

EAB Research Projects Conference 2019



The 6th edition of the EAB Research Projects Conference will take place on the 16th, 17th and 18th of September 2019, at the premises of Fraunhofer IGD in Darmstadt, Germany.

[Full story](#)

EAB Research Award 2019 Finalists



The final of the EAB Research and Industry Award 2019 will take place on September 18 in Darmstadt, Germany. The award ceremony will be at the same premises as the EAB Research Projects conference.

[Full story](#)

JRC Report on Face Identification Published



The EU Joint Research Centre (JRC) has published its study on Face Identification Technology for its Implementation in the Schengen Information System (SIS).

[Full story](#)

Next events:

September 16 – 18, 2019: EAB Research Projects Conference (EAB-RPC) 2019

September 16, 2019: German TeleTrusT Biometrics Working Group

September 17, 2019: 9th EAB General Assembly

September 18, 2019: EAB Biometrics Research and Industry Awards 2019

September 19 – 20, 2019: BIOSIG 2019 – 18th International Conference of the Biometrics Special Interest Group

Special reports:



ICB 2019 Conference

Conference report on IAPR ICB 2019

Crete, Greece, 2019-06-07

The 12th IAPR International Conference on Biometrics (ICB 2019) was held on the island of Crete from 04 to 07 June 2019.



FG 2019 Conference

May 14-18, 2019
Lille, France

Conference report on IEEE FG 2019

Lille, France, 2019-05-18

The 14th IEEE International Conference on Automatic Face and Gesture Recognition (FG 2019) was held in Lille, France from 14 to 18 May 2019. It attracted more than 200 participants from research and industry across the globe.



London Identity Week 2019
ExCel Center, June 11 to 13

Table of contents

- EAB Research Projects Conference 2019
- EAB Research Award 2019 Finalists
- JRC Report on Face Identification Published
- Report on the H2020 EU Project PROTECT
- Computational Workload in Biometric Identification Systems: An Overview
- JRC Report on Fingerprint and Palmprint Identification Published
- Open access article published by researchers from EURECOM
- Court Action after Termination of Contract
- Pilot Project of the Known Traveller Digital Identity Programme
- Call for Papers: BTAS – Special Session
- ISO/IEC JT1 SC37 Conference in Darmstadt, Germany
- EU Regulation on Mandatory Biometric Data in ID Cards
- VentureBeat Award on Face Biometrics
- Briefing to the UN Counter-Terrorism Directorate on sharing of Biometric Data to tackle Terrorism
- Identity Week 2019 sees record attendance and participation
- BTAS-2019 – Special Session on Generalizability and Adaptability in Biometrics (GAPinB)
- Conference report on Identity Week 2019
- Conference report on IAPR ICB 2019
- Frontex Conference on Morphing on 9–10 October
- Eye Segmentation Challenge
- Summer School Report

EAB Research Projects Conference 2019



The 6th edition of the EAB Research Projects Conference will take place on the 16th, 17th and 18th of September 2019, at the premises of Fraunhofer IGD in Darmstadt, Germany.

The conference is organized by the European Association on Biometrics (EAB) in cooperation with the Joint Research Centre (DG JRC) of the European Commission, through its Cyber and Digital Citizens' security Unit. The EAB-RPC 2019 will be co-located with the [EAB Research Award](#) and the [IEEE BIOSIG Conference](#), later that same week.

The conference is currently the largest event on European research in the area of Biometrics and Identity Management, and it is endorsed by Matthias Oel (Director of Directorate B "Migration, Mobility and Innovation" of DG HOME) and by Dan Chirondojan (Director of Directorate E "Space Security and Migration" of DG Joint Research Centre).

Over the previous five successful editions, EAB-RPC has become the main forum in Europe where attendees can simultaneously: promote research carried out in biometrics, forge new links and networks, and identify the appropriate partners for possible future project applications.

This year's edition will feature:

- Presentations by 19 European funded projects in the fields of biometrics, border management and identity management: RHUMBO, TRESPASS-ETN, PRIMA, HUNIQUE, PROTECT, BODEGA, LIGHTEST, SMILE, FOLDOUT, TRESSPASS, SWAN, PYCSEL, STELLAR I-RIS, QUARDCARD, SMART-TRUST, SOTAMD, AMBER, D4FLY, RESPECT.
- Keynote by Andrea De Candido, Acting Head of Unit of Unit B.4 at DG HOME "Unit of Innovation and Industry for Security". The unit is responsible for the security calls in H2020 and the forthcoming Horizon Europe. Mr De Candido will address the priorities of the Commission on this field and the new pillars of Horizon Europe.
- Keynote by Richard Rinkens (DG Home, unit B.3). He will address the difficult topic of interoperability among the large European IT systems with special attention to biometrics.
- A session with live demonstrations of applications developed in the participating projects.
- A round table with 4 panelists coming from different European law-enforcement agencies where all attendees will have the chance to participate on the topic "Operational Needs meet research".

For further information on the conference, a detailed agenda, or to register to the event, please visit the dedicated website:

<https://www.eab.org/events/program/177>

If you would like your European-funded project to participate in the conference please contact the Conference Chair:

javier.galbally@ec.europa.eu

EAB Research Award 2019 Finalists



The final of the EAB Research and Industry Award 2019 will take place on September 18 in Darmstadt, Germany. The award ceremony will be at the same premises as the EAB Research Projects conference.

The finalists have been selected by a panel of internationally respected experts and will present the findings of their research projects:

- Tiago de Freitas Pereira (Idiap Research Institute): Learning How To Recognize Faces in Heterogeneous Environments
- Klemen Grm (University of Ljubljana): Face hallucination using cascaded super-resolution and identity priors
- Patrick Schuch (Norwegian University of Science and Technology): Learning Neighbourhoods for Fingerprint Indexing

Participation at the event is free of charge, but registration is required. For further details please visit:

<https://www.eab.org/events/program/180>

This prestigious award is granted annually to individuals, who have made a significant contribution to the field of biometrics research. For information please visit: <https://www.eab.org/award/cfp.html>

The history of the European Research and Industry Award can be studied in the EAB awards Hall of Fame:

https://www.eab.org/award/hall_of_fame.html

The European Biometric Research and Industry Awards 2019 are kindly sponsored by Idemia and mymarq.

JRC Report on Face Identification Published



The EU Joint Research Centre (JRC) has published its study on Face Identification Technology for its Implementation in the Schengen Information System (SIS).

The report assesses the readiness and availability of automatic face recognition technology for its integration in SIS. This functionality has been introduced in the latest SIS Regulation adopted on the 28th of November 2018. The legislation determines the use of this technology first in the context of regular border crossing, however it also foresees its possible use in the near future in the context of police and judicial cooperation.

The first part of the report introduces automatic face recognition technology, presenting a thorough review of the state of the art, which concludes with the lessons learnt and the challenges faced by automatic face recognition systems.

The second part makes an analysis of how face recognition technology can be integrated within CS-SIS and presents the different use-cases in which the functionality will be exploited. A number of recommendations for the successful implementation of face processing techniques in CS-SIS are then proposed.

You can access the report at: http://publications.jrc.ec.europa.eu/repository/bitstream/JRC116530/sis_face-jrc_science_for_policy_report_22.07.2019_final.pdf

Report on the H2020 EU Project PROTECT

The EAB CEO Jean Salomon attended the PROTECT project meeting in London and reports about the project findings before the project conclusion.

Current Status

An intermediate PROTECT project progress report has already been presented to all EAB delegates during the 2018 yearly Darmstadt EAB September event. As this 10-member Consortium project is about to finalize its work, a concluding running demonstration has been presented by invitation to a selected audience on July 24 and 25, 2019 in London.

Professor James Ferryman from the University of Kent first summed up, on behalf of his Consortium colleagues, the project achievements, promoting live enrolment and multiple biometric verifications to empower free movement across multiple types of border control verifications. R&D-rich topics linking and dealing with different biometric modalities such as 2D and 3D face, periocular recognition, thermal imaging, or vein (uniquely for land border control), were part of PROTECT's active portfolio's unobstructed approach to "on-the-fly" biometric verifications.

Hot topics and breakthroughs for 2 very hot days in London

As part of PROTECT's multi-modality border crossing trials, a proof-of-concept for pedestrian border crossing at a rail border has been organized on both July 24 and July 25 around a live demonstration of the PROTECT active biometric corridor in the official Eurostar arrival hall at London St. Pancras. The test lane was operated by the Consortium team in the presence of the Home Office border Force. Invited PROTECT delegates played the travelers' roles.

Some of the images of these twin demonstrations are visible at the consortium website: <http://www.projectprotect.eu/>

The team found that the corridor is able to sustain flows of briskly walking individual travelers separated by 7 seconds. The time to perform a full biometric verification varied from 21 to 29 seconds, depending on user familiarity.

By triggering the passenger free walk across the corridor portal with his attached smart phone, the project provided an insight about emerging trends in the use of digital "virtual" travel documents in the future, in line with the ongoing progress of the DTC (Digital Travel Credentials) specifications of ICAO's New Technologies Working Group.

The deliberate choice of multiple sensor technologies, and the critical design of an "S" shaped corridor to favor full frontal biometric captures, including the use of multiple heights cameras, all enable to deliver up to 5 different (independently ranked) biometric verification criteria that can potentially be fused, including the capacity for multiple face spoofing detection (from paper, masks, or video replay).

An open-ended conclusion

The PROTECT consortium recognizes there are still many open avenues to explore and priorities to settle in terms of scalability and reproducibility of its findings. This should also involve an evolution toward a preferred environment for high TRL solutions, aiming at future operational field adoption of some of the techniques jointly explored, in particular by Academia members of the Consortium's.

Several of the initial assumptions taken for granted along the development of the PROTECT R&D-level approach still require significant legislative evolution and some PIA breakthroughs, before they are deemed acceptable (e.g. a "virtual smartphone passport"). This is a recognized prerequisite for some useful and creative PROTECT findings to ultimately evolve into public adoption.

Computational Workload in Biometric Identification Systems: An Overview

Open access article published by researchers from Hochschule Darmstadt

CRISP scientists ([P. Drozdowski](#), [Dr. C. Rathgeb](#), [Prof. Dr. C. Busch](#)) from [Hochschule Darmstadt](#) investigated the topic of efficient biometric identification from both the academic and industry perspective. The work was conducted in the context of [LOEWE-3](#) sponsored project [BioBiDa -- Biometrics and Big Data](#) and resulted in an article entitled "[Computational Workload in Biometric Identification Systems: An Overview](#)" being published with an *open access license* in the [IET Biometrics](#) journal. The article can be freely accessed by following [this link](#).

The article provides a comprehensive overview of methods for efficient biometric identification irrespective of the chosen biometric characteristic. Accordingly, its contributions are threefold:

- A taxonomy, which conceptually categorises the computational workload reduction methods in biometric identification.
- A comprehensive survey of the existing methods reported in the scientific literature and organised by the relevant high-level concepts from the aforementioned taxonomy.
- A diversified discussion pertaining to relevant technical and practical considerations and trade-offs, an industry perspective, and open research issues/challenges.

Abstract: Computational workload is one of the key challenges in biometric identification systems. The naïve retrieval method based on an exhaustive search becomes impractical with the growth of the number of the enrolled data subjects. Consequently, in recent years, many methods with the aim of reducing or optimising the computational workload, and thereby speeding-up the identification transactions, in biometric identification systems have been developed. In this article, a taxonomy for conceptual categorisation of such methods is presented, followed by a comprehensive survey of the relevant academic publications, including computational workload reduction and software/hardware-based acceleration. Lastly, the pertinent technical considerations and trade-offs of the surveyed methods are discussed, along with an industry perspective, and open issues/challenges in the field.

JRC Report on Fingerprint and Palmprint Identification Published

The EU Joint Research Centre (JRC) has published its study on Fingerprint and Palmprint Identification Technologies for their Implementation in the Schengen Information System (SIS).

The report assesses the technology readiness and availability of new functionalities – based on automatic fingerprint and palmprint recognition technologies – for their integration into the Schengen Information System (SIS). These functionalities have been introduced in the revised SIS Regulations adopted on 28th of November 2018, both in the context of police and judicial cooperation. The report is structured in two parts.

In Part I, the automatic fingerprint and palmprint recognition functionalities are introduced together with a review of the latest developments and state of the art, quality metrics and important biometric standards are provided; and it is concluded with a summary section entitled "lessons learnt".

In Part II, the functionalities are placed into the context of Schengen Information System. Use-cases for border control and police and judiciary cooperation in criminal matters are presented, and a list of recommendations for the successful implementation of fingerprint and palmprint processing technologies into the Schengen Information System are provided.

You can access the report at: http://publications.jrc.ec.europa.eu/repository/bitstream/JRC116442/jrc116442_sis_latent-jrc-science_for_policy_report_final_22.07.2019.pdf

Open access article published by researchers from EURECOM

EURECOM scientists (C. Gald, V. Chiesa and J.-L. Dugelay) have published with their international co-authors a survey article on the benefits of Light Fields for face recognition.

The article provides a comprehensive overview of the plenoptic function in light-field-capturing devices, which are rapidly evolving. Existing image-processing techniques need to be revisited to match the richer information provided. This article explores the use of Light Fields for face analysis.

This field of research is very recent but already includes several works reporting promising results. Such works deal with the main steps of face analysis and include but are not limited to: face recognition; face presentation attack detection; facial soft-biometrics classification; and facial landmark detection. This article aims to review the state of the art on light fields for face analysis, identifying future challenges and possible applications.

The article can be freely accessed at: <https://www.mdpi.com/1424-8220/19/12/2687/pdf>

Court Action after Termination of Contract

NEC Australia is taking court action due to the termination of the Australian Criminal Intelligence Commission Biometric Identification Services (BIS) project.

NEC is seeking financial compensation as the BIS was substantially built and ready to undergo systems testing before it terminated. You can read more at: <https://www.itwire.com/strategy/nec-australia-seeks-compensation-for-terminated-biometric-services-contract-2.html>

Pilot Project of the Known Traveller Digital Identity Programme

The Netherlands are starting trials in a pilot project of the Known Traveller Digital Identity Programme (KTDI), which enables travellers between Canada and the Netherlands using their mobile phone instead of the passport.

The intention of the programme is to speed up the flow of passengers. You can read more at: <https://www.weforum.org/agenda/2019/06/you-might-soon-be-travelling-without-a-passport-this-is-how/>

Call for Papers: BTAS – Special Session

The paper submission deadline for the Special Session on Generalizability and Adaptability in Biometrics (GAPinB) during the IEEE BTAS 2019 conference has been extended to July 30th.

The challenges of generalization of algorithms and solutions in biometrics has been a long-standing but critical problem. The advancements in biometric solutions have achieved very high accuracy for various problems on databases investigated for the relative problem. However, the recent works have pointed the deficiencies in scaling of such algorithms across databases and sensors. The problem is persistently seen for identification and verification across cross-spectral data, attack detection across variety of data. The limited scalability of the algorithms needs newer and robust solutions to make the biometric systems adaptable for various kind of data. BTAS-2019 – Special session on Generalizability and Adaptability in Biometrics is organized to evaluate the impact and mitigation measures of such generalization problems in biometric systems. This half-day Special Session in conjunction with BTAS-2019, calls for high-quality, previously unpublished works related to approaches and methodologies.

Papers are invited to report on following topics, but not limited to:

- Novel algorithms for identification and verification solutions across heterogeneous data.
- Attack detection mechanisms for heterogeneous data.
- Cross-sensor scalability issues in biometrics.
- Cross-database attack (e.g., spoofing/presentation attack) detection mechanisms
- CNNs for generalizability solutions.

The special session GAPinB will take place during the 10th IEEE International Conference on Biometrics: Theory, Applications and Systems (BTAS) 23–26 September 2019, Tampa, Florida.

You can read more at: <https://sites.google.com/view/btas-gapinb/home>

ISO/IEC JT1 SC37 Conference in Darmstadt, Germany



The international standardisation committee on Biometrics ISO/IEC JTC1 SC37 met for its Summer 2019 Working Group meetings in Darmstadt from 08th July to 12th July.

During the week Working Group 3 discussed the comments on the Draft International Standards (DIS) for Extensible biometric data interchange formats:

- [ISO/IEC 39794-4 Finger image data](#)
- [ISO/IEC 39794-5 Face image data](#)

These two standards are now promoted to Final Draft International Standard (FDIS) and will be published in December 2019.

Further during the July meeting Working Group 5 discussed revision of [ISO/IEC 19795-1](#) and promoted the document to DIS level.

The next committee meeting will take place in the U.S. on January 20-24, 2020. In order to participate in the July conference contact your national standardisation body (and the respective mirror-committee of SC37) – see: <https://www.iso.org/members.html>

EU Regulation on Mandatory Biometric Data in ID Cards

The European Commission has published the new Regulation 2019/1157 on ID cards. This Regulation strengthens the security standards applicable to identity cards issued by Member States to their nationals and to residence documents issued by Member States to Union citizens.

New ID cards shall include face and fingerprint images as biometric reference data. However this Regulation does not require Member States to introduce identity cards or residence documents where they are not provided for under national law.

Considerable differences exist currently between the security levels of national identity cards issued by Member States and residence permits for Union nationals residing in another Member State and their family members. Those differences increase the risk of falsification and document fraud and also give rise to practical difficulties for citizens when they wish to exercise their right of free movement.

Security features are necessary to verify if a document is authentic and to establish the identity of a person. The establishment of minimum security standards and the integration of biometric data in identity cards are important steps in rendering their use in the Union more secure.

Identity cards shall include a highly secure storage medium which shall contain a facial image of the holder of the card and two fingerprints in interoperable digital formats. Children under the age of 12 years may be exempt from the requirement to give fingerprints. Children under the age of 6 years shall be exempt from the requirement to give fingerprints.

You can find the Regulation (EU) 2019/1157 at:

<https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:32019R1157>

EAB Biometric News, July 30, 2019

VentureBeat Award on Face Biometrics

The VentureBeat AI Innovation Award "All for Good" was granted to Joy Buolamwini, Timnit Gebru and Inioluwa Rajiim Bereich for their work on face biometrics bias.

The ethical and technical issues around facial recognition software continue to spark a heated debate. The award winners have focused in particular on the significant problem of algorithmic bias in identifying gender and people with darker skin. You can read more at:

<https://venturebeat.com/2019/07/11/announcing-the-winners-of-the-ai-innovation-awards-at-transform-2019/>

see also: <https://venturebeat.com/2019/04/03/prominent-ai-researchers-call-on-amazon-to-stop-selling-rekognition-facial-analysis-to-law-enforcement/>

EAB Biometric News, July 30, 2019

Briefing to the UN Counter-Terrorism Directorate on sharing of Biometric Data to tackle Terrorism

The non-governmental organization Privacy International has published a briefing to the UN Counter-Terrorism Executive Directorate on the responsible use and sharing of biometric data to tackle terrorism.

This briefing is in context to the UN Security Council resolutions on counterterrorism: Recently with Resolution 2396 (2017) the UN Security Council decided that states shall develop and implement systems to collect and share biometrics data for purposes of counterterrorism.

As biometric data is sensitive data the briefing analyses identification systems and national legal frameworks. Furthermore it reflects on necessity and proportionality assessment.

You can read more at: <https://www.privacyinternational.org/advocacy/3066/briefing-un-counter-terrorism-executive-directorate-biometric-data>

EAB Biometric News, July 30, 2019

Identity Week 2019 sees record attendance and participation

The organisers behind Identity Week 2019 have announced that it was their biggest and most successful show to date

"In total we welcomed 33% more attendees compared with 2018 – totaling 2,867 identity industry professionals. Coming from 76 nations, we brought together international governments, NGOs, standards groups, academia and the crème de la crème of the identity industry suppliers", they wrote in a statement.

The three-day Identity Week 2019 Conference and Exhibition, at its new home in ExCeL London, featured more than 180 speakers presenting in 50 sessions, including high-profile Grand Designs case histories, special government-only sessions, and expert insight from leading secure document examiners, banks, airlines, privacy groups and more. Read more: <http://www.planetbiometrics.com/article-details/i/10318/>

You can also read the report of our EAB-CEO on the event at: <https://www.eab.org/files/newsletter/2019-07-report-Identity-Week-2019-Conference.pdf>

EAB Biometric News, July 30, 2019

BTAS–2019 – Special Session on Generalizability and Adaptability in Biometrics (GAPinB)

BTAS–2019 – Special session on Generalizability and Adaptability in Biometrics is organized to evaluate the impact and mitigation measures of such generalization problems in biometric systems. This half–day Special Session in conjunction with BTAS–2019, calls for high–quality, previously unpublished works related to approaches and methodologies.

The challenges of generalization of algorithms and solutions in biometrics has been a long–standing but critical problem. The advancements in biometric solutions have achieved very high accuracy for various problems on databases investigated for the relative problem. However, the recent works have pointed the deficiencies in scaling of such algorithms across databases and sensors. The problem is persistently seen for identification and verification across cross–spectral data, attack detection across variety of data. The limited scalability of the algorithms needs newer and robust solutions to make the biometric systems adaptable for various kind of data. Read more: <https://sites.google.com/view/btas-gapinb/home>

EAB Biometric News, July 30, 2019

Conference report on Identity Week 2019



The Identity Week triple track Conference was held at the London ExCel Center between June 11 and June 13, 2019.

It was chaired by Mark Lockie from the Terrapin organization, and gathered more than 2,800 visitors. The event included a large single space exhibition of major technology and solution vendors in each of the 3 tracks: SDW 2019, Digital ID 2019, and Planet Biometrics 2019.

Parallel conferences were run with a mix of speakers' presentations and open discussion panels on many hot topics. While the triple conference tracks and 14 industry–run round tables were reserved for subscribing delegates, additional links

between the industry and visitors were favored by two free–access theaters run in hot subject highlighted in parallel within the exhibition area.

The organizers' choice was to broaden the realm of SDW, the original Secure Document World, to both the ubiquitous digital transformation of the

industry and to the development of large scale biometrics–savvy projects.

EAB as a partner of the Identity Week event

EAB was very pleased to act as an official partner of the Identity Week during the event, and did actively participate in it. Many distinguished EAB members from both academia and the industry were invited as speakers, panelists or even moderators in the various tracks. In particular, EAB's CEO did moderate a fair portion of the event's Planet Biometrics track, which focused on specific application areas where Biometrics takes an active role in enhancing ID security.

Conference report on IAPR ICB 2019



The 12th IAPR International Conference on Biometrics (ICB 2019) was held on the island of Crete from 04 to 07 June 2019.

The ICB conference is the premier forum for the presentation of new advances and research in biometrics. This year the conference was held in Greece. The conference included 88 paper presentations and three keynote talks.

You can read the conference report at:

<https://www.eab.org/files/newsletter/2019-07-report-ICB-2019-Conference.pdf>

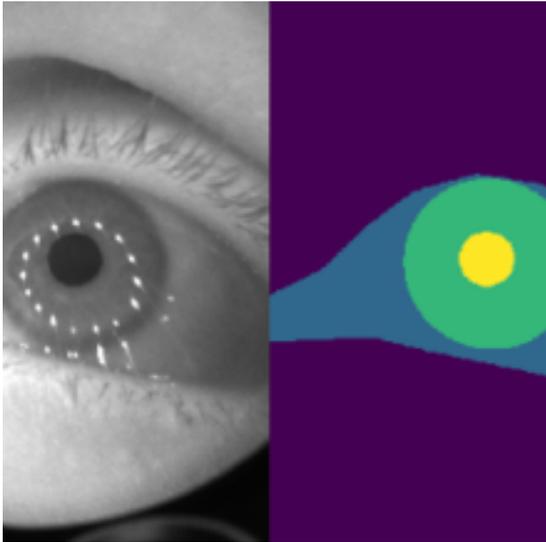
Frontex Conference on Morphing on 9–10 October

Frontex, the European Border and Coast Guard Agency, is organising a conference dedicated to the use of biometrics in the context of border control, with this year's thematic focus on morphing and its possible implications for border security.

The conference will take place in Warsaw, Poland on 9–10 October, 2019 and will largely focus on the topic of morphing. The conference will provide a platform for international dialogue by bringing together the law enforcement community that acknowledges morphing as a potential problem, and the research community and industry that are actively developing ways to prevent, detect and/or defeat morphing attacks.

More information on the conference and the **Call for Extended Abstracts** with a submission deadline of 2019-08-02 can be found at: <https://frontex.europa.eu/research/invitations/call-for-extended-abstracts-for-the-international-conference-on-biometrics-for-borders-BKZVHx>

Eye Segmentation Challenge



Facebook has announced a semantic eye segmentation challenge.

In the context of Facebook's work on immersive AR/VR applications they need unprecedented eye tracking performance. Eye tracking must be precise, accurate, and work all the time for every individual. This in turn requires robust pupil and iris segmentation. Thus Facebook has launched a **semantic segmentation challenge**. They are seeking solutions that can segment the key eye regions: the sclera, the iris, the pupil, and everything else (background).

The submission deadline is September 15, 2019

You can read more at: <https://research.fb.com/programs/openeds-challenge/>

Summer School Report

The 16th International Summer School for Advances in Biometric Authentication: Biometrics and Forensic Science in the Deep Learning Era has been held on May 27th to 31st 2019 in Alghero, Italy.

This was the 16th edition of a strongly established training course started in 2003 to promote knowledge dissemination and research in Biometrics and related fields.

The school main theme was related to the application of deep learning technologies to biometrics and forensic science. The school particularly addressed the impact of deep learning in developing more efficient and secure biometric systems.

Several subjects were taught at the summer school forming a total of 24 hours of theoretical lectures from 17 different lecturers and 4 hours of guided practical sessions using MatLab tools. The subjects ranged from fundamentals such as machine learning and pattern recognition techniques, applied to biometrics, as well as more advanced topics such as neuroscience and applied subjects such as biometric spoofing and biometric template protection, large-scale evaluation and the deployment of biometrics technologies in forensic cases.

This 16th edition of the summer school, featured a line-up of exceptional lecturers, selected from the editorial boards of top-level scientific journals and conferences. Prof. James Haxby, an outstanding neuroscientist, presented a lecture on the representation of visual data in the brain and the topographic mapping to design such representations from MRI recordings. Prof. Lior Wolf, from Facebook research labs, presented an overview of how to deploy deep learning and convolutional neural networks in biometrics. Prof. Vishal Patel, from Rutgers University, presented a lecture on the use of mobile devices for continuous authentication. All lecturers, among the most highly reputed experts in their fields, presented the most up-to-date view in Biometric technologies and Forensic applications.

The school week also included three special sessions on Monday, Tuesday and Thursday evening, devoted to an informal meeting and open discussion among the participants and the lecturers.

38 participants attended the school lectures. The class was formed by students coming from different universities, industries and research centres in the following 15 different countries (in brackets are the number of participants, if greater than one):

Albania (2), Australia (2), Austria (3), Brazil (2), Czech Republic (2), Finland, France (4), Germany (3), Israel (3), Italy (3), Malaysia, Netherlands (3), Russia (3), Switzerland, United Kingdom, USA (3).

This year's students demonstrated a strong interest in the application of biometrics to forensic cases as well to other scenarios. Most of them are either working directly in the design of biometric systems or pursuing high-level scientific research in the field. This not only facilitated the interaction between students and lecturers, but also stimulated and challenged even the most experienced lecturers with questions and requests for explanations in the course of almost all presentations. As a result, both the students and lecturers have been much involved in technical discussions and plans for collaborations.

Most of the students actively took part in the practical sessions. A project was assigned to group splits of the class and an award was assigned to the best projects.

Remarkably, also representatives of government agencies and forensic laboratories attended the school courses. This not only denotes the high reputation gained by the school, but also a deep interest of different government offices in the adoption and newer biometric technologies at the service of the citizens.

For the future editions of the school organizers plan to continue with the open evening discussions, firstly started this year. These informal meetings were very much appreciated and provided several promising hints for further research and discussion. In the next school edition more care will be devoted in the guidance of the discussion and possibly on taking notes of the discussion outcomes. A list of potential topics for discussion may be also requested to the participants before the school beginning.

The 17th edition of the Int.I Summer School on Biometrics will be held on June 1st to 5th 2020. The school will keep the same track of this year's edition investigating further the potential but also the limitations of Deep Learning for Biometrics, Data Science and Forensic Science. It will also attempt to capitalize on the knowledge from Neuroscience and the architecture of the human visual cortex to stimulate further research on new models for deep networks.