Guest Editorial

Privacy, described as "an integral part of our humanity" and "the beginning of all freedom", is one of the most important social and political issues in our information society. It is characterised by a growing range of enabling and supporting technologies and services such as communications, telemedicine, multimedia, biometrics, big data, the internet, social networks, and video surveillance. Each of these can potentially lead to privacy intrusion.

De-identification, which is defined as the process of removing or concealing personal identifiers or replacing them with surrogate personal identifiers to prevent direct or indirect identification of a person, is recognised as an efficient tool to protect a person's privacy.

The contributions for this Special Section are mainly the result of research activities and cooperation associated with COST Action IC1206 “De-identification for Privacy Protection in Multimedia Content”.

The section contains six papers in the following topic areas: speaker and face de-identification, de-identification of soft-biometric personal identifiers, and privacy protection in telemedicine.

The paper "On the influence of speaker de-identification in depression detection" by Paula Lopez-Otero et al. deals with the problem of assessing a patient's level of depression using de-identified speech to protect the individual's privacy. Two speaker de-identification approaches based on voice transformation via frequency warping and amplitude scaling are proposed. Experiments carried out in the framework of the Audio/Visual Emotion Challenge 2014 show that the suggested de-identification approaches achieve promising de-identification results at the cost of a slight degradation of depression detection.

The following four papers relate to face de-identification. In the paper "Image privacy protection with secure JPEG transmorphing", L. Yuan and T. Ebrahimi propose secure JPEG transmorphing as a framework for protecting image visual privacy in a secure, reversible, and highly flexible and personalised manner. The subjective and objective evaluation of the results of experiments indicates that the proposed protection scheme provides near lossless image reconstruction, a controllable level of file size expansion, a good degree of privacy protection and, especially, better subjective pleasantness.

The paper "An efficient approach to de-identifying faces in videos" by L. Meng et al. presents a novel approach that extends face de-identification from person specific (closed) sets of facial images to open sets of video frames. The proposed approach achieves privacy protection and preservation of facial expressions simultaneously through the simple operation of adding a pre-calculated identity shift to the original face instances in the input video.

"Face de-identification with generative deep neural networks" by B. Meden et al. considers a novel face de-identification pipeline which combines the Viola-Jones off-shell detector, a VGG-based convolution neural network feature extractor, a feature matcher, a generative neural network and face swap module. The experiments show that the proposed pipeline ensures anonymity by synthesising artificial surrogate faces using generative neural networks (GNNs).

In their paper "Privacy protection of tone-mapped HDR images using false colours" the authors S. Çiftçi et al. seek to answer the following set of research questions: Does false colouring reduce the intelligibility of faces? Do different false colour palettes have a different impact on intelligibility? How does false colouring interact with tone-mapping? Does false colouring have a different effect on face recognition algorithms than on human observers? This work studies the reliability of false colours when used for the privacy protection of HDR images represented by tone mapping operators (TMOs). Different techniques are tested: a simple TMO based on the Gamma transform, a complex local TMO, and two approaches based on false colour palettes.

In "Face, hairstyle and clothing colour de-identification in video sequences", K. Brkić et al. introduce a system for person de-identification in video data that de-identifies biometric and non-biometric features, namely faces, hairstyles and clothing colours. Face de-identification is performed based on the detection of human faces and silhouettes in the input video and by substituting the detected faces with random synthesised faces obtained using a deep convolutional generative adversarial network. Additionally, hairstyles are rendered over the synthesised faces, and the human silhouette is re-coloured so that skin hues are preserved and the clothing hues are altered. Qualitative and quantitative evaluation of the experimental results suggests that the proposed system produces de-identified images that look natural, at the same time being resistant to re-identification attacks.

All of the papers selected for this Special Section demonstrate certain progress in recent research on the de-identification of biometric and soft-biometric personal identifiers, but many problems related to de-identification for privacy protection are still unsolved. In spite of the huge efforts of various academic research groups, institutions and companies, research in the field of de-identification and multimodal de-identification, which is related to concealing or replacing simultaneously present non-biometric, physiological, behavioural and soft-biometric personal identifiers with surrogate identifiers, is still in its infancy.

Guest Editor Biographies:

Slobodan Ribarić, PhD, is Full Professor at the Department of Electronics, Microelectronics, Computer and Intelligent Systems at the Faculty of Electrical Engineering and Computing of the University of Zagreb, Croatia, and head of the Laboratory of Pattern Recognition and Biometric Security Systems (RUBOISS). He received his BSc. in Electronics, an MSc in Automatics, and a PhD in Electrical Engineering from the Faculty of Electrical Engineering, Ljubljana, Slovenia, in 1974, 1976, and 1982, respectively. His research interests include pattern recognition, artificial intelligence, biometrics, and robot vision. He has published more than one hundred and sixty papers and five books on these topics.

Professor Ribarić has been the chair of the IC1206 COST Action “De-identification for Privacy Protection in Multimedia Content”, and is currently lead researcher of the four-year project "Privacy Protection in Surveillance Systems" funded by the Croatian Science Foundation. He is a member of the IEEE and MIPRO.

Arun Ross is a Professor in the Department of Computer Science and Engineering at Michigan State University (MSU) and the Director of the i-PRoBe Lab. Prior to joining MSU in 2013, he was a faculty member at West Virginia University (WVU) from 2003 to 2012. He also served as the Assistant Site Director of the NSF Center for Identification Technology and Research (CITeR) between 2010 and 2012.

Arun received the B.E. (Hons.) degree in Computer Science from the Birla Institute of Technology and Science, Pilani, India, and the M.S. and Ph.D. degrees in Computer Science and Engineering from Michigan State University.

He is the co-author of the textbook “Introduction to Biometrics” and the monograph “Handbook of Multibiometrics,” and the co-editor of “Handbook of Biometrics”. He is a recipient of the IAPR JK Aggarwal Prize, the IAPR Young Biometrics Investigator Award (YBIA), the NSF CAREER Award, and was an invited speaker at the Frontiers of Science Symposium organised by the National Academy of Sciences in November 2006. He is also a recipient of the 2005 Biennial Pattern Recognition Journal Best Paper Award and the Five Year Highly Cited BTAS 2009 Paper Award.

Arun served as a panellist at a counter-terrorism event that was organised by the United Nations Counter-Terrorism Committee (CTC) at the UN Headquarters in May 2013. He was an Associate Editor of IEEE Transactions on Information Forensics and Security (2009 – 2013), and IEEE Transactions on Image Processing (2008 – 2013). He currently serves as Associate Editor of IEEE Transactions on Circuits and Systems for Video Technology, Senior Area Editor of IEEE Transactions on Image Processing, Area Editor of the Computer Vision and Image Understanding Journal, Associate Editor of the Image and Vision Computing Journal, and Chair of the IAPR TC4 on Biometrics.