

Commenced Publication in 1973

Founding and Former Series Editors:

Gerhard Goos, Juris Hartmanis, and Jan van Leeuwen

Editorial Board

David Hutchison

Lancaster University, Lancaster, UK

Takeo Kanade

Carnegie Mellon University, Pittsburgh, PA, USA

Josef Kittler

University of Surrey, Guildford, UK

Jon M. Kleinberg

Cornell University, Ithaca, NY, USA

Friedemann Mattern

ETH Zurich, Zurich, Switzerland

John C. Mitchell

Stanford University, Stanford, CA, USA

Moni Naor

Weizmann Institute of Science, Rehovot, Israel

C. Pandu Rangan

Indian Institute of Technology, Madras, India

Bernhard Steffen

TU Dortmund University, Dortmund, Germany

Demetri Terzopoulos

University of California, Los Angeles, CA, USA

Doug Tygar

University of California, Berkeley, CA, USA

Gerhard Weikum

Max Planck Institute for Informatics, Saarbrücken, Germany

More information about this series at <http://www.springer.com/series/7412>

Jie Zhou · Yunhong Wang
Zhenan Sun · Yong Xu
Linlin Shen · Jianjiang Feng
Shiguang Shan · Yu Qiao
Zhenhua Guo · Shiqi Yu (Eds.)

Biometric Recognition

12th Chinese Conference, CCBR 2017
Shenzhen, China, October 28–29, 2017
Proceedings

Editors

Jie Zhou
Tsinghua University
Beijing
China

Yunhong Wang
Beihang University
Beijing
China

Zhenan Sun
Institute of Automation
Chinese Academy of Sciences
Beijing
China

Yong Xu
Harbin Institute of Technology (Shenzhen)
Shenzhen
China

Linlin Shen
Shenzhen University
Shenzhen
China

Jianjiang Feng
Tsinghua University
Beijing
China

Shiguang Shan
Institute of Computing Technology
Chinese Academy of Sciences
Beijing
China

Yu Qiao
Shenzhen Institute of Advanced Technology
Chinese Academy of Sciences
Shenzhen
China

Zhenhua Guo
Graduate School at Shenzhen
Tsinghua University
Shenzhen
China

Shiqi Yu
Shenzhen University
Shenzhen
China

ISSN 0302-9743 ISSN 1611-3349 (electronic)
Lecture Notes in Computer Science
ISBN 978-3-319-69922-6 ISBN 978-3-319-69923-3 (eBook)
<https://doi.org/10.1007/978-3-319-69923-3>

Library of Congress Control Number: 2017957549

LNCS Sublibrary: SL6 – Image Processing, Computer Vision, Pattern Recognition, and Graphics

© Springer International Publishing AG 2017

This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, express or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Printed on acid-free paper

This Springer imprint is published by Springer Nature
The registered company is Springer International Publishing AG
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

Preface

Security and privacy issues are topics of growing concern in the Internet era and as a result of the growing demand for anti-terrorism activity. This raises great interest in biometric technology, which provides substantial advantages over traditional password- or token-based solutions. Biometric recognition systems have been extensively deployed worldwide in law enforcement, government, and consumer applications. In China, thanks to the huge population using the Internet and smart phones and to the great investment of the government in security and privacy protection, the biometric market is rapidly growing and biometric research keeps attracting the attention of numerous scholars and practitioners. These researchers have been addressing various biometric problems, promoting diverse biometric techniques, and making significant contributions to the biometrics field. The Chinese Conference on Biometric Recognition (CCBR), an annual conference held in China, provides an excellent platform for biometric researchers to share their progress and advances in the development and applications of biometric theory, technology, and systems.

CCBR 2017 was held in Shenzhen during October 28–29, 2017, and was the 12th in the series that has been successfully held in Beijing, Hangzhou, Xi'an, Guangzhou, Jinan, Shenyang, Tianjin, and Chengdu since 2000. CCBR 2017 received 137 submissions, each of which was reviewed by at least three experts from the Program Committee. Based on the rigorous review comments, 15 papers (11%) were selected for oral presentation and 65 papers (47%) for poster presentation. These papers make up this volume of the CCBR 2017 conference proceedings covering a wide range of topics: face recognition and analysis; fingerprint, palm-print, and vascular biometrics; iris biometrics; gesture and gait; emerging biometrics; voice and speech; video surveillance; feature extraction and classification theory; and behavioral biometrics.

We would like to thank all the authors, reviewers, invited speakers, volunteers, and Organizing Committee members, without whom CCBR 2017 would not have been successful. We also wish to acknowledge the support of the Chinese Association for Artificial Intelligence, Institute of Automation of Chinese Academy of Sciences, Springer, Shenzhen University, Harbin Institute of Technology (Shenzhen), Pingan

Technology, ZKTeco Co., Ltd., IrisKing Co., Ltd., Taisau Co., Ltd. for sponsoring, and China Fortune Land Development Co., Ltd. this conference. Special thanks are due to Dan Chen and Hao Gui for their hard work in organizing the conference.

October 2017

Jie Zhou
Yunhong Wang
Zhenan Sun
Yong Xu
Linlin Shen
Jianjiang Feng
Shiguang Shan
Yu Qiao
Zhenhua Guo
Shiqi Yu

Organization

Advisory Committee

Anil K. Jain	Michigan State University, USA
Tieniu Tan	Institute of Automation, Chinese Academy of Sciences, China
David Zhang	The Hong Kong Polytechnic University, Hong Kong, SAR China
Jingyu Yang	Nanjing University of Science and Technology, China
Xilin Chen	Institute of Computing Technology, Chinese Academy of Sciences, China
Jianhuang Lai	Sun Yat-sen University, China

General Chairs

Jie Zhou	Tsinghua University, China
Yunhong Wang	Beihang University, China
Zhenan Sun	Institute of Automation, Chinese Academy of Sciences, China
Yong Xu	Harbin Institute of Technology (Shenzhen), China
Linlin Shen	Shenzhen University, China

Program Chairs

Jianjiang Feng	Tsinghua University, China
Shiguang Shan	Institute of Computing Technology, Chinese Academy of Sciences, China
Yu Qiao	Shenzhen Institutes of Advanced Technology, Chinese Academy of Sciences, China
Zhenhua Guo	Graduate School at Shenzhen, Tsinghua University, China
Shiqi Yu	Shenzhen University, China

Program Committee

Caikou Chen	Yangzhou University, China
Cunjian Chen	Canon Information Technology (Beijing), China
Fanglin Chen	National University of Defense Technology, China
Weihong Deng	Beijing University of Posts and Telecommunications, China
Yuchun Fang	Shanghai University, China
Keren Fu	Shanghai Jiao Tong University, China
Quanxue Gao	Xidian University, China
Shenghua Gao	ShanghaiTech University, China
Yongxin Ge	Chongqing University, China
Xun Gong	Southwest Jiaotong University, China

Zhe Guo	Northwestern Polytechnical University, China
Zhenhua Guo	Graduate School at Shenzhen, Tsinghua University, China
Hu Han	Institute of Computing Technology, Chinese Academy of Sciences, China
Zhenyu He	Harbin Institute of Technology (Shenzhen), China
Ran He	Institute of Automation, Chinese Academy of Sciences, China
Qingyang Hong	Xiamen University, China
Dewen Hu	National University of Defense Technology, China
Di Huang	Beihang University, China
Wei Jia	Hefei University of Technology, China
Xiaoyuan Jing	Wuhan University, China
Wenxiong Kang	South China University of Technology, China
Kurban Ubul	Xinjiang University, China
Zhihui Lai	Shenzhen University, China
Huibin Li	Xi'an Jiaotong University, China
Weijun Li	Institute of Semiconductors, Chinese Academy of Sciences, China
Wenxin Li	Peking University, China
Zhifeng Li	Shenzhen Institutes of Advanced Technology, Chinese Academy of Sciences, China
Dong Liang	Nanjing University of Aeronautics and Astronautics, China
Shengcai Liao	Institute of Automation, Chinese Academy of Sciences, China
Eryun Liu	Zhejiang University, China
Feng Liu	Shenzhen University, China
Heng Liu	Anhui University of Technology, China
Manhua Liu	Shanghai Jiao Tong University, China
Yiguang Liu	Sichuan University, China
Zhi Liu	Shandong University, China
Guangming Lu	Harbin Institute of Technology (Shenzhen), China
Jiwen Lu	Tsinghua University, China
Xiao Luan	Chongqing University of Posts and Telecommunications, China
Haifeng Sang	Shenyang University of Technology, China
Fumin Shen	University of Electronic Science and Technology of China, China
Kejun Wang	Harbin Engineering University, China
Yiding Wang	North China University of Technology, China
Yi Wang	Hong Kong Baptist University, Hong Kong, SAR China
Xiangqian Wu	Harbin Institute of Technology, China
Lifang Wu	Beijing University of Technology, China
Xiaohua Xie	Sun Yat-sen University, China
Yuli Xue	Beihang University, China
Haibin Yan	Beijing University of Posts and Telecommunications, China
Gongping Yang	Shandong University, China
Jinfeng Yang	Civil Aviation University of China, China
Jucheng Yang	Tianjin University of Science and Technology, China

Wankou Yang	Southeast University, China
Yingchun Yang	Zhejiang University, China
Yilong Yin	Shandong University, China
Weiqi Yuan	Shenyang University of Technology, China
Baochang Zhang	Beihang University, China
Lei Zhang	The Hong Kong Polytechnic University, Hong Kong, SAR China
Lin Zhang	Tongji University, China
Man Zhang	Institute of Automation, Chinese Academy of Sciences, China
Yongliang Zhang	Zhejiang University of Technology, China
Zhaoxiang Zhang	Institute of Automation, Chinese Academy of Sciences, China
Cairong Zhao	Tongji University, China
Qijun Zhao	Sichuan University, China
Weishi Zheng	Sun Yat-sen University, China
Xiuzhuang Zhou	Capital Normal University, China
En Zhu	National University of Defense Technology, China
Wangmeng Zuo	Harbin Institute of Technology, China

Organizing Committee Chair

Zhifeng Lai	Shenzhen University
-------------	---------------------

Contents

Face

Detecting Face with Densely Connected Face Proposal Network.	3
<i>Shifeng Zhang, Xiangyu Zhu, Zhen Lei, Hailin Shi, Xiaobo Wang, and Stan Z. Li</i>	
Deep Transformation Learning for Depression Diagnosis from Facial Images	13
<i>Yajun Kang, Xiao Jiang, Ye Yin, Yuanyuan Shang, and Xiuzhuang Zhou</i>	
Comparison and Fusion of Multiple Types of Features for Image-Based Facial Beauty Prediction	23
<i>Fangmei Chen, David Zhang, Cunrui Wang, and Xiaodong Duan</i>	
Deep Embedding for Face Recognition in Public Video Surveillance.	31
<i>Guan Wang, Yu Sun, Ke Geng, Shengguang Li, and Wenjing Chen</i>	
Random Feature Discriminant for Linear Representation Based Robust Face Recognition	40
<i>Jian-Xun Mi, Xiangbin Ma, Qiankun Fu, Chaowei Zhao, and Can Long</i>	
Adv-Kin: An Adversarial Convolutional Network for Kinship Verification. . .	48
<i>Qingyan Duan, Lei Zhang, and Wei Jia</i>	
Max-Feature-Map Based Light Convolutional Embedding Networks for Face Verification	58
<i>Zhou Yang, Meng Jian, Bingkun Bao, and Lifang Wu</i>	
Three Dimensional Face Recognition via Surface Harmonic Mapping and Deep Learning	66
<i>Xiaofan Wei, Huibin Li, and Xianfeng David Gu</i>	
2D-3D Heterogeneous Face Recognition Based on Deep Canonical Correlation Analysis	77
<i>Shupeng Wang, Di Huang, Yunhong Wang, and Yuanyan Tang</i>	
Age Estimation by Refining Label Distribution in Deep CNN	86
<i>Wanxia Shen, Li Sun, Song Qiu, and Qingli Li</i>	
Face Recognition via Heuristic Deep Active Learning	97
<i>Ya Li, Keze Wang, Lin Nie, and Qing Wang</i>	

One-Snapshot Face Anti-spoofing Using a Light Field Camera	108
<i>Xiaohua Xie, Yan Gao, Wei-Shi Zheng, Jianhuang Lai, and Junyong Zhu</i>	
Content-Independent Face Presentation Attack Detection with Directional Local Binary Pattern	118
<i>Le Qin, Le-Bing Zhang, Fei Peng, and Min Long</i>	
Matching Depth to RGB for Boosting Face Verification	127
<i>Han Liu, Feixiang He, Qijun Zhao, and Xiangdong Fei</i>	
Deeply Learned Pore-Scale Facial Features.	135
<i>Xiaodong Wang, Yuwei Liang, Xianxian Zeng, Dong Li, and Wei Jia</i>	
Synthesis and Recognition of Internet Celebrity Face Based on Deep Learning	145
<i>Jiancan Zhou, Guohang Zeng, Jia He, Xi Jia, and Linlin Shen</i>	
Face Detection with Better Representation Using a Multi-region WR-Inception Network Model	154
<i>Lianping Yang, Yuanyuan Li, Xu Duan, and Xiangde Zhang</i>	
Coarse and Fine: A New Method for Gender Classification in the Wild.	162
<i>Qianbo Jiang, Li Shao, Zhengxi Liu, and Qijun Zhao</i>	
Joint Collaborative Representation with Deep Feature for Image-Set Face Recognition	172
<i>Hui Li and Meng Yang</i>	
Multi-task Deep Face Recognition.	183
<i>Jirui Yuan, Wenya Ma, Pengfei Zhu, and Karen Egiazarian</i>	
Enhancing 3D Facial Expression Recognition by Exaggerating Geometry Characteristics	191
<i>Weijian Li, Yunhong Wang, Huibin Li, and Di Huang</i>	
Fingerprint, Palm-Print and Vascular Biometrics	
Dorsal Hand Vein Recognition Based on Improved Bag of Visual Words Model	203
<i>Yiding Wang and Shan Dong</i>	
Local Orientation Binary Pattern with Use for Palmprint Recognition	213
<i>Lunke Fei, Yong Xu, Shaohua Teng, Wei Zhang, Wenliang Tang, and Xiaozhao Fang</i>	
Multi-scaling Detection of Singular Points Based on Fully Convolutional Networks in Fingerprint Images	221
<i>Jin Qin, Congying Han, Chaochao Bai, and Tiande Guo</i>	

An Efficient Slap Fingerprint Segmentation Algorithm Based on Convnets and Knuckle Line.	231
<i>Siqi Tang, Jin Qin, Yan Liu, Congying Han, and Tiande Guo</i>	
An Adaptive Contrast Enhancement Method for Palm Vein Image	240
<i>Xiongwei Sun, Xiubo Ma, Chunyi Wang, Zede Zu, Shouguo Zheng, and Xinhua Zeng</i>	
A Scheme of Template Selection and Updating for Palmprint Authentication Systems	250
<i>Xi Chen, Ming Yu, Feng Yue, and Bin Li</i>	
Supervised Hashing with Deep Convolutional Features for Palmprint Recognition	259
<i>Jingdong Cheng, Qiule Sun, Jianxin Zhang, and Qiang Zhang</i>	
Contrast Research on Full Finger Area Extraction Method of Touchless Fingerprint Images Under Different Illuminants.	269
<i>Kejun Wang, Yi Cao, and Xianglei Xing</i>	
Fingerprint Pore Extraction Using U-Net Based Fully Convolutional Network	279
<i>Haixia Wang, Xicheng Yang, Lingtao Ma, and Ronghua Liang</i>	
Fingerprint Pore Extraction Based on Multi-scale Morphology	288
<i>Yuanrong Xu, Guangming Lu, Feng Liu, and Yanxia Li</i>	
Finger Vein Presentation Attack Detection Using Convolutional Neural Networks.	296
<i>Xinwei Qiu, Senping Tian, Wenxiong Kang, Wei Jia, and Qiuxia Wu</i>	
Fingerprint Minutiae Detection Based on Multi-scale Convolution Neural Networks.	306
<i>Huinan Jiang and Manhua Liu</i>	
Customized Local Line Binary Pattern Method for Finger Vein Recognition	314
<i>Haiying Liu, Lingfei Song, Gongping Yang, Lu Yang, and Yilong Yin</i>	
Fingerprint Segmentation via Convolutional Neural Networks.	324
<i>Xiaowei Dai, Jie Liang, Qijun Zhao, and Feng Liu</i>	
Feature Guided Fingerprint Pore Matching	334
<i>Feng Liu, Yuanhao Zhao, and Linlin Shen</i>	
A CNN-Based Fingerprint Image Quality Assessment Method	344
<i>Jianqi Yan, Xiaowei Dai, Qijun Zhao, and Feng Liu</i>	

2D Fake Fingerprint Detection for Portable Devices Using Improved Light Convolutional Neural Networks	353
<i>Yongliang Zhang, Bing Zhou, Xiaoguang Qiu, Hongtao Wu, and Xiaosi Zhan</i>	
Fusing 3D Gabor and Block-Wise Spatial Features for Hyperspectral Palmprint Recognition	361
<i>Mian Li, Weicheng Xie, and Linlin Shen</i>	
Weighted Graph Based Description for Finger-Vein Recognition.	370
<i>Ziyun Ye, Jinfeng Yang, and Jose Hernandez Palancar</i>	
Iris	
Iris Recognition Based on Adaptive Gabor Filter	383
<i>Shuai Liu, Yuanning Liu, Xiaodong Zhu, Guang Huo, Jingwei Cui, and Yihao Chen</i>	
Deep Convolutional Features for Iris Recognition	391
<i>Xingqiang Tang, Jiangtao Xie, and Peihua Li</i>	
Mobile Iris Recognition via Fusing Different Kinds of Features	401
<i>Qi Wang, Xia Su, Zhenlin Cai, and Xiangde Zhang</i>	
Coarse-to-Fine Iris Recognition Based on Multi-variant Ordinal Measures Feature Complementarity	411
<i>Hui Zhang, Man Zhang, Zhaofeng He, Hang Zou, and Rui Wang</i>	
An Eye Localization Method for Iris Recognition	420
<i>Yongliang Zhang, Xiaozhu Chen, Xiao Chen, Dixin Zhou, and Erzhe Cao</i>	
Visible Spectral Iris Segmentation via Deep Convolutional Network	428
<i>Yuqing He, Saijie Wang, Kuo Pei, Mingqi Liu, and Jiawei Lai</i>	
Gesture and Gait	
Gesture Recognition Based on Deep Belief Networks	439
<i>Yunqi Miao, Linna Wang, Chunyu Xie, and Baochang Zhang</i>	
DeepGait: A Learning Deep Convolutional Representation for Gait Recognition	447
<i>Xianfu Zhang, Shouqian Sun, Chao Li, Xiangyu Zhao, and Yuping Hu</i>	
Gait Identification by Joint Spatial-Temporal Feature.	457
<i>Suibing Tong, Yuzhuo Fu, Heifei Ling, and Enbang Zhang</i>	

A Convolutional Neural Network for Gait Recognition Based on Plantar Pressure Images	466
<i>Yanlin Li, Dexiang Zhang, Jun Zhang, Lina Xun, Qing Yan, Jingjing Zhang, Qingwei Gao, and Yi Xia</i>	
Pose-Based Temporal-Spatial Network (PTSN) for Gait Recognition with Carrying and Clothing Variations.	474
<i>Rijun Liao, Chunshui Cao, Edel B. Garcia, Shiqi Yu, and Yongzhen Huang</i>	
Windowed DMD for Gait Recognition Under Clothing and Carrying Condition Variations	484
<i>Jiawei Wang, Edel B. Garcia, Shiqi Yu, and Dexin Zhang</i>	
Emerging Biometrics	
Research on Dig-Imprint Detection of Three-Dimensional Footprints.	495
<i>Han Sun, Yunqi Tang, and Wei Guo</i>	
ECG Based Identification by Deep Learning.	503
<i>Gang Zheng, Shengzhen Ji, Min Dai, and Ying Sun</i>	
Realtime Human-UAV Interaction Using Deep Learning	511
<i>Ali Maher, Ce Li, Hanwen Hu, and Baochang Zhang</i>	
Adapting Convolutional Neural Networks on the Shoeprint Retrieval for Forensic Use	520
<i>Yang Zhang, Huanzhang Fu, Emmanuel Dellandréa, and Liming Chen</i>	
Motion Analysis Based Cross-Database Voting for Face Spoofing Detection	528
<i>Lifang Wu, Yaowen Xu, Meng Jian, Wei Cai, Chuncan Yan, and Yukun Ma</i>	
Personal Identification Based on Content-Independent EEG Signal Analysis.	537
<i>Yifan Li, Yinghui Zhao, Taifeng Tan, Ningjie Liu, and Yuchun Fang</i>	
Handwaving Authentication: Unlocking Your Smartwatch Through Handwaving Biometrics	545
<i>Zhao Wang, Chao Shen, and Yufei Chen</i>	
Identification of the Normal and Abnormal Heart Sounds Based on Energy Features and Neural Network	554
<i>Ting Li, Hong Tang, and Xiao-ke Xu</i>	

The Android-Based Acquisition and CNN-Based Analysis for Gaze Estimation in Eye Tracking	562
<i>Wei Wen, Tong Chen, and Meng Yang</i>	

Voice and Speech

Efficient Audio-Visual Speaker Recognition via Deep Heterogeneous Feature Fusion	575
<i>Yu-Hang Liu, Xin Liu, Wentao Fan, Bineng Zhong, and Ji-Xiang Du</i>	
Prioritized Grid Highway Long Short-Term Memory-Based Universal Background Model for Speaker Verification.	584
<i>Jianzong Wang, Hui Guo, and Jing Xiao</i>	
Assistance of Speech Recognition in Noisy Environment with Sentence Level Lip-Reading	593
<i>Jianzong Wang, Yiwen Wang, Aozhi Liu, and Jing Xiao</i>	

Video Surveillance

Rich Features and Precise Localization with Region Proposal Network for Object Detection	605
<i>Mengdie Chu, Shuai Wu, Yifan Gu, and Yong Xu</i>	
Sparse Similarity Learning with a Local Appearance Model for Person Tracking.	615
<i>Xiang Li, Min Xu, Zeqiang Wei, and Liming Shao</i>	
Research on Temporal Structure for Action Recognition	625
<i>Wengang Feng, Huawei Tian, and Yanhui Xiao</i>	
Real-Time Object Detection Using Efficient Convolutional Networks	633
<i>Xian Zhou, You-Ji Feng, and Xi Zhou</i>	
Holistic Crowd Interaction Modelling for Anomaly Detection.	642
<i>Jiaxing Pan and Dong Liang</i>	
Robust Partial Person Re-identification Based on Similarity-Guided Sparse Representation	650
<i>Min Ren, Lingxiao He, Haiqing Li, Yunfan Liu, Zhenan Sun, and Tieniu Tan</i>	
Person Re-identification by Integrating Static Texture and Shape Cues.	660
<i>Canaan Tinotenda Madongo, Di Huang, and Jiaxin Chen</i>	

Feature Extraction and Classification Theory

Decision-Level Fusion Method Based on Deep Learning	673
<i>Kejun Wang, Meichen Liu, XueSen Hao, and Xianglei Xing</i>	
Laplacian Regularized Non-negative Sparse Low-Rank Representation Classification	683
<i>Jingshan Li, Caikou Chen, Xielian Hou, and Rong Wang</i>	
The Variants of Weber Local Descriptor and Their Applications for Biometrics.	691
<i>Jingting Lu, Hui Ye, Wei Jia, Yang Zhao, Hai Min, Wenxiong Kang, and Lunke Fei</i>	
Generative Multi-region Segmentation by Utilizing Saliency Information	700
<i>Lei Zhou and Yubin Xia</i>	
Truncated Nuclear Norm Based Low Rank Embedding	708
<i>Fanlong Zhang, Heyou Chang, Guowei Yang, Zhangjing Yang, and Minghua Wan</i>	

Behavioral Biometrics

Chinese Sign Language Recognition Based on SHS Descriptor and Encoder-Decoder LSTM Model	719
<i>Xiaoxu Li, Chensi Mao, Shiliang Huang, and Zhongfu Ye</i>	
SCUT-MMSIG: A Multimodal Online Signature Database	729
<i>Xinyi Lu, Yuxun Fang, Wenxiong Kang, Zhiyong Wang, and David Dagan Feng</i>	
Orientation-Aware Text Proposals Network for Scene Text Detection	739
<i>Huijuan Huang, Zhi Tian, Tong He, Weilin Huang, and Yu Qiao</i>	
Uyghur Off-Line Signature Recognition Based on Local Central Line Features	750
<i>Kurban Ubul, Ya-li Zhu, Mutallip Mamut, Nurbiya Yadikar, and Tuergen Yibulayin</i>	
Author Index	759