

An empirical study for density peak clustering

Viet-Vu Vu*, Byeongnam Yoon**, Hong-Quan Do*, Hai-Minh Nguyen***, Tran-Chung Dao***,
Cong-Mau Tran****, Doan-Vinh Tran*****,

*VNU Information Technology Institute, Vietnam National University, Hanoi, Vietnam

**Global IT Research Institute GIRI

***ICTU – University of Information and Communication Technology, Thai Nguyen University,
Vietnam

****HaTinh University, HaTinh city, Vietnam

*****University of Education, Vietnam National University, Hanoi, Vietnam
vuvietvu@vnu.edu.vn

Abstract—Density Peak Clustering (DPC) is one of the most effective density-based clustering algorithms due to its ability to detect arbitrary clusters while being robust to noise. Since the first introduction in 2014, it has been cited a thousand times. This paper presents a comprehensive analysis of the DPC algorithm’s performance on some UCI and Gaussian data sets. These used data sets have different properties such as intersecting clusters, unbalanced data, or different densities, such that not many clustering algorithms can perform well. From the obtained results, we aim to evaluate advantages and disadvantages of the algorithm and propose some open research directions.

Keyword—Density based clustering, density peak clustering, complex data.



Assoc. Prof. Dr. Viet-Vu Vu received the B.S. degree in Computer Science from Hanoi University of Education in 2000, a M.S. degree in Computer Science from Hanoi University of Technology in 2004, and a Doctor Degree in Computer Science from Paris 6 University in 2011. He is a researcher at Information Technology Institute, Vietnam National University, Hanoi. His research interests include clustering, active learning, semi-supervised clustering, and E-government applications.



Byeongnam Yoon (M’97) He became a Member of IEEE in 1997. He was born in Seoul Korea 1949. He got the PhD in computer science, Chungnam National University, Korea, 1997. He worked for the Sperryrand UNIVAC as a Computer Specialist 1974 -1978, Samsung as a Manager of Telecommunications Section 1978 - 1982, Electronics & Telecommunications Research Institute (ETRI) as a Principal Researcher 1982 – 1999, National Information society Agency (NIA) as a Senior Executive Director General 1999 – 2010, Kyonggi University (KGU) as an Associate Professor, Faculty of Computer Science 2010-2016. He is an invited professor at Information Technology Institute, Vietnam National University, Hanoi Vietnam since 2017, and Global IT Research Institute GIRI as a President 1999 – current. His research area includes Telecommunications, Internet, Software, Web programming & security, e-Government, Enterprise Architecture, Workflow, BPM. System Work Method. SPICE, CMMI, etc.



MSc. Hong-Quan Do received a double M.S. degree in Information and Communication Technology from University of Science and Technology of Hanoi, Vietnam and The University of Rennes 1, France in 2015. He is a researcher at Information Technology Institute, Vietnam National University, Hanoi. His research concentrates primarily on Clustering, Semi-supervised Clustering, Image processing and Recommender Systems. At the present, he has also been involved in some E-Government projects, and E-Commerce Recommendation applications.



Dr. Nguyen Hai Minh received a PhD degree in Computer science and Engineering from Kyungpook National University, Korea in 2014. He is a dean of Faculty of Information Technology - ICTU. His study focuses on Health Informatics, Health IT Standards and Medical Image Processing.



M.IT Tran-Chung Dao received a M.IT degree in Information Technology from Manuel S. Enverga University Foundation, Philippines 2013. He is a lecturer at Thai Nguyen University Information and communication technology, Thai Nguyen, Viet Nam. His research concentrates primarily on Clustering and Image processing.



M.S Cong-Mau Tran received the B.S. degree in Computer Science from Hanoi University of Education in 2000, a M.S. degree in Computer Science from University of Technology – Vietnam National University, Hanoi in 2011. Now, he is a lecturer at the Faculty of Engineering – Technology, Ha Tinh University, Vietnam. His research interested include data mining, clustering, image processing and its applications.



Assoc. Prof. Dr. Doan-Vinh Tran received a PhD degree in Informatics Education from the Russian Academy of Educational Sciences, Russia in 1997. Now, he is a lecturer at the Faculty of Educational Technology, University of Education, Vietnam National University, Hanoi. His research concentrates primarily on Informatics Education, Digital Education, applications VR/AR/MR/XR in Digital Education, Clustering, and Image processing.