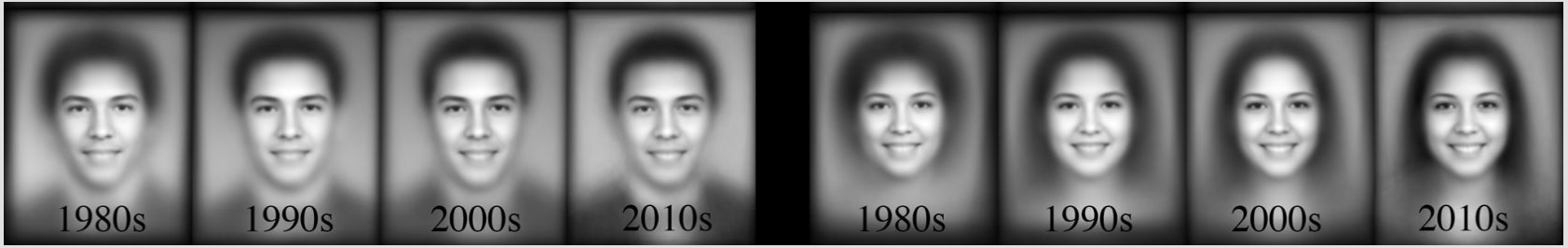
* people in the early 20th century hid their emotions



Mostly Not Smiling to Mostly Smiling: Predicting when a Yearbook photo was taken

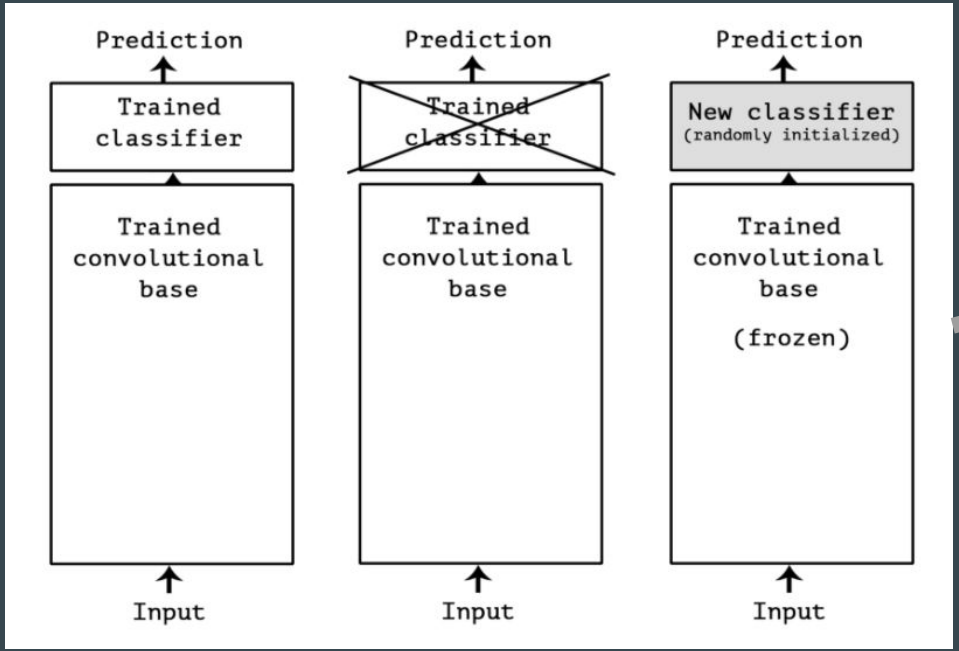
•••

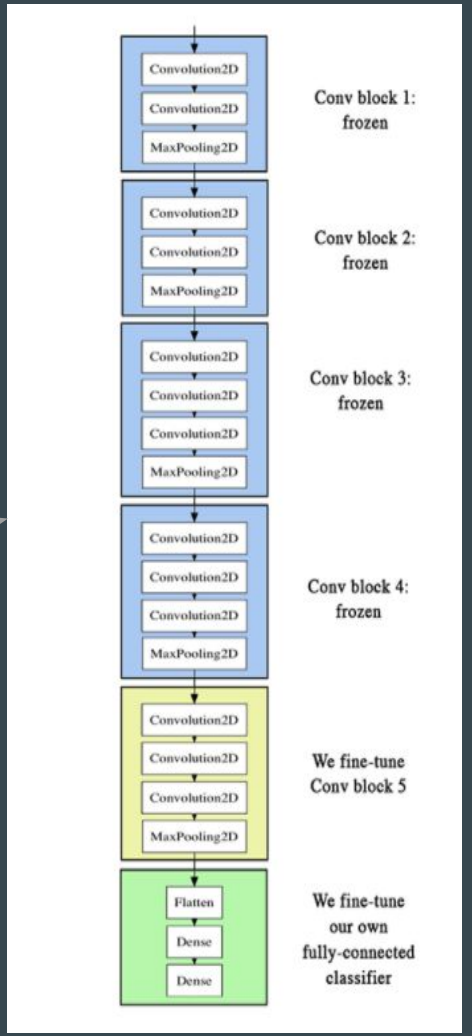
Amin Anvari, Diego Garcia-Olano, Farzan Memarian

UT Austin
Fall 2017

Methodology

Transfer Learning & Fine-tuning:





Challenges

- Loss function
- Network Architecture
- Hyper-parameter tuning
- Overfitting
- Speeding up training

Loss functions

$$loss_1 = \frac{1}{n}\sum_{j=1}^{n} Cross\_Entropy(y_p^j, y_t^j)$$

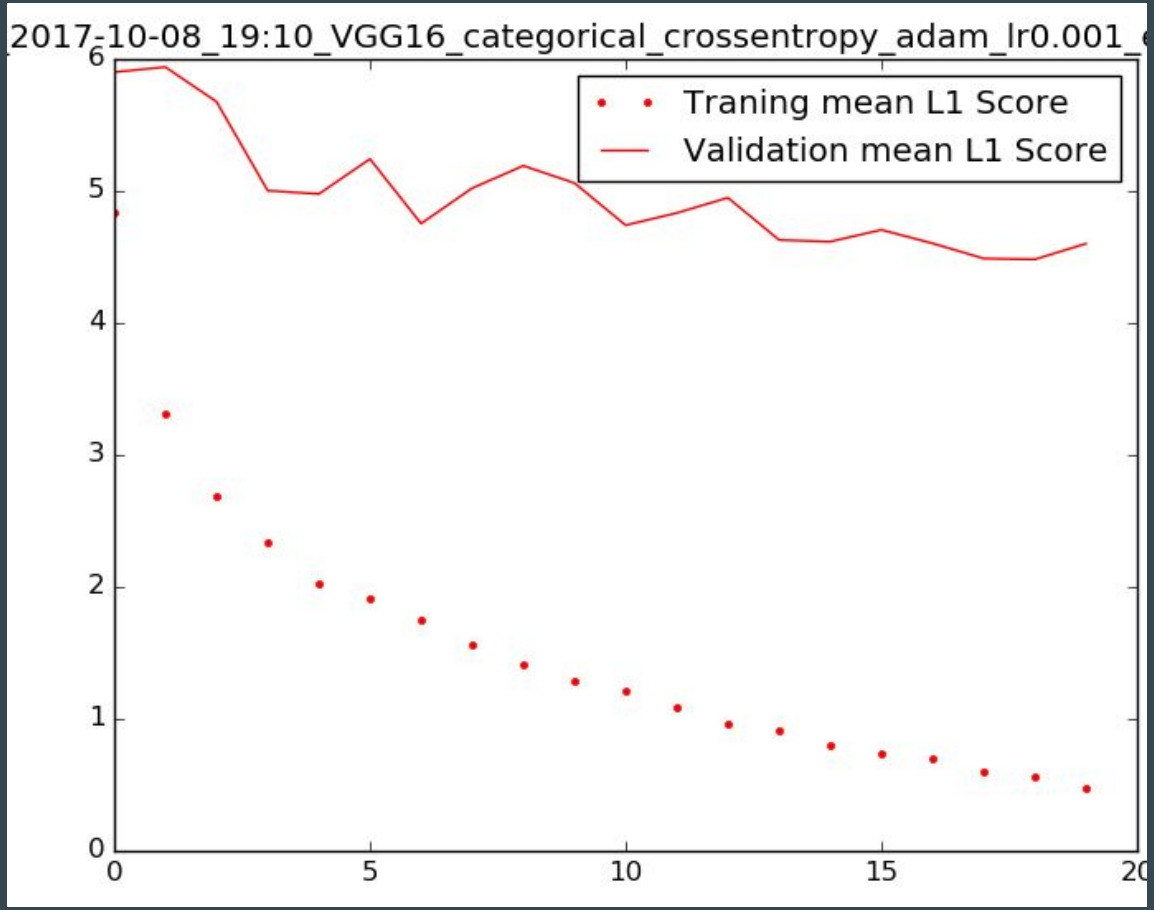
$$loss_2 = \frac{1}{n}\sqrt{\sum_{j=1}^{n} |year_p^j - year_t^j|^2}$$

$$loss_3 = \frac{1}{n}\sum_{j=1}^{n} Cross\_Entropy(y_p^j, y_t^j) + \frac{C}{n}\sqrt{\sum_{j=1}^{n} |year_p^j - year_t^j|^2}$$

$$loss_4 = \frac{1}{n}\sum_{j=1}^{n} Cross\_Entropy(y_p^j, y_t^j) + \frac{C}{n}\sum_{j=1}^{n} |year_p^j - year_t^j|$$

$$loss_5 = \frac{1}{n}\sum_{j=1}^{n} Cross\_Entropy(y_p^j, y_t^j) + \frac{C}{n}\sum_{j=1}^{n} \|y_p^j - y_t^j\|_1$$

The Best performing model:
L1 distance = 4.5 years



Visualization and Debugging

Visualizing important regions in an image according to the network

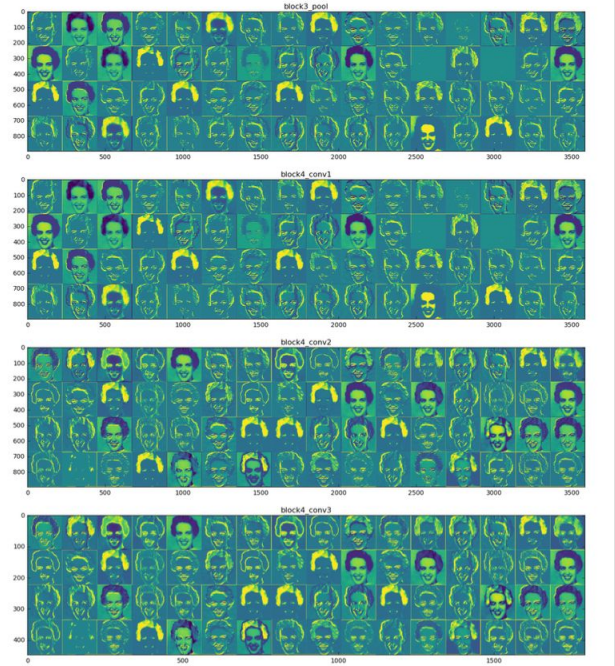


Figure 9. Visualizing intermediate activations

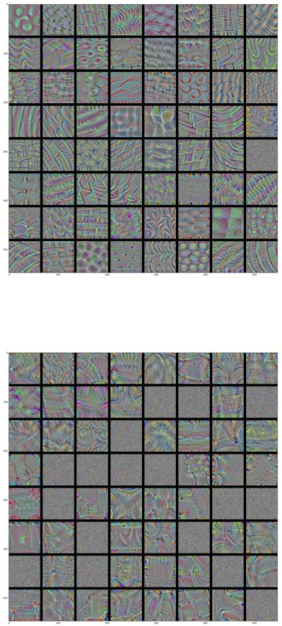


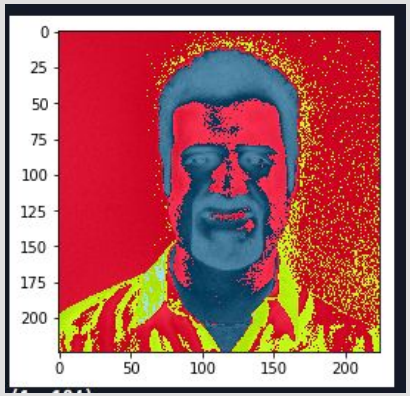
Figure 10. Visualizing convnet filters, block3_conv1 (top image), block4_conv1 (middle image), and block5_conv1 (bottom image)

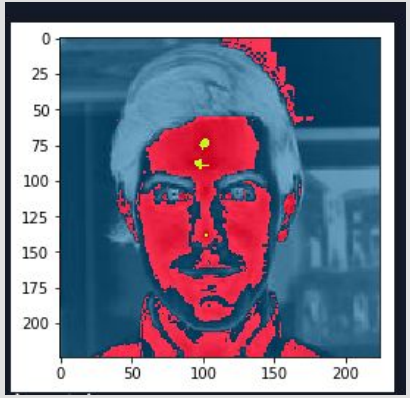
Figure 11. Heatmaps of class activations

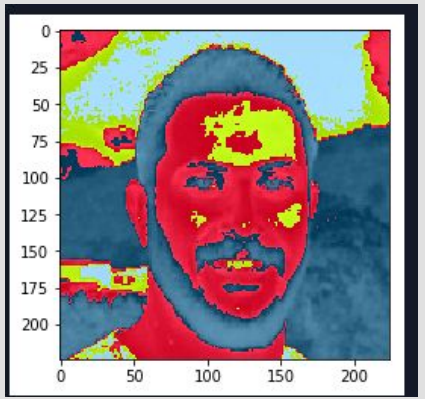
What year were our photo’s taken?

* Grad-CAM: (from Visual Explanations from Deep Networks via Gradient-based Localization).

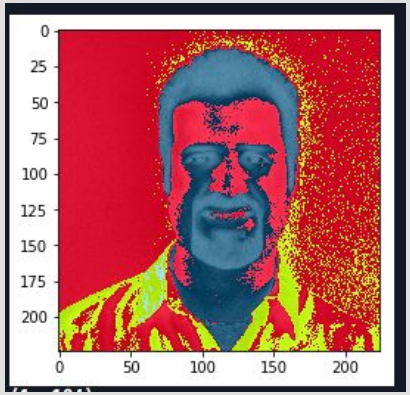


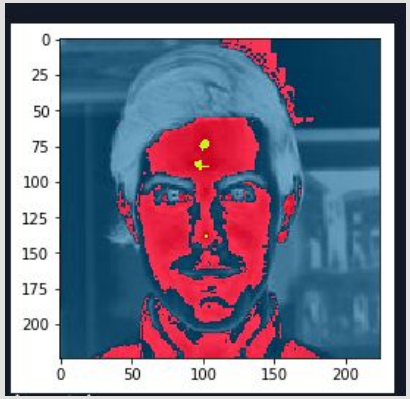



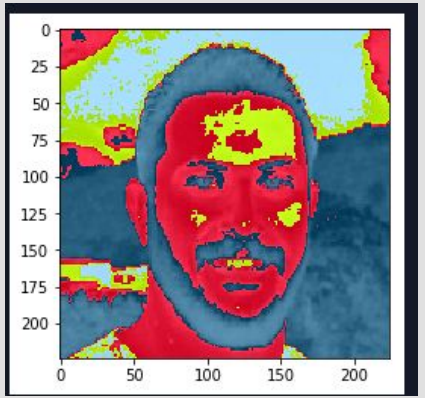


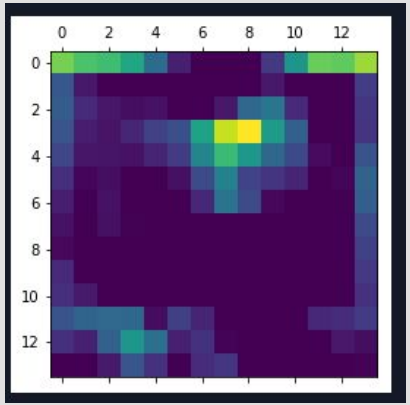


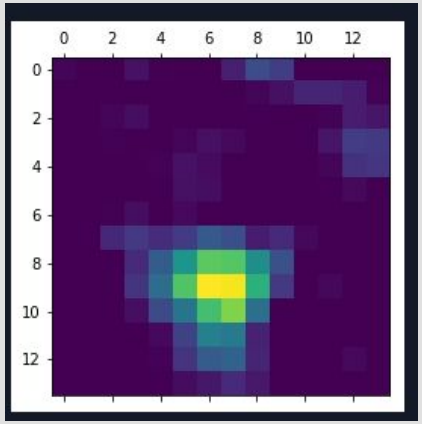
Preprocessing Step

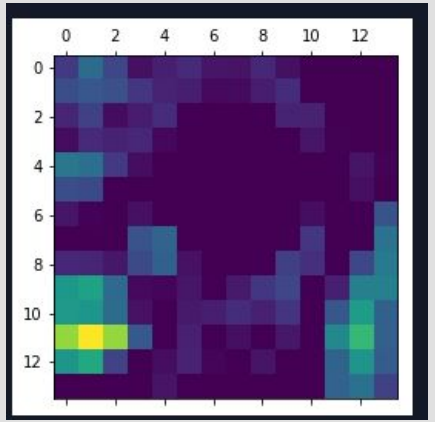




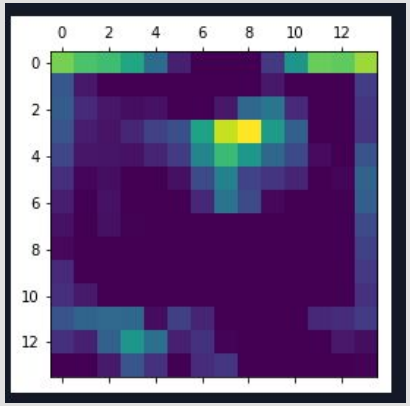


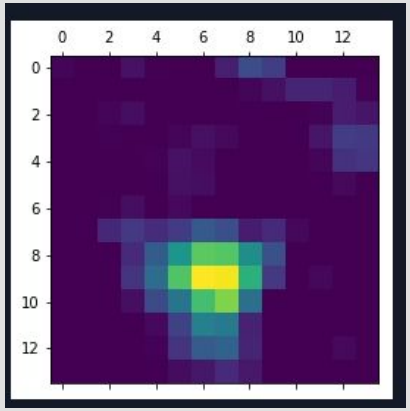


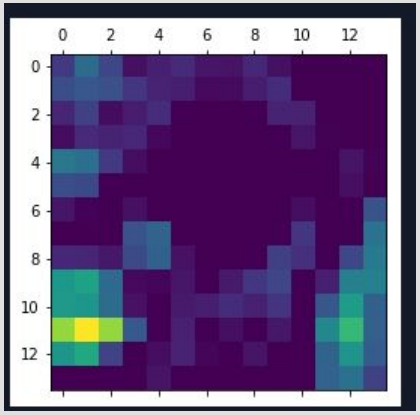




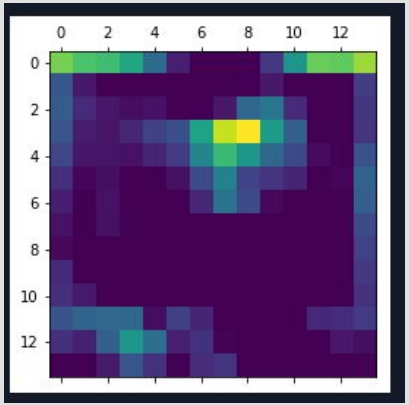
How important each location is with respect to its class

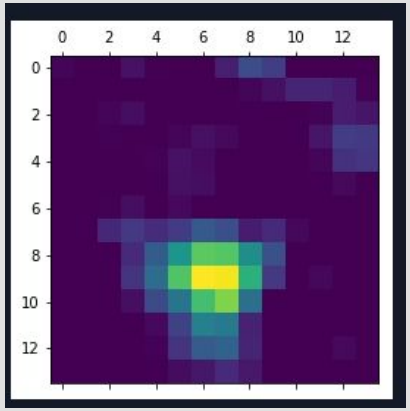


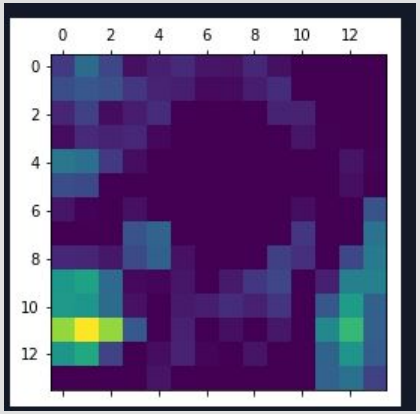




HEATMAPS OVERLAID ON ORIGINAL PHOTOS







1990 !

2002

2008

What’s so special about us!!

- Compared various architectures
- Random, Coarse to fine parameter tuning
- Devised new loss functions
- Visualized the network