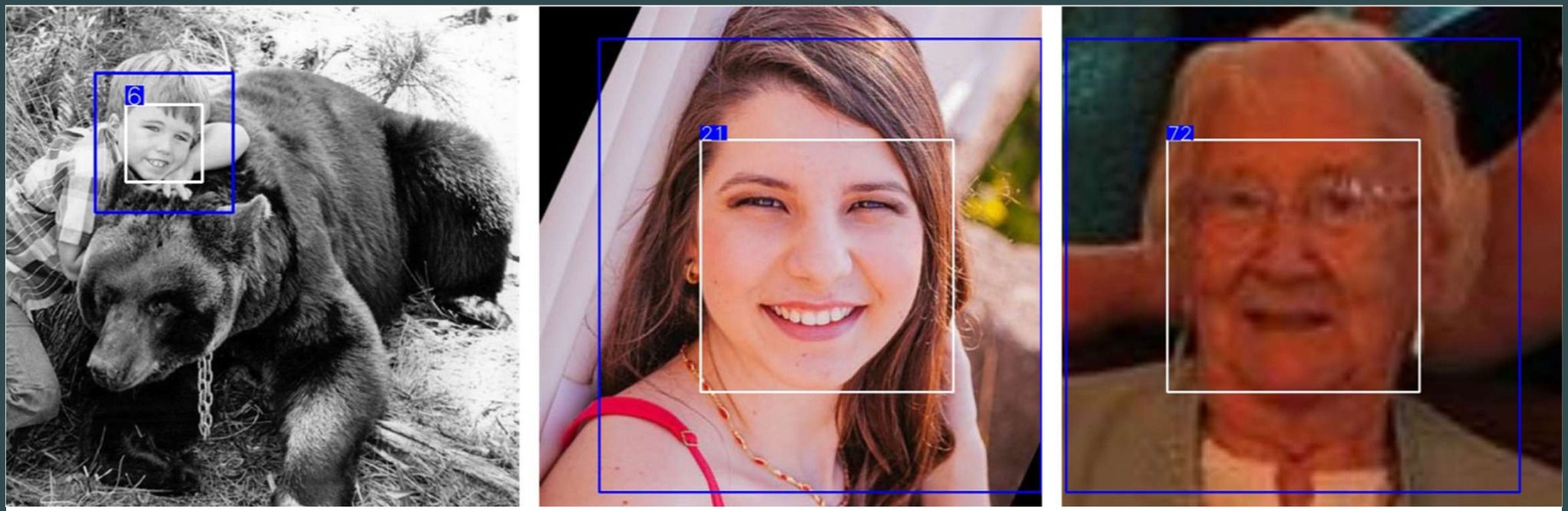
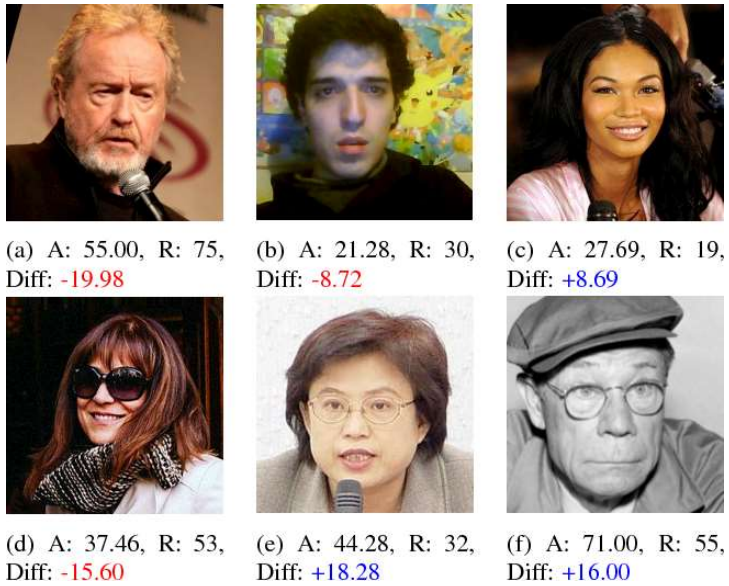


Project Age Estimation Pytorch

Farouk KHLIFI – Ilias SAGHIR

Model description

- Model is trained using APPA-REAL dataset
- Pretrained models are used (by default : Resnet)
- We use vgg16 for technical constraints
- Adam optimizer is used by default



(a) A: 55.00, R: 75, Diff: -19.98

(b) A: 21.28, R: 30, Diff: -8.72

(c) A: 27.69, R: 19, Diff: +8.69

(d) A: 37.46, R: 53, Diff: -15.60

(e) A: 44.28, R: 32, Diff: +18.28

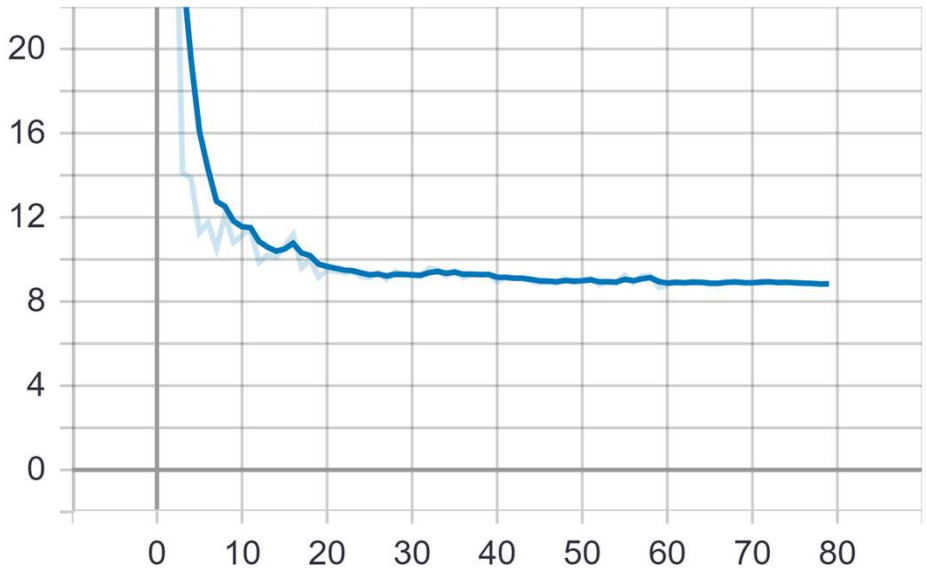
(f) A: 71.00, R: 55, Diff: +16.00

Classification

- Cross Entropy loss $L(\hat{y}, y) = -\sum_{k}^{K} y^{(k)} \log \hat{y}^{(k)}$
- Using vgg16 pretrained layers, we obtain a MAE of roughly 10 after 80 epochs of training
- However, this is not the most suitable framework and loss for our problem. Classes are somewhat related and ordered.
- Big mistakes in age estimation should be penalized, which is not the case here

Regression

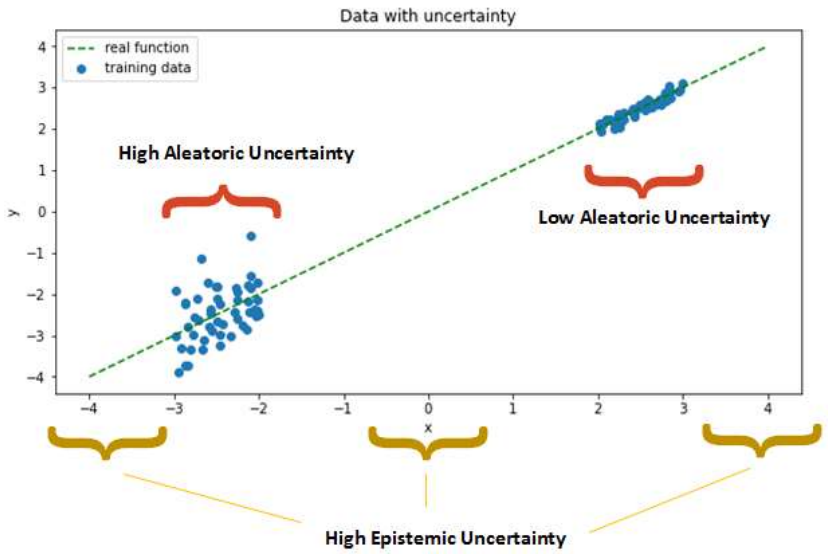
- We change the network output and the loss function (use MSE)
- We notice a significant decrease in MAE



Regression loss over 80 epochs

Aleatoric Loss

- A way to measure (aleatoric) uncertainty on a prediction
- Aleatoric uncertainty is modeled by placing a distribution over the output of the model (vs. prior on weights for Epistemic uncertainty)
- can further be categorized into **homoscedastic** uncertainty and **heteroscedastic** uncertainty

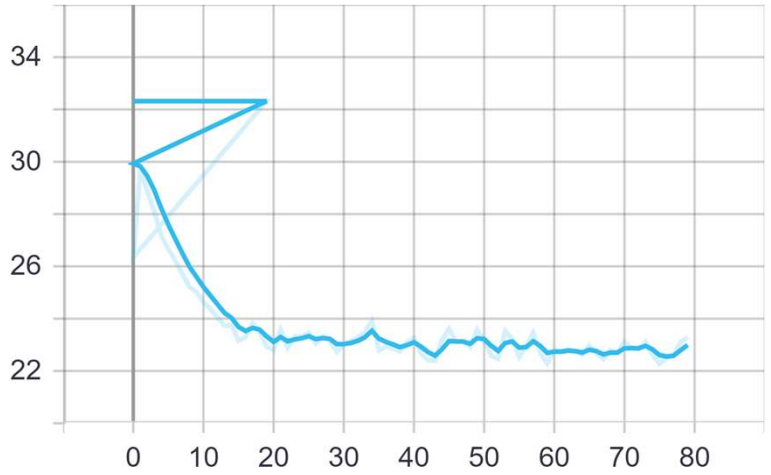


Aleatoric Loss

- Replace the loss function with the following :

$$Loss = \frac{||y - \hat{y}||_2}{2\sigma^2} + \frac{1}{2}\log\sigma^2$$

- σ is trained either as an independant model parameter (Homoscedastic) or as a data-dependent model output (Heteroscedastic)



Heteroscedastic aleatoric loss over 80 epochs

Ordinal classification

- A classification that takes into account ordered labels

Rank consistent ordinal regression for neural networks with application to age estimation

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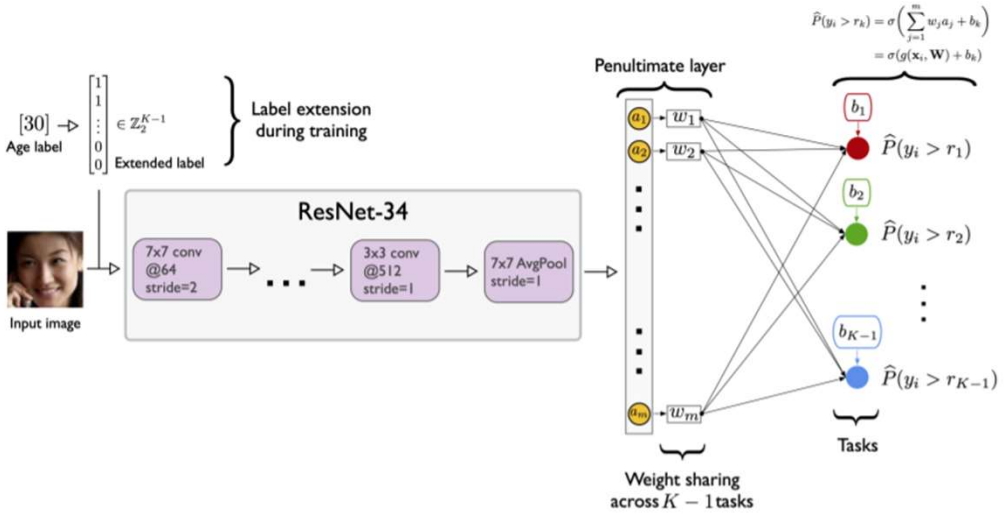

Fig. 2. Illustration of the consistent rank logits CNN (CORAL-CNN) used for age prediction. From the estimated probability values, the binary labels are obtained via Eq. 5 and converted to the age label via Eq. 1.