

Biometrics: New Photo Forensics

“Facial Recognition Software –an application that can be used to automatically identify or verify individuals from video frame or digital images. Some facial recognition software uses algorithms that analyze specific facial features, such as the relative position, size and shape of a person’s nose, eyes, jaw and cheekbones.” –Techopedia



Jane Doe Photo No. 2 in George Hodel album

IN CHAPTER 5 OF THIS BOOK, *Scene of the Crime*, I briefly re-examined Photo No. 2 (seen above) and presented some visual comparisons to several photographs of murder victim, Jean Spangler who, as we know, disappeared two days after Dr. George Hodel’s October 6, 1949, posting of bail on his arrest for incest and child molestation.

Since writing that chapter, I have been presented with the new evidence confirming that in both K9 Buster and expert witness Dr. Arpad Vass’ opinion that “human decomposition is or was present in or near the grounds of the Sowden/Hodel residence.”

Based on the new findings in Chapter 24, *The Smell of Death*, along with the discovery of the additional circumstances pointing to the possibility that she might well be the “10th Dahlia victim,” I decided to see if I could pursue some photo comparison possibilities.

To that end, I conducted some online research and made contact with Dr. Robert Frischholz, in Nuremberg, Germany. Dr. Frischholz is the chief technology officer for BioID, a firm specializing in state-of-the-art facial recognition and identification. Dr. Frischholz has been honored by Marquis Who’s Who since 1998 and IBC for his outstanding contributions to science in the fields of image processing motion analysis and biometrics. With numerous publications and patents, he is considered one of the world’s leading biometric experts

specializing in the field of facial recognition and in 2001 was named International Scientist of the Year.



*Dr. Robert Frischholz
Named 2001 International Scientist of the Year*

In November 2013, I emailed Dr. Frischholz with minimal background on my investigation and requesting his assistance in attempting to see if by using his 21st century facial recognition technology, he might be able to include or exclude my father's "Jane Doe" photograph from either of the two knowns: Elizabeth Short and Jean Spangler.

Dr. Frischholz agreed to try, but first provided me with a few cautionary words of advice. Here are some extracts from his initial response to my request:

6 November 2013

Hi Steve,

Thanks for writing me. Well I actually receive many of those inquiries, and most of the time unfortunately I am unable to help. Simply because reliable face recognition requires two photos from the same viewing angle, more or less the same lighting, and not too much age difference...

Closed eyes interestingly do not disturb the process very much, since most facial recognition algorithms avoid using the eye information (yes simply because of the fact that eyes could be closed or of sun glasses used).

All of the images I ever was asked to compare never gave a good matching score – because of the reasons given above. If, on the other hand, your two images would give a high matching score, this indeed would mean that there is a strong probability that those are the same person!

So just send me the images you have, and I can run them through our company's facial recognition engine, and if the matching score is really high, you have some strong proof that it is the same person!

Nevertheless, at least here in Germany, facial recognition is not approved by law. So the result can only either confirm you in your suspicion, or raise more uncertainties. It will not undoubtedly solve your problem.

Anyway, if it helps, as said just send me the pics and I will see what results we can get.

Kind regards
Robert

11 November 2013

Hi Steve,

I got your pictures. Ok this seems to be a bit more complicated than I thought (need to correct the in-plane rotation precisely to have a fair result).

Please give me a few days on this.

Best regards
Robert

15 November 2013

Dear Steve,

Sorry that it took so long, but I wanted to make sure that all experiments I made are correct. Let me first summarize what we have: We have several photos of ID=1 called "Elizabeth Short." Then we have several photos of ID=2 called "Jean Spangler." Then we have only one photo of ID=3 called "Jane Doe."

I trained our automatic facial recognition system (let's call it AFR from now on for the sake of simplicity) with all the photos we have from ID's 1 and 2, and then tested against ID number 3 to see which matching scores we get, and whether any of those scores would mean that #3 is actually #1 or #2...

Tests against ID2: The matching scores of ID3 against ID2 are quite low. In other words, our AFR says that "Jean Spangler" is not very similar to "Jane Doe."

Tests against ID1: The matching scores of ID3 against ID1 are remarkably high. In other words, our AFR says that "Elizabeth Short" is very similar to "Jane Doe."

If the question would have been "who is more similar to Jane Doe", then our AFR would definitely say "Elizabeth Short." The matching score is relatively high. Not as high as our AFR would need it to say it definitively IS her, but high enough to say that those two are very similar.

This was surprising to me, too. As I told you earlier, I often receive similar questions, and receive two photos to match, and I never got a score as high as this one. Even though the images are not really suitable for face recognition. For most accurate results, one needs to look straight into the camera, and none of the images supplied do that perfectly.

Best regards
Robert

19 November 2013

Dear Steve,

Well to answer your two questions:

To test your images, I used the BioID engine. This engine was tested several times, especially by German institutions, and can be considered as being state-of-the-art in commercial face recognition.

Nevertheless, I am talking to you privately, so please do not assume those numbers are official numbers from BioID.

Now to somehow answer your other question, about some interpretation of that score, well I made some additional experiments and try to give more light to this:

In all biometric technologies, the test sample is compared to each trained (“enrolled”) image in the training data set. This comparison gives a “score”, which is usually a floating point number in the range of 0.0 to 1.0. The higher, the better. But this score is not a simple percentage – having a score of 0.7 does not mean “it is 70% sure that this one is the same person.” Things are unfortunately much more complicated.

But to somehow give you some better assessment of the score of “Jane Doe,” I used the score that her picture gave when comparing to the pictures of “Elizabeth Short,” and made tests with some of our test sets for face evaluation today. I used a mixture of a few thousand sample images for testing, and found that the important “FAR” was 8.5%...

FAR means “false acceptance rate,” that means that 8.5% of all test images were incorrectly evaluated as being a match when using the Jane Doe threshold. Or in other words, the chance of falsely identifying an image as Elizabeth Short is 8.5%.

Do not take those 8.5% too serious, this is depending on the dataset used for testing. Several hundred thousand of test images should be used to give more precise result. From my experience, I expect the FAR of that Jane Doe sample to be between 5% and 10%.

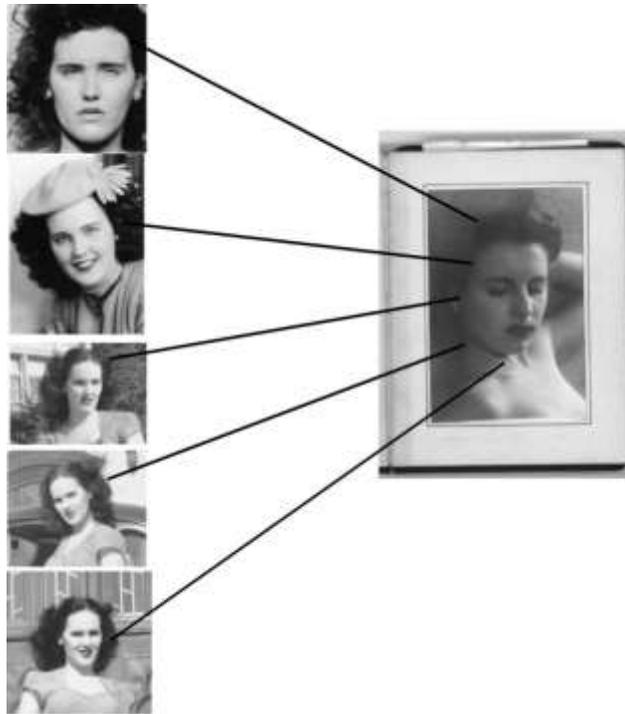
Or, being even less scientific, one could rephrase that to be: BioID’s AFR rates the positive match between the image of Jane Doe and the ones supplied for Elizabeth Short as being reliable between 90% and 95%.

I hope this is somehow better understandable. 90-95% assurance seems to be quite high, but as I said it would not be accepted in a serious test. In your country, N.I.S.T. tests all face recognition engines from time to time, and currently suggests the FAR to be set to 0.1% – would mean an AFR needs to have 99.9% reliability for a positive match!

But anyway, as I wrote earlier, for such old photos, the results are astonishingly high.

Hope I was not too complicated with all those numbers. I tried to give you some feeling about the meaning of that score without going too deep into mathematics.

Best Regards,
Robert



State-of-the-art AFR (Automatic Facial Recognition) computer rates the positive match between the known image of Elizabeth Short and the "Jane Doe" photo in Dr. George Hodel's photo album as being reliable between 90% and 95%.

A very special thank you to Dr. Robert Frischholz for conducting the facial recognition comparisons.

As he points out, while the results cannot be accepted as a mathematical certainty that the Jane Doe image is in fact Elizabeth Short, the 90-95% assurance certainly lends strong circumstantial weight to that possibility.

Or let's use Dr. Frischholz prescient words prior to conducting his facial recognition examination:

"Nevertheless, at least here in Germany, facial recognition is not approved by law. So the result can only either confirm you in your suspicion, [emphasis mine] or raise more uncertainties. It will not undoubtedly solve your problem."