

Through the eyes of RoboFace

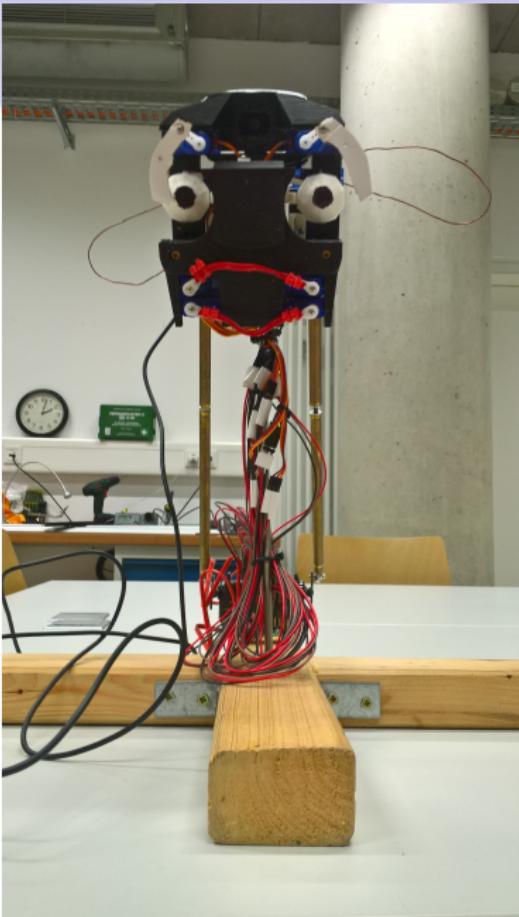
Deep Vision – final project

Letiția Elena Pârcălăbescu

8th of February 2017

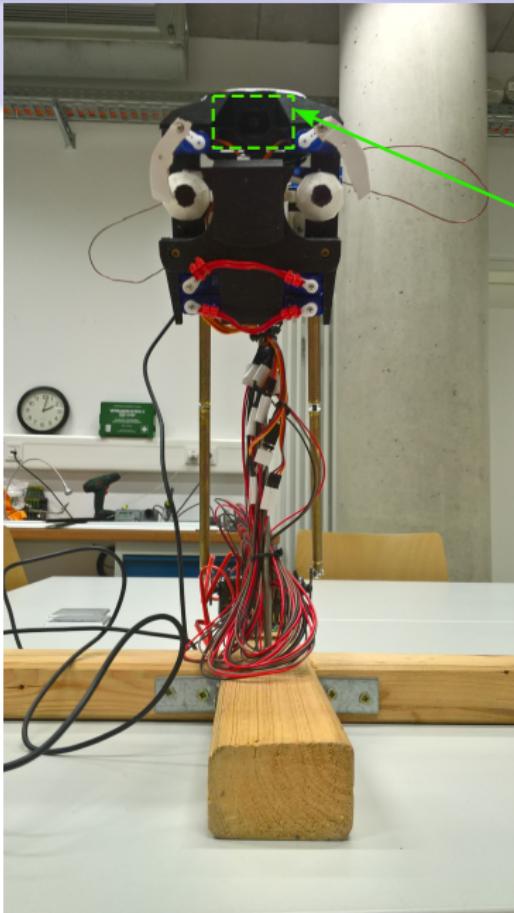
RoboFace

Problem description



RoboFace

Problem description



→ Webcam

CelebA Dataset web (2016)

202.599 images, 10.177 identities, 40 attributes per image

Large-scale CelebFaces Attributes (CelebA) Dataset

Ziwei Liu Ping Luo Xiaogang Wang Xiaoou Tang

Multimedia Laboratory, The Chinese University of Hong Kong



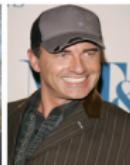
CelebA Dataset

Sample Images

Eyeglasses



Wearing Hat



Bangs



Wavy Hair



Pointy Nose



Mustache



Oval Face



Smiling



CelebA dataset

Attribute selection

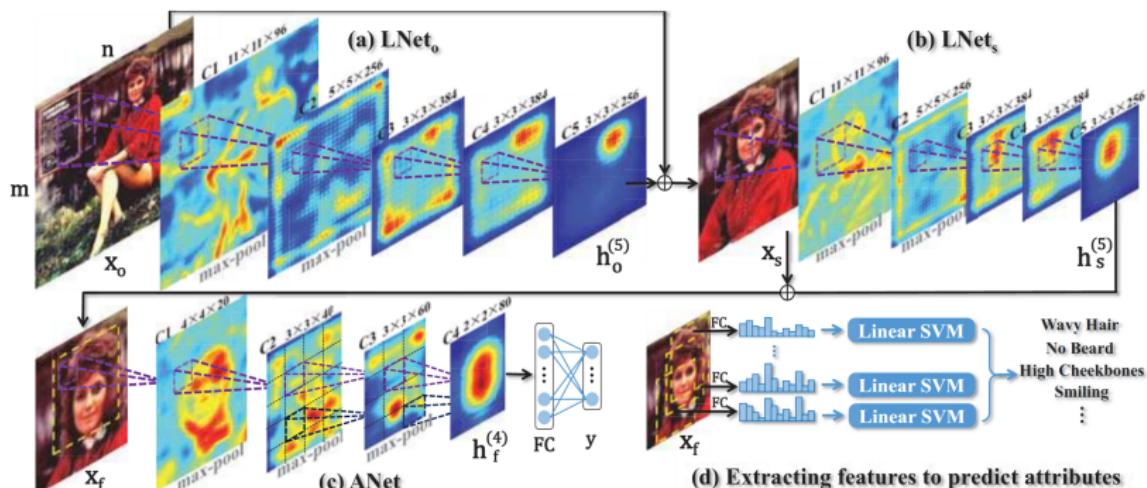
chose 13 labels out of 40 available

- | | |
|-----------------------|--------------------|
| ① Black Hair | ⑧ No Beard |
| ② Blond Hair | ⑨ Smiling |
| ③ Brown Hair | ⑩ Straight Hair |
| ④ Eyeglasses | ⑪ Wavy Hair |
| ⑤ Gray Hair | ⑫ Wearing Earrings |
| ⑥ Male | ⑬ Wearing Lipstick |
| ⑦ Mouth Slightly Open | |

Deep Learning Face Attributes in the Wild

Ziwei Liu and Tang (2015)

Joint face localisation and attribute prediction using only image-level attribute tags.



Deep Learning Face Attributes in the Wild

Ziwei Liu and Tang (2015)

Response map of the LNet (on attributes).



Own Approach

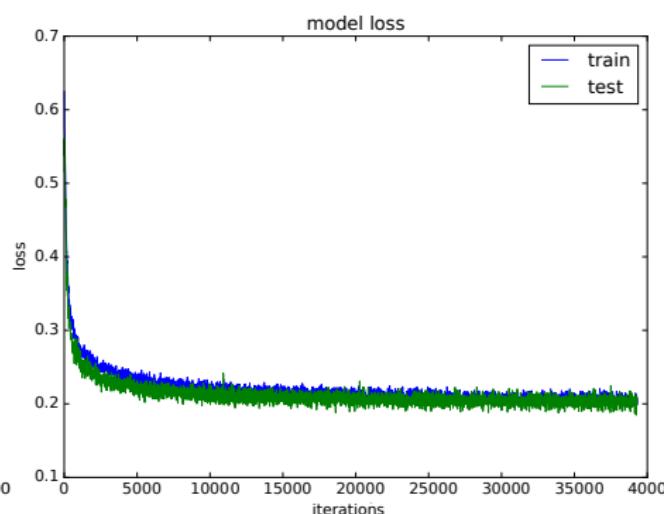
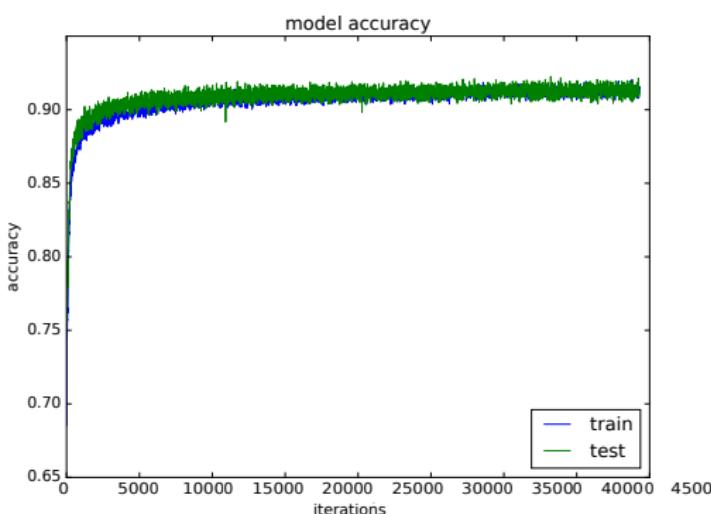
Architecture

- ① 32 of neurons in each convolutional layer
- ② Activations: Relu
- ③ 9 x 9 convolution → Max Pooling
- ④ 7 x 7 convolution → Max Pooling
- ⑤ 5 x 5 convolution → Max Pooling
- ⑥ 3 x 3 convolution → Max Pooling
- ⑦ 3 x 3 convolution → Max Pooling
- ⑧ Dropout(0.25)
- ⑨ 512 Dense
- ⑩ Dropout(0.5)
- ⑪ 13 Dense
- ⑫ Sigmoid
- ⑬ Binary Crossentropy
- ⑭ Adadelta optimiser
- ⑮ Overall: 125,709 parameters

Own Approach

How to not do it!

Without data normalisation: beautiful training curve, BUT...



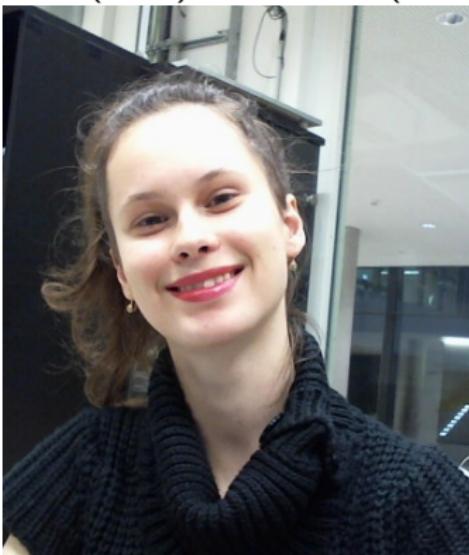
Own Approach

How to not do it!

... BUT no generalisation capability at all!

The predicted classes on the real world images from the robot are:

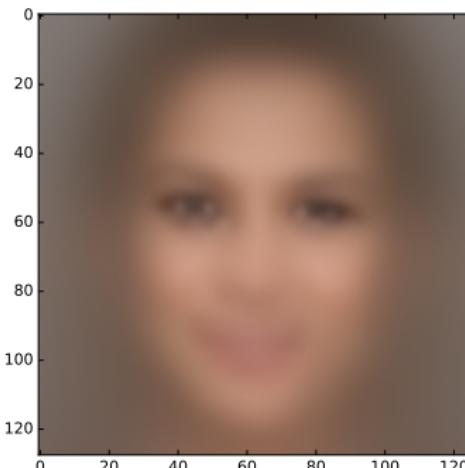
Male (0.89), No beard (0.76)



Data normalisation

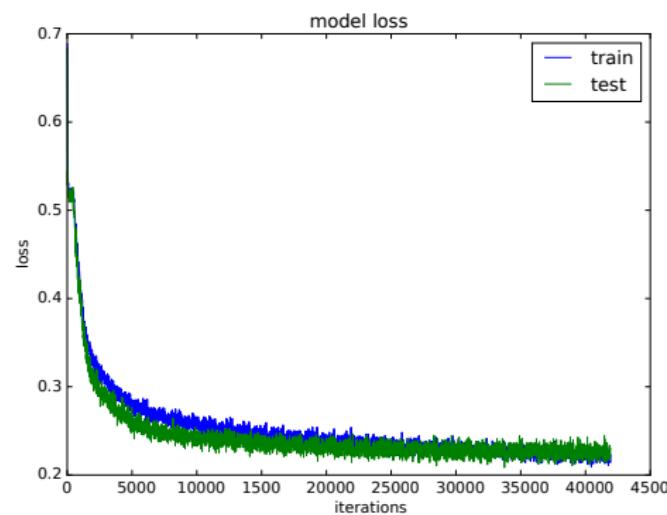
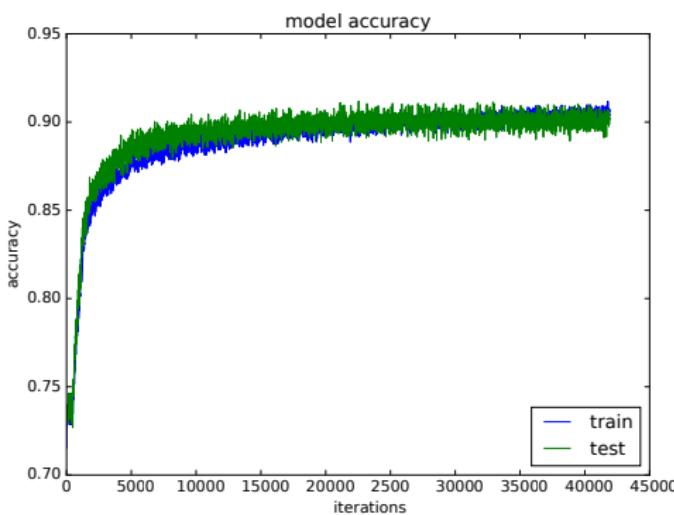
How to really do it!

- ① center the eyes
- ② resize images to have the same inter ocular distance
- ③ rotate image to make the inter ocular line look horizontal
- ④ resize image to 128 x 128 pixels
- ⑤ subtract the mean face



Own Approach

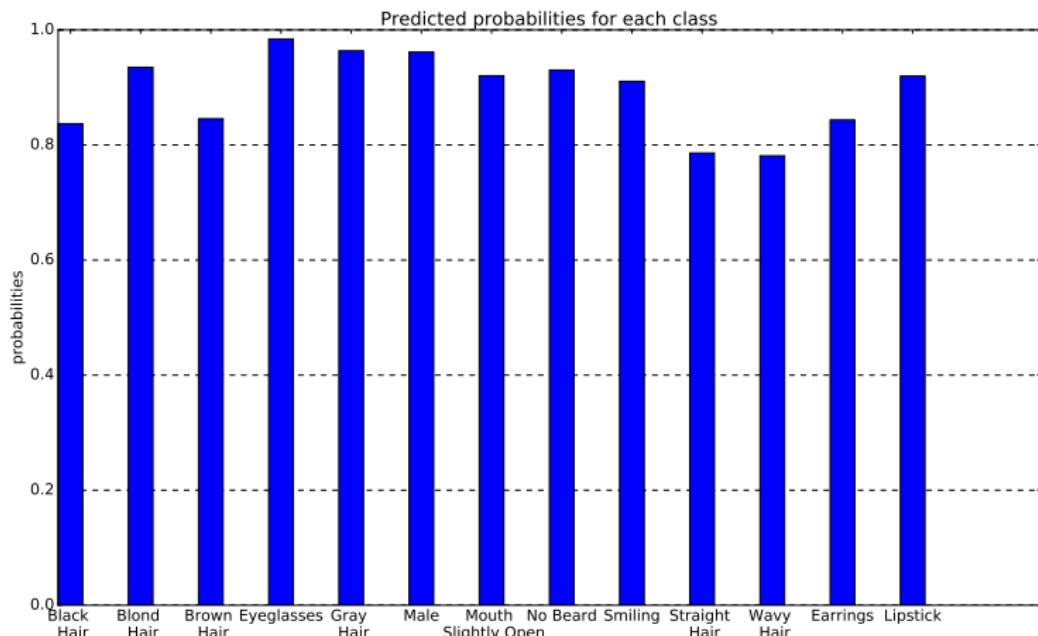
Training curves



Own Approach

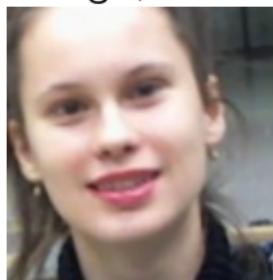
Final accuracy per class

overall accuracy of 90%



Exemplary results

'Black Hair', 'Mouth Slightly Open', 'No Beard', 'Smiling',
'Wearing Earrings', 'Wearing Lipstick'



'Black Hair', 'Mouth Slightly Open', 'No Beard', 'Straight Hair',
'Wearing Lipstick'

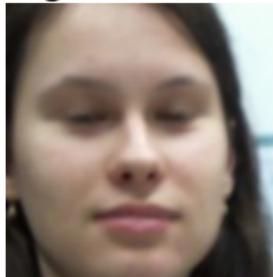


Exemplary results

'Black Hair', 'Mouth Slightly Open', 'No Beard', 'Smiling',
'Straight Hair', 'Wearing Earrings', '**Wearing Lipstick**



'Black Hair', '**Male**', 'Straight Hair' – only 2 out of 45 examples.



References

Celeba website, 2016. URL

<http://mmlab.ie.cuhk.edu.hk/projects/CelebA.html>.

X. W. Ziwei Liu, Ping Luo and X. Tang. Deep learning face attributes in the wild. In *Proceedings of International Conference on Computer Vision (ICCV)*, 2015.