ANALYSIS AND SURVEY ON VARIOUS CLOUD COMPUTING ALGORITHMS AND ITS CHALLENGES

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Abstract- In today's world multi day cloud computing assumes a significant job in web period because of the a progressive portable applications cloud computing turns out to be increasingly significant it is a definitive answers for this versatile application cloud computing opens another time for computing technology by and by there are different web benefits through the various clouds some striking administrations are, Amazon web administrations, elastic compute cloud, Google cloud. Cloud Computing is a blasting web driven technology, which renders a pool of assets, for example, system, stockpiling, and applications on-request premise. The clouds Services must be exceptionally verified with the goal that it expands the reception of cloud for big business the board. The cloud administrations are shared by multitenant utilizing web channel which is a vulnerable to assaults. Cloud computing is presented to numerous dangers. This paper surveys different sorts of cloud computing calculations and its difficulties.

***Keywords**: Cloud Computing, Challenges, Algorithms, Architecture, Node, Servers*

1. INTRODUCTION

Like genuine clouds which are the gatherings of water atoms, the expression "cloud" in cloud computing is the accumulation of systems. The client can utilize the modalities of cloud computing limitlessly at whatever point requested. Rather than setting up their very own physical foundation, the clients usually lean toward a middle person supplier for the administration of the web in cloud computing. The clients need to pay just for the administrations they had utilized. The remaining task at hand can be moved to decrease the outstanding burden in cloud computing. A heap of administration is taken care of by the systems which structures the cloud that is the reason the heap on neighborhood PCs isn't substantial while running an application. So the order of equipment and programming at the client side is diminished. All we need an internet browser to utilize cloud computing. All we need an internet browser like chrome to utilize cloud computing. Cloud is a stretch out of matrix computing, disseminated computing and parallel computing where everything is fill in as administration. It is a model for empowering configurable computing assets. Accordingly cloud computing can be said helpful, on interest system access to a common pool of to give Internet-based computing administration. Cloud computing expands on officially existing computing innovations, for

example, lattice computing and virtualization. These are the types of the dispersed computing advancements. Cloud computing relegate remote administrations with a client's information, calculation and programming. It is a model which gives on interest access to a mutual pool computing asset like servers, stockpiling, systems, applications and administrations.

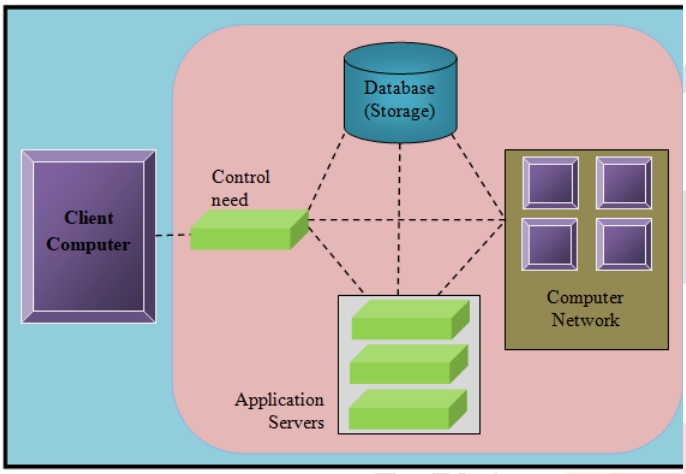

Figure 1: Architecture of Cloud Computing

Cloud computing and capacity arrangements furnish clients and ventures with different abilities to store and process their information in outsider information centre's. It relies upon sharing of assets to gain cognizance and economy of scale over a system. Because of the focal points like shoddy expense of administrations, superior high computing force, versatility, openness and accessibility cloud computing has progressed toward becoming requested.

Cloud computing removes the accentuation from neighborhood PCs. It is less about the machine you use at home or moving and increasingly about what's going on PCs numerous miles away. Rather than putting away data on your PC, advanced cell or tablet, your information can be kept remotely. It will at that point be made accessible to any gadget that is equipped for understanding it. Normally, most cloud computing is directed by means of an internet browser however there are different ways, including extraordinarily made applications for PCs, tablets and advanced cells. These go about as passageways for cloud administrations. They likewise imply that you don't generally need devoted programming introduced on your machines. The advantage of this is clear: abruptly you are not attached to your own PC. You don't should be attached to your own telephone. All you need is a method for getting to the information and that be done from any machine. As should be obvious, this varies from conventional computing since you needn't bother with versatile capacity media nor are you depending on how strong or quick your machine is. With cloud computing, you are seeing projects and information being overseen and given as an administration over the web and it opens up numerous potential outcomes.

2. LITERATURE SURVEY

1. Remi Sahl, Paco Dupont, Christophe Messager, Marc Honnorat, Tran Vu La [2018]**:** Proposed to propels a functional use of eminent distributed computing innovations that tends to issues experienced in the earth observation and meteorological space. Routinely extending satellite catch innovations result in greater and greater data that is being taken care of by a consistently expanding number of complex counts for the period of climate projections, estimates, etc. Associations and masters that work on this kind of

getting ready chains fight with limit and processing issues that distributed computing innovations can endure. This kind of engineering transforms into significantly progressively significant as cloud providers propose open pay-per-use benefits that make such structure monetarily handy. This relates the multifaceted design of satellite data getting ready with the courses of action that distributed computing can offer. It nuances use cases that component the necessity for a united access to data between getting ready resources with control impediments, for adaptable limit and appropriated registering capacities, and for hardware improvement to restrain the two costs and taking care of time. the space associations have been impelling a couple of satellite trains of low polar circle satellites passing on countless earth pictures every day. These data may be used to watch the earth by taking care of the nearby picture into noteworthy and accurate geophysics parameters. The SNOWBIRDS (Strong Wind Retrieval from SAR) windfield estimation computation made by Exwexs fills in for example of the system critical to allow profitable treatment of such data. Seasonal residents are used for assessing wind fields (ie. bearing and speed) as raster data at high spatial objectives (100m). The European Space Agency (ESA) impelled the SENTINEL1 star gathering including two polar-revolving around satellites which work day and night, perform radar imaging, and engage the obtainment of imagery paying little personality to the climate. Around 2000 SENTINEL-1 pictures arrive every day and are used for wind field estimations.

2. Mohit Agarwal, Dr. Gur Mauj Saran Srivastava [2016**]:** Proposed to current situation, Cloud registering cut itself as a developing innovation which empowers the association to use equipment, programming and applications with no forthright expense over the web. The test before the cloud specialist co-op is, the means by which productively and viably the basic processing assets like virtual machines, arrange, capacity units, and transfer speed and so on ought to be overseen with the goal that no figuring gadget is in under-use or over-usage state in a dynamic domain. A decent errand planning system is constantly required for the dynamic portion of the undertaking to keep away from such a circumstance. The Genetic Algorithm based undertaking planning procedure, which will appropriate the heap adequately among the virtual machine with the goal that the overall reaction time (QoS) ought to be insignificant. A correlation of this Genetic Algorithm based undertaking planning system is performed on CloudSim test system which demonstrates that, this will outflank the current strategies like Greedy based, First – Come first – Serve (FCFS) methods. Hereditary Algorithms are enlivened by the hypothesis of development, as indicated by which fittest species/arrangement will endure and permitted to propagation while the unfit or powerless will be disposed of or extinct. Genetic calculations are prestigious to for their dependability and productivity for finding the worldwide ideal arrangement in an exceptionally perplexing and huge example space where the greater part of different calculations fizzles. In finding the ideal answer for both single targets just as multiobjective. In assignment planning for

distributed computing condition. In GA, each individual arrangement is known as chromosome and the accumulation of chromosome

3. Pieter-Jan Maenhaut, Hendrik Moens, Bruno Volckaert, Veerle Ongenae and Filip De Turck [2017]**:** Proposed to distributed computing, the proficient administration of assets is vital as an expanded use of the accessible assets can result in higher adaptability and huge vitality and cost decreases. Trial approval of novel asset the executives system is expensive and tedious, and frequently requires inside and out learning of and command over the fundamental cloud stage. Accordingly, numerous novel systems are just assessed by methods for recreations, in which the entire distributed computing condition is displayed and simulated. Regardless, trial approval ought to likewise be considered during the approval, as these kinds of investigations can frequently result in new bits of knowledge or they can be utilized to tweak some particular parameters. To exhibit a general methodology for the test approval of cloud asset the executives procedures, together with the presentation of a cloud testbed connector which was intended to encourage the progression from recreations towards exploratory approval on physical cloud testbeds and delineate our answer by methods for two contextual investigations, concentrating on two distinct sorts of testbeds. The connector principally goes about as a dispatcher towards explicit administrations of the assessed cloud setup, and enables analysts to effectively approve their thoughts without plunging profound into the unpredictable subtleties of the basic cloud platform Within the setting of distributed computing, productive administration of accessible assets is vital as it can result in higher versatility, yet additionally in noteworthy vitality and cost decreases. As of late, a great deal of research has been finished with respect to the productive distribution of cloud assets. This is regularly done by solidifying the required virtual machines or holders on couple of physical hosts. Novel asset assignment techniques anyway are regularly just assessed by methods for reproductions, for instance by utilizing CloudSim, a develop system for the demonstrating and reenactment of distributed computing situations.

4. Giuseppe Portaluri, Stefano Giordano [2015]**:** Proposed another assignment allocator for Cloud Data Center (DC). The usage depends on two unique heuristics: Multi-Objective Genetic Algorithms (MOGA) and Simulated Annealing (SA). The allocator diminishes in the meantime both assignment fulfillment time and server and switches control utilization, staying away from system interface clog. The assessment results demonstrate that the created methodology can play out the static assignment of an enormous number of autonomous errands on homogeneous single-center servers with quadratic time unpredictability for MOGA and a direct time multifaceted nature for SA. File Terms—Data center, Cloud Computing, Multi-Objective Genetic Algorithm, Simulated Annealing, Resource Allocation, Power Efficiency. Propose an undertaking allocator for Cloud Computing Data Centers (DCs). The created methodology improves DC execution and limits server and switch utilization. The allocator performs static planning of free assignments on

homogeneous single-center assets, and it depends on two distinctive meta-heuristics: Multi-Objective Genetic Algorithms (MOGAs) and Simulated Annealing (SA). The usage is finished utilizing a particular java-based open source structure for MOGA, called jMetal, with a self-customized and tunable system for multi-objective SA. Figuring servers are displayed with single-center processors offering a fixed computational power communicated in guidelines every second. Assignments designated for execution on a similar server share similarly server's handling power. Servers left inert can be put into a rest mode limiting their capacity utilization.

5. Peidong Sha 1, Zhixiang Zhu [2016]**:** RSA is Partially homomorphic cryptosystem, in view of the highlights of the RSA calculation, plan an encryption framework, this encryption framework initially separates whether the estimations of the open key and private key created during the encryption procedure contain prime number, at that point joins with the Pascal's triangle hypothesis and RSA calculation model and inductive techniques to develop another cryptosystem that meets homomorphic calculation of certain activities on cihpertexts(e.g., augmentations, multiplications), Thus the new cryptosystem fulfills completely homomorphic encryption in distributed computing. The completely homomorphic encryption was at first proposed by Rivest, adleman, dertouzous after they set forward the protection homomorphism in which present the strategy for utilizing equipment way to deal with accomplish full homomorphic encryption. its strategy for utilizing equipment approach exists security execution issues. Accordingly craig centry utilized the techniques for bootstrapping and ideal lattices to make the full homomorphic encryption work. in topsy-turvy encryption calculation RSA calculation is renowned for its wide scope of uses. For the full homomorphic encryption, it is very valuable in the security of the distributed computing, it implies that self-assertive performing expansion and multiplication among cihpertexts will results the indistinguishable performing expansion and multiplication among plaintexts. Thought the normal for the RSA calculation, clearly RSA calculation just gets the normal for multiplication of the full homomorphic encryption. Design the expansion calculation to make it acquires the normal for multiplication as well as gets the normal for expansion in the full homormorphic encryption, in this new calculation will fit completely homomorphic encryption calculation in the distributed computing.

6. Hyeong-Jin Kim, Hyeong-Il Kim, Jae-Woo Chang[2017]: Proposed a protected and productive kNN grouping calculation that hides the subsequent class mark and data access designs. Calculation can bolster productive kNN grouping by utilizing scrambled file plot and the Yao's jumbled circuit. Proposed calculation accomplishes around multiple times preferred execution over the current plan, as far as grouping time. To upgrade the exhibition of the calculation, to embrace the encoded record plan proposed. Yao's distorted circuits permits two gatherings holding inputs x and y, separately, to assess a capacity f(x,y) without releasing any data about the contributions

past what is inferred by the capacity yield. One gathering creates an encoded rendition of a circuit to figure f. The other party carelessly assesses the yield of the circuit without adapting any halfway qualities. In this manner, the Yao's distorted circuit gives high security level. Proposed a kNN order plot (PPkNN), which is the main work that performs grouping over the encoded data. The plan embraces SkNNm to recover k applicable records to an inquiry and decides the class name of the question. The plan can safeguard the two data security and inquiry protection while concealing data access design. Be that as it may, the plan experiences high calculation overhead since it considers all the scrambled data during the inquiry handling. The plan jelly data security, question protection, and moderate outcomes all through the inquiry preparing. The plan likewise conceals the data access design from the cloud. To accomplish this, they embrace SkNNm plot among different secure kNN plans when recovering k applicable records to an inquiry. In any case, the plan experiences high calculation overhead since it considers all the scrambled data during the inquiry handling. Because of the protection issues, databases should be encoded before being redistributed to the cloud. To proposed another safe and productive kNN characterization calculation that can disguise the subsequent class mark and the data access design. In addition, the calculation can bolster proficient kNN order by utilizing a scrambled file conspires and the Yao's jumbled circuit.

7. Yangyang Dai, Yuansheng Lo, Xin Lu[2015]: Proposed a novel undertaking booking algorithm MQoS-GAAC with multi-QoS imperatives is proposed, considering the tedious, use, security and unwavering quality in the planning procedure. The algorithm coordinates ant colony optimization algorithm (ACO) with genetic algorithm (GA). To create the underlying pheromone effectively for ACO, GA is summoned. With the structured wellness work, 4-dimensional QoS objectives are assessed. the proposed algorithm has best execution both in adjusting assets and guaranteeing QoS. Proposes an assignment planning algorithm MQoS-GAAC in cloud figuring, which is thinking about multi-dimensional QoS requirements and the blend of ACO and GA. MQoSGAAC beats the inadequacies of customary planning algorithm, which considers QoS for clients as the wellness capacity to channel the proper assets. Dynamic combination methodology is utilized to decide the best combination time for ACO and GA. Burden adjusting element is viewed as when setting starting pheromone in ACO. Refreshing pheromone utilizes neighborhood and worldwide refreshing principles, and the measure of changed pheromones is controlled by the QoS estimation of assets. The algorithm improves the client QoS, yet in addition keeps the asset burden adjusting. Also, further improve the general framework execution. Because of the illuminating productivity in the later time of GA isn't high, so it is anything but difficult to prompt countless redundant emphases. Furthermore, in the fundamental phase of ACO, lacking of pheromone will prompt collect pheromone for quite a while in the underlying

hunt. In this way, consolidating GA and ACO and incorporating QoS proposed MQoS-GAAC algorithm (task planning algorithm dependent on genetic algorithm and ant colony optimization algorithm with the multi-dimensional QoS requirements in cloud figuring). proposes an assignment booking algorithm MQoSGAAC, which is thinking about multi-QoS requirements and on the mix of ACO and GA. By intertwining ACO and GA and changing over the QoS into enrollment works as a GA wellness work, to find that the ideal planning plan meets client nature of administration. This algorithm in time length and asset burden adjusting is better than ACO and GA, and significantly improve the QoS.

8. Kashifuddin Qazi, Igor Aizenberg[2018]: Proposed a host asset use forecast approach, in view of a complex-valued neural system. The algorithm can be additionally altered later on to be material to quantum registering situations. A proof-of-idea is assessed on genuine burden follows from a network. The algorithm is looked at against some current stateof-the-craftsmanship have load expectation algorithms to exhibit its precision. the proposed expectation component uses MLMVN which is a feed-forward neural system, using complex-valued neurons. This offers higher usefulness, better speculation capacity and straightforwardness of learning. Moreover, MLMVN learning is sans subsidiary, and abstains from falling into nearby optima's. The principle refinement of MLMVN when contrasted with the old style feed forward neural system, is that its structure squares are Multi-Valued Neurons (MVN) with complex-valued loads. Utilizing complex-valued data sources/yields, loads and activation capacities, it is conceivable to expand the usefulness of a solitary neuron and a neural system, to improve their presentation, and to lessen the preparation time. The technique is utilized to accomplish both present moment and long haul forecasts. Proposed a complex-valued neural system way to deal with foreseeing outstanding tasks at hand in datacenters. These expectations are very helpful for an assortment of datacenter the executives concerns, for example, load adjusting, load combination, remote memory portion, and so forth the proposed forecast arrangement produces best in class exactness for certifiable lattice burden follows. A quantum adaptation of the complex-valued system is at present being taken a shot at, which could offer incredible speed advantages to datacenters.

9. Monika Lagwal, Neha Bhardwaj[2017]: Proposed GA way to deal with taking care of the LB in cloud computing. Proposed approach is more proper than the present methods work, as we executed the cloudlets in less time and playing out the heap adjusting in greater gainfulness. Cloud Load balancing (CLB) takes the abundance of the cloud's adaptability and the physically to meet rerouted outstanding task at hand and to improve generally accessibility. To conquer the issues from leaving issues we utilized new plan genetic-algorithm approach, with the goal that cost and time proficient outcomes can be gain. For expense and time effectiveness yields, we first short our procedures as per the expense and the chose of VM and savvy procedures are taken for making new chromosome by hybrid, with the

assistance of GA. At that point the dealer allots powerful procedures to customers based on the expense and time viable way. Proposed to adjust the remaining task at hand among VM in a cloud datacenter. On-request self-administration When any client wants administration and assets, at that point the cloud will give administration On-request. Cloud provisioning of administrations have ability and control to perform like server and capacity, which can be performed by the buyer singularly, without person association with each specialist co-op. this algorithm can accomplish better burden adjusting in a huge scale cloud-figuring condition With expanding high solicitation of cloud benefits today, issues of On-request giving of administrations and assets are given in cloud-base condition and can't be negligence or neglect. To make productively control of the cloud servers, convincing of efficient technique. GA use to achieve the time productivity objective and results without harming worth of administration. To adjust the remaining burden by orchestrating VM based on their preparing force and organizing the cloudlets as per their Length for example number of guidelines in the cloudlet. The rundown of VM and cloudlets is then submitted to agent for the assignment. Intermediary dispenses through GA, assignment of assets is finished.

10. Lino Chamorro, Fabio Lopez-Pires, Benjam ın Baran[2016]: Proposed A genetic algorithm for an effective and adaptable goals of the thought about issue. Great nature of arrangements gotten by the proposed algorithm when contrasted with a best in class Integer Linear Programming (ILP) algorithm. Also, great dimension of adaptability of the proposed algorithm for huge examples of the thought about issue. Proposes a genetic algorithm for a versatile goal of a broker oriented VMP issue thinking about powerful situations. GA displayed in Algorithm 1 right off the bat checks if the issue has at any rate one arrangement. At that point it produces a lot of irregular hopefuls P0, whose arrangements are fixed to guarantee that it contains just doable arrangements. The algorithm at that point assesses the wellness of the considerable number of arrangements of P0 and best arrangement is chosen and spared as Pbest. The transformative procedure pursues a similar conduct: initial, an age is augmented; arrangements are chosen from past population. The developmental procedure is rehashed until the algorithm meets a halting measure, (for example, a greatest number of ages). At long last restoring the best discovered arrangement Pbest. Choice is performed utilizing the roulette strategy; developmental populaces are created by hybrid of guardians considering single-point hybrid technique. At that point, a bitwise transformation strategy is performed on every person inside a specific likelihood of change. Proposing a novel genetic algorithm (GA) for fathoming the considered representative situated VMP issue in unique conditions proposed A genetic algorithm for an effective and versatile goals of the thought about issue. Moreover, great dimension of adaptability of the proposed algorithm for huge examples of the thought about issue. Proposes a genetic algorithm for a versatile goal of a representative situated VMP issue thinking about powerful conditions.

3. CHALLENGES OF CLOUD COMPUTING

Despite the potential increments achieved from the cloud registering, the affiliations are moderate in enduring it as a result of the going with obstacles: data setback, data cleaning, account catching, less order over the methodology, insider attacks by the CSP‟s, nonappearance of genuine points, nonattendance of adaptability/development beginning with one pro center then onto the following, less strong, nonappearance of auditability, less QoS .These imperatives lead to the issues or difficulties, for instance, – security, interoperability, virtualization, data spillage, resource sharing, load modifying ,multi-residency, and Service Level Agreement. There are various advantages as referenced above, regardless of the way that cloud processing has various difficulties. While moving from owning site to cloud space, associations must careful about the advantages and difficulties of cloud figuring.

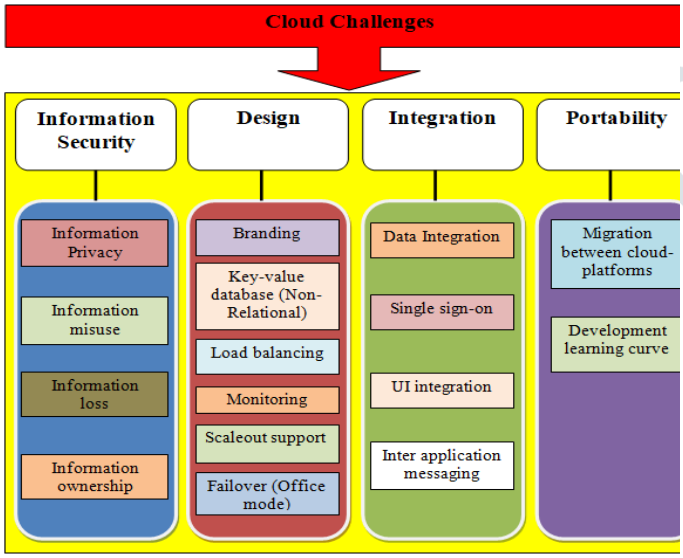

Figure 2: Cloud Challenges

While separating these difficulties, security of data is the most dull work in cloud processing. As shown by a diagram did by Gartner over 70% of Chief Technical Officers acknowledged that the fundamental reason behind not using cloud processing organizations is that of the data security and assurance concerns. Influencing the affiliations especially minimal ones about security concern is a dull work; they are not set up to dispose of their structure and brief move to cloud. Most by far of the affiliations are eagerly watching this issue and not set up to move to cloud space, this is essential reason without advancement some other unapproved customer sharing the application or stage in the cloud, this reason the uprightness frustration. As data are the base for giving cloud processing organizations, for instance, Data as a Service, Software as a Service, Platform as a Service, keeping data genuineness is a key errand.

CONCLUSION

Today, we can utilize versatile and strong figuring with the help of lattice processing, passed on too cloud registering conditions inside the limits of the Internet. The initiation in cloud registering was anticipated its massive power contingent upon end customers running from individuals and best in class associations affiliations. Cloud figuring is another perspective of registering utilities that guarantees to give more noteworthy versatility, increasingly moderate, and more viability in IT organizations to end customers. Cloud Computing has pulled in a couple of undertakings due to various advantages that it offers as progressively significant adaptability, faster association, low costs or pay per use, on intrigue security control

and distinguishing proof of system changing. The survey was made out of 100 research papers with 30 selected models.

References:

1. Remi Sahl, Paco Dupont, Christophe Messager, Marc Honnorat, Tran Vu La" **High-resolution ocean winds: Hybrid-cloud infrastructure for satellite imagery processing"**,IEEE2018.

2. Mohit Agarwal, Dr. Gur Mauj Saran Srivastava**"A Genetic Algorithm inspired task scheduling in Cloud Computing"**,IEEE 2016.

3. Pieter-Jan Maenhaut, Hendrik Moens, Bruno Volckaert, Veerle Ongenae and Filip De Turck" **Resource Allocation in the Cloud: From Simulation to Experimental Validation"**,IEEE 2017.

4. Giuseppe Portaluri, Stefano Giordano**"Power Efficient Resource Allocation in Cloud Computing Data Centers using Multi-Objective Genetic Algorithms and Simulated Annealing"**IEEE 2015.

5. Peidong Sha 1, Zhixiang Zhu **" The Modification Of Rsa Algorithm To Adapt Fully Homomorphic Encryption Algorithm In Cloud Computing"**IEEE 2016.

6. Hyeong-Jin Kim, Hyeong-Il Kim, Jae-Woo Chang**," A Privacy-Presering kNN Classification Algorithm using Yao's garbled circuit on Cloud Computing",** 2017 IEEE 10th International Conference on Cloud Computing.

7. Yangyang Dai , Yuansheng Lou2 , Xin Lu**," A Task Scheduling Algorithm Based on Genetic Algorithm and Ant Colony Optimization Algorithm with Multi-QoS Constraints in Cloud Computing",** 2015 7th International Conference on Intelligent Human-Machine Systems and Cybernetics.

8. Kashifuddin Qazi, Igor Aizenberg**," Towards Quantum Computing Algorithms for Datacenter Workload Predictions"**, 2018 IEEE 11th International Conference on Cloud Computing.

9. MONIKA LAGWAL, NEHA BHARDWAJ**," Load balancing in Cloud Computing using Genetic Algorithm",** ©2017 IEEE International Conference on Intelligent Computing and Control Systems.

10. Lino Chamorro, Fabio Lopez-Pires, Benjam ın Baran**," A Genetic Algorithm for Dynamic Cloud Application Brokerage",** 2016 IEEE International Conference on Cloud Engineering.

11. Ojasvee Kaneria, R K Banyal "Analysis and Improvement of Load Balancing in Cloud Computing" 978-1-5090-5515-9/16/$31.00 ©2016International Conference on Communication and Electronics Systems (ICCES), IEEE.

12. Ronak R Patel,Swachil J Patel,"**IMPROVED GA USING POPULATION REDUCTION FOR LOAD BALANCING IN CLOUD COMPUTING",**2016 Intl. Conference on Advances in Computing, Communications and Informatics (ICACCI), Sept. 21¬24, 2016, Jaipur, India IEEE.

13. I. Aizenberg, L. Sheremetov, L. Villa-Vargas, and J. MartinezMunoz, **"Multilayer neural network with multi-valued neu-** ˜ rons in time series forecasting of oil production," Neurocomputing, vol. 175, pp. 980–989, 2016.

14. Bei Wang, Jun Li, "**Cost-Effective Scheduling Precedence Constrained Tasks in Cloud Computing,"** IEEE International Conference on Cloud Computing and Big Data Analysis, 2017.

15. Jiawei Xing, Jun Li**," HEFTD Algorithm in Cloud Computing",** 2018 the 3rd IEEE International Conference on Cloud Computing and Big Data Analysis.