



face recog



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Face recognition

What is face
recognition?

Face recognition



[Courtesy of Baidu]

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Face recognition
+ liveness detection (real person, not picture)

Face verification vs. face recognition

→ Verification (Not so hard)

- Input image, name/ID
- Output whether the input image is that of the claimed person

1:1

99%

99.9

"one-to-one problem"

~~the person is~~

→ Recognition (harder task)

- Has a database of K persons
- Get an input image
- Output ID if the image is any of the K persons (or "not recognized")

1:K

harder

need higher precision.

K=100 ←

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one shot learning



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Face recognition

One-shot learning

"one-shot" learning

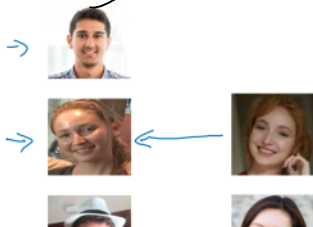
Challenge

Have to learn from

one picture to recognize a person

In many other tasks, need many a large training set

One-shot learning

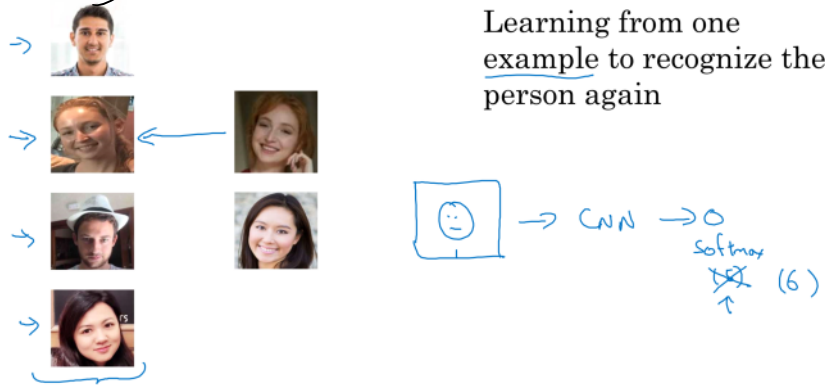


Learning from one example to recognize the person again

☹️ → CNN → 0

Also, one new member requires re-training the whole model?
— another challenge

One-shot learning



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Also, one new member requires re-training the whole model?
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Learning a “similarity” function

→ $d(\text{img1}, \text{img2}) = \text{degree of difference between images}$

If $d(\text{img1}, \text{img2}) \leq \tau$ “same”
If $d(\text{img1}, \text{img2}) > \tau$ “different” } Verification.



$d(\text{img1}, \text{img2})$

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function
learning (d)

Input a pair of image, tell if they are the same person.

Output ~~same~~ how similar/diff

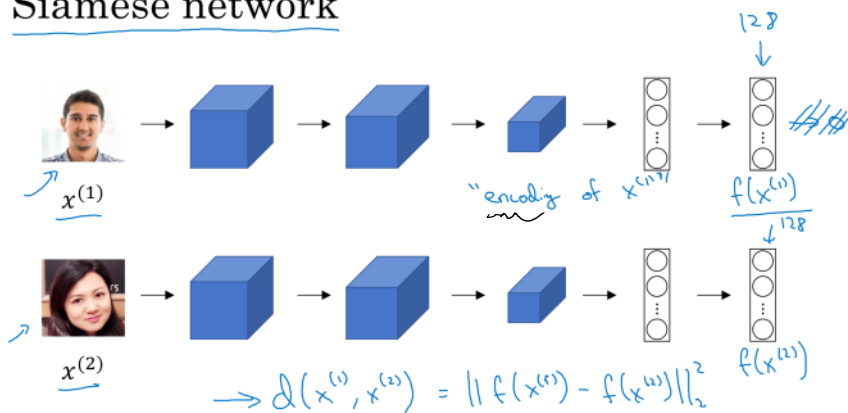


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Face recognition

Siamese network

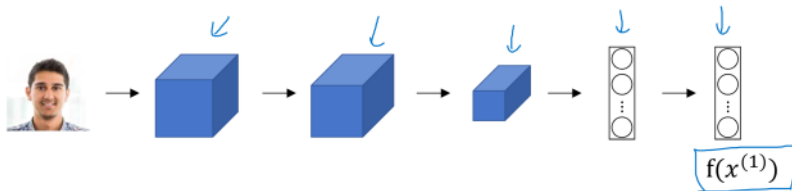
Siamese network



[Taigman et. al., 2014] DeepFace closing the gap to human level performance]

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Goal of learning



Parameters of NN define an encoding $f(x^{(i)})$ *128*

Learn parameters so that:

If $\underline{x^{(i)}}, \underline{x^{(j)}}$ are the same person, $\|f(x^{(i)}) - f(x^{(j)})\|^2$ is small.

If $x^{(i)}, x^{(j)}$ are different persons, $\|f(x^{(i)}) - f(x^{(j)})\|^2$ is large.

loss function $\frac{1}{2} \|x^{(i)} - x^{(j)}\|^2$...

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triplet loss



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Triplet loss

want same
encoding

want different encoding.

Always look at 3 images at a time

an anchor positive negative
A P

"Margin"

Add ② so that the model won't set all
encodings so that $f(l) \approx 0$

force the map —
doesn't care how much negative it is

Do need A and P. need multiple pictures of the
Same person.

- Can't train the cys with one pic for
one person
- But after train, can use the model
for one-shot learning problem

↑ the computational efficiency.

Hard example so that the gradient
descent works to make the model
right

so that.

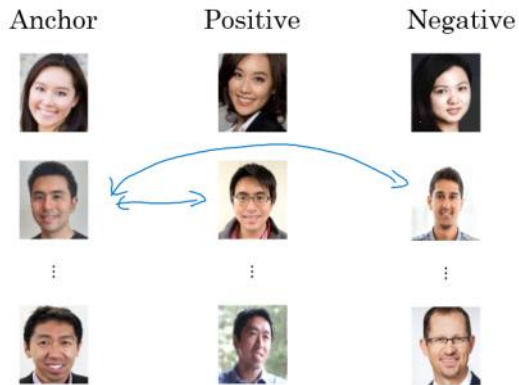
★ Details

★ Details

right

→ details about choosing triplets to train.

Training set using triplet loss



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Commercial | trained with very large ($\sim 10 \sim 100 \text{ mil}$) dataset
Face Recognition

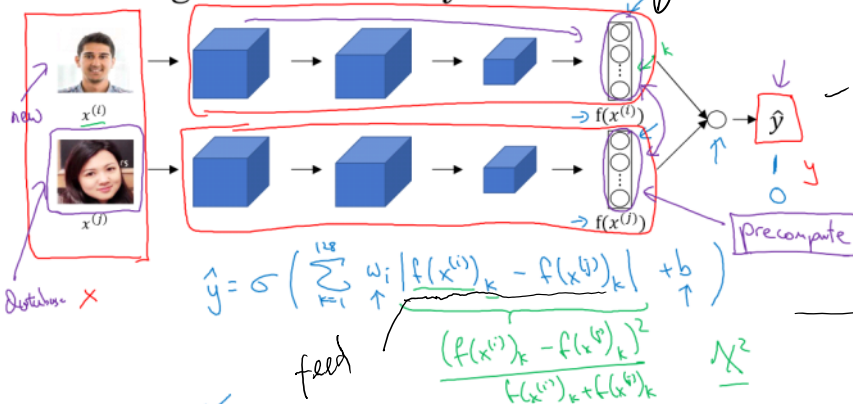
Some companies upload pre-trained models.



Face recognition

Face verification and binary classification

Learning the similarity function











[Taigman et. al., 2014. DeepFace closing the gap to human level performance]

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feed the element-wise distance of the two last stage representations as X of a logistic regression

Face verification supervised learning

x		y	
		1	"Same"
		0	"Different"
		0	
		1	

[Taigman et. al., 2014. DeepFace closing the gap to human level performance]

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