Computer algorithm outperforms humans on 'Labeled Faces in the Wild' benchmark

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Samples of the datasets in the experiments. From left to right: LFW, Multi-PIE, MORPH, Web Images, and Life Photos. Credit: arXiv:1404.3840 [cs.CV]

(Phys.org) —For the first time a computer has beaten the human average when attempting to discriminate between faces in the Labeled Faces in the Wild (LFW) dataset. The team from China that programmed the computer and trained the software has written a paper describing their efforts and achievements and have uploaded it to the *arXiv* preprint server.

People are better at recognizing faces than computers—everyone knows that. Not so well known is that computers are slowing catching up—the work by a pair of researchers in China, is proof of that. In their paper Chaochao Lu and Xiaoou Tang note that they have fine-tuned an algorithm used for distinguishing between faces in photographs, but note that the real breakthrough came in the training. In order for a computer to figure out if the people shown in two different photographs are the same person, the computer has to have a much broader dataset to draw on.

People get better at recognizing faces the more often they see them—scientists aren't sure why this is exactly, but it clearly has something to do with adding more data as a person is seen from more angles, in different light, using different expressions, while wearing makeup or not, etc. The same thing is true for a computer. In order to discern if two photos show the same person, the computer has to have seen that person before in multiple environments—to allow that to happen, the researchers exposed their system (using the Discriminative Gaussian Process Latent Variable Model), which they call GaussianFace, to multiple datasets, such as the Multi-PIE database or Life Photos. Both offer multiple pictures of the same person to allow for not just better comparison capabilities for those in those datasets, but for getting smarter in general regarding how to match faces in other datasets.

The approach used by the research duo obviously worked as they report a success rate of 98.52 percent on the LFW, compared to an average of 97.53 percent for humans—the first time a computer has ever beaten the human average. The LFW is a database with a dataset of 13,000 headshots of famous people and has become a standard benchmark for testing facial recognition using a computer. Beating humans on the LFW is a truly remarkable achievement, of course, but, as the researchers note, it is just one benchmark. Computer technology still has a long way to go before matching the abilities of humans in generalized surroundings.

More information: Surpassing Human-Level Face Verification Performance on LFW with GaussianFace, arXiv:1404.3840 [cs.CV] arxiv.org/abs/1404.3840

Abstract
Face verification remains a challenging problem in very complex conditions with large variations such as pose, illumination, expression, and occlusions. This problem is exacerbated when we rely unrealistically on a single training data source, which is often insufficient to cover the intrinsically complex face variations. This paper proposes a principled multi-task learning approach based on

Discriminative Gaussian Process Latent Variable Model, named GaussianFace, to enrich the diversity of training data. In comparison to existing methods, our model exploits additional data from multiple source-domains to improve the generalization performance of face verification in an unknown target-domain. Importantly, our model can adapt automatically to complex data distributions, and therefore can well capture complex face variations inherent in multiple sources. Extensive experiments demonstrate the effectiveness of the proposed model in learning from diverse data sources and generalize to unseen domain. Specifically, the accuracy of our algorithm achieves an impressive accuracy rate of 98.52% on the well-known and challenging Labeled Faces in the Wild (LFW) benchmark. For the first time, the human-level performance in face verification (97.53%) on LFW is surpassed.

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