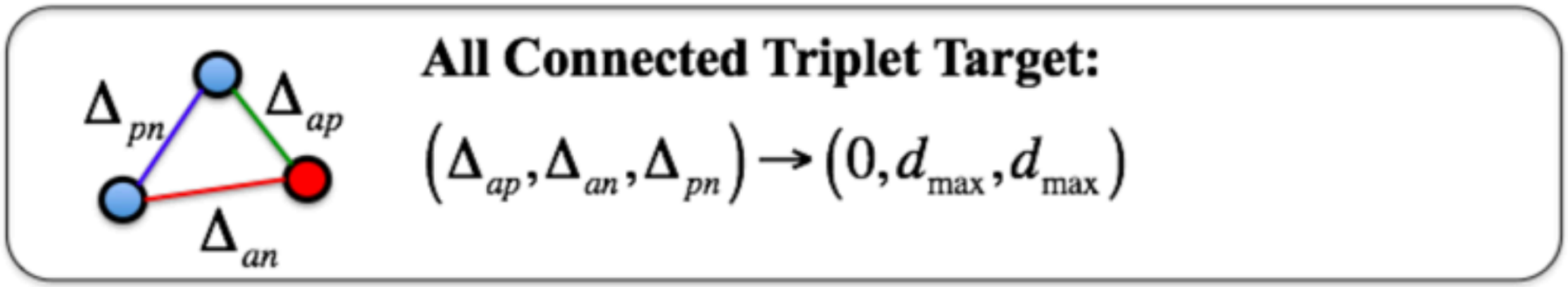

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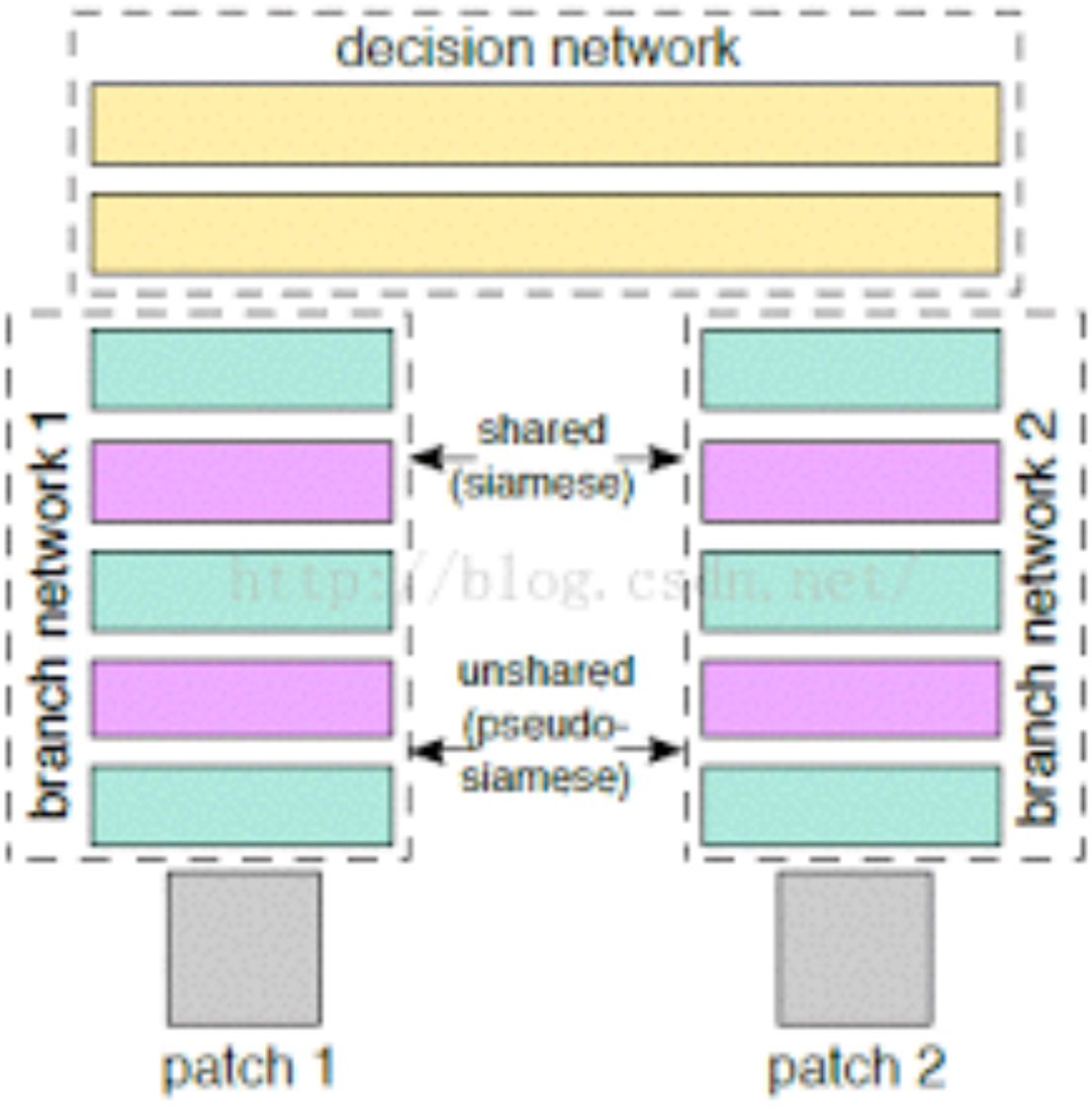
Siamese Network



計算距離、相似度

Get feature

經過權重共享
或不共享的網路

輸入兩張圖

Siamese Network

Euclidean distance

$$\mathrm{d}(\mathbf{p}, \mathbf{q}) = \mathrm{d}(\mathbf{q}, \mathbf{p}) = \sqrt{(q_1 - p_1)^2 + (q_2 - p_2)^2 + \cdots + (q_n - p_n)^2}$$

$$= \sqrt{\sum_{i=1}^{n} (q_i - p_i)^2}.$$

From wikipedia

Siamese Network

Contrastive loss

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

- 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

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

Contrastive loss

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

- Y = 0，兩圖相似
  - D(F1,F2) 為距離，距離越小，loss越小

Siamese Network

Contrastive loss

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

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Siamese Network

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- Y = 1，兩圖不相似
  - D(F1,F2) 為距離，距離越大，loss越小
  - m為一個固定值，當D(F1,F2) < m就會產生損失

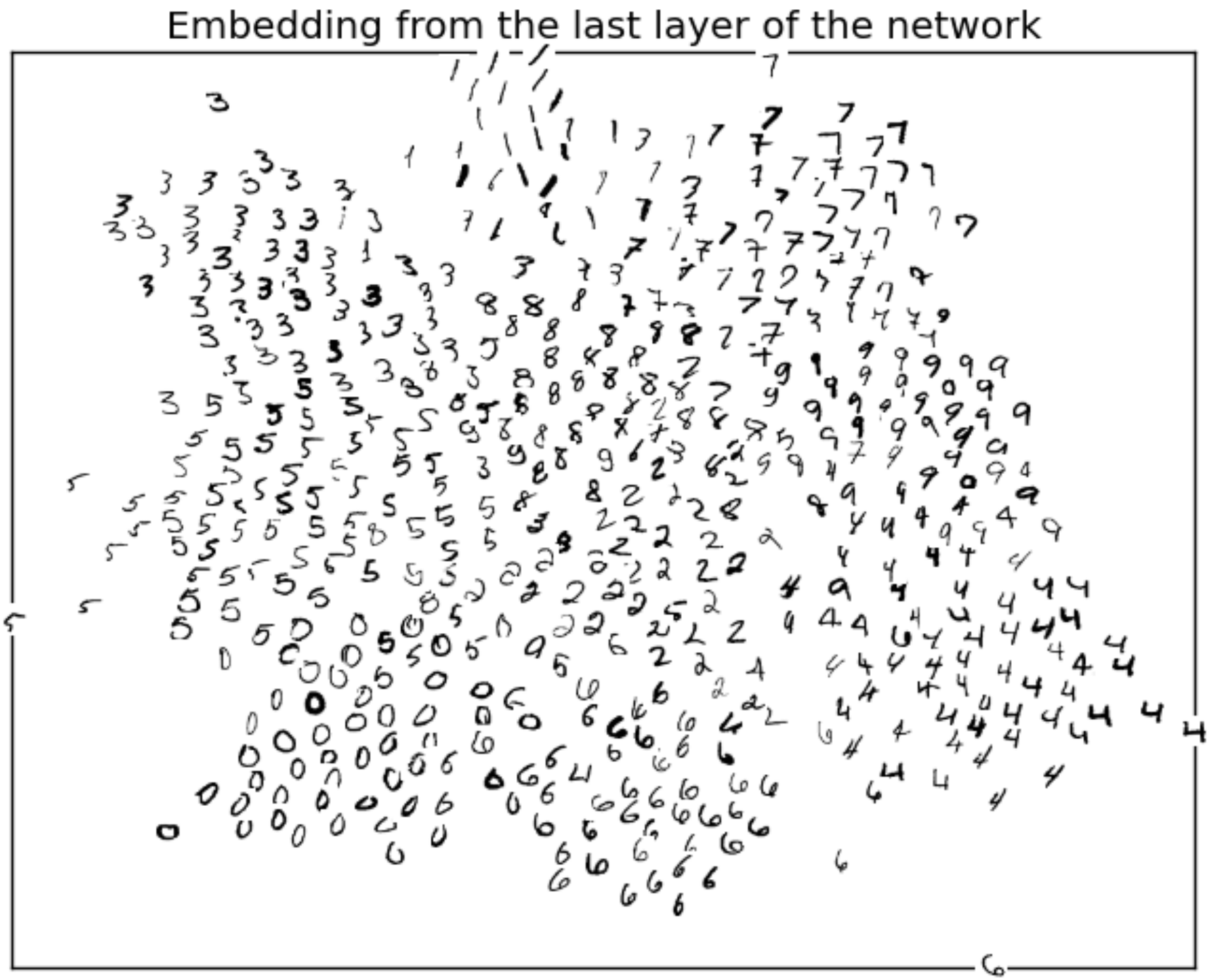
Siamese Network

Contrastive loss

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

- 這裡的 loss function 要能判別，對兩張圖片
  - 相似性越大，距離越近，loss就越小
  - 相似性越小，距離越遠，loss就越小

Siamese Network

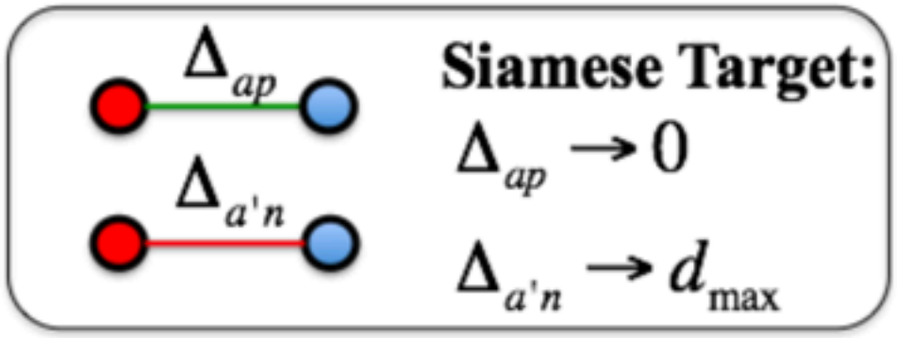


但這不是唯一的方法...

Triplet loss

還是發生在上個禮拜四...

Siamese Target and Triplet Target



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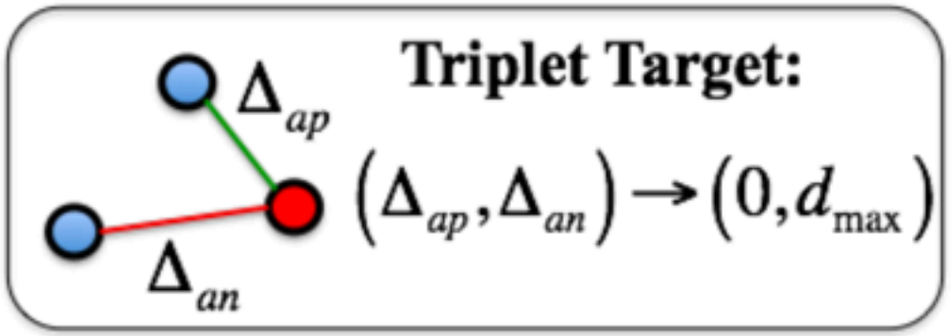

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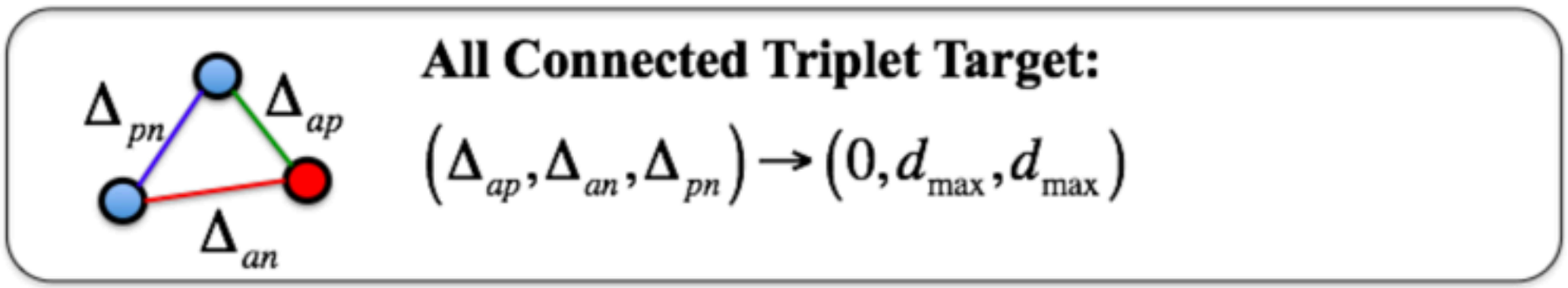

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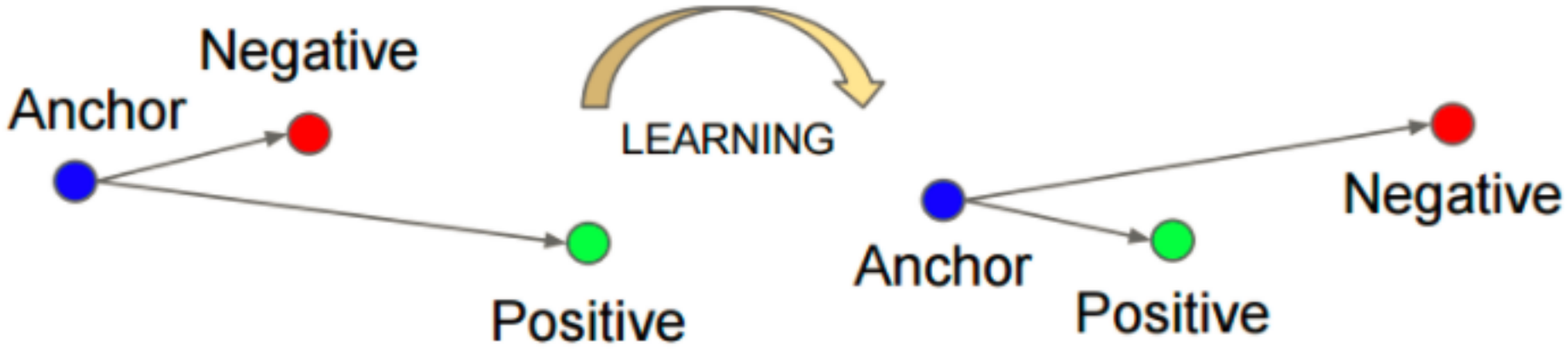
Triplet loss

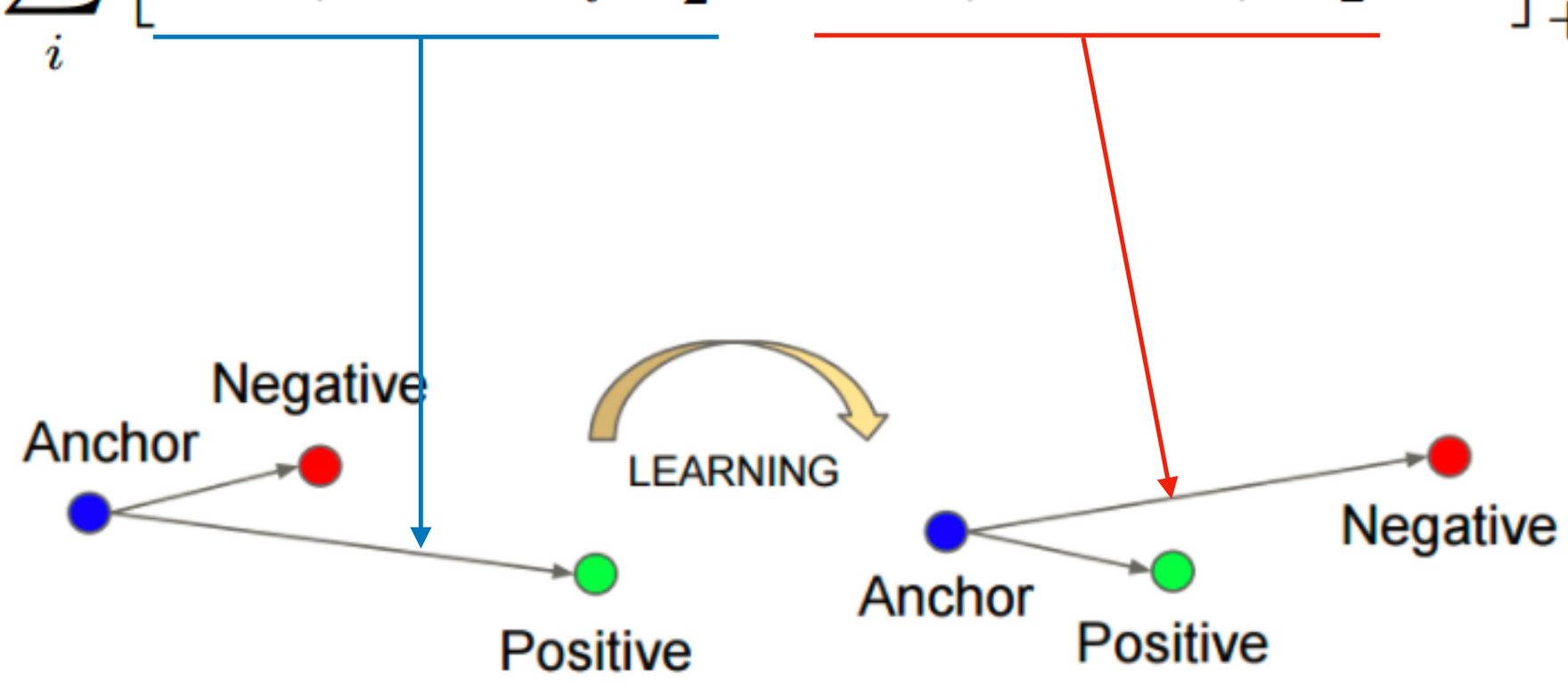


- Triplet 是一個三元組：Anchor, Negative, Positive
- 訓練一個**參數共享或者不共享**的網絡，得到三個元素的特徵表達

Triplet loss

目標函數：

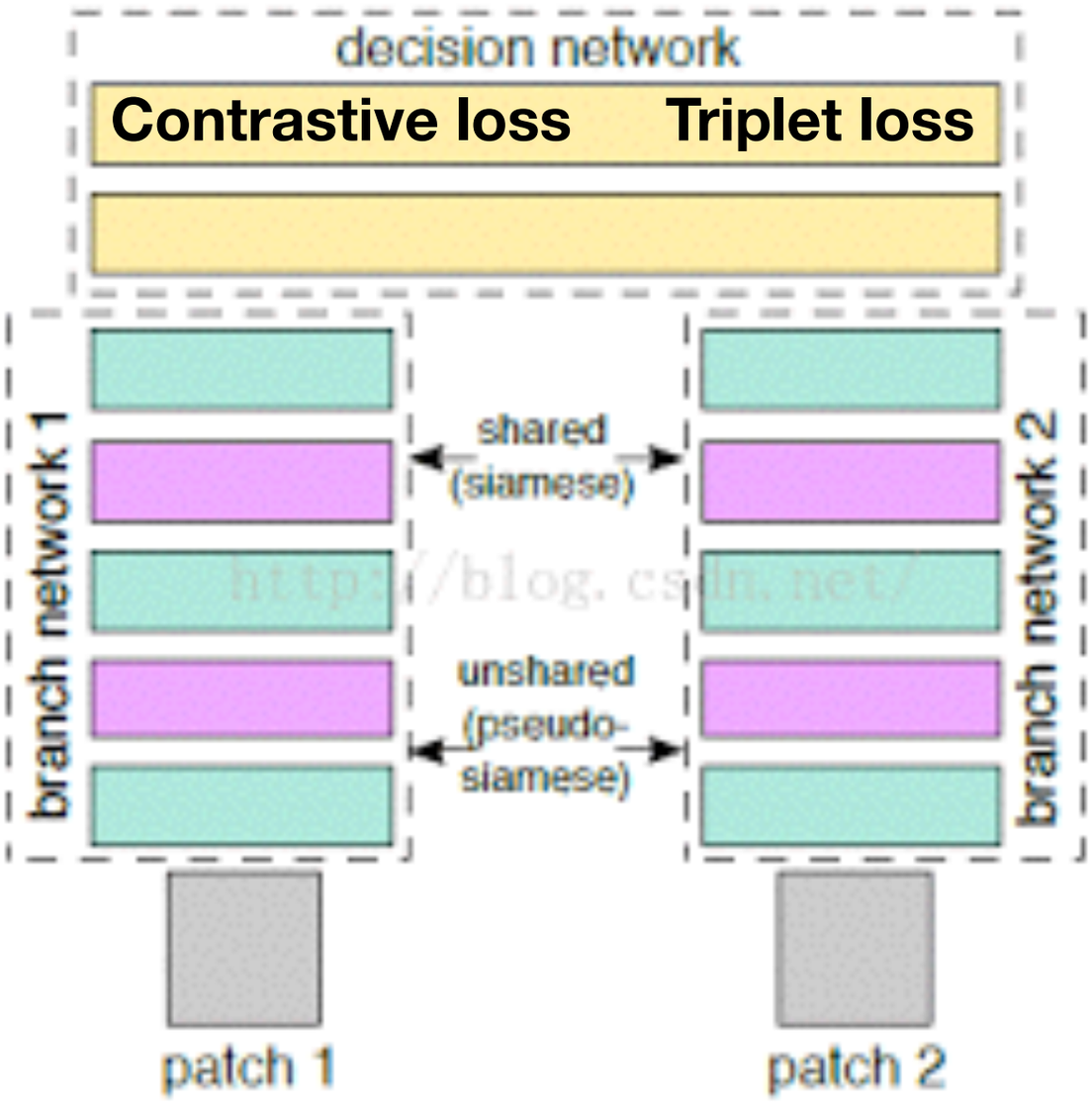
$$\sum_{i}^{N}\left[\|f(x_i^a)-f(x_i^p)\|_2^2-\|f(x_i^a)-f(x_i^n)\|_2^2+\alpha\right]_+$$



所以我說...Label 呢？

好像...真的沒有

Conclusion



計算距離、相似度

Get feature

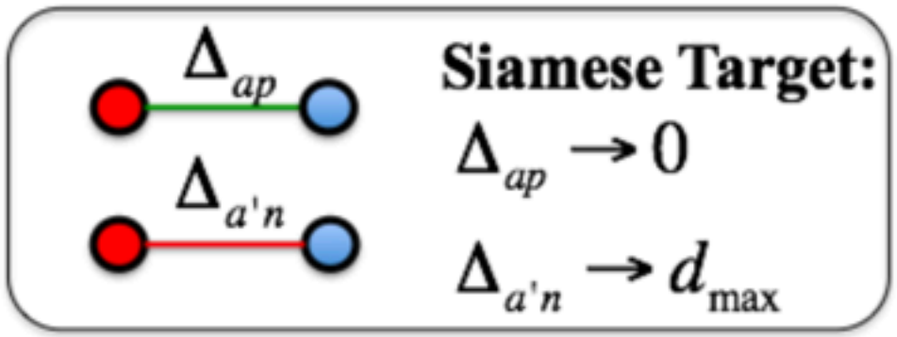
經過權重共享
或不共享的網路

輸入兩張圖

有人還記得我今天的主題是筆跡判定嗎...？

我保證這是最後一次出現...

Siamese Target and Triplet Target



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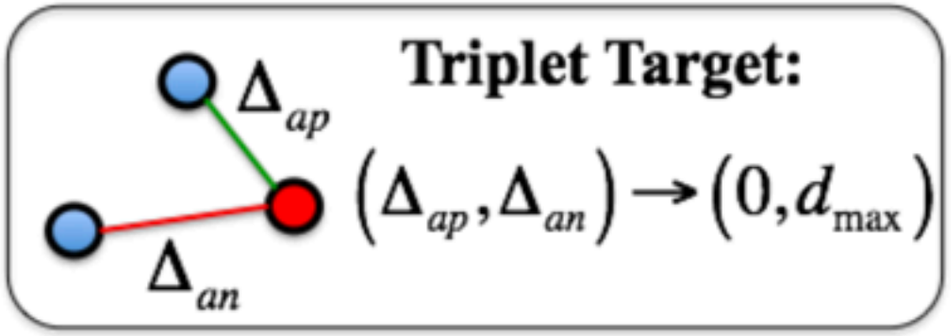

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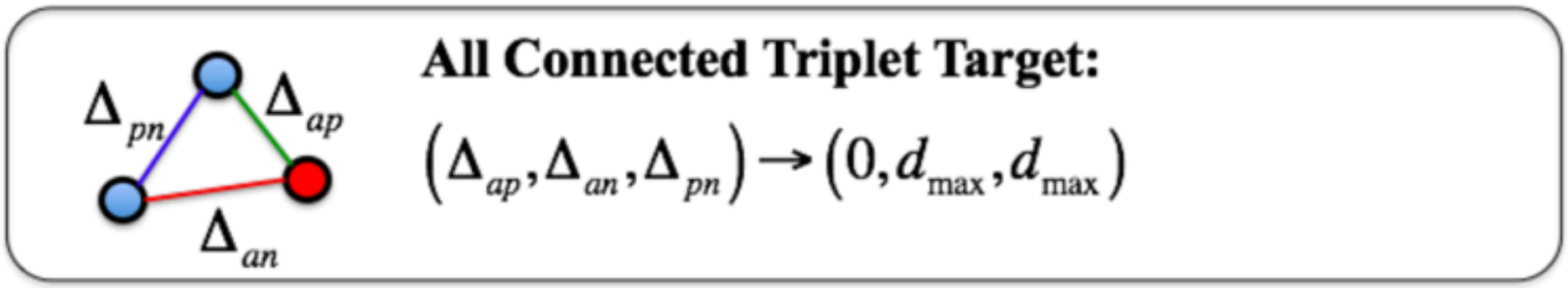

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參考資料

- 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

你說資料？

自己的簽名 x 30

自己的簽名 x 30

模仿別人的簽名 x 30

模仿別人的簽名 x 30

自己的簽名 x 30

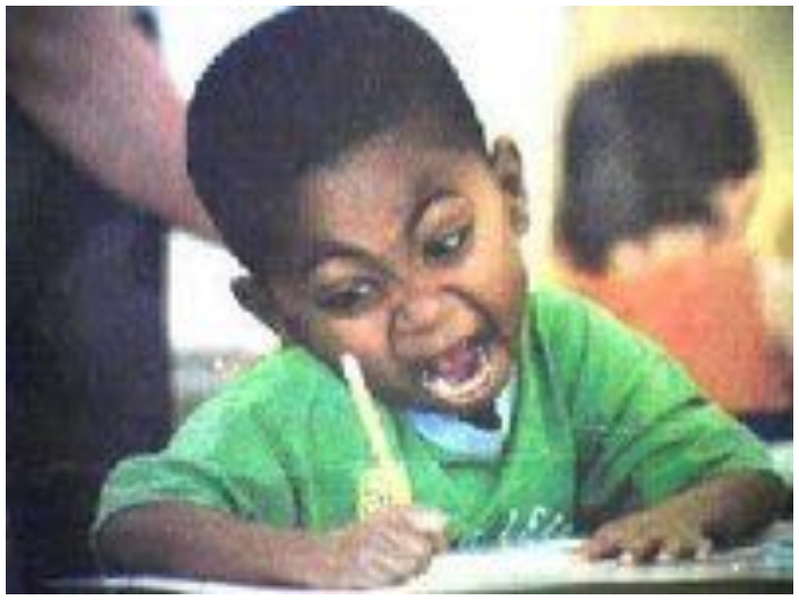
自己的簽名 x 30

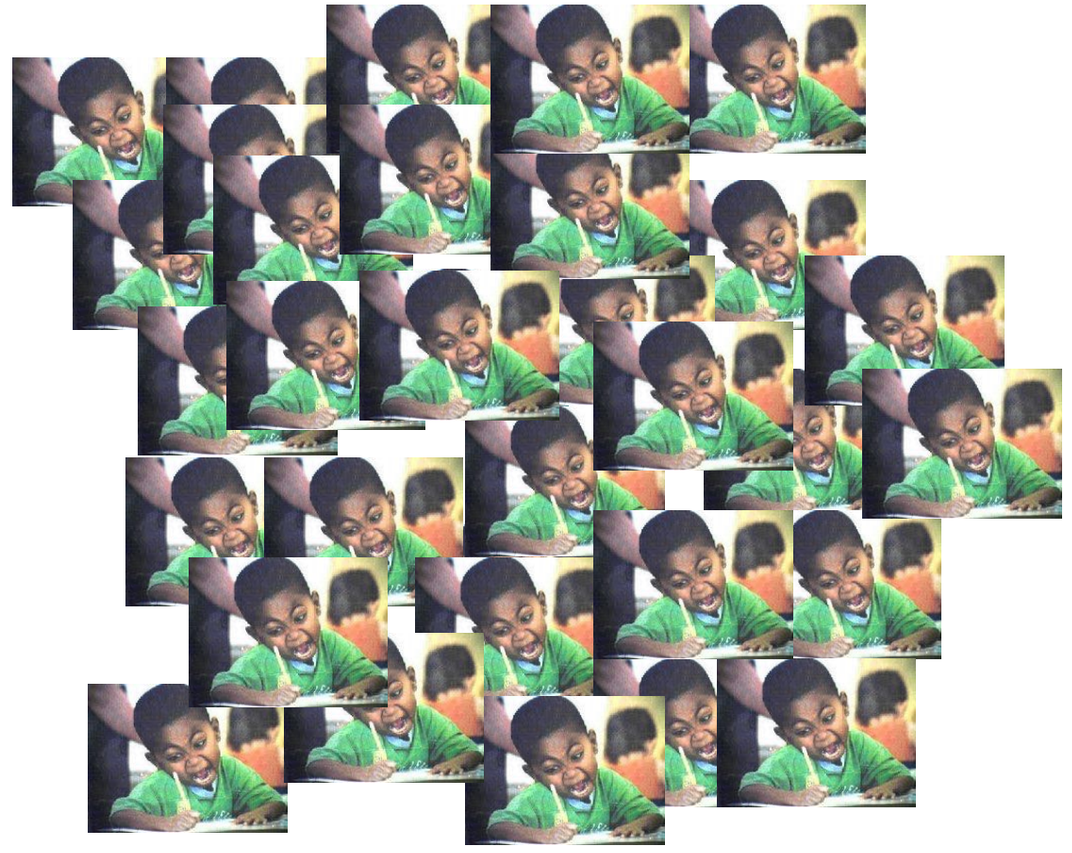
模仿別人的簽名 x 30

模仿別人的簽名 x 30

For training

For testing





自己的簽名 x 30

自己的簽名 x 30

900 Positive pairs

模仿別人的簽名 x 30

900 negative pairs

模仿別人的簽名 x 30

謝謝大家