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Neha Yadav · Anupam Yadav
Jagdish Chand Bansal · Kusum Deep
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Harmony Search and Nature Inspired Optimization Algorithms

Theory and Applications, ICHSA 2018

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Preface

It is a matter of pride that 4th International Conference on Harmony Search, Soft Computing and Applications (ICHSA 2018) is being organized in India for the very first time. It is noted that earlier editions of this conference were held at South Korea and Spain. This annual event of ICHSA is a joint effort of many reputed institutes: BML Munjal University, Gurugram; National Institute of Technology Uttarakhand; and Korea University. The first and second series of this conference were held at Korea University, Seoul, Republic of Korea. Professor Joong Hoon Kim, Korea University, has successfully organized first two versions in his Parent University. The third conference of the series was organized at Tecnalia, Bilbao, Spain. Keeping the legacy of the conference on it was a proud moment to organize it in India at BML Munjal University in collaboration with NIT Uttarakhand, Korea University, and Soft Computing Research Society during 7–9 February 2018. The focus of ICHSA 2018 is to provide a common platform for all the researchers working in the area of harmony search and other soft computing techniques and their applications to diverse areas of control systems, data mining, game theory, supply chain management, signal processing, pattern recognition, big data applications, cloud computing, defence disaster modelling, renewable energy, robotics water and waste management, structural engineering, etc. ICHSA 2018 attracted a wide spectrum of thought-provoking articles. A total of 117 high-quality research articles were selected for the appearance in the form of this proceedings.

We strongly hope that the papers published in this proceedings will be helpful for improving the understating of various soft computing methods, and it will inspire many upcoming researchers in this field as a torchbearer. The real-life applications presented in this proceedings show the contemporary significance and future scope of soft computing methods. The editors express their sincere gratitude to ICHSA 2018, Chief Patron, Patron, Keynote Speakers, Chairs of the conference, reviewers and local organizing committee; without their support, it would be impossible to maintain the quality and standards of this conference series. We pay our sincere thanks to the Springer and its team for their invaluable support in the

preparation and publication of this conference proceedings. Over and above, we express our deepest sense of gratitude to the 'BML Munjal University' for facilitating the hosting of the conference.

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Prof. Joong Hoon Kim is associated with School of Civil, Environmental and Architectural Engineering, Korea University, South Korea. His major areas of interest include optimal design and management of water distribution systems, application of optimization techniques to various engineering problems, and development and application of evolutionary algorithms. He has 216 journal publications, 262 conference proceedings, several books/chapters to his credit. His publications include *A New Heuristic Optimization Algorithm: Harmony Search*, Simulation, February 2001, Vol. 76, pp 60–68, which has been cited over 2,500 times by other journals of diverse research areas.

Privacy Preserving Data Mining: A Review of the State of the Art

Shivani Sharma and Sachin Ahuja

Abstract Safeguarding of security in information mining has risen as an outright essential for trading secret data as far as information investigation, approval, and distributing. Constantly raising web phishing postured serious danger on across the board proliferation of delicate data over the web. Then again, the questionable sentiments and conflicts intervened unwillingness of different data suppliers towards the unwavering quality insurance of information from exposure frequently comes about absolute dismissal in information sharing or off base data sharing. This article gives an all-encompassing outline on new point of view and precise translation of a rundown distributed literary works through their fastidious association in subcategories. The crucial ideas of the current protection safeguarding information mining strategies, their benefits, and deficiencies are displayed. The present security protecting information mining methods are ordered in light of contortion, affiliation administer, shroud affiliation control, scientific categorization, bunching, cooperative characterization, outsourced information mining, disseminated, and k-anonymity, where their remarkable points of interest and hindrances are underlined. This watchful investigation uncovers the past improvement, show examine challenges, future patterns, the holes and weaknesses. Promote huge improvements for more powerful security insurance and safeguarding are confirmed to be compulsory.

Keywords Association · Classification · Clustering · Data mining · Distortion K-anonymity · Outsourcing · Privacy preserving

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1 Introduction

Preeminent web security against web ridiculing has turned into a need. The dangers forced due to always expanding trick assaults with cutting-edge disloyalty have turned into another test as far as moderation. Recently, web mocking brought on critical security and financial worries on the clients and endeavors around the world. Variegated correspondence channels through web administrations, for example, web-based business, web managing an account, investigate, and online merchant has misused both human and programming powerlessness experienced enormous budgetary misfortune. So there is an improved need of protection saving information digging strategies for secured and dependable data trade over the web. The expansion of putting away clients' individual information prompted an enhanced information mining calculation with pointed effect on the data sharing. The security must ensure three mining angles completely that contains affiliation tenets, order, and bunching [47]. The challenging issues of information mining are deliberated in numerous groups [37]. The data sharing for aggregate interests in now possible due to the advancement in distributed computing innovation.

Presently, various privacy preservation data mining methods are available. The methods that are available are association rule, classification, clustering, condensation, and cryptographic, distributed privacy preservation, K-anonymity etc. [47]. Privacy-preserving approaches in data mining ensure the information by adjusting them to cover or eradicating the first delicate one to be hidden. Essentially, the strategies depend on the ideas of protection disappointment, the degree to decide the first information gave by the client from the changed one, and estimation of data misfortune and information precision [66]. The fundamental reason for all the current strategies is to contribute a smaller among exactness and security. Different methodologies that make utilization of cryptographic procedures to safeguard the individual data are extremely costly [6]. In some cases, the people are apathetic to share the whole informational collection and may wish to shroud the data utilizing assortments of assertion. The fundamental purpose behind executing such procedures is to keep up people's protection while removing aggregate outcomes over the whole information [1]. It is critical to secure the information conveyed to different suppliers. For protection, customers' data should be distinguished before imparting to the doubtful clients who are not specifically permitted to get to the applicable information.

1.1 Privacy Preserving Data Mining (PPDM)

Raju et al. [46] graphed the usage for including or copying the tradition based homomorphic encryption close by the surviving thought of automated envelope technique in achieving shared information mining while in the meantime keeping the private information unblemished among the normal social occasions. The proposed strategy presented rich effect on different applications. Ashok and Mukkamala [34] perceived

a plan of soft based mapping procedures as to security saving qualities and the ability to keep up a comparable relationship with various fields. Zong and Qi [43] outlined particular existing techniques of information digging for the confirmation of protection depending upon information transport, mutilation, mining computations, and information or rules stowing without end. About information flow, less counts are starting late used for security confirmation information mining on brought together and dispersed information. Matwin [32] broke down and analyzed the propriety of protection saving information mining techniques. Usage of specific techniques unveiled their ability to block the uneven use of information mining. Vatsalan et al. [58] analyzed 'Protection Preserving Record Linkage' (PPRL) system, that empowered the relationship to interface their databases by safeguarding the security. Sachan et al. [47] and Malina and Hajny [31] explored the present protection saving frameworks for cloud organizations, in which the result is portrayed on bleeding edge cryptographic sections. The course of action demonstrated the darken get to, the unlink limit and control of cover of passed on information. At long last, this game plan is done, the trial results are gotten and the execution is perceived.

1.2 Data Distortion Dependent PPDM

Three new models were proposed by Kamakshi and Babu [18] that included customers, data focuses, and databases of each site. Since the data focus is totally unconcerned therefore, the customers and the site database part seem interchangeable. Brankovic and Islam [15] presented a strategy that included diverse novel strategies that influenced every one of the components in the database. Test conclusions demonstrated that the outlined system is extremely sufficient in preserving the first examples in a bothered dataset.

Kamakshi [17] outlined an imaginative idea to enthusiastic analyze the fragile parts of PPDM. Finding of these perspectives relies on upon the skirt furthest reaches of delicacy of every trademark. It is understood that the data proprietor adjusted the incentive under grouped fragile perspective utilizing swapping system to ensure the data privacy. The data was adjusted in a way, such that it pointed the same underlying properties of the data. A short time later, Zhang et al. (2012a) outlined a recently adorn authentic likelihood based commotion era system called HPNGS. The impersonation conclusion demonstrated that the HPNGS can lessen the quantity of commotion necessities over its arbitrary supplement till 90%. The focus was on the privacy security along with clamor jumble in distributed computing (Zhang et al. 2012b). As an outcome, another affiliation likelihood based commotion era procedure (APNGS) was created. The examination established that the proposed APNGS to some degree enhanced the privacy insurance on clamor tangle including affiliation probabilities at a direct additional cost than ordinary perfect outlines.

1.3 Association Rule Based PPDM

Aggarwal and Yu [1] highlighted two vital parts including the connection lead mining, for instance, support and conviction. For an association control $X => Y$, the support is the rate of trades in the dataset which fuses X U Y. The nature of an association run $X => Y$ is the extent of the trades number by X. Furthermore, Belwal et al. [4] reduced the introduction of support and assurance of sensitive precepts without changing the given database. Regardless, suggested adjustment can be executed through starting late including parameters interfacing with database trades and association rules. Display day thought contain Changed support, Altered assurance and Concealing counter. The count associated the importance of support and sureness. In this way, it shrouded the fundamental sensitive connection manage with no horrible. Regardless, it can cover up only the precepts for single delicate thing on the left hand side (LHS). Li and Liu [26] proposed a connection represent digging figuring for security protecting known as DDIL. The introduced framework relies on upon demand constraint and information unsettling impact. The honest to goodness information can be covered up by using DDIL count to upgrade the security beneficially. This is a gainful strategy to make different things from balanced information. Experiential results exhibit that this framework is capable for making agreeable estimations of protection alter with suitable decision of self-assertive parameters. Naeem et al. [35] arranged a computation which separated the limited alliance standards with thorough elimination of the alluded to disagreeable, for instance, the period of undesirable, non-veritable association rules while yielding no "covering" disillusionment. This strategy used fundamental numerical measures in place of common structure, especially measuring method in light of central slant.

Vijayarani et al. [59] elucidated the system for quantifiable revelation control gathering, the database gathering, and the cryptography gathering. Less adequacy of information needs high cost. A refreshed mutilation procedure for security safeguarding persistent thing set mining was arranged by Srivastava et al. [51], secured fp & nfp probability guidelines. Upgraded viability is accomplished within the sight of an irrelevant pressure security by modifying the two new parameters. Jain et al. [16] arranged another framework to decrease the support of the left-hand side (LHS) and right-hand side (RHS) oversee thing to cover up or guarantee the association rules. The familiar strategy is found with be helpful as it rolled out less improvement to the information entries to secure a course of action of rules with less CPU usage time than the main work. It is kept to association oversee so to speak.

1.4 Hide Association Rule Based PPDM

Weng et al. [63] presented Fast Hiding Sensitive Association Rules (FHSAR) calculation. This guaranteed the delicate affiliation rules (SAR) with less unfavorable, where an approach is intended to avoid concealed disappointments. What's more, two

heuristic methods were acquainted with upgrading the execution of the framework to take care of the issues. The heuristic capacity is additionally connected to choose the past weight for every particular exchange so that the request of altered exchanges can be chosen successfully. Dehkordi et al. [7] progressed multi-target method for ensuring the delicate affiliation leads in enhancing the security of database. The protection and exactness of dataset progressed in proposed strategy depending on hereditary calculation (GA) idea. Verykios et al. (2009) displayed a correct outskirt based procedure to accomplish an ideal outcome to stow away fragile regular thing sets with least expansion of the underlying database. This strategy applies an augmentation to the underlying database as opposed to modifying the current database. Kasthuri and Meyyappan [20] acquainted another calculation with breaking down the fragile things by disguising the touchy affiliation rules. This system found the basic thing sets and delivered the affiliation rules. Average affiliation rules idea is found the fragile things. Covering the touchy affiliation rules utilizing picked fragile things is discovered valuable.

Quoc et al. [44] have presented a heuristic calculation in light of the convergence cross section of regular thing sets to secure the arrangement of secret affiliation rules utilizing bending technique. To bring down the reactions, the heuristic for support and certainty minimization situated crossing point grid (HCSRIL) calculation are utilized.

1.5 Classification Based PPDM

Xiong et al. [65] presented storage room neighbor grouping strategy that relies on upon Secure Multiparty Computation (SMC) procedures to settle the protection cons in less laps alongside the pf determination of the protection safeguarding closest neighbor and the classification of protection preserving. This development is uniform in regard of productivity, execution, and protection security. In addition, it is adaptable to the various settings to accomplish distinctive enhancement condition. Singh et al. [52] introduced novel order strategy for smooth and powerful protection for cloud information. The evaluation of the closest neighbors for K-NN arrangement was based on Jaccard comparability measure and the balance test is transported into make sense between two scrambled records. This method encouraged a guaranteed nearby neighbor calculation at every hub in the cloud and arranged the concealed records by means of weighted K-NN order plot. It is essential to focus on authorizing the sturdiness of the outlined calculation with the goal that speculation to various information mining errands can be made, where security and secrecy are craved. Baotou [3] exhibited a successful development based on arbitrary bother network to safeguard security characterization information mining. This technique is polished on unmistakable information of character sort, Boolean sort, grouping sort and numeric sorts. The exploratory unveiled the to a great degree decorated components of this new planned calculation as far as protection security and proficiency of information mining calculation, where the processing technique is exceedingly lessened however

at more prominent cost. Vaidya et al. [57] presented vertical apportioned information mining approach. This plan was able to adjust and upgrade distinctive information mining applications as choice trees. Promote powerful arrangements are required to find tight upper bound on the multifaceted nature. Sathiyapriya and Sadasivam [49] looked into the characterization techniques in grouping protection safeguarding strategies and talked about the benefits and restrictions of various strategies.

1.6 Clustering Based PPDM

Yi and Zhang [67] sketched out a few points before clarifications to ensure classification of dispersed k-implies grouping and conveyed an inflexible clarification for fairly contributing multiparty convention which implies that grouping is utilized on vertically divided information, albeit every information site contributed k-implies bunching uniformly. As per essential origination, information destinations cooperate to encode k values with a normal general key in each phase of grouping. At that point, it safely looked at k values and yielded the list of the base without showing the transitional qualities. In some setting, this is convenient and more effective than Vaidya–Clifton convention [57].

1.7 Associative Classification Based PPDM

Raghuram and Gyani [45] presented an acquainted grouping model contingent upon vertically apportioned datasets. A scalar item based outsider security safeguarding model is received to keep up the protection for information sharing procedure among various clients. The veracity of the given technique is approved on its VCI databases with moving outcomes. Lin and Lo [27] composed an arrangement of calculations comprising of Equal Working Set (EWS), Small Size Working Set (SSWS), Request on Demand (ROD), and the Progressive Size Working Set (PSWS).

Harnsamut and Natwichai [13] presented novel heuristic calculation that relies upon Classification Correction Rate (CCR) of a particular database to secure database. The outlined strategy was tried and the exploratory outcomes are approved. The heuristic calculation is observed to be to a great degree compelling and effective.

Seisungsittisunti and Natwichai [50] sketched out the issues identified with information change to protect security for information mining strategy and affiliated grouping in an incremental information situation. An incremental polynomial time calculation is intended to adjust the information to keep up a security standard called k-namelessness.

1.8 Privacy Preserving Outsourced Data Mining

Giannotti et al. [11] illustrated the issues related to the outsourcing of affiliation control digging assignment for a corporate security saving system. An assault model is composed in light of the foundation information for protection saving outsourced mining depending upon one–one exchange figures of things that contained the false exchanges to share each figure thing.

Worku et al. [64] decorated the execution of the above outline by diminishing the computational escalated operations, for example, bilinear mapping. The technique pronounced the outcomes to be more secure and effective after careful examination of security execution. However, the information square inclusion resulted in conspire non-dynamic. Along these lines, the advancement of a total fundamental and secure general investigation technique remains an open test for a cloud framework.

1.9 Distributed Method Based PPDM

Ying-hua et al. [68] made it clear that the DPPDM is dependent upon particular essential advancements. Existent methodologies are gathered into three groups named secure multiparty calculation, bother and confined inquiry. Li [25] compared the work of each group by outlining and assessing a symmetric key based security safeguarding configuration to strengthen mining tallies. An allurement study is anticipated to the investigation of the ensured calculation by exhibiting a disagreeable reputation framework in remote system. The planned structure displayed an allure for acting mischievously hubs to carry on legitimately. Exploratory conclusion uncovered the framework proficiency in finding the trespass hubs and enhanced throughput of entire system consistently. Besides, Dev et al. [9] perceived mystery risk associated with information mining on cloud framework and outlined an appropriated system to evacuate such perils. Tassa [56] outlined another plan for secured mining of affiliation standards in on a level plane conveyed database. The planned plan showed benefits over better plans related than execution and security. This plan encased two arrangement of principles. Chan and Keng [5] proposed approaches which rely upon Field and Row-Level scattering of value-based information. The creators planned a conveyed structure to secure outsourcing affiliation mining rules and investigated the achievability of its appropriation. The outlined structure for allotting exchanges to send servers relies on upon the significance of the sorts of protection idea to a client. Xu and Yi [66] inspected the security protecting conveyed information mining that goes through unmistakable stages and proceeded. The creators proposed scientific categorization to insist the consistency and assessment of the conventions effectiveness. Inan and Saygin [14] planned a strategy to assemble disparity designs for flat conveyed information mining. Nanavati and Jinwala [36] illustrated distinctive methodology of co-agent setup for the protection of the specific gatherings world-