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Efficient Modulation and Coding Scheme Selection Using Machine Learning

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ABSTRACT

This paper presents a systematic and comprehensive survey that reviews the latest research efforts focused on machine learning (ML) based performance improvement of wireless networks, while considering all layers of the protocol sin wireless communication network. First, the related work and paper contributions are discussed, followed by providing the necessary background on data-driven approaches and machine learning to helpnon-machine learning experts understand all discussed techniques. Then, a comprehensive review is presented on works employing ML-based approaches to optimize the wireless communication parameters settings to achieve improved network quality-of-service (QoS) like modulation and scheduling of energy allocation We first categorize these works into: radio analysis, energy analysis and network prediction approaches, followed by subcategories within each. Finally, open challenges and broader perspectives are discussed.

Keywords: corona virus, COVID-19, SVM, LSTM, Machine Learning, LASSO.

INTRODUCTION

Nowadays, mobile communication networks are evolving in a tremendous way, constantly increasing their supported bit rates but also the complexity of the network in each upgraded version. A suitable example is the recent Massive Multiple-Input-Multiple-Output (MIMO) technology, which is boosting capacity and throughput in significant rates, while raising the BS processing complexity. Consequently, the need for more intelligent processing in the base station is essential and necessary. An efficient way to approach this problem would be the addition of the capability to predict, in a precise way, the optimal throughput at the Evolved Node B (eNodeB). This tactic would make the scheduling for a single or group of user equipment much more efficient in time and energy perspective.

The scheduler, located at the BS, is responsible for resource allocation in the downlink. Based on the received information from each UE in the uplink, the Channel Quality Indicator (CQI) is used to determine the user's downlink Modulation Coding Scheme (MCS) using a lookup table. With the continuous advance in technology, both at the user and base station sides, the modulation schemes are increasing and the MCS table is growing, reaching 31 distinctive settings in Long Term Evolution (LTE), compared to 15 in Wideband Code Division Multiple Access (WCDMA). Furthermore, with the increasing number of UEs, especially in 5G where the estimated number is expected to be up to 1 billion subscriptions reaching 2023 [3], a base station will have to serve multiple mobile terminals simultaneously and accurately.

RELATED WORKS

Ayesha M. Talha et.al has proposed in this paper Database redistributing is a typical distributed computing worldview that permits information proprietors to exploit its on-request capacity and computational assets. The primary test is keeping up information classification concerning untrusted parties i.e., Wirless communication Network specialist organization, just as giving applicable question brings about ongoing to confirmed clients. Existing methodologies either bargain classification of the information or experience the ill effects of high correspondence cost between the worker and the client. To beat this issue, we propose a double change and encryption conspire for spatial information, where encoded inquiries are executed completely at the administration supplier on the encoded database and scrambled outcomes are come back to the client. The client issues scrambled
spatial range questions to the specialist organization and afterward utilize the encryption key to unscramble the inquiry

reaction returned. Yinbin Miaoet.al has proposed in this paperFog computing, as an extension of Wirless communication Network computing, outsources the encrypted sensitive data to multiple fog nodes on theedge of Internet of Things (IoT) to decrease latency and network congestion. However, the existing cipher text retrieval schemes rarelyfocus on the fog computing environment and most of them still impose high computational and storage overhead on resource-limitedend users. In this paper, we first present a Lightweight Fine-Grained cipher texts Search (LFGS) system in fog computing by extendingCipher text-Policy Attribute-Based Encryption (CP-ABE) and Searchable Encryption (SE) technologies, which can achieve fine-grainedaccess control and keyword search simultaneously. The LFGS can shift partial computational and storage overhead from end users tochosen fog nodes. Furthermore, the basic LFGS system is improved to support conjunctive keyword search and attribute update toavoid returning irrelevant search results and illegal accesses. The formal security analysis shows that the LFGS system can resistChosen-Keyword Attack (CKA) and Chosen-Plaintext Attack (CPA), and the simulation using a real-world dataset demonstrates thatthe LFGS system is efficient and feasible in practiceIn this paper, we demonstrated a Lightweight Fine-GrainedSearch (LFGS) system for the resource-limited EUs in fogcomputing. Boyang Wang et.al has proposed in this paper spatial information have wide applications, e.g., area based administrations, and mathematical range inquiries (i.e., discovering focuses inside mathematical territories, e.g., circles or polygons) are one of the major hunt capacities over spatial information. The rising interest of re-appropriating information is moving huge scope datasets, including enormous scope spatial datasets, to open mists. In the meantime, because of the worry of insider assailants and programmers on open mists, the security of spatial datasets ought to be mindfully protected while questioning them at the worker side, particularly for area based and clinical utilization. In this paper, we formalize the idea of Geometrically Searchable Encryption, and propose an effective plan, named FastGeo, to ensure the security of customers' spatial datasets put away and questioned at an open worker. With FastGeo, which is a novel two-level quest for scrambled spatial information, a fair however inquisitive worker can effectively perform mathematical range questions, and accurately return information focuses that are inside a mathematical range to a customer without learning delicate information focuses or this private question.

OBJECTIVE

The property of channel reciprocity can be used for time division duplex (TDD) based systems using channel state information (CSI). However, the computational complexity can increase in 5G with the expected use of massive MIMO, and some previous works suggest CSI based beamforming to improve the signal transmissions and energy efficiency of the system. To predict the MCS, ML can be used at the base station and the training and uplink data can be used to simplify the process for the scheduler remarkably. Resulting this way, in faster and more accurate predictions of MCS. Moreover, an optimal MCS improves the throughput and can be used by the content provider to dynamically adjust the quality of service. Firstly, this feature can improve the efficiency of the base station, and subsequently, the scheduling of the various users which are operating inside the cell controlled by the BS.In addition, the motivational reason of using ML techniques in our work is not only because of its rapid growth in usage perspective by the researching community, but rather by cause of the increasing capabilities and the potential of implementing different ways of learning into various situations.

MODULES

A.DATA

The records records consolidates the all out licensed cases, the entire quantity of passings, as of past due avowed cases, and the overall variety of eased instances regions. We extensively utilized the statistics on the brand new results in All over world, it consolidates the statistics, and right here, the data comes from actual indicators from various international locations.

B.ESTIMATION PROCESS

In distinctive manipulate tiers, the Basic replica variety adjustments significantly and it influences the depth of manage immediately. In addition, the incubation period of the virus impacts the rate of transmission directly. These two parameters need to be anticipated. Current literature shows that the uncontrolled Basic reproduction. Therefore, we chose the valuation range within the corresponding variety. For the managed Basic replica number, the variety of valuation turned into decided on in the range of [0, .15].

C. PREPROCESSING

The dataset is frequently partitioned, conflicting, and except crippled in unequivocal practices or floats, and is seemingly going to comprise unique mistakes. Information pre coping with is a proven manner for settling such issues.

D.PREDICTION

This strategy is suitable to contain prescient brain companies or trademark facts as such disorder occasion or non-event binomial impacts. The expectation exactness of various estimations can be utilized for diverse functions. They contain the charge at which common (non-anticipated forecast as it should be predicts responsiveness (non-irresistible illness), exactness (expected degree of expected pattern), high-quality prescient really worth, terrible prescient really worth (as it should be anticipated contamination price is)), the share is Normal expectancies are a share of the probability that the enlargement inside the entire cycle surpasses the precision of the man or woman).

E.CLASSIFICATION

The information classifier we the use of multiple AI strategies to predicts the aim magnificence for every instructive document point. With the assist of the gathering technique, a peril detail may be connected with infections impacted people agencies with the aid of isolating their times of sicknesses. So we performed pc primarily based intelligence method of LSTM approach.

DATABASE DESIGN

Database layout is the process of producing a detailed data version of a database. This logical records version consists of all the needed logical and bodily layout choices and physical

garage parameters had to generate a layout in a Data Definition Language, which can then be used to create a database. A completely attributed statistics version contains distinct attributes for every entity. The term database design may be used to explain many exceptional parts of the design of an ordinary database machine. Principally, and maximum efficiently, it can be concept of as the logical layout of the base statistics structures used to keep the statistics. In the relational version these are the tables and perspectives. In an object database the entities and relationships map immediately to object lessons and named relationships. However, the term database design could also be used to apply to the overall technique of designing, not just the base information structures, but additionally the forms and queries used as part of the overall database software in the database management system (DBMS). The maximum critical consideration in designing the database is how data might be used. The essential objectives of designing a database are:

DATA INTEGRATION

In a database, statistics from numerous file are coordinated, accessed and operated upon as via it is in a single report. Logically, the information are centralized, physically, the facts may be located on extraordinary devices, related thru information verbal exchange centers.

DATA INTEGRITY

Data integrity approach storing all facts in one vicinity simplest and how each utility to get admission to it. This method consequences in extra steady data, one replace being enough to gain a new document repute for all programs which use it.

BACKGROUND AND MOTIVATION

The property of channel reciprocity can be used for time division duplex (TDD) based systems using channel state information (CSI). However, the computational complexity can increase in 5G with the expected use of massive MIMO, and some previous works suggest CSI based beam forming to improve the signal transmissions and energy efficiency of the system. To predict the MCS, ML can be used at the base station and the training and uplink data can be used to simplify the process for the scheduler remarkably. Resulting this way, in faster and more accurate predictions of MCS. Moreover, an optimal MCS improves the throughput and can be used by the content provider to dynamically adjust the quality of service. Firstly, this feature can improve the efficiency of the base station, and subsequently, the scheduling of the various users which are operating inside the cell controlled by the BS. In addition, the motivational reason of using ML techniques in our work is not only because of its rapid growth in usage perspective by the researching community, but rather by cause of the increasing capabilities and the potential of implementing different ways of learning into various situations.

PURPOSE AND AIMS

This Master's thesis is focusing on the MCS selection in a cellular system. The main aim is to simplify and optimize the downlink process at the BS for a single UE. Moreover, ML will be used to predict the optimal MCS for this user. The model will take into consideration the training data and the continuous flow of uplink data aiming to determine
the channel parameters for the UE. More specifically, our project investigates the capability of predicting an accurate MCS index for independent users while the base station is receiving the uplink feedback from the different
UEs across its cell territory. The accuracy of this MCS selection has to be high enough, so the resource allocation can be improved and the overall scheduling process at the BS enhances in energy and speed perspective. The topic of this thesis has not been found in other works in the engineering community, although similar works tried to explore the advantages of machine learning in mobile communication networks, as in [4]- [8]. Furthermore, those works are using different methods of ML, implementing various algorithms like Support Vector Machines (SVM), k- Nearest Neighbors (k-NN), or even Principal Component Analysis (PCA) and Reinforcement Learning (RL) which are unsupervised methods, in contrast to our approach of examining the case MCS selection in LTE systems. Thus, our thesis, can be characterized as the continuation that [8] is proposing as we are targeting equivalent objectives, even though multiclass Neural Network learning is being implemented instead of Reinforcement Learning. The main questions which this thesis is going to research thoroughly and try to answer in the best possible way are:

1. How to predict an MCS index for future transmission?
2. How accurate is the prediction of the MCS index selection of our ML algorithm?
3. What is the future work that could be done to upgrade this ML model?

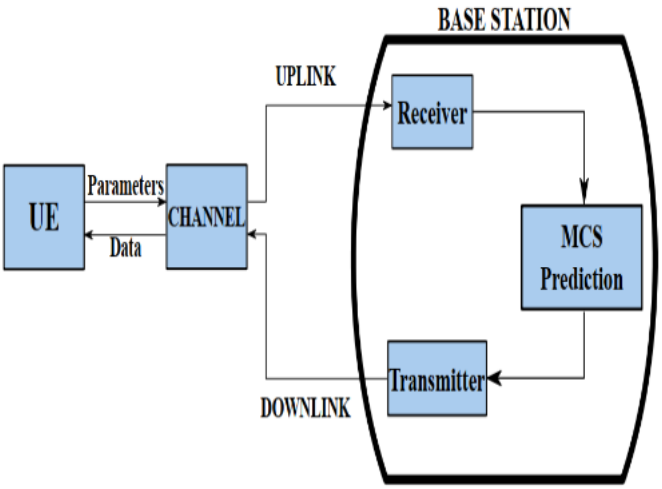


Fig 1:

However, implementing machine learning at the base station will be the main challenge as no similar work was done before. This includes continuous data training and a relatively accurate MCS index prediction. Therefore, another challenge will be minimizing the complexity of the system while getting accurate results. Optimization will be based on some available models already in use, and if necessary, some new ones. The number of users will increase gradually, according to the accuracy of the results.

APPROACH AND METHODOLOGY

This section describes the methods that the thesis will be based on, firstly the generation and after that the capturing of several training sequences using a network testing environment so that we can use these sequences as input to the simulation model. Additionally, the input of the data sequences in combination with the ML algorithm will produce the MCS selection decision for the specific user that it is required. Afterwards, the decision output of the model will be repeatedly fed at the training database in a closed loop form process. Accordingly, MATLAB and Python are going to be our main tools for simulating and testing the ML algorithms and channel conditions. Also, a professional network simulator, provided by the company is used for the previous mentioned generation and capturing of the data sequences. Simplifying our main goal, a single MCS selection must be estimated successfully. Furthermore, for the training of machine learning model, Python will be used, providing it in this way with necessary parameters which will be used at the decision unit and are explained in more detail later on the section 5.2. Various simulations for testing and measuring the accuracy of the model for the user equipment were done in a network simulation laboratory. The overall system model which will be used in our project and will be explained in detail piece by piece on the following sections is depicted.

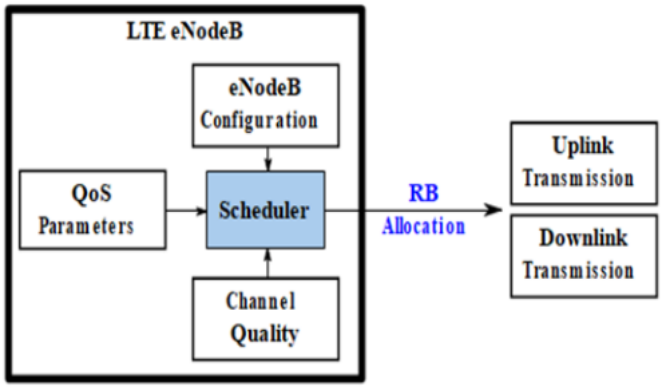


Fig 2:

EXISTING SYSTEM

In our master's thesis, the main goal is to investigate the prediction accuracy of our ML algorithm. Related work to our goal, has been done by other researchers in [4]-[8]. Although, all the authors chose different approaches and ML algorithms for their independent problems that had to examine. In [4][5], the authors are using SVM algorithms to explore the capabilities of them in several scenarios and various alternative parameters to consider. The channel and modulation selection are implemented by the SVM method for cognitive radio [4], and an online Adaptive Modulation and Coding (AMC) scheme that operates in realistic conditions for different channel parameters [5] is further inspected. In [6] [7] the authors are questioning the usage of

machine learning in MIMO-OFDM systems and how useful they can become for increasing SNR ordering and average throughput. The methods of k-NN, and a hybrid model of Deep Neural Network with Principal Component Analysis (PCA) are used in [6] and [7], respectively. Finally, in [8] the creators are investigating the AMC selection in LTE systems with purpose to show how inaccurate are the feedbacks and the MCS selection on channel qualities when they are implemented under a real- time model. Moreover, Reinforcement Learning (RL) is applied under the Markov Decision Process (MDP) method, aiming to decrease the channel prediction errors of link adaptation performance. Consequently, in our project we are trying to explore different channel parameters to successfully predict the MCS index in the future framework using a multi-class NN algorithm. A target which has not been examined by other researchers, but it has been proposed in some extend in.

DRAWBACKS

The focus of this project is providing a more efficient algorithmic method for MCS selection than the existing one in LTE. Besides, there are many limitations on the overall system that must be considered before a final decision is made. This thesis is restricted by the nature of the data logs for the training of the model, because of the unavailability of real-time data logs. Thus, our work is limited and cannot be expanded on many realistic scenarios as the data comes from network testing environment of the laboratory. Another limitation that was critically influencing the scope of our work was the stationary position of the simulated UEs inside the laboratory environment. This immobile behavior of the users restricted the overall results of the thesis, as moving scenarios were excluded from the project by cause of insufficient data measurements. Moreover, a significant challenge which we had to face was the time extend of our research which restricted the thesis investigation to the case of Neural Network Multi-Class algorithm exclusively Identity based keyword extraction is not available

- Less security.
- Poor reliability.

PROPOSED SYSTEM

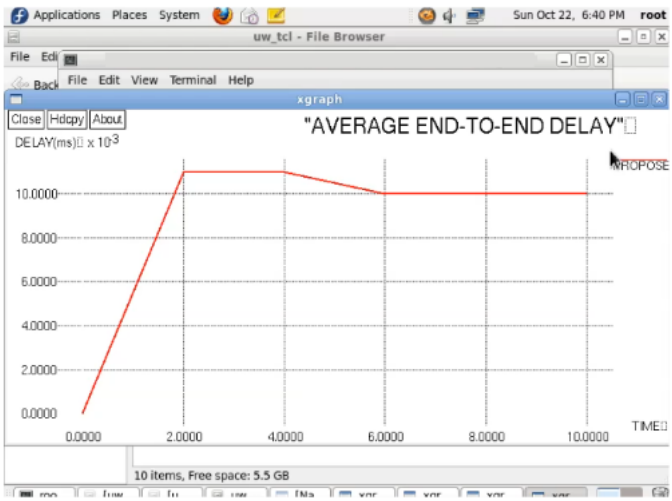
- MCS prediction for the future subframes/slots using ML.Extend the MCS prediction for the candidate users of MU-MIMO.

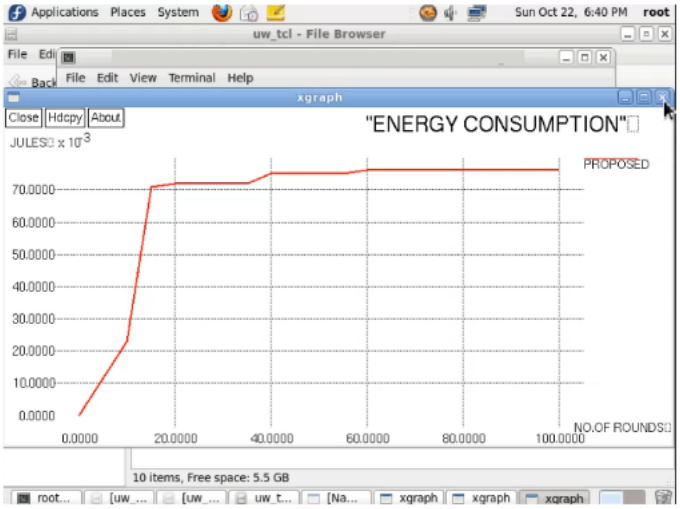
o To diminish the process at the scheduler, one can provide it with information for future subframes using ML. Based on chapter 4, ML can provide a good accuracy given the constant flow of data from the UE to the scheduler. Therefore, given the decision is an integer between 0 to 31, for the LTE-advanced Pro (Release 14) [28], classification algorithm is to be used instead of regression for the following reasons:

- Output is an integer with predefined number of classes and neighbors.
- High complexity of regression as several parameters are taken.

ADVANTAGE

1. Multi-keyword ranked ontology keyword mapping and search over encrypted Wirless communication Network data MKS- Tree(Multidimensional keyword Search).
2. “Coordinate matching” by inner product similarity.
3. Secured Multi keyword ranked ontology keyword mapping and search : To design search schemes which allow multi-keyword query and provide result similarity ranking for valuable data retrieval, instead of returning undifferentiated results.
4. Privacy: To prevent Wireless communication Network server from learning additional information from dataset and index, and to meet privacy requirements. Effectiveness with high performance: Above goals on functionality and privacy should be achieved with low communication and computation overhead.





CONCLUSION

After implementing the designed system, based on chapters 5 and 6, several simulations were made to test the curacy of the prediction. As neural network was used, the sub-predictions were also simulated separately to test the fficiency of all parts using 10% of the dataset as testing size. The overall dataset size of collected samples reached approximately the 400.000 entries. The results, shown in this chapter, will be divided by prediction type, where the scenario and MCS predictions will be simulated separately, before simulating the whole algorithm. Moreover, as the k-NN is implemented in both cases, the number of neighbors will also be tested to find the highest accuracy.

REFERENCES

1. Talha M, Kamel I, Aghbari ZA. Facilitating secure and efficient spatial query processing on the Wirless communication Network. IEEE Trans Wirless Commun Netw Comput. 2019;7(4).
2. Miao Y, Ma J, Liu X, Weng J, Li H, Li H. Lightweight fine-grained search over encrypted data in fog computing. IEEE Trans Serv Comput. 2019;12(5):772-85. doi: 10.1109/TSC.2018.2823309.
3. Wang B, Li M, Xiong L. Fastgeo: efficient geometric range queries on encrypted spatial data. IEEE Trans Depend Sec Comput. 2019;16(2):245-58. doi: 10.1109/TDSC.2017.2684802.
4. G. Xu, H. Li, Y. Dai, K. Yang and X. Lin, "Enabling Efficient and Geometric Range Query With Access Control Over Encrypted Spatial Data," in IEEE Transactions on Information Forensics and Security, April 2019; 14(4): pp. 870-885, doi: 10.1109/TIFS.2018.2868162.
5. Ji Y, Xu C, Xu J, Hu H. 'vabs: Towards verifiable attribute based search over shared Wirless ommunication Network data, in Proc. of the 35th International Conference on Data Engineering. Macao. China; 2019:2028-31.
6. Ni J, Zhang K, Yu Y, Lin X, Shen X. Providing task allocation and secure deduplication for mobile crowd sensing via fog computing. IEEE Trans Depend Sec Comput. 2018;17(3):581-94.
7. Arshad MU, Kundu A, Bertino E, Ghafoor A, Kundu C. Efficient and scalable integrity verification of data and query results for graph databases. IEEE Trans Knowl Data Eng. 2018;30(5):866-79. doi: 10.1109/TKDE.2017.2776221.
8. Yang A, Xu J, Weng J, Zhou J, Wong DS. Lightweight and privacy-preserving delegatable proofs of storage with data dynamics in Wirless communication Network storage. IEEE Trans Wirless Ommunication Netw Comput. 2018. doi: 10.1109/TCC.2018.2851256.
9. Ni J, Zhang K, Yu Y, Lin X, Shen XS. Privacy-preserving smart parking navigation supporting efficient driving guidance retrieval. IEEE Trans Veh Technol. 2018;67(7):1-. doi: 10.1109/TVT.2018.2805759.
10. Zhang W, Lin Y, Gu Q. Catch you if you misbehave: ranked keyword search results verification in Wirless communication Network computing. IEEEtrans Wirless Commun Netw Comput. 2018;6(1):74-86.