

IEEE

# MultiMedia

<http://www.computer.org>

APRIL-JUNE 2016



UBIQUITOUS  
MULTIMEDIA

IEEE  computer society

CELEBRATING 70 YEARS



# IEEE MultiMedia

April–June 2016 Vol. 23, No. 2

Published by the IEEE Computer Society  
in cooperation with the IEEE Communications Society  
and IEEE Signal Processing Society



## Ubiquitous Multimedia

- 12 Guest Editors' Introduction**  
**Ubiquitous Multimedia: Emerging Research on Multimedia Computing**  
*Yonghong Tian, Min Chen, and Leonel Sousa*
- 16 Nonlocal In-Loop Filter: The Way Toward Next-Generation Video Coding?**  
*Siwei Ma, Xinfeng Zhang, Jian Zhang, Chuanmin Jia, Shiqi Wang, and Wen Gao*
- 28 A Novel Semi-Supervised Dimensionality Reduction Framework**  
*Xin Guo, Yun Tie, Lin Qi, and Ling Guan*
- 42 Multimodal Ensemble Fusion for Disambiguation and Retrieval**  
*Yang Peng, Xiaofeng Zhou, Daisy Zhe Wang, Ishan Patwa, Dihong Gong, and Chunsheng Victor Fang*
- 54 Planogram Compliance Checking Based on Detection of Recurring Patterns**  
*Song Liu, Wanqing Li, Stephen Davis, Christian Ritz, and Hongda Tian*

[www.computer.org/multimedia](http://www.computer.org/multimedia)

**Editorial:** Unless otherwise stated, bylined articles, as well as product and service descriptions, reflect the author's or firm's opinion. Inclusion in *IEEE MultiMedia* does not necessarily constitute endorsement by the IEEE or the IEEE Computer Society. All submissions are subject to editing for style, clarity, and length. IEEE prohibits discrimination, harassment, and bullying. For more information, visit [www.ieee.org/web/aboutus/whatis/policies/p9-26.html](http://www.ieee.org/web/aboutus/whatis/policies/p9-26.html).

**Reuse Rights and Reprint Permissions:** Educational or personal use of this material is permitted without fee, provided such use: 1) is not made for profit; 2) includes this notice and a full citation to the original work on the first page of the copy; and 3) does not imply IEEE endorsement of any third-party products or services. Authors and their companies are permitted to post the accepted version of IEEE-copyrighted material on their own Web servers without permission, provided that the IEEE copyright notice and a full citation to the original work appear on the first screen of the posted copy. An accepted manuscript is a version that has been revised by the author to incorporate review suggestions, but not the published version with copyediting, proofreading, and formatting added by IEEE. For more information, please go to: [www.ieee.org/publications\\_standards/publications/rights/paperversionpolicy.html](http://www.ieee.org/publications_standards/publications/rights/paperversionpolicy.html). Permission to reprint/republish this material for commercial, advertising, or promotional purposes or for creating new collective works for resale or redistribution must be obtained from IEEE by writing to the IEEE Intellectual Property Rights Office, 445 Hoes Lane, Piscataway, NJ 08854-4141 or [pubs-permissions@ieee.org](mailto:pubs-permissions@ieee.org). Copyright © 2016 IEEE. All rights reserved.

**Abstracting and Library Use:** Abstracting is permitted with credit to the source. Libraries are permitted to photocopy for private use of patrons, provided the per-copy fee indicated in the code at the bottom of the first page is paid through the Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

**Circulation:** *IEEE MultiMedia* (ISSN 1070-986X) is published quarterly by the IEEE Computer Society. IEEE Headquarters: Three Park Ave., 17th Floor, New York, NY 10016-5997. IEEE Computer Society Publications Office: 10662 Los Vaqueros Circle, PO Box 3014, Los Alamitos, CA 90720-1264; +1 714 821 8380. IEEE Computer Society Headquarters: 2001 L St., Ste. 700, Washington, DC 20036. Subscribe to *IEEE MultiMedia* by visiting [www.computer.org/multimedia](http://www.computer.org/multimedia).

**Postmaster:** Send address changes and undelivered copies to *IEEE MultiMedia*, IEEE, Membership Processing Dept., 445 Hoes Lane, Piscataway, NJ 08855, USA. Periodicals Postage is paid at New York, NY, and at additional mailing sites. Canadian GST #125634188. Canada Post International Publications Mail Product (Canadian Distribution) Sales Agreement #0487848. Canada Post Publications Mail Agreement Number 40013885. Return undeliverable Canadian addresses to P.O. Box 122, Niagara Falls, ON L2E 6S8. Printed in USA.



Cover Image: Peter Nagy



## Feature Articles

- 64 An Image Encryption Algorithm Based on Autoblocking and Electrocardiography**  
*Guodong Ye and Xiaoling Huang*
- 72 Extended Guided Filtering for Depth Map Upsampling**  
*Kai-Lung Hua, Kai-Han Lo, and Yu-Chiang Frank Wang*
- 84 Managing Intellectual Property in a Music Fruition Environment**  
*Adriano Baraté, Goffredo Haus, Luca A. Ludovico, and Paolo Perlasca*

## Departments

- 2 EIC's Message**  
*Yong Rui*  
Understanding Multimedia
- 4 Research Projects**  
*Tilman Dingler, Passant El Agroudy, Huy Viet Le, Albrecht Schmidt, Evangelos Niforatos, Agon Bexheti, and Marc Langheinrich*  
Multimedia Memory Cues for Augmenting Human Memory
- 95 Scientific Conferences**  
*Qiong Liu*  
The BAMMF Series in Silicon Valley

*Call for Papers: Advancing Multimedia Distribution, p. 27*  
*Advertising Index, p. 41*  
*IEEE CS Information, p. 52*  
*Call for Papers: New Signals in Multimedia Systems, p. 53*

ISSN 1070-986X

**Editor in Chief**  
Yong Rui

*Microsoft Research*

**Associate Editors in Chief**

Susanne Boll  
Alan Hanjalic  
Wenjun Zeng

*University of Oldenburg, Germany*  
*Delft University of Technology*  
*University of Missouri-Columbia*

**Editorial Board**

Ian Burnett  
Andrea Cavallaro  
Shu-Ching Chen  
Touradj Ebrahimi  
Farshad Fotouhi  
Gerald Friedland  
Winston Hsu  
Gang Hua  
Benoit Huet  
Hayley Hung  
Aisling Kelliher  
Shiwen Mao  
Cees G.M. Snoek  
Rong Yan

*RMIT University*  
*Queen Mary University of London*  
*Florida International University*  
*Swiss Federal Institute of Technology*  
*Wayne State University*  
*University of California, Berkeley*  
*National Taiwan University*  
*Stevens Institute of Technology*  
*Eurecom*  
*Technical University of Delft*  
*Virginia Tech*  
*Auburn University*  
*University of Amsterdam*  
*Snapchat*

**Advisory Board**

Forouzan Golshani  
William Grosky  
Ramesh Jain  
Sethuraman Panchanathan  
John R. Smith

*Calif. State Univ., Long Beach*  
*University of Michigan*  
*University of California, Irvine*  
*Arizona State University*  
*IBM*

**Editorial Management**  
**Editorial Product Lead**  
**Senior Manager, Editorial Services**  
**Manager, Editorial Services**  
**Assoc. Mgr., Peer Review & Periodical Admin.**

Shani Murray  
Cathy Martin  
Robin Baldwin  
Brian Brannon  
Hilda Carman

**Director, Products and Services**  
**Senior Business Development Manager**  
**Senior Advertising Coordinator**

Evan Butterfield  
Sandra Brown  
Marian Anderson

**Magazine Operations Committee**

Forrest Shull (chair), Brian Blake, Maria Ebling, Lieven Eeckhout, Miguel Encarnacao, Nathan Ensmenger, Sumi Helal, San Murugesan, Yong Rui, Ahmad-Reza Sadeghi, Diomidis Spinellis, George K. Thiruvathukal, Mazin Yousif, Daniel Zeng

**Publications Board**

David S. Ebert (VP for Publications), Alfredo Benso, Irena Bojanova, Greg Byrd, Min Chen, Robert Dupuis, Niklas Elmqvist, Davide Falessi, William Ribarsky, Forrest Shull, Melanie Tory

**Submissions:** Send to <https://mc.manuscriptcentral.com/cs-ieee> (Manuscript Central). Please check to see if you have an account by using the Check for Existing Account button. If you don't have an account, please sign up. Submit proposals for special issues to John R. Smith ([jsmith@us.ibm.com](mailto:jsmith@us.ibm.com)). All submissions are subject to editing for style, clarity, and length.