Introduction

- Facial recognition systems perform poorly on face with obscured features
- We propose a specialized secondary network that is trained for some particular obscurity, with a dispatcher network selecting the recognition network to use. We demonstrate this for beards.
- We achieve an accuracy of $0.9829 \pm 0.0125$ compared to a baseline FaceNet\cite{Schroff2015} accuracy of $0.9429 \pm 0.0202$ on our test set of celebrity images with and without beards.
- With an accurate dispatcher network, our method theoretically offers strict improvements over existing face recognition systems.

Data

Examples of celebrities with and without beards:

- Needed a custom dataset because we only wanted thick beards to be fed into our specialized network and not faces with just some stubble.
- Collected 1600 images (800 with and w/o beard) with some taken from the CelebA \cite{Liu2015} dataset and others downloaded individually from the internet for training/testing just the dispatcher network. There were upwards of 400 identities in this.
- Downloaded another ~1650 images individually of 60 different identities with and w/o beard to train/test just our specialized secondary network.
- Preprocessed the data by running face detection with MTCNN to align, crop, and resize images. Also augmented the data with random cropping, rotation, and flipping.

Results

<table>
<thead>
<tr>
<th>Model</th>
<th>Dataset</th>
<th>Accuracy</th>
<th>Validation Rate</th>
<th>AUC</th>
<th>ERR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>LFW\cite{Huang2007}</td>
<td>0.9852 ± 0.0065</td>
<td>0.9250 ± 0.0237</td>
<td>0.998</td>
<td>0.015</td>
</tr>
<tr>
<td>Baseline</td>
<td>Beards</td>
<td>0.9429 ± 0.0202</td>
<td>0.1542 ± 0.0585</td>
<td>0.986</td>
<td>0.070</td>
</tr>
<tr>
<td>Specialized</td>
<td>Beards</td>
<td>0.9829 ± 0.0124</td>
<td>0.4657 ± 0.0948</td>
<td>1.00</td>
<td>0.013</td>
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</tbody>
</table>

Face Recognition: Our specialized face recognition network achieves significantly higher accuracy than the standard FaceNet model.

Beard Recognition: Our dispatcher network recognizes the presence of a beard. Using a convolutional network architecture, we achieve high beard recognition accuracy.

Method

- We pass the input images through three different blocks, namely, conventional FaceNet, dispatcher, and our specialized network.
- Depending on the output of the dispatcher network (which detects the presence of a beard), we use the output of either the conventional FaceNet block or that of our specialized network.
- The specialized network is similar to FaceNet but has been trained on our additional beard/no beard (52 identities) dataset.

References

