

A Survey on Optimization and Security of 5G

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Abstract: This paper provides the background about the previous scientific research that has been done with the consideration of current and future scenarios of 5G wireless communication networks, on the basis of power optimization and security analysis.

Keywords: 5G, Security

1. Introduction and Literature Background

Upkar Varshney et al. [1] this survey has compared the novel ideas with the existing 4G assistances and contemplates future predictions as 4G wireless networks. They are getting a lot of consideration from researcher's word wide, mobile users, device manufacturers and wireless carriers.

Cheng-Xiang Wang et al. [6] this paper has proposed a probable cellular architecture that splits indoor and outdoor scenarios. In the end, several future challenges that are opposing these technologies are also discussed.

Patrick Kwadwo Agyapong et al. [7] this paper proposed a two-layer architecture for addressing the challenges of 5G mobile networks. It consists of a radio network, a network cloud and incorporated different technologies like small cells, massive MIMO, control/user plane split, NFV, and SDN.

2. Background about Massive MIMO

Boyu Li et al. [13] this paper has introduced and compared the three strategies i.e., CTDD, ZDD and ZDD-IR of small cell in-band wireless backhaul in massive MIMO systems. While ZDD might attain improved throughput than CTDD, reliant on the conditions, even with residual self-interference and self-interference cancellation capability at small cells. However it might normally attain improved throughput than CTDD and ZDD.

Samip Malla et al. [15] in this paper, the problem of using the hybrid network comprises of the massive MIMO and small cell networks, is highlighted.

Prasad Rayi et al. [17] this paper has done work on minimizing the power and improving the spectral efficiency by the process of non-coherent convex optimization for massive MIMO with SCA points in a macro cell environment.

Emil Bjornson et al. [19] in this paper, two densification techniques namely massive MIMO and small cell access points are combined for minimizing the total power consumption, while satisfying the QoS constraints.

Emil Bjornson et al. [20] in this paper, a cellular network is designed by combining the massive MIMO and small cell approach for achieving high energy efficiency.

Abbas Kazerouni et al. [23] this paper has considered the impact on pilot contamination and capacity of massive MIMO cellular networks of reducing cell size. The simulation results have confirmed the above analysis.

Shuguang Cui et al. [27] this paper has done work on to minimized the energy consumption of the wireless systems in which the nodes operate on batteries, while fulfilling the throughput and delay demands. This has been done by analyzing the best modulation strategy which will help in minimizing the total energy consumption.

Weisi Guo et al. [28] this paper has done work on optimizing the cellular network's cell locations. In the first part of the paper, advanced modelling, radio planning methods. The second part of the paper targets on the algorithms that will assist LPN deployment by utilizing the information of the interference and physical environment. The proposed techniques has helped in improving the network performance and reducing the radio planning complexity.

Nan E et al. [32] this paper has done work on the deployment of new small cells on the existing heterogeneous network for meeting the extra traffic demand of hot-spot (HS) users. In order to achieve this, a reduced-complexity iterative algorithm is developed for solving the joint optimization problem of optimizing the number and locations of new small cells and user associations of all cells. The simulation results have shown that the proposed iterative algorithm considerably outdoes the random deployment of new small cells.

B. Badic et al. [33] this paper investigates the new architectural methods that will help in improving the energy efficiency of a cellular radio access network (RAN). This paper confirms that the cell energy consumption ratio reduces and capacity density increases with the reducing cell size, but the overall RAN energy consumption remains unchanged. This can be done by introducing a sleep mode. In this mode, energy is saved by powering off the cells that are without the active users. Hence by combining a sleep mode with a small-cell deployment architecture, the energy consumption gain can be increased, while the cell energy consumption ratio continues to decrease with decreasing cell size.

3. Background about the security of wireless communication

Günther Horn et al. [39] this paper has done work in the direction of a 5G security architecture and debates about the probable security desires and mechanisms for 5G mobile networks.

M. Geva et al. [41] this paper has investigated the security threats in the internet and concluded that the bandwidth distributed denial-of-service attack is highly vulnerable in which many hosts send a large number of packets to cause congestion and thus helps in disrupting the legitimate traffic.

Ningrinla Marchang et al. [45] in this paper, a game-theoretic model of intrusion detection systems (IDSs) for Mobile Ad hoc Networks has been shown. For the prevailing intrusion detection systems for MANETs, it is concluded that a detection system sits on every node has to run all the time. But this seems to be expensive overhead for a battery powered mobile devices. Hence game theory is introduced for judging the interactions between the intrusion detection system and the attacker, for determining the always running status of the IDS without conceding on its efficiency. The simulation results have concluded that there is no need of running IDS all the time.

Amira Bradai et al. [46] this paper has done work by proposing the model in which the game theory is used in association for improving the detection and optimizing the intrusion detection systems. This paper evaluated the status of HIDS by modeling the game between the HIDS and attackers. This process is divided in to three phases. In the first phase, reputation is build. Second phase elects the leader based on the reputation and then

in the third phase, game theory helps the leader in deciding about the activation or deactivation of the HIDS for the optimization reasons.

Karlina Khiyarin Nisa, et.al, (2014) proposed in this paper [38] that there have been various areas located across the globe that have been facing the forest fire related issues. There are remote sensing satellites that have been recording the information attained from the hotspots present within the specified areas. The analysis of the datasets gathered can provide the helpful information related to the forest fires and also can help one know the chances when they can occur. Within the R programming language, the Shiny web framework is utilized for implementing the DBSAN algorithm. The data sets of the hotspots present in Kalimantan Island and South Sumatra Province in years 2002-2003 is provided within this paper for analyzing the clustering performance. There is a need of the minPts and Eps parameters within the DBSAN algorithm in this work. There will be increase in number of noises which are less within the minPts. Here will be less number of clusters generated when the value of Eps is bigger. Various operations are performed for calculating both of these values and the acquired values are utilized within the DBSAN algorithms to enhance the performance of the results.

Negar Riazifar, et.al, (2015) proposed in this paper [39] that for the purpose of detecting various serious diseases such as hypertension, diabetes and glaucoma, the retinal vessel segmentation method has been utilized over the years. The retinal images within the algorithms have provided various methods through which the segmentation of blood vessels can be done. On the basis of the clustering DBSAN algorithm, the retinal vessel segmentation method is to be analyzed. Within this algorithm, the clusters of arbitrary shapes are to be recognized with the help of the density-based notion of the clusters. There is a need of only one parameter within this algorithm which is also to be provided with the help of the suggestions made by the client. There are numerous measures that are to be utilized for comparing the performance of the proposed algorithm with the already existing algorithms. There have already been made various advancements within this blood vessel segmentation process. However, not all the enhancements provided have been useful to the process. And so, each of the problems have been solved with the help of DBSAN algorithms which include the identification of correct input parameters, localizing the arbitrary shaped clusters and the completion of the process within the time limit given. It has been seen through the experimental results that this algorithm has given better performance results as compared to the other algorithms.

Yumian Yang, et.al, (2014) proposed in this paper [40] that the evaluation of E-commerce sites in an accurate manner has been required as its growth has been increased. There are huge dimensions of characteristics and uneven density involved within the E-commerce sites. These diversions result in decreasing the performance accuracies of the results that are evaluated. In this paper, the data which involves the 100 E-commerce sites of the Ministry of Commerce People's Republic of China in the year of 2013-2014. At the initial step, the dimensionality of the data is reduced with the help of factor analysis. On the basis of various investigation results, the enhanced DBSAN algorithm is utilized for processing the uneven density present within the data

available within these 100 E-commerce sites. When the Euclidean distance is to be calculated, the weights of the data are ignored by the previous algorithm. This will result in causing major issues within the accuracy of the results achieved. However, the factor analysis process eliminates all such problems arising within the already existing algorithms. There are various comparisons made among the new proposed DBSAN algorithm as well as the already existing ones. The simulation results achieved show that there has been an improvement in the results achieved by the new proposed algorithm.

Xiaoqing Yu, et.al, (2014) proposed in this paper [41] that the spatial clustering is a very important factor affecting the data mining and knowledge discovery processes. For the purpose of removing noise within the arbitrary shaped clusters, the DBSAN algorithm has been considered as a good method. The clustering analysis distribution process is to be performed on the weibo location information and within this paper, the DBSAN algorithm is utilized for this. The k-means clustering algorithm is compared with the DBSAN algorithm which can show that the DBSAN algorithm is really beneficial in providing the required results. Numerous noise points and data points are generated within each cluster through this process. There is no shaping of the noise points provided within the clusters with the help of k-means clustering algorithm. There is thus, various numbers of points that can affect it. The main objective of the DBSAN algorithm is identified and is implemented here. The current city of the territory can be located with the help of this algorithm when it is applied to the data that has the complete city planning. The effectiveness of this algorithm can be seen with the help of its comparisons made with various other algorithms. Further, more operations can be performed within this process which can also differentiate the data on the basis of various different properties.

4. Conclusion

This paper has shown the detailed literature review in the three phases related to the power optimization and security analysis of 5G wireless communication Network

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