

CONFERENCE REPORT



EAB RPC 2020

EAB Research Projects Conference

Web Event, 14-16 September 2020

www.eab.org/rpc2020

The leading voice for digital ID & biometrics, in Europe



7th EAB Research Projects Conference 2020

The 7th edition of the EAB Research Projects Conference (EAB-RPC) took place on the 14, 15, and 16 September 2020. Due to the COVID-19 crisis, the event was held totally virtually, thus constituting a new experience for the organisers and participants alike.

The conference was organised by the European Association of Biometrics (EAB) in cooperation with the Joint Research Centre (DG JRC) of the European Commission, through its Cyber and Digital Citizens' security Unit.

The conference is currently the largest event on research funded by the European Union in the area of Biometrics and Identity Management. Over the previous 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 welcomed **114** participants from academia, industry, and public institutions.

Day 1

The conference began with a **keynote** by *Lucilla Sioli*, Director of Directorate A – Artificial Intelligence and Digital Industry at the European Commission DG CNECT. The keynote focussed on the European perspective on artificial intelligence (AI). The market of AI is growing quickly and already now has a tremendous monetary value. Systems which rely on AI bring



Lucilla Sioli
Director
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DG CONNECT – European Commission

benefits to the consumers and businesses alike; however, some risks exist, especially in terms of fundamental human rights.

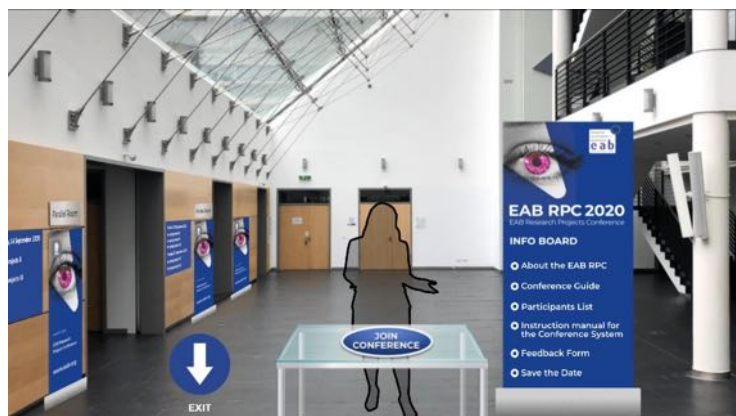
The EU has announced its AI strategy in 2020, which foresees a coordination across member states and a number of initiatives. The EU Commission hopes to strengthen research and networking by supporting, also financially, partnerships between academic and commercial entities. To ensure broad participation and understanding of current issues and public sentiments, a public consultation has been conducted. The respondents are generally cautious about AI-based systems (including biometrics), with key concerns being breaches of fundamental rights and discriminatory outcomes.

The Commission is currently analysing the consultation results in detail and plans to publish a revised coordinated plan. Furthermore, in the near future, legal requirements and/or conformity assessments regarding training data, data storage, transparency, robustness and accuracy, accountability and liability, and human oversight could be imposed on AI-based systems. This pertains especially to high-risk applications, including biometrics. In this context, it is important to balance the need for regulation with space for innovation.



Regarding biometrics specifically, many respondents of the public consultation believed they should be outright banned or heavily regulated. The Commission is currently investigating options for legislation and practical regulations around biometrics. A number of workshops and expert consultations has been conducted; in the near future (October 9th), the AI alliance assembly on will host a dedicated biometrics workshop. Some of the key topics for biometrics could be accuracy and compliance testing, impact assessments, and standardisation. A workshop on standardisation is planned in November.

After the opening keynote, the session on **ongoing projects** was opened with two presentations of the **H-Unique** project. First, *Bryan M. Williams* (Lancaster University) gave an overview of the project, whose key purpose is to investigate and quantify anatomical variation in hands based on various anatomical traits, including but not limited to veins, freckle patterns, knuckle patterns, and nails. The project is a collaboration between technical experts and anatomists. The results of the project are of high relevance for applications in law enforcement and court cases, where quantifying the strength of forensic evidence is crucially important. *Xiaowei Gu* (Lancaster University) then presented preliminary results on superficial hand vein matching with the goal of demonstrating the uniqueness of dorsal vein. On a small database, very promising accuracy rates were achieved. Future work aims to test with larger DBs and automated extraction of vein patterns.



Dimitris Kyriazanos (National Centre for Scientific Research "Demokritos") presented for the **TRESSPASS** project. The project focuses on integrated EU border management based on a systematic risk assessment aided by live (behaviour, analytics) and background data (national DBs etc.), while maintaining compliance with ethical and legal boundaries. One of key elements of the research pertains to

intelligent data fusion and dynamic risk assessment in real-time in order to identify suspicious or undesirable incidents. A sophisticated, integrated simulation platform for operational flow and passenger/personnel crowd simulation which supports multiple models, parameters, and behavioural patterns has been developed. However, the pilots of the project have unfortunately been affected (delays) by COVID-19.

Armin Reuter (VERIDOS) presented the progress of **D4FLY** project. In the first phase of the project, the current state of the art research was surveyed, and a study was conducted to facilitate understanding of the needs and requirements of end stakeholders. Site visits began promising but were unfortunately affected by COVID-19. This notwithstanding, several key findings were established, namely that big differences exist between border crossing points (local circumstances, traffic profiles, risk profiles, environmental specifics etc.). It is therefore important to ensure user-centric approach and well-defined procedures. The project developed a “verification corridor”, wherein biometric recognition and presentation attack detection can be carried out on-the-move utilising multiple biometric characteristics and information fusion. Furthermore, tools for visual (guided) as well as automated analysis of breeder documents were developed. Future research items include development of innovative sensors (e.g. for iris-on-the-move and multi-spectral data acquisition), as well as improvements to anti-spoofing methods and interpretability thereof.

James Ferryman (University of Reading) presented for **FOLDOUT** project. The motivation for the project is to provide support of border guards in intervention decision-making, to detect irregular border crossings and illegal transport, and to help in search & rescue operations. The researchers aim to develop a modular, multi-modal border surveillance solution with a variety of ground and sky-based sensors and a fusion thereof. Some of key challenges include border areas with heavy vegetation and forests, as well as robustness w.r.t. different weather conditions. Highlights of the project progress thus far include development of

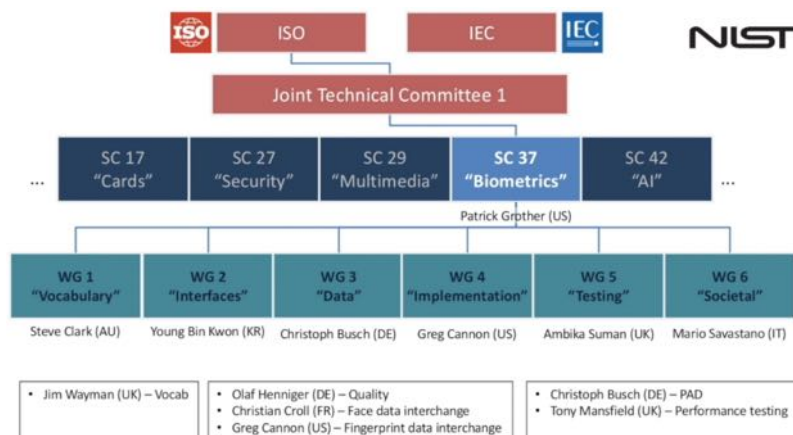


first novel prototype sensors, software for data processing and evaluation, and collection of ground truth data. First operational demonstrator/pilot project has been set up in Bulgaria. Future steps include development and integration of the sensors and analytics, anomaly detection module, development of supporting tools (e.g. for terrain classification and sensor placement) and testing in practice. Unfortunately, delays in practical tests occurred due to COVID-19.

James Ferryman (University of Reading) also presented the results of the **PROTECT** project. The technologies developed in the project facilitate improved biometrics at borders – less intrusive, faster, usable, accurate, and driven with by a privacy-by-design system architecture. The researchers contributed several innovations within the individual recognition methods, PAD, privacy, and fusion. On the practical side, a seamless on-the-move biometrics corridor was developed, featuring multi-modal (iris, face, voice, veins, anthropometrics) sensors and information fusion. The contactless technologies used in the corridor are especially relevant in the time of COVID-19. Future work in the area of the project might include accessibility and inclusivity studies, improvements in the contactless biometric technologies, as well as challenges with image quality for iris on-the-move systems.

Day 2

The second day opened with two **EAB training sessions on biometric standards**. *Patrick Grother* (National Institute for Standards and Technology NIST) gave an overview of the work of ISO/IEC JTC1 SC37 work and explained the intricacies of the standardisation process. The scope of SC37's work includes "standardization of generic biometric technologies pertaining to human beings to support interoperability and data interchange among applications and systems. Generic human biometric standards include: common file frameworks; biometric application programming interfaces; biometric data interchange formats; related biometric profiles; application of evaluation criteria to biometric technologies; methodologies for performance testing and reporting and cross jurisdictional and societal aspects¹. In recent years, SC37 has established numerous liaisons with other committees in JTC1, as well as with relevant external organisations (e.g. eu-LISA). In a discussion, the participants agreed that one of the key issues in standardisation is fostering the awareness throughout the academic and commercial community. This general presentation was followed by presentations of some of the most important and widespread biometric standards:



Jim Wayman (British Standards Institute BSI) talked about the harmonized biometric vocabulary (2382-37:2020) and discussed the challenges in its creation.

Tony Mansfield (National Physical Laboratory NPL) gave an overview of the upcoming revision of the biometric performance testing standard (19795-1:2020). The standard makes it possible to empirically evaluate important operational aspects such as error rates and throughput rates of a biometric system. An advantage of this standard is that it is generic and generally applicable (e.g. verification, identification, small and large scale, modality-independent, different scenarios). The upcoming (end of 2020 or beginning of 2021) revision decided to update the concepts w.r.t recent technological developments and to align with the harmonised vocabulary. Furthermore, new metrics were added (selectivity), some were deprecated unless operationally relevant (single figure of merit, such as EER, HTER, AUC).

Christoph Busch (Hochschule Darmstadt) discussed the presentation attack detection standards (30107-1 and 30107-3). Those standards address attacks which happen during presentations at the biometric sensor, i.e. human-biometric system interactions. A number of methods (e.g. artefacts, surgery, disguise, make-up) can be used to circumvent biometric systems through impersonation and concealment. The aforementioned standards provide a taxonomy of presentation attack instruments, as well as a methodology and metrics for assessment of presentation attack performance (security vs convenience trade-off) and assessment of attack efficacy (system vulnerability w.r.t. attacks).

Christoph Busch (Hochschule Darmstadt) also discussed the scope of 3rd Generation Passport Standards, which is a joint work with ICAO and aims to continue taking advantage of biometrics in (machine readable) travel documents. Such documents, already issued in

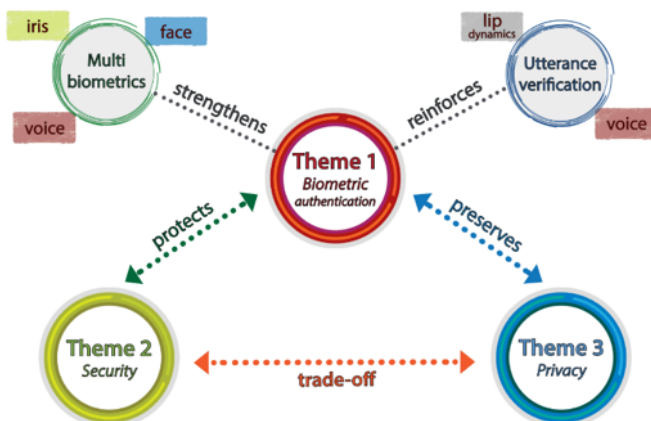
¹ <https://www.iso.org/committee/313770.html>

100+ countries around the world, establish a unique link between document and document owner, thus providing more security and more speed during various processes (e.g. border controls). A key goal of the new standard is to be both forward and backward compatible, meaning that new data must not disturb the processes in older systems, and new standards shall include at least the mandatory data from the previous versions. The sessions on standards were closed by several presentations on biometric data interchange.



Olaf Henniger (Fraunhofer IGD) presented the standard which deals with the overall framework (39794-1), while *Greg Cannon* and *Christian Croll* (Photo-Me) talked about specific standards relating to fingerprint image (39794-4) and face image (39794-5) data, respectively. Each speaker emphasised the need of forward and backward compatibility, as well as rules and guidelines to achieve the extensibility of the encodings of biometric data. Furthermore, future works w.r.t. contactless technologies and extensions to current technologies were discussed, along with quality and security compliance. The session was closed by *Ralph Lessmann* (HID Global), who gave a more practical and technical view of integration aspects and challenges associated with the aforementioned data interchange standards.

The conference continued with several sessions on **ongoing projects**. Three presentations were held for the **RESPECT** project. *Marta Gomez-Barrero* (Hochschule Ansbach) presented recent developments on unknown Presentation Attack Detection for Facial Images. With the goals of improvement of accuracy, reinforcement of reliability, and addressing security risks, several promising PAD approaches have been developed. More specifically, the researchers concentrated on biometric characteristics which can be captured using ubiquitous smart devices and which facilitate computationally manageable homomorphic encryption of biometric templates. The developed approaches rely on multi-modal fusion to protect against presentation attacks and facilitate generalisation, while preserving privacy. Future work in this area might include cross-database experiments. *Antitza Dantcheva* (INRIA) talked about deepfake images and videos. Deepfakes can



facilitate some positive uses (e.g. virtual reality, movie production and games), but can also be used for malicious purposes such as fake news, fake porn, and blackmail. In the context of the project, the researchers developed an adversarial learning approach for generation of deepfake facial videos from images. The proposed method preserves the general subject appearance and motion consistency, while generating a range of emotions. On the topic of deepfake detection, it was established that deepfakes are

difficult to detect (especially in compressed or low-quality videos) and that current models generalised poorly beyond the training set and required large amount of training data.

More research is needed to develop robust and accurate deepfake detectors; another ongoing research topic is interpretability of generative and deep learning-based systems. *Andreas Nautsch* (EURECOM) presented new metrics for security and privacy assessments in biometric systems. The proposed security metric facilitates risk assessment in a tandem (PAD and recognition) system with a Bayesian risk-assessment framework. It makes it possible to set decision thresholds based on quantifiable metric/costs and is theoretically generalisable to any biometric modality generalisable. The proposed privacy metric is based on zero evidence and prior/post entropy and maps privacy to forensic evidence concepts. With the proposed metric, it is possible to compute expected privacy disclosure on the population level, as well as worst-case privacy disclosure on individual level. The metrics are not yet included in ISO/IEC biometric standards but might be interesting to consider in the future.

The next three talks were dedicated to the **COMPRISE** project. *Thomas Kleinbauer* (Saarland University) provided an overview of the project, which concentrates on voice-enabled services in commercial and consumer products.



The key objective was to address practical and ethical concerns in such systems with a privacy-by-design methodology in development of tools which reduce costs and increase inclusiveness. Some of the highlights of the project progress so far include research on privacy-driven speech and text transformations, as well as improved inclusiveness through machine translation and adaptation to speakers with accents. Furthermore, first modularly designed SDK versions and demonstrators have been developed with open-source code made available to the community. *Brij Mohan Lal Srivastava* (INRIA) presented research results on recently developed approaches towards speaker anonymization. Promising results were achieved in anonymisation with adversarial and voice conversion methods to hide speaker identity but maintain speech content. The proposed method was evaluated empirically using different attacker models, thereby showing the role/impact of attacker knowledge on the anonymisation efficacy. The researchers are also currently co-organising a speech anonymisation challenge. *Thomas Kleinbauer* (Saarland University) then closed the session with a talk on sensitive information in conversations with voice assistants. Such assistants may record sensitive data (beyond identity, e.g. location with timestamp, associations, interests, credit card, soft biometric traits, health information). The researchers looked into ways to detect the sensitive information and replace it. Doing so is a very challenging task, as sensitive information is difficult to define, domain and context dependent, and linguistically there exist different ways of expressing same information. On the other hand, when replacing information, it is challenging to quantify the privacy level and maintain text coherence. More research is needed on this utility and privacy trade-off.

The second day concluded by presentations of **Innovative Training Networks (ITN)**. "ITN supports competitively selected joint research training and/or doctoral programmes, implemented by partnerships of universities, research institutions, research infrastructures, businesses, SMEs, and other socio-economic actors from different countries across Europe and beyond."² *Raymond Veldhuis* (University of Twente) provided an overview of the **PriMa**

² https://ec.europa.eu/research/mariecurieactions/actions/get-funding/innovative-training-networks_en

project, which focuses on privacy. The project goes beyond biometrics, addressing various aspects and domains (i.e. privacy analysis, privacy protection, and impact assessments) in an interdisciplinary fashion. Joint events with another ITN project (TresPass-ETN) are planned. The first months of the project consisted mostly of conceptual work, although first practical results were already achieved. *Amina Bassit* (University of Twente) presented one of such



results, which concerned the integration of biometric recognition and homomorphic encryption (HE). HE allows computations on encrypted data and is potentially well-suited to address certain data protection requirements of biometric systems and to mitigate the consequences of data breaches. In addition to security requirements, however, accuracy and efficiency need to be considered as well. The researchers achieved promising results achieved for verification of in HE domain of facial and signature data. Furthermore, different attacker models (beyond of what was considered in the literature thus far) were considered in security analysis of the proposed system.

Mariano Alcañiz (Universidad Politecnica de Valencia) presented the **RHUMBO** project, which aims to develop an understanding of consumer decisions through application of neuroscientific methods, which is a relatively new field of research. The researchers study implicit responses (subconscious brain processes) through use of mixed reality and biometric signal processing, rather than explicit responses (traditional marketing techniques such as surveys and questionnaires) to deepen their understanding of consumer decisions. Thus far, the project conducted a shopper classification study and a study for prediction of demographic attributes based on behavioural responses. They also implemented an extractor of >100 metrics related to implicit behaviour of shoppers. The conducted research could facilitate interesting future application, such as virtual reality (VR) stores and might be even extended to physical stores. The researchers believe such technologies could benefit both the consumers (e.g. by adapting to their needs) and the companies (e.g. revenue/profit increases).

Massimiliano Todisco (EURECOM) presented an overview of the **TReSPAsS-ETN** project, which aims to develop the next generation of secure and privacy preserving biometrics which are compliant with legal, ethical, and societal frameworks. The project has just started.



Richard Guest (University of Kent) presented the results of **AMBER** project, which focused on biometrics on mobile devices. The key themes of the project were novel solutions for data collection and multi-modal evaluation, as well as privacy and accessibility. The project is coming to an end soon and a number of interesting results were achieved, including fingerprint PAD based on spatio-temporal descriptors, ear imaging and recognition, a pilot study for finger-vein

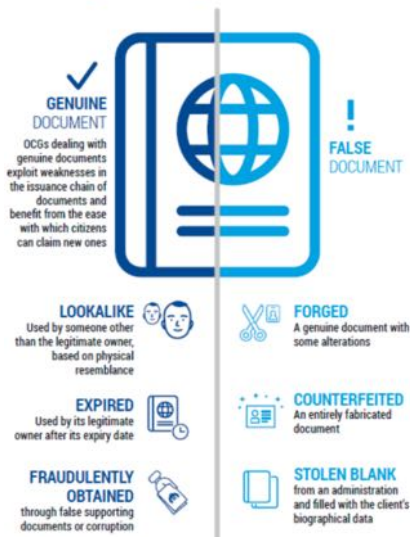
computations with mobile devices and external sensor.

Day 3

The third day was opened by *Andra Sirgmet*s (Estonian Forensic Science Institute) who presented the **TELEFI** project. The project focuses on a European-level exchange of facial images. The researchers conducted a pan European study via web-based survey, face-to-face interviews, and a legal review. The results of the study will be summarised in a report and scientific paper, which will describe the current status (practices and procedures, databases, technical solutions, legal regulations, quality standards) and visions/opinions of member states towards exchange of facial data. The detailed analysis of the results will also be presented during Conference on



Understanding the different types of document fraud

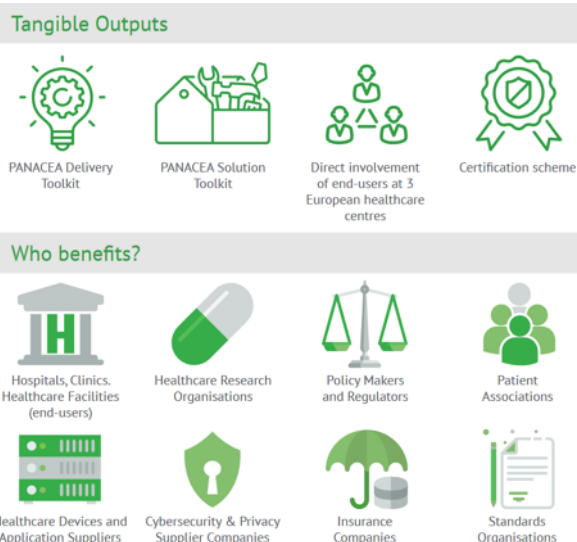


Facial Recognition in Criminal Investigations in 2-3 February, 2021, which will be held as a virtual event.

Kiran Raja (Norwegian University of Science and Technology) talked about the current status of research into morphing attack detection. Morphing can be used to create facial images which contain biometric information of multiple data subjects, thus breaking the unique link between biometric data and identity. Furthermore, vulnerable travel document issuance processes can be abused to introduce such images into genuine travel documents (passports). In **SOTAMD** project, the researchers conducted experiments to empirically assess the vulnerability of various open-source and commercial systems towards morphing and proposed numerous methods for detection of morphed images, achieving promising results in terms of detection error rates. The project developed a benchmark platform and collected a high-quality dataset of images, thereby enabling independent testing of morphing detection methods.

Christoph Busch (Norwegian University of Science and Technology) introduced the new **iMARS** project, which concentrates on solutions for image manipulation attacks. The project will address morphing and other image manipulation techniques, as well as document fraud. Furthermore, contributions to standardisation in this area are expected and needed.

The next session was devoted to **PANACEA** project, which focuses on protection and privacy of hospital and health infrastructures with smart cyber security and cyber threat toolkit for data and people. Hospitals are a valuable target for attackers and generally possess weak defences and security practices. *Claude Bauzou* (IDEMIA) presented the overall goals of the project, which are to deliver a holistic cybersecurity toolkit in the context of healthcare. *Aghiles Adjaz* (IDEMIA) then talked about an identity management platform for hospital staff. Current authentication solutions are often deemed impractical by the hospital



staff; in a requirement engineering part of the project, some of the identified requirements were that such a system be easy to use, secure, affordable, easily integrable, and GDPR compliant. The researchers proposed to create a platform based on decentralised smartphone biometrics to serve as access tokens. Furthermore, considering the specific requirements of the hospital-domain, algorithms for facial recognition with masks were developed and achieved very good results in a NIST benchmark. *Emmanouil Spanakis* (FORTH-ICS) then presented another important aspect of this project, standardisation. The researchers contributed to biometrics and healthcare standards, most prominently the ISO/IEC TR 21419 has been re-opened with a new draft being currently under consideration.

The next session was opened by *Christos Xenakis* (University of Piraeus), who presented the **INCOGNITO** project. The focus of the project is identity verification with privacy-preserving credentials for anonymous access to online services. To counterbalance the risks of privacy infringements and data breaches, the researchers aim to develop a platform for qualified anonymity infrastructure based on cryptographic credentials, federated logins, and blockchain. Qualified anonymity allows to partition one's identity into attributes and control access to them in a fine-grained, case-by-case manner.

Rami Qahwaji (Bradford University) talked about the development of multimodal biometric systems in the context of **eBORDER** project. The researchers propose innovative passenger-centric multi-modal biometric systems with on-the-fly authentication. The project is interdisciplinary and addresses areas such as wireless security, biometric recognition, and data fusion, which are aimed for use at EU borders.

Xavier Mamy (IDEMIA) presented the results of the **VICTORIA** project, which focused on utilising video analysis to facilitate and accelerate investigation of criminal and terrorist activities. The researchers developed novel tools for detection and tracking of objects, faces, persons, vehicles etc., and audio analysis with quick response times. Assessment in real operational scenarios has also begun. The final conference of the project with live demos is planned for November 16-18 and will be held virtually.



The final project session featured **finished projects**. *Heiko Roßnagel* (Fraunhofer IAO) presented for the **LIGHT^{est}** project. The project focused on development of a lightweight infrastructure for global heterogeneous trust management in support of an open ecosystem of stakeholders and trust schemes. The developed open and interoperable architecture and toolset were tested in two use case pilots. All code developed in the course of this project is open-source and a step-by-step guide (cookbook) is available. There still exist numerous possibilities for future research in this area and a new project proposal is on the way.

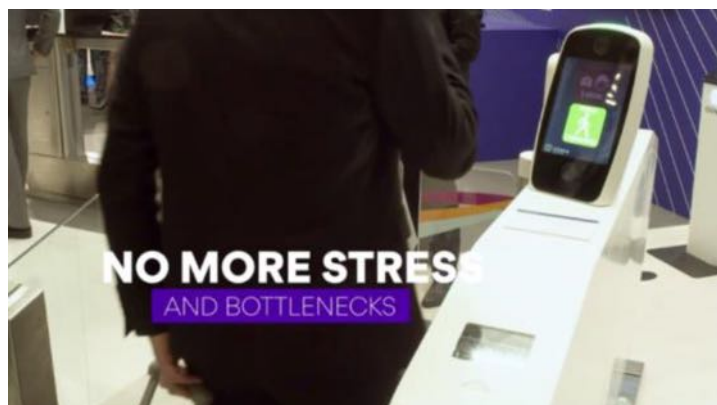
Dimitra Triantafyllou (Center for Research and Technology Hellas) presented the results of the **SMILE** project. The project addressed the topic of smart mobility at the European land borders. The researchers focused on low cost technological solutions, which can contribute to convenience without sacrificing security. Functional prototypes for various modules/applications (for travellers, border control, monitoring/statistics) were developed. Pilots demonstrations were held at three pilot sites, although some restrictions and interruptions due to COVID-19 unfortunately took place. The developed systems should

accelerate the border check procedure and overall high user satisfaction with the pilots was recorded.

Raghavendra Ramachandra (Norwegian University of Science and Technology) presented the results of **SWAN** project, which aimed to develop biometric solutions which are fast, trustworthy, and secure for real-time authentication at banking transactions. The researchers concentrated on smartphone-driven biometrics with existing sensors, privacy-by-design approach, presentation attack detection, and incorporated multi-modal biometric fusion into their concepts. To evaluate the developed methods, biometric databases were collected and made available on the BEAT platform. Furthermore, the project resulted in a spin-off company, MOBAI.

The final session featured two **talks by industrial sponsors** of the event.

Pedro Alves (IDEMIA) talked about the changing paradigms and emerging challenges of air travel in the era of COVID-19. The pandemic crisis has severely affected the air travel industry. A new paradigm is emerging, where sanitary concerns and health controls become a top priority. There is a strong demand for acceleration of digital and seamless passenger journey.



The industry is working to maximise of off-airport actions, limit human-to-human interactions, optimise passenger flows, and minimise contagion risk. One of key technologies in this context are contactless biometrics, facial recognition with high accuracy despite masks, risk-based analysis to support decision making, as well as flexible processes in general. Several pilots are currently ongoing with the hope of aiding the recovery of the industry.

Georg Hasse (secunet Security Networks) talked about portable and handheld devices for high quality biometric border checks. Automation and portable/mobile devices are seen as key enablers for the entry-exit system (EES) at EU borders, which will be introduced to improve the quality of border controls across Europe. The presentation also included a set of recommendations for image quality requirements based on empiric study.

The third day was closed by a **round-table panel discussion** moderated by *Farzin Deravi* (University of Kent) and *Dinusha Frings* (Citizen ID) on **bias, fairness, and ethics in biometrics**. Those issues have recently become a hot topic in research community and society in general. The participants, *David Reichel* (FRA, European Agency for Fundamental Rights), *Irina Orssich* (EC–DG CNECT, DG for Communications Networks, Content and Technology), *Elisabet Leitert* (NFC, National Forensic Centre Sweden), *Didier Meuwly* (NFI/UTwente, Netherlands Forensic Institute/University of Twente), *Damianos Chronakis* (ECTC, European Counter Terrorism Centre), discussed among other matters, how ethical issues, including bias and fairness, are currently affecting the application of biometric technologies, what areas of future operation of biometrics technologies may be impacted by ethical concerns, and how research and development effort could be best directed to address current and future ethical issues facing the use of biometric technologies.



Damianos
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Terrorism Centre*



David
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Rights*



Didier
Meuwly

*Netherlands
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University of Twente*



Irina
Orssich

*DG for
Communications
Networks, Content
and Technology*

Following the round-table discussion, the experts answered numerous questions from the audience, whereupon the whole EAB-RPC event was concluded.

Concluding Remarks

The presentations and complementary information from the speakers are available on the EAB website³. The EAB-RPC and the Darmstadt Biometric Week was well attended. Thus, a new edition of EAB-RPC will take place next year, on 13-15 September 2021. The EAB Research Projects Conference 2021 will again be co-located with the IEEE BIOSIG conference during the Darmstadt Biometric Week⁴.

About EAB

The EAB is the leading voice for biometrics and digital identity, for Europe.

As a non-profit organization, EAB represents and connects a growing community of biometrics and digital ID stakeholders from across Europe. Our purpose is to foster innovation, support networking across markets and stakeholders, and provide trusted and impartial advice. The EAB's membership includes the European Commission, business leaders, governments, institutes and academia. Members meet regularly at EAB hosted and partnered events and networking opportunities, across Europe.

³ <https://eab.org/events/program/195>

⁴ <https://eab.org/events/program/219>