

**VNU JOURNAL OF SCIENCE:
COMPUTER SCIENCE AND COMMUNICATION ENGINEERING**

Editor-in-Chief

Nguyen Huu Duc

Key Laboratory for Micro-nano Technology, Vietnam National University, Hanoi, Vietnam

Deputy Editor-in-Chief

Hoang Van Quang

VNU Journal of Science, Hanoi, Vietnam

Managing Editors

Nguyen Thanh Thuy (Hanoi, Vietnam), Dang Van Hung (Hanoi, Vietnam),
Pham Bao Son (Hanoi, Vietnam), Le Sy Vinh (Hanoi, Vietnam), Dang Duc Hanh (Hanoi, Vietnam)

Associate Editors

Le Hoai Bac (Hanoi, Vietnam), Ho Tu Bao (Hanoi, Vietnam), Huynh Thi Thanh Binh (Hanoi, Vietnam),
Nguyen Thanh Binh (Da Nang City, Vietnam), Claude Sammut (Australia), Dinh Dung (Hanoi, Vietnam),
Dinh Trieu Duong (Hanoi, Vietnam), Le Dinh Duy (Ho Chi Minh City, Vietnam), Lukasz Greda (Germany),
Phan Xuan Hieu (Hanoi, Vietnam), Nguyen Thi Minh Huyen (Hanoi, Vietnam), Jay Bagga (United States),
Ho Van Khuong (Ho Chi Minh City, Vietnam), Sylvain Lagrue (France), Bui Thu Lam (Hanoi, Vietnam),
Xuandong Li (China), Zhiming Liu (China), Pham The Long (Hanoi, Vietnam), Luong Chi Mai (Hanoi, Vietnam),
Nguyen Le Minh (Japan), Sanjiva Prasad (New Delhi), Le Hoang Son (Hanoi, Vietnam), Nguyen Huu Thanh (Hanoi, Vietnam),
Quan Thanh Tho (Ho Chi Minh City, Vietnam), Chu Duc Trinh (Hanoi, Vietnam), Cao Hoang Tru (Ho Chi Minh City, Vietnam),
Tran Xuan Tu (Hanoi, Vietnam), Wei-Ngan Chin (Singapore), Jean-Daniel Zucker (France)

Advisory Editorial Board

Gunnar Liedberg Bo (Singapore), Luu Van Boi (Hanoi, Vietnam), Le Van Cam (Hanoi, Vietnam),
Nguyen Huu Chau (Hanoi, Vietnam), Nguyen Dinh Duc (Hanoi, Vietnam), Dinh Van Duc (Hanoi, Vietnam),
Truong Quang Hai (Hanoi, Vietnam), Nguyen Hoa (Hanoi, Vietnam), Wolfgang Knoll,
Nguyen Hoang Luong (Hanoi, Vietnam), Phan Tuan Nghia (Hanoi, Vietnam), Nguyen Hong Son (Hanoi, Vietnam),
Nguyen Thanh Thuy (Hanoi, Vietnam), Pham Hung Viet (Hanoi, Vietnam)

Secretary

Ngo Thi Thu Binh Dang Duc Hanh
Tel.: (84) 983030634; Tel.: (84) 946686408;
E-mail: binhntt@vnu.edu.vn E-mail: hanhdd@gmail.com

Aims and Scope

VNU Journal of Science: Computer Science and Communication Engineering publishes peer-reviewed research papers, communications and reviews dealing with: computer science, software engineering, computer engineering, information systems, computer networks, electronics and telecommunications.

Publication Information

Published by the *VNU Journal of Science*, 144 Xuan Thuy Road, Cau Giay District, Hanoi, Vietnam. Copyright © 2018 by Vietnam National University, Hanoi. All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise without the written permission of the *VNU Journal of Science*. However, single photocopies of single articles may be made for private study or research. Illustrations and short extracts from the text of individual contributions may be copied provided that the source is acknowledged, the permission of the authors is obtained and the *VNU Journal of Science* is notified. Multiple copying is permitted by the *VNU Journal of Science* in accordance with the Vietnamese Laws.

Further Information is available at website: <http://js.vnu.edu.vn>

Publication Permit No 223/GP-BTTTT, issued 22/7/2014. Printed at Hoang Quoc Viet Technology and Science Joint Stock Company, 18 Hoang Quoc Viet Street, Cau Giay District, Hanoi, Vietnam. Legal Deposit: Quarter IV/2018.