AUTHOR COMMENTARIES - From Special Topics

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Jonathon Phillips
From the Special Topic of Face Recognition

According to our analysis of Face Recognition research over the past decade, the scientist whose work ranks at #2 by total citations and #1 by cites per paper is Dr. P. Jonathon Phillips, with 25 papers cited a total of 890 times. In Essential Science Indicators℠ *from Thomson Reuters, his work can be found in the fields of Computer Science and Engineering.*

Dr. Phillips hails from the National Institute of Standards and Technology (NIST), where he is Program Manager for Face Recognition. He is also a fellow of the International Association of Pattern Recognition.

In the interview below, he talks with ScienceWatch.com *about his career in face recognition technology.*

SW: Would you tell us a bit about your educational background and research experiences?

I have a BS in Mathematics, an MS in Electronic and Computer Engineering, a Ph.D. in Operations Research, and my Ph.D. adviser was a prominent statistician. The interdisciplinary nature of my education gave me an appreciation and understanding of fields closely related to face recognition. In my job, I am simultaneously a researcher and a government program manager. The program manager aspect of my job makes me a better scientist by keeping me focused on the big picture.

SW: How did you get involved in facial recognition research?

In the fall of 1992 I was working on my Ph.D. and employed by the US Army Research Laboratory (ARL), and I had an arrangement with my managers that my dissertation could be part of my job. In January 1993, the ARL started to manage the FacE Recognition Technology (FERET) program for DARPA. I jumped at the opportunity to be program manager for the FERET program and to conduct research on face recognition for my dissertation. Managing the FERET program was a great experience that allowed me to get involved in automatic face recognition just as the field was taking off.

"Many proposed face recognition applications will either replace or assist security guards."

SW: Your most-cited paper in our analysis is the 2000 *IEEE T Pattern Analysis* paper, "The FERET evaluation methodology for face-recognition algorithms," which has been cited close to 400 times. Would you walk our readers through this paper and why you think it is so highly cited?

The primary goals of the FERET program were to determine if automatic face recognition was feasible and to identify the most promising approaches. Since face recognition

algorithms are based on computer vision and machine learning techniques, measuring performance of face recognition algorithms requires testing them on standardized data sets. This paper showed that automatic face recognition was feasible and provided a benchmark for measuring progress in automatic face recognition. The benchmarks in this paper became a de facto standard in the research community.

SW: Would you share some of the major advances this field has seen over the past decade, as well as the problems that continue to need work?

One major advance in face recognition has been the development of graphics techniques for manipulating images of faces. These techniques include morphable models that allow a non-frontal image of a face to be transformed to a frontal image. A second area of progress is automatic processing of faces in video. With the availability of inexpensive video cameras that are designed for uploading video to the web, I see recognition and processing of unconstrained video of faces as an important and challenging problem.

SW: One of your more recent papers, the 2007 *IEEE T Pattern Analysis* paper, "Face recognition algorithms surpass humans matching faces over changes in illumination," shows that computer-based face recognition programs actually outperformed humans. Would you talk a bit about this paper and how the computers won out?

"Since face recognition algorithms are based on computer vision and machine learning techniques, measuring performance of face recognition algorithms requires testing them on standardized data sets."

Many proposed face recognition applications will either replace or assist security guards. So, a natural baseline for algorithms is human performance on unfamiliar faces. The results in this paper showed that computers are capable of out performing people on recognition of frontal face images. Since 1993, there has been a significant effort to develop recognition algorithms from frontal face images. Computers won because of a decade's worth of research in face recognition from frontal images.

SW: What are your hopes for progress in facial recognition research over the next decade?

I would like to see greater collaboration among psychologist, neuroscientists, and automatic face recognition researchers. I believe that by incorporating algorithm models into psychological and neuroscience studies it is possible to gain greater understanding into how humans process faces. Also, an understanding of human performance on face recognition can provide performance goals for algorithms.

SW: What would you like the "take-away lesson" about your research to be?

I have two "take-away lessons." First, to paraphrase my adviser, "Only work on problems that are interesting." The second is to collaborate with researchers in aligned fields. The work on comparing humans and computes was only possible as a collaborative effort with Prof. Alice O'Toole, of the University of Texas at Dallas.

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Jonathon Phillips's current most-cited paper in *Essential Science Indicators*, with 385 cites:

Phillips PJ, *et al.*, "The FERET evaluation methodology for face-recognition algorithms," *IEEE Trans. Patt. Anal. Mach. Int.* 22(10): 1090-104, October 2000. Source: *Essential Science Indicators* from Thomson Reuters.

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back to top

Special Topics : Face Recognition : Jonathon Phillips Interview - Special Topic of Face Recognition

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