

# **2020 17th International Conference on Frontiers in Handwriting Recognition (ICFHR 2020)**

**Dortmund, Germany  
7 – 10 September 2020**



**IEEE Catalog Number: CFP20311-POD  
ISBN: 978-1-7281-9967-2**

**Copyright © 2020 by the Institute of Electrical and Electronics Engineers, Inc.  
All Rights Reserved**

*Copyright and Reprint Permissions:* Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

For other copying, reprint or republication permission, write to IEEE Copyrights Manager, IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854. All rights reserved.

***\*\*\* This is a print representation of what appears in the IEEE Digital Library. Some format issues inherent in the e-media version may also appear in this print version.***

IEEE Catalog Number:	CFP20311-POD
ISBN (Print-On-Demand):	978-1-7281-9967-2
ISBN (Online):	978-1-7281-9966-5

**Additional Copies of This Publication Are Available From:**

Curran Associates, Inc  
57 Morehouse Lane  
Red Hook, NY 12571 USA  
Phone: (845) 758-0400  
Fax: (845) 758-2633  
E-mail: [curran@proceedings.com](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

CURRAN ASSOCIATES INC.  
**proceedings**  
.com

# 2020 17th International Conference on Frontiers in Handwriting Recognition (ICFHR) **ICFHR 2020**

## Table of Contents

Message from the Conference Chairs	xiii
Organizing Committee Members	xv
Program Committee Members	xvi
Additional Reviewers	xviii
Sponsors	xx
Keynotes	xxi
Acknowledgements	xxiv

## Machine Learning I

SRR-GAN: Super-Resolution Based Recognition with GAN for Low-Resolved Text Images	1
<i>Ming-Chao Xu (Institute of Automation of Chinese Academy of Sciences, China; University of Chinese Academy of Sciences, China), Fei Yin (Institute of Automation of Chinese Academy of Sciences, China; University of Chinese Academy of Sciences, China), and Cheng-Lin Liu (Institute of Automation of Chinese Academy of Sciences, China; University of Chinese Academy of Sciences, China; CAS Center for Excellence of Brain Science and Intelligence Technology, China)</i>	
Air-Writing Recognition Using Deep Convolutional and Recurrent Neural Network Architectures	7
<i>Grigoris Bastas (Institute for Language and Speech Processing, Athena R.C.), Kosmas Kritsis (Institute for Language and Speech Processing, Athena R.C.), and Vassilis Katsouros (Institute for Language and Speech Processing, Athena R.C.)</i>	
Improving the Robustness of LSTMs for Word Classification Using Stressed Word Endings in Dual-State Word-Beam Search	13
<i>Mahya Ameryan (University of Groningen, The Netherlands) and Lambert Schomaker (University of Groningen, The Netherlands)</i>	
Recurrence-Free Unconstrained Handwritten Text Recognition Using Gated Fully Convolutional Network	19
<i>Denis Coquenot (LITIS, France), Clément Chatelain (LITIS, France), and Thierry Paquet (LITIS, France)</i>	

Improving Offline HTR in Small Datasets by Purging Unreliable Labels .25.....	
	<i>José Carlos Aradillas (Universidad de Sevilla), Juan José Murillo-Fuentes (Universidad de Sevilla), and Pablo M. Olmos (Universidad Carlos III Madrid)</i>

## Document Processing and Retrieval

Joint Layout Analysis, Character Detection and Recognition for Historical Document Digitization .31.....	
	<i>Weihong Ma (South China University of Technology, China), Hesuo Zhang (South China University of Technology, China), Lianwen Jin (South China University of Technology, China), Sihang Wu (South China University of Technology, China), Jiapeng Wang (South China University of Technology, China), and Yongpan Wang (Alibaba Group, China)</i>
Skeletal Similarity Based Structural Performance Evaluation for Document Binarization .37.....	
	<i>Augusto César Monteiro Silva (University of São Paulo), Nina S. T. Hirata (University of São Paulo), and Xiaoyi Jiang (University of Münster)</i>
Towards Query-by-eXpression Retrieval of Cuneiform Signs .43.....	
	<i>Eugen Rusakov (TU Dortmund University, Dortmund, Germany), Turna Somel (Academy of Science and Literature Mainz, Germany), Gernot A. Fink (TU Dortmund University, Germany), and Gerfrid G. W. Müller (Academy of Science and Literature Mainz, Germany)</i>
Bootstrapping Weakly Supervised Segmentation-free Word Spotting through HMM-Based Alignment .49.....	
	<i>Tomas Wilkinson (Uppsala University, Sweden) and Carl Nettelblad (Uppsala University, Sweden)</i>
Identifying and Tackling Key Challenges in Semantic Word Spotting .55.....	
	<i>Oliver Tüselmann (TU Dortmund University), Fabian Wolf (TU Dortmund University, Dortmund, Germany), and Gernot A. Fink (TU Dortmund University, Dortmund, Germany)</i>
Improving Handwritten Word Synthesis for Annotation-free Word Spotting .61.....	
	<i>Fabian Wolf (TU Dortmund University), Kai Brandenbusch (TU Dortmund University, Dortmund, Germany), and Gernot A. Fink (TU Dortmund University, Dortmund, Germany)</i>

## Historical Documents

The "ScribbleLens" Dutch Historical Handwriting Corpus .67.....	
	<i>Hans Dolfing (Independent, USA), Jerome Bellegarda (Apple Inc., USA), Jan Chorowski (University of Wrocław, Poland), Ricard Marxer (Université de Toulon, Aix Marseille Univ, France), and Antoine Laurent (LIUM - University of Le Mans, France)</i>
Data Augmentation and Text Recognition on Khmer Historical Manuscripts .73.....	
	<i>Dona Valy (Institute of Technology of Cambodia, Cambodia), Michel Verleysen (Université Catholique de Louvain, Belgium), and Sophea Chhun (Institute of Technology of Cambodia)</i>

A Comparison of Sequential and Combined Approaches for Named Entity Recognition in a Corpus of Handwritten Medieval Charters .79.....	
	<i>Emanuela Boroş (TEKLI, France), Verónica Romero (Universitat Politècnica de València, Spain), Martin Maarand (TEKLI, France), Kateřina Zenklová (Národní Archiv, Czech Republic), Jitka Křečková (Národní Archiv, Czech Republic), Enrique Vidal (Universitat Politècnica de València, Spain), Dominique Stutzmann (IRHT-CNRS, France), and Christopher Kermorvant (TEKLI, France)</i>
The Carabela Project and Manuscript Collection: Large-Scale Probabilistic Indexing and Content-Based Classification .85.....	
	<i>Enrique Vidal (Universitat Politècnica de València, Spain), Verónica Romero (Universitat Politècnica de València, Spain), Alejandro H. Toselli (Universitat Politècnica de València, Spain), Joan Andreu Sánchez (Universitat Politècnica de València, Spain), Vicente Bosch (Universitat Politècnica de València, Spain), Lorenzo Quirós (Universitat Politècnica de València), José Miguel Benedit (Universitat Politècnica de València, Spain), Jose Ramón Prieto (Universitat Politècnica de València, Spain), Moisés Pastor (Universitat Politècnica de València, Spain), Francisco Casacuberta (Universitat Politècnica de València, Spain), Carlos Alonso (Instituto Andaluz del Patrimonio Histórico), Carmen García (Instituto Andaluz del Patrimonio Histórico, Spain), Lourdes Márquez (Instituto Andaluz del Patrimonio Histórico, Spain), and Carmen Otero (Instituto Andaluz del Patrimonio Histórico, Spain)</i>
docExtractor: An Off-the-Shelf Historical Document Element Extraction .91.....	
	<i>Tom Monnier (École des Ponts, France) and Mathieu Aubry (École des Ponts, France)</i>
Recognizing Japanese Historical Cursive with Pseudo-Labeling-Aided CRNN as an Application of Semi-Supervised Learning to Sequence Labeling .97.....	
	<i>Ayumu Nagai (Gunma University)</i>

## Text Recognition and Authentication

Handwriting Prediction Considering Inter-Class Bifurcation Structures .103.....	
	<i>Masaki Yamagata (Kyushu University, Japan), Hideaki Hayashi (Kyushu University, Japan), and Seiichi Uchida (Kyushu University, Japan)</i>
What is the Reward for Handwriting? – A Handwriting Generation Model Based on Imitation Learning .109.....	
	<i>Keisuke Kanda (Kyushu University, Japan), Brian Kenji Iwana (Kyushu University, Japan), and Seiichi Uchida (Kyushu University, Japan)</i>
Dynamic Handwriting Analysis for Parkinson's Disease Identification Using C-BiGRU Model .115.....	
	<i>Momina Moetesum (Vision &amp; Learning Lab, Bahria University, Islamabad, Pakistan), Imran Siddiqi (Vision &amp; Learning Lab, Bahria University, Islamabad, Pakistan), Farah Javed (Vision &amp; Learning Lab, Bahria University, Islamabad, Pakistan), and Uzma Masroor (Air University, Islamabad, Pakistan)</i>

A Deep Learning Framework with Histogram Features for Online Writer Identification .121.....	<i>Sounak Ray (Indian Institute of Technology Guwahati, India), Adrish Roy (Indian Institute of Technology Guwahati, India), and Suresh Sundaram (Indian Institute of Technology Guwahati, India)</i>
A Semantic Segmentation-based Method for Handwritten Japanese Text Recognition .127.....	<i>Kha Cong Nguyen (Tokyo University of Agriculture and Technology, Japan), Cuong Tuan Nguyen (Tokyo University of Agriculture and Technology, Tokyo, Japan), and Masaki Nakagawa (Tokyo University of Agriculture and Technology, Tokyo, Japan)</i>
A Study of BPE-Based Language Modeling for Open Vocabulary Latin Language OCR .133.....	<i>Wenping Hu (Microsoft Research Asia, Beijing, China), Yikang Luo (Shanghai Jiao Tong University, Shanghai, China), Ji Meng (Microsoft Cloud+AI, Beijing, China), Zifei Qian (Microsoft Cloud+AI, Beijing, China), and Qiang Huo (Microsoft Research Asia, Beijing, China)</i>

## Machine Learning II

Distilling Content from Style for Handwritten Word Recognition .139.....	<i>Lei Kang (Computer Vision Center, Spain; Omni:US, Germany), Pau Riba (Computer Vision Center, Spain), Marçal Rusiñol (Computer Vision Center, Spain), Alicia Fornés (Computer Vision Center, Spain), and Mauricio Villegas (Omni:US, Germany)</i>
Two Semi-Supervised Training Approaches for Automated Text Recognition .145.....	<i>Gundram Leifert (University of Rostock, Germany), Roger Labahn (University of Rostock, Germany), and Joan Andreu Sánchez (Universitat Politècnica de València, Spain)</i>
Improving Handwritten OCR with Augmented Text Line Images Synthesized from Online Handwriting Samples by Style-Conditioned GAN .151.....	<i>Mingyang Guan (Beijing Institute of Technology, China), Haisong Ding (University of Science and Technology of China, China), Kai Chen (Microsoft Research Asia, China), and Qiang Huo (Microsoft Research Asia, China)</i>
Weakly Supervised Learning for Over-Segmentation Based Handwritten Chinese Text Recognition .157.....	<i>Zhen-Xing Wang (University of Chinese Academy of Sciences, China; Institute of Automation of Chinese Academy of Sciences, China), Qiu-Feng Wang (Xi'an Jiaotong-Liverpool University, China), Fei Yin (Institute of Automation of Chinese Academy of Sciences, China; University of Chinese Academy of Sciences, China), and Cheng-Lin Liu (Institute of Automation of Chinese Academy of Sciences, China; University of Chinese Academy of Sciences, China; CAS Center for Excellence of Brain Science and Intelligence Technology, China)</i>
Attention Augmented Convolutional Recurrent Network for Handwritten Japanese Text Recognition .163.....	<i>Nam Tuan Ly (Tokyo University of Agriculture and Technology), Cuong Tuan Nguyen (Tokyo University of Agriculture and Technology), and Masaki Nakagawa (Tokyo University of Agriculture and Technology)</i>

An Attention Based Method for Offline Handwritten Urdu Text Recognition .169.....  
*Tayaba Anjum (Punjab University College of Information Technology, Pakistan) and Muhammad Nazar Amin Khan (Punjab University College of Information Technology, Pakistan)*

## Mathematics and Music Recognition

Improving Attention-Based Handwritten Mathematical Expression Recognition with Scale Augmentation and Drop Attention .175.....  
*Zhe Li (South China University of Technology, China), Lianwen Jin (South China University of Technology, China), Songxuan Lai (South China University of Technology, China), and Yecheng Zhu (South China University of Technology, China)*

Improvement of End-to-End Offline Handwritten Mathematical Expression Recognition by Weakly Supervised Learning .181.....  
*Thanh-Nghia Truong (Tokyo University of Agriculture and Technology), Cuong Tuan Nguyen (Tokyo University of Agriculture and Technology), Khanh Minh Phan (Tokyo University of Agriculture and Technology), and Masaki Nakagawa (Tokyo University of Agriculture and Technology)*

Lyrics Recognition and Syllable Assignment of Medieval Music Manuscripts .187.....  
*Christoph Wick (University of Würzburg, Germany), Alexander Hartelt (University of Würzburg, Germany), and Frank Puppe (University of Würzburg, Germany)*

Exploring the Two-Dimensional Nature of Music Notation for Score Recognition with End-to-End Approaches .193.....  
*Antonio Ríos-Vila (University of Alicante, Alicante, Spain), Jorge Calvo-Zaragoza (University of Alicante, Alicante, Spain), and José M. Iñesta (University of Alicante, Alicante, Spain)*

Handwritten Music Recognition Improvement through Language Model Re-Interpretation for Mensural Notation .199.....  
*Manuel Villareal (Universitat Politècnica de València, Spain) and Joan Andreu Sánchez (Universitat Politècnica de València, Spain)*

Handwritten Historical Music Recognition by Sequence-to-Sequence with Attention Mechanism .205  
*Arnau Baró (Computer Vision Center - Universitat Autònoma de Barcelona), Carles Badal (Universitat Autònoma de Barcelona), and Alicia Fornés (Computer Vision Center - Universitat Autònoma de Barcelona)*

## Competitions

ICFHR 2020 Competition on Offline Recognition and Spotting of Handwritten Mathematical Expressions - OffRaSHME .211.....  
*Da-Han Wang (Xiamen University of Technology, China), Fei Yin (Institute of Automation of Chinese Academy of Sciences, China), Jin-Wen Wu (Institute of Automation of Chinese Academy of Sciences, China), Yu-Pei Yan (Xiamen University of Technology, China), Zhi-Cai Huang (Xiamen University of Technology, China), Gui-Yun Chen (Xiamen University of Technology, China), Yao Wang (Xiamen University of Technology, China), and Cheng-Lin Liu (Institute of Automation of Chinese Academy of Sciences, China)*

ICFHR 2020 Competition on Image Retrieval for Historical Handwritten Fragments .216.....	
	<i>Mathias Seuret (Friedrich-Alexander-Universität Erlangen-Nürnberg), Anguelos Nicolau (Friedrich-Alexander-Universität Erlangen-Nürnberg), Dominique Stutzmann (Institut de Recherche et d'Histoire des Textes, Centre National de la Recherche Scientifique - UPR841), Andreas Maier (Friedrich-Alexander-Universität Erlangen-Nürnberg), and Vincent Christlein (Friedrich-Alexander-Universität Erlangen-Nürnberg)</i>
ICFHR 2020 Competition on Short Answer Assessment and Thai Student Signature and Name Components Recognition and Verification (SASIGCOM 2020) .222.....	
	<i>Abhijit Das (Indian Statistical Institute, Kolkata, India), Hemmaphan Suwanwivat (James Cook University, Cairns, Australia), Umapada Pal (Indian Statistical Institute, Kolkata, India), and Michael Blumenstein (University of Technology Sydney, Sydney, Australia)</i>

## Posters

The HHD Dataset .228.....	
	<i>Irina Rabaev (Shamoon College of Engineering, Israel), Berat Kurar Barakat (Ben-Gurion University of the Negev, Israel), Alexander Churkin (Shamoon College of Engineering, Israel), and Jihad El-Sana (Ben-Gurion University of the Negev, Israel)</i>
Towards Accurate Identification and Removal of Shirorekha from Off-Line Handwritten Devanagari Word Documents .234.....	
	<i>Mohammad Idrees Bhat (University of Mysore, Mysore, Karnataka-India), B. Sharada (University of Mysore, Mysore, Karnataka-India), SK Md Obaidullah (Aliah University, Kolkata, West Bengal-India), and Mohammad Imran (Ntt Data Information Processing Services Private Limited, Whitefield Bangalore, Karnataka-India)</i>
Unsupervised Deep Learning for Handwritten Page Segmentation .240.....	
	<i>Ahmad Droby (Ben-Gurion University of the Negev), Berat Kurar Barakat (Ben-Gurion University of the Negev), Borak Madi (Ben-Gurion University of the Negev), Reem Alaasam (Ben-Gurion University of the Negev), and Jihad El-Sana (Ben-Gurion University of the Negev)</i>
Period Classification of 3D Cuneiform Tablets with Geometric Neural Networks .246.....	
	<i>Bartosz Bogacz (Heidelberg University, Germany) and Hubert Mara (Heidelberg University, Germany)</i>
Exploring the Impact of Handwriting Recognition on the Automated Scoring of Handwritten Student Answers .252.....	
	<i>Christian Gold (University of Duisburg-Essen, Duisburg, Germany) and Torsten Zesch (University of Duisburg-Essen)</i>
Text Content Based Layout Analysis .258.....	
	<i>José Ramón Prieto Fontcuberta (Universitat Politècnica de València), Vicente Bosch (Universitat Politècnica de València), Enrique Vidal Ruíz (Universitat Politècnica de València), Dominique Stutzmann (Institut de Recherche et d'Histoire des Textes, Centre National de la Recherche Scientifique), and Sébastien Hamel (Institut de Recherche et d'Histoire des Textes, Centre National de la Recherche Scientifique)</i>

Collection of Online and Offline Handwritten Japanese Characters and Handwriting Classification Using the Data .264.....	Yoko Seki ( <i>National Research Institute of Police Science</i> )
Integrating Writing Dynamics in CNN for Online Children Handwriting Recognition .270.....	Simon Corbillé ( <i>Univ Rennes, France</i> ), Élisabeth Fromont ( <i>Univ Rennes, IUF, France</i> ), Éric Anquetil ( <i>Univ Rennes, France</i> ), and Pauline Nerdeux ( <i>Univ Rennes, France</i> )
Spatio-Temporal Clustering for Grouping in Online Handwriting Document Layout Analysis with GRU-RNN .276.....	Serhii Polotskyi ( <i>Samsung R &amp; D Institute Ukraine (SRK), Ukraine</i> ), Olga Radvononko ( <i>Samsung R &amp; D Institute Ukraine (SRK), Ukraine</i> ), Ilyia Degtyarenko ( <i>Samsung R &amp; D Institute Ukraine (SRK), Ukraine</i> ), and Ivan Deriuga ( <i>Samsung R &amp; D Institute Ukraine (SRK), Ukraine</i> )
Point-to-Set Similarity Based Deep Metric Learning for Offline Signature Verification .282.....	Yecheng Zhu ( <i>South China University of Technology</i> ), Songxuan Lai ( <i>South China University of Technology</i> ), Zhe Li ( <i>South China University of Technology</i> ), and Lianwen Jin ( <i>South China University of Technology</i> )
Attention Combination of Sequence Models for Handwritten Chinese Text Recognition .288.....	Zheng-Yu Zhu ( <i>China University of Petroleum, Beijing, China</i> ), Fei Yin ( <i>Institute of Automation, Chinese Academy of Sciences, Beijing, China</i> ), and Da-Han Wang ( <i>Xiamen University of Technology, Xiamen, China</i> )
Digitizing Handwriting with a Sensor Pen: A Writer-Independent Recognizer .295.....	Mohamad Wehbi ( <i>Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany</i> ), Tim Hamann ( <i>STABILO International GmbH, Germany</i> ), Jens Barth ( <i>STABILO International GmbH, Germany</i> ), and Bjoern Eskofier ( <i>Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany</i> )
Robust Handwriting Recognition with Limited and Noisy Data .301.....	Hai Pham ( <i>Carnegie Mellon University, US</i> ), Amrith Setlur ( <i>Carnegie Mellon University, US</i> ), Saket Dingliwal ( <i>Carnegie Mellon University, US</i> ), Tzu-Hsiang Lin ( <i>Carnegie Mellon University, US</i> ), Barnabás Póczos ( <i>Carnegie Mellon University, US</i> ), Kang Huang ( <i>The Boeing Company, US</i> ), Zhuo Li ( <i>The Boeing Company, US</i> ), Jae Lim ( <i>The Boeing Company, US</i> ), Collin McCormack ( <i>The Boeing Company, US</i> ), and Tam Vu ( <i>The Boeing Company, US</i> )
A Siamese Network-Based Approach for Matching Various Sizes of Excavated Wooden Fragments ..... 307	Trung Tan Ngo ( <i>Tokyo University of Technology and Agriculture</i> ), Cuong Tuan Nguyen ( <i>Tokyo University of Technology and Agriculture</i> ), and Masaki Nakagawa ( <i>Tokyo University of Technology and Agriculture</i> )
A Modular Region and Text Line Layout Analysis System .313.....	Benjamin Kiessling ( <i>École Pratique des Hautes Études, Université PSL</i> )
Online Signature Verification Using Time Warp Edit Distance Based Kernel .319.....	Sarojit Auddya ( <i>IIT Guwahati</i> ), Rajat Kumar Singh ( <i>IIT Guwahati</i> ), and Suresh Sundaram ( <i>IIT Guwahati</i> )

Extension of a Bi-Dimensional Grammar for Online Interpretation of Structured Documents: Application on Architecture Plans and Geometry Domains .325.....	325
<i>Omar Krichen (University of Rennes, CNRS, IRISA), Nathalie Girard (University of Rennes, CNRS, IRISA), and Eric Anquetil (University of Rennes, CNRS, IRISA)</i>	
Muscle Activation Profiles Based on the Proportionality Hypothesis of the Kinematic Theory of Human Movements .331.....	331
<i>Ben Braithwaite (Polytechnique Montréal), Réjean Plamondon (Polytechnique Montréal), and Mickaël Begon (Université de Montréal)</i>	
Graph Edit Distance for the Analysis of Children's On-Line Handwritten Arithmetical Operations .337.....	337
<i>Arnaud Lods (Learn &amp; Go, France), Éric Anquetil (Univ Rennes, CNRS, IRISA, France), and Sébastien Macé (Learn &amp; Go, France)</i>	
Handwritten Chinese Characters Recognition Using Two-Stage Hierarchical Convolutional Neural Network .343.....	343
<i>Nina Aleskerova (Moscow Institute of Physics and Technology, Russia) and Aleksei Zhuravlev (Moscow Institute of Physics and Technology, Russia)</i>	
Unconstrained Handwritten Arabic Text-Lines Segmentation Based on AR2U-Net .349.....	349
<i>Takwa Ben Aïcha Gader (University of Tunis, ENSIT-LaTICE, Tunisia) and Afef Kacem Echi (ENSIT-LaTICE, University of Tunis)</i>	
Online Handwritten Mathematical Symbol Segmentation and Recognition with Bidirectional Context .355.....	355
<i>Cuong Tuan Nguyen (Tokyo University of Agriculture and Technology), Thanh-Nghia Truong (Tokyo University of Agriculture and Technology), Huy Quang Ung (Tokyo University of Agriculture and Technology), and Masaki Nakagawa (Tokyo University of Agriculture and Technology)</i>	
Transcription Alignment for Highly Fragmentary Historical Manuscripts: The Dead Sea Scrolls .361.....	361
<i>Daniel Stökl Ben Ezra (EPHE, PSL), Bronson Brown-DeVost (Georg-August University, Göttingen, Germany), Nachum Dershowitz (Tel Aviv University), Alexey Pechorin (Tel Aviv University), and Benjamin Kiessling (EPHE, PSL)</i>	
Signatures' Stability Evaluation in a Multi-Device Scenario .367.....	367
<i>Donato Impedovo (University of Bari Aldo Moro), Giuseppe Pirlo (University of Bari Aldo Moro), and Lucia Sarcinella (University of Bari Aldo Moro)</i>	
Attention Based Writer Independent Verification .373.....	373
<i>Mohammad Abuzar Shaikh (State University of New York at Buffalo, NY, USA), Tiehang Duan (State University of New York at Buffalo, NY, USA), Mihir Chauhan (State University of New York at Buffalo, NY, USA), and Sargur N. Srihari (State University of New York at Buffalo, NY, USA)</i>	
<b>Author Index</b> .381.....	381