IEEE Biometrics Council

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Newsletter

Beta Version

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Highlights

- Interview with Chairman UIDAI
- Report - FG 2011
- Face Recognition
- New Biometrics Databases

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Welcome

It is my pleasure to introduce new officers of the IEEE Biometrics council in this very first edition of the Biometrics Council Newsletter. Please join me in welcoming *Arun Ross* as VP Education and *Ajay Kumar* as VP Publications who have recently started their positions in the council along with me. They join current VP's *Joe Campbell*, *Patrick Flynn*, and *Salil Prabhakar*.

We thankfully acknowledge *Rama Chellappa* for his consistent efforts in stabilizing and promoting the council across various societies. Fortunately, he has agreed to be available to provide the good advice we will need in his capacity as past president as well as the nominations committee chair.

The outgoing VP Publications *Larry Hall* made us proud at the last TAB review by working with EIC *Kevin Bowyer* to bring out the Biometrics Compendium just in time before the review. The compendium is being considered as a model by many other societies and councils. *Terry Boult* managed the VP Education role extremely well coordinating evaluation of several educational activities proposals submitted to the council. Many thanks to *Larry Hall* and *Terry Boult* for all their efforts and contributions.

I look forward to working with you all in making IEEE Biometrics Council a great success story in promoting the work in biometrics technologies and applications.

Nalini Ratha, President, IEEE Biometrics Council

Have You Signed-up?

Are you missing our regular announcements on awards, biometrics competitions, conferences, compendium, newsletter, .. ?

Please sign-up today at our IEEE Biometrics Council website!

AADHAAR

The Unique Identification number (Aadhaar) project is run by the Unique Identification Authority of India (UIDAI) since 28 January 2009. Originally called the "Unique ID for Below Poverty Line (BPL) families", the project's aim is to provide unique identification numbers to all residents of India (1.2 billion people), with priority for underprivileged families who lack proper identification to open bank accounts or access cash subsidies. The uniqueness is ensured by linking the *Aadhaar* numbers to a Central Identities Data Repository (CIDR) containing left and right iris scans, all ten fingerprints and face photograph (along with demographic information such as name, date of birth, gender and address), coupled with a de-duplication process for each new enrolment. In order to prevent fraud and identity theft, *Aadhaar* numbers are assigned randomly from the space of all 12-digit numbers; in other words, it is theoretically impossible to recover the date of birth, location or any other information from a stolen *Aadhaar* number alone. Although participation in the scheme is still voluntary, ten million *Aadhaar* numbers have already been issued and with more than 400,000 enrolments a day, the UIDAI is expecting 600 million enrolments by 2014. This project has attracted US$680 million in phase two funding, creating business opportunities worth US$1.2 billion in biometric readers and cards sales alone (according to Frost & Sullivan's estimation by year 2015); and for the underprivileged, *Aadhaar* facilitates their access to the financial system. However, the project is not without its critics. First and foremost are privacy concerns, followed by the technical issues relating to the performance. The linking of public and commercial services to *Aadhaar* numbers could potentially create scenarios that challenge existing legal framework for the privacy protection (worse yet if this scheme is to become mandatory). Secondly, there are data quality, performance and reliability issues associated with the management of a very large scale biometrics system. We are now going to ask the UIDAI a few questions and these have been answered from the highest level in our spotlight section on next page:

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Spotlight: Large Scale Biometrics Deployments

INTERVIEW QUESTION

Nandan Nilekani
Chairman, Unique Identification Authority of India (UIDAI)

The first phase of the Aadhaar project is a success while similar projects have failed in the US and UK. What do you think are the biggest reasons for its success (in addition to the 'popular support' which you have mentioned in earlier interview)?

The Aadhaar project which was launched in September 2010 has already crossed the 25 million mark of Aadhaar numbers generated. Our aim is to ensure that 1 million Aadhaar numbers would be generated a day from October 2011 onwards. We have created a scalable model which will see enrolments and generation of unique numbers rising in the coming months. The thrust of the project is inclusion and providing to millions of residents a proof of identity. It is an enabler to better access to public services. There is a great demand for the Aadhaar number and people are coming forward in large numbers to enroll into the system.

Are the advantages of Aadhaar already visible at this stage? Can you give us specific examples?

Today, the Aadhaar number is sufficient KYC (Know Your Customer) for opening a small bank account, getting a mobile connection as well as an Liquified Petroleum Gas cylinder connection. This has immense benefit to the resident. Further, people who had no proof of identification earlier have a proof of identity which they can utilize to access services. As the number becomes more ubiquituous, various applications will be built around it to provide benefit to the resident.

Aadhaar is probably the largest project of its kind ever rolled out in the world, so surprises are only expected (as no one has done it at that scale). What are the biggest unexpected challenges that the UIDAI has faced? Would you mind sharing some of the lessons learned?

The Aadhaar project is one of the most complex technological projects being implemented anywhere in the world. There are a number of challenges that we face on technology and implementation. The UIDAI is constantly improving to address various challenges both expected and unexpected.

If another country wants to implement a similar project and asks you for advice, how would you tell them to begin?

Valuable lessons can be learnt from our experience in implementing this project. This could be done through proper channels within Government.

What are your views on the legal challenges on privacy and data protection associated with this project? Can legislation solve all problems?

We have a legislation proposed that addresses a number of issues relating to security and data protection. The UIDAI adopts the best standards and also prescribes standards to be adopted by the various partners in the ecosystem in this regard.

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Automatic Face And Gesture Recognition 2011

The Ninth IEEE Conference on Automatic Face and Gesture Recognition (FG 2011) and associated workshops and tutorials were held at the Fess Parker's Doubletree Resort in Santa Barbara, CA on March 21-25. The five workshops and three tutorials were held on March 21 and 25, and the main conference was held March 22-24, 2011.

Omron, IBM and Google were silver-level sponsors of the meeting; NICTA, Microsoft Research and NSF were also sponsors. Corporate exhibitors at the meeting included 3dMD, Machine Perception Technologies, Dimensional Imaging Ltd and NVIDIA.

Jamie Shotton of Microsoft Research Cambridge gave the opening Keynote Talk on the first day.

Three excellent keynote talks both informed and entertained conference attendees. Jamie Shotton, Microsoft Research Cambridge, kicked off the first day with a talk on "Body Part Recognition: Making Kinect Robust". Brad Duchaine, Dartmouth College, spoke on "Exploring human social perception via deficits and disruptions". And Jonathan Gratch, University of Southern California, gave a talk titiled "So She's Smiling, Now What?"

Participants of FG 2011

Ross Beveridge and Rogerio Feris organized the first FG Doctoral Consortium, with funding from NSF. Ten PhD students were selected from over twenty applicants. Each of the ten received travel reimbursement and was paired with a mentor in their research area for the meeting. Mentors had a luncheon with the students and a panel discussion on career advice. The ten Doctoral Consortium participants were Shizhi Chen, City College of New York; Thang Dinh, University of Southern California; Mark Hansen, University of West England; Ehsan Hoque, MIT Media Lab; Kang Liu, Leibniz Universitaet Hannover; Yui Man Lui, Colorado State University; Gayathri Mahalingam, University of Delaware; Loren Schwarz, Technische Universität Mü nchenl Hamit Soyel, Eastern Mediterranean University; a nd Chao Wang, Oregon Health & Science University.

Program Co-Chair Marian Bartlett (UCSD) congratulating one of the Outstanding Paper awardees, Laren Schwarz (Technical University of Munich) as Paper Awards Chair Jeffrey Cohn (University of Pittsburgh) looks.

Program Co-Chairs Marian Bartlett (UCSD), Kevin Bowyer (Univ. of Notre Dame), Rainer Stiefelhagen (Karlsruhe Institute of Technology) [left to right]

The conference received 236 submissions, involving a total of 665 authors. Over 170 persons were involved in supplying over 650 reviews of submitted papers. The reviewing process resulted in the selection of 96 papers for presentation at the conference. Of these, 38 were scheduled as oral presentations and 68 as poster presentations. Also, following a NIPS-style format, 20 of the posters were also scheduled for short "spotlight" oral presentations. The poster sessions were quite lively and interactive. Approximately 280 people registered to attend the conference.

General Co-Chairs Matthew Turk (UC Santa Barbara, left), Stan Li (Chinese Academy of Sciences, right).

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Age-Invariant Face Recognition

Unsang Park and Anil K. Jain, *Michigan State University, USA*

In spite of the significant improvements in face recognition technology over the past two decades, *unconstrained* face recognition remains a challenging problem due to the large intra-subject variations and small inter-subject variations. Even though some of the major sources of intra-subject variations (*e.g.*, pose, expression and illumination) can be controlled in constrained imaging environments (*e.g.*, driver license and passport), age variation is still a challenge in face recognition applications.

Figure 1: Age variation is known to degrade the performance for face recognition.

Most of the age invariant face recognition methods proposed in the literature can be categorized into two major classes: (i) generative approach and (ii) discriminative approach. Generative approaches learn the temporal changes in facial appearance; by accumulating the aging patterns of a number of subjects, an age specific appearance model can be obtained. Both holistic and component based approaches have been proposed in this category. The holistic approach uses principal components and the component based approach uses combinations of segmented facial components to generate aging simulated image. After the aging simulation, the appearance difference between probe and gallery images becomes smaller, resulting in an improved recognition accuracy. Discriminative approaches do not attempt to explicitly learn the appearance changes across ages, but they in the generative approaches, learn robust feature sets that are invariant to aging variations. As multiple face images of the same subject at different ages are used to learn the intra-class variation. The Linear Discriminant Analysis (LDA) method is applied to minimize the intra-class variation to extract a more robust feature space.

The advantage of a generative approach [1]-[2] is that it can provide the aging simulation results in an image format, *i.e.*, the face image can be verified by a human expert during the matching process. However, the disadvantage of the generative approach is that it requires a set of facial landmark points that delineate the primary facial components (*e.g.*, eyes, nose, and mouth). The advantage of discriminative approach is that it only requires the eye coordinates to normalize the face images in terms of rotation and scale. The two eye coordinates can be detected more reliably than other facial landmark points. The disadvantage of discriminative approach is that it conducts the face matching using facial features where the user cannot intervene. Therefore, a generative approach is more preferable when the landmark detection results are reliable and the aging simulated image is required. Otherwise, the discriminative approach would be more useful. It has been shown that a

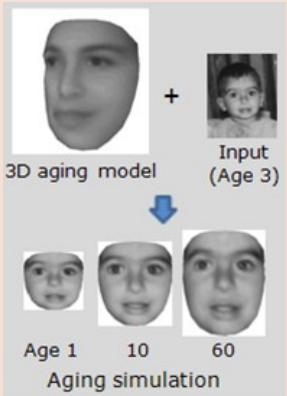

Figure 2: Schematics for generative facial aging model.

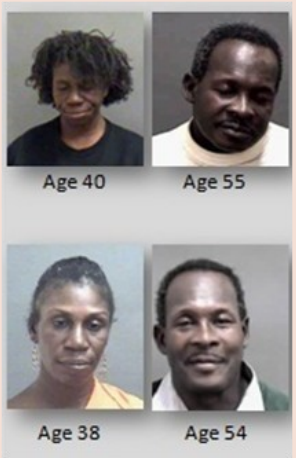

Figure 3: Examples where the fusion of the generative and the discriminative model succeeds in face recognition.

combination of generative and discriminative approaches can further improve the face recognition performance of a COTS face matcher from 79% to 85.4%. Fig. 3 shows example face images where the generative and discriminative approaches improved the matching accuracy.

In summary, age-invariant face recognition is necessary in several major applications of face recognition. We have described two major approaches for aging modeling based on generative and discriminative frameworks. While these approaches show promising results, further research is needed to develop aging modeling techniques for specific age interval, gender, and ethnicity.

References:

[1] U. Park, Y. Tong, and A. K. Jain, "Age Invariant Face Recognition," *IEEE Transactions on Pattern Analysis and Machine Intelligence*, vol. 32, pp. 947-954, May 2010.

[2] J. Suo, S. Zhu, S. Shan, and X. Chen, "A compositional and dynamic model for face aging," *IEEE Trans. Pattern Analysis and Machine Intelligence*, vol. 32, no. 3, pp. 385-401, March 2010.

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Forthcoming Biometrics Conferences

IEIEEE/IAPR International Joint Conference on Biometrics (IJCB 2011)

Washington, DC, Oct 11-13, 2011

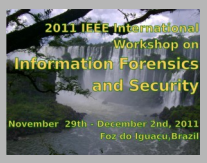
http://www.cse.nd.edu/IJCB_11/

The International Joint Conference on Biometrics (IJCB 11) is a special combination of two major biometrics research conference traditions, the International Conference on Biometrics (ICB) and the Biometrics Theory, Application and Systems (BTAS) conference. The blending of these two conferences for this one year is through special agreement of the IEEE and IAPR, and should present quite an exciting event for the entire worldwide biometrics research community.

2011 IEEE International Workshop on Information Forensics and Security (WIFS'11)

Iguaçu Falls, Brazil, Nov 29 - Dec 2, 2011

http://wifs11.org/default.aspx



The 2011 IEEE Intl. Workshop on Information Forensics and Security (WIFS'11), will be held in Iguaçu Falls, Brazil, on November 29th - December 2nd, 2011. The WIFS'11 organization team is proud to announce that this year WIFS will feature Student Best Paper Awards & Travel grants: 10 student papers will be granted awards. The top five will receive a Gold paper award certificate, and another five will receive Silver paper awards certificate. WIFS'11 will feature three prominent keynote speakers: Patrick Flynn, William Horn, and Ton Kalker. WIFS'11 will also feature four tutorials in addition to the traditional scientific program. The tutorials will take place at the first day of the event and will be offered for free for all WIFS'11 registered attendees.

2011 IEEE Conference on Technologies for Homeland Security

Greater Boston, Massachusetts, November 15-17, 2011

http://ieee-hst.org/

The eleventh annual IEEE Conference on Technologies for Homeland Security (HST '11), will be held 15-17 November 2011 in Greater Boston, Massachusetts. This conference brings together innovators from leading universities, research laboratories, Homeland Security Centers of Excellence, small businesses, system integrators and the end user community and provides a forum to discuss ideas, concepts and experimental results.

International Conference on Biometrics (ICB 2012)

New Delhi, India, 30 Mar - 1 Apr 2012

http://icb12.iiitd.ac.in

The 5th International Conference on Biometrics (ICB 2012) will have a broad scope and invites papers that advance biometric technologies, sensor design, feature extraction and matching algorithms, analysis of security and privacy, and evaluation of social impact of biometrics technology. Topics will include biometric systems based on fingerprint, iris, face, voice, gait and other modalities as well as biometric fusion and emerging biometrics based on novel sensing technologies.

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New Biometrics Databases in Public Domain

Several new biometrics databases have recently been made available in public domain to promote research and evaluation efforts. The databases detailed in the following list are freely and publicly accessible from their respective web links.

1. 3D Twins Expression Challenge ("3D TEC") Dataset

This dataset contains 3D face scans from 107 pairs of twins which have been acquired during the 2010 *Twins Festival Day*. There are total of 428 scans from 214 individuals, each with a 3D face scan with a smiling expression and a scan with a neutral expression. The scans were acquired with a Minolta Vivid 910. The details to acquire this dataset are available at http://www.nd.edu/~cvrl/CVRL/Data_Sets.html

2. A Natural Visible & Infrared Facial Expression Database (USTC-NVIE Database)

This database consists of natural visible and infrared facial expression images, which contains both spontaneous and posed expressions of more than 100 subjects, recorded simultaneously by a visible and an infrared thermal camera, with illumination provided from three different directions. The posed database also includes expression image sequences with and without glasses. The spontaneous face image database includes images of 103 subjects under front illumination, 99 subjects under left illumination, and 103 subjects under right illumination, while 107 subjects are included in the this database. This database has been acquired by *The Key Laboratory of Computing and Communication Software* of Anhui Province (CCSL), in PR China, and can be requested online from the link http://nvie.ustc.edu.cn/index.html

3. IIT Delhi Ear Database (Version 1.0)

The IIT Delhi ear image database contains ear images acquired from a distance using contactless imaging setup and the imaging is performed in the indoor environment. The currently available database of 471 images is acquired from 125 different subjects and each subject has at least three ear images. The resolution of these images is 272 × 204 pixels and all these images are available in jpeg format. In addition to the original images, this database also provide automatically normalized and cropped ear images of size 50 × 180 pixels. This distribution also facilitates a larger version of ear database (automatically cropped and normalized) from 212 users with 754 ear images and is made available on request. The database can be downloaded be requested online from the link http://webold.iitd.ac.in/~biometrics/Database_Ear.htm

4. Bosphorus Hand Vein Database

The Bosphorus Hand Vein Database is now publicly made available to support research and development efforts on the personal identification using palm dorsal vein patterns from the hands. This hand vein data is acquired using near infrared imaging using two near infrared illumination sources. This database contains 1575 images of the left hands from the 100 subjects which are acquired using multiple but realistic situations. All the images are distributed as 300 × 240 pixel gray-scale images with the resolution of 8-bit. This database can be requested online from the web link http://bosphorus.ee.boun.edu.tr/hand/Home.aspx

5. The Hong Kong PolyU Low-Resolution Fingerprint Database Version 1.0

Hong Kong Polytechnic University low resolution fingerprint database consists of low resolution fingerprint (surface texture) images contributed from the male and female volunteers. This database has been largely acquired in The Hong Kong Polytechnic University campus using a contactless setup that uses a low resolution webcam. This database has 1466 images from the 156 subjects, all the images are in bitmap (*.bmp) format. In this dataset about 93% of the subjects are younger than 30 years. The finger images were acquired in two separate sessions with a minimum interval of one month, maximum interval of over six months and the average interval of 66.8 days. In each session, each of the subjects provided 6 index finger image samples for this database. The details to acquire this database are available at http://www.comp.polyu.edu.hk/~csajaykr/fplr.htm

Please visit IEEE biometrics council website for more details on council activities. We welcome all your comments/suggestions and our mailing address is: Ajay.Kumar@inet.polyu.edu.hk

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