THE INTELLIGENT DESIGNING OF A SMART SPECTRUM SENSING USING OPTIMAL MACHINE LEARNING SCHEME FOR COMPLEX MOBILE NETWORKS

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Abstract

Mobile networks have become the backbone of telecommunications in recent years, with the widespread use of cell phones, tablets and other mobile devices. Networks are technologies that are constantly evolving, used to interact with and connect with consumers. The frequencies of mobile networks can be used by multiple network subscribers at the same time. The Cell tower sites and mobile devices handle frequencies so that low-power interrupters can minimize their services. Signal reception, call quality, and speed depend on many factors. The User location, service provider, and equipment all play a role. A mobile network is a complex spider web that includes communication towers, antennas, network cores, and devices that generate traffic generating end-to-end data flow across our mobile devices. In this paper, a smart machine learning network algorithm is established at the point of cells placed in a given spatial area, filled with rotation or transfer stations placed at the center of the cells. It beyond this basic framework, there are many different types of mobile networks are evaluated and achieved the best results as per the proposed machine learning method.

Keywords:

Signal Reception, Call Quality, Location Monitoring, Service Provider, Mobile Communication, Machine Learning

1. INTRODUCTION

The Mobile networks are also called cellular networks. They are "cells" that connect to each other and are designed for telephone switches or switches. These cells use areas that are usually hexagonal, at least one transceiver, and different radio frequencies. These transceivers are cell towers spread all over the world connected to our electronics. They connect to each other to deliver packets of signals data, voice, and text and eventually bring these signals to mobile devices such as cell phones and tablets. The network service providers use each other's towers in multiple locations, creating a complex web that offers the widest possible network coverage for subscribers. The Different types of mobile technologies are used to provide mobile network services to users. Any variation used by large service providers is different, so mobile devices are usually built to use the technology of the planned carrier. GSM phones do not work on CDMA networks, and vice versa. Commonly used radio systems are GSM (Global Communication Global System) and CDMA (Code Division Multi Access). The AT&T, T-Mobile and most other providers around the world use GSM, which makes them a widely used mobile network technology. The LTE (Long Evolution) is GSM based and offers high network capability and speed. GSM and CDMA do not differ much in quality, but the way they work. From a customer standpoint, the GSM phone connects all customers' data to a removable SIM card because GSM is convenient; To change phones, the customer replaces the SIM card in the new GSM phone and connects it to the provider's GSM network. A GSM network must accept any GSM-compatible phone. CDMA Phones, on the other hand, are not easily surrounded. "Validators," not SIM cards, but only authorized phones are allowed on their networks. Some CDMA Phones have SIM cards, but these were not available flexibly when used over LTE networks or phone US GSM in the mid-1990s, with some networks switching from analog to digital. They are locked into CDMA, the most advanced mobile network technology. Here the machine learning models are provided the efficient results.

After several speeds up for 3G technology (3.5 and 3.75) comes the 4G network called LTE (Long Term Evolution). The fourth-generation network is currently very widespread on a general level with the help of machine learning. This system has greatly improved the range of antennas for the 3G network and it is with this technology that the mobile network begins to have the quality, speed and stability of the fiber optic network, supporting the largest streaming services without pioneers. Finally, the fifth generation of 5G has arrived. This network landed in the strange reality of 2020, with a significant technological leap, at least a hundred times faster than previous networks, greater stability and tremendous ability to host a larger number of users. 5G certainly opens the door to a web of things: cars, homes, appliances and entire buildings ending up intelligently, receiving power from the network for our convenience. The 5G network is not only a new set of antennas, but a paradigm shift that will profoundly affect our entire social order. The Smart cities and instant downloads of vast data and robotic traffic really pushes us into a new and unpredictable era.

2. LITERATURE REVIEW

Yang C et al. [1] Recommended improved spectrum sharing methods with the help of machine laeraning. That is, the unused empty spectrum is calculated first. And based on that calculation they are given that space on the primary basis which is on the waiting list of the secondary user. Matinmikko et al. [2] calculated the disturbances in shared spectrum systems with the help of machine learning approach. Based on that, they identified the primary users who have the appropriate license to use that spectrum. After classifying them they were assured that spectrum would be allocated to them by that license. Jorswieck et al. [3] calculated that distributed spectrum applications with a machine learning model and it would increase the usability and usability of that cellular network. Spectrum allocation was calculated there based on these calculation methods. Michelusi et al. [4] classified a machine learning based sensing method that helps to calculate vacancies in the spectrum. Morning spots on that particular wavelength were calculated based on its analysis results. So, while it was being calculated whether the primary user was constantly there or not, it was found that the series of interruptions of the second user could also is a nuisance to them. Ai et al. [5] were constantly monitored Users' devices with smart machine learning method. They calculated and analyzed important data such as the power their devices consume when using the

bandwidth. Based on these results it is easy to calculate how much power is required by which device is used. Zhu et al. [6] calculated the spectrum leasing method with artificial intelligence based deep learning model. This means that the space will be temporarily reserved for the secondary user in the absence of the primary user. Secondary users will be charged for using it. Thus the benefit to companies is high. But this leasing method will vary depending on the inconvenience to the secondary user when the primary user enters and the extent to which they are prepared for changes in the switching mode. Duan et al. [8] introduced the artificial intelligence-based machine learning model for spectrum sharing system based on interaction. That is, the spectrum is allocated to them based on the interaction of the primary user and the interaction of the secondary user. Priority will be given to the first comer here. Others may need to be on the waiting list. Priority is given to communication here.

3. PROBLEM IDENTIFICATION

Sometimes, when a user wants to call another person, there may be a problem establishing a connection with the cellular network, resulting in a message appearing on the screen of the smart phone or tablet: Mobile network not available. Owners of any cellular operator may encounter a similar error: MTS, Megaphone, Tele2, Beeline, etc. The main reasons for the unavailability of the mobile network and what to do:

- **Device Malfunction**: Your device may have an operating system malfunction. In this case, the Internet can work. In this case, you need to restart your phone / tablet.
- **Poorly Installed SIM Card**: If the SIM card is poorly installed and does not fit snugly in the slot, this can lead to the phone not catching the network and the message "Mobile network not available" will be displayed. In this stage pull out the SIM card and reinstall.
- **SIM Card Blocked**: In some cases, the operator may block the card. Now you contact your operator.
- **SIM Card is Damaged**: The Damaged SIM card can cause communication problems. Now you replace the SIM card.
- **Bad Mobile Network Connection**: When registering the SIM card in the cellular network, the new type of connection is preferred. That is, if the SIM card captures 3G and 4G networks, a 4G network is preferred. In this case, the quality of the 4G connection may be poor. Due to this, problems arise and the inscription is displayed: "Mobile network not available." In this case, you need to go to the phone settings and set the desired connection type manually. The video clip at the end of the article will show you how to do this.
- **Very Serious Operating System Issues (iOS, Android)**: Over time, the device may experience the effects of various types of crashes, errors, conflicts with other applications, and viruses. In this case you move on to factory reset. You need to find out how to do this for a particular model on the phone or tablet manufacturer's website.
- **Incorrect Mobile Network**: Phone settings may contain a misreported mobile network. When you call frequently or frequently, it displays the message "Selected mobile network not available" or "Specific mobile network not available", then you need to set the automatic network selection in the phone settings.
- **Bad Firmware**: It is also possible to have bad firmware on the phone. Now, you update your mobile device yourself or contact a service center.

To find out what is causing the problem, it is a good idea to do the following:

- Insert another SIM card into your phone, which will eliminate or detect a malfunction in the phone;
- Insert your SIM card into another phone, which will eliminate or detect a malfunction in the SIM card.

4. PROPOSED SYSTEM

One of the most frequently encountered errors by Android users around the world is the error that the mobile network is not available. This is the most annoying error of all errors. The proposed machine learning approach was deal these issues. It turns your phone into a toy. If the network is not available and you are not connected to the network via Wi-Fi, you can only use your phone to play games or something similar. In this proposed system, we have covered the first three ways you can solve this problem. To help you in an emergency by learning to break this annoying bug, read on.

The Network theory is a field of computer science and network science that is part of graph theory (the study of graphs and mathematical structures). The Network theory is often used to explore the method of classifying and modeling complex networks. Many complex networks share some common features such as size less degree distribution.

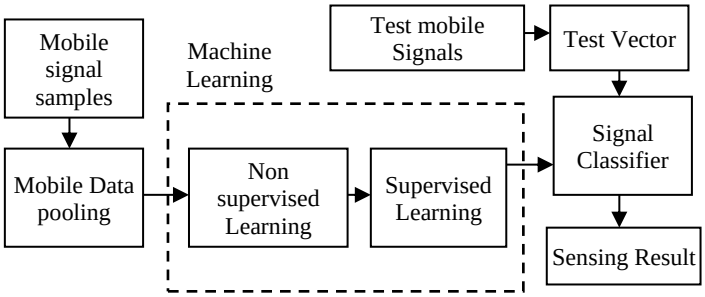

Fig.1. Network Detection Elements

If the network on your phone suddenly starts to disappear, it does not see or cannot find the mobile operator, sometimes you can solve this problem without the help of mobile service. It is very difficult to independently determine the cause of this network behavior with the help of the machine learning shows in Fig.1 on the phone, but you can take several steps to eliminate the problem partially or completely. Such activities include changing the settings inside the phone, checking the phone for malfunctions, and contacting your mobile operator directly. First, look at the network icons in the upper corner of the screen, which usually tell you a lot. The first reason is that the SIM card slot inside your phone is broken. This happens if you insert the SIM card incorrectly, drop your phone and scratch the side of the SIM card slot. It is very easy to determine if the phone is not working to turn the SIM on and off: it is simply not visible. In this case,

you can try resetting the SIM card to another location if it is provided on your phone. If the SIM is working and the network appears, you have solved the problem. You need to repair your phone and fix the slot.

If the Smartphone's attempt to call a person fails due to a "Network not found" error, you should look at the network indicator (these are vertical or horizontal sticks that indicate the quality of the reception). If it is empty here, it indicates with the help of machine learning:

- Lack of network coverage at a particular location;
- Lack of network performance;
- The contact with the base station on the phone page failed.

In the first case, everything is clear - if the mobile network is not available, you need to find a site where it exists with the help of machine learning. Such situations often arise outside the city, where there are many times fewer base stations than in the city. In the second case, the appearance of the inscription "Mobile network not available" on the megaphone may be related to some technical work on the operator's side. The situation is very rare because the camera equipment is very resistant. It's very easy to find out which side of the breakdown is - just try calling from another phone. if it shows an error, you have to wait until the megaphone gets its mobile network with the help of machine learning.

4.1 IMPLEMENTATION

Step 1: Network Browser: Scanning the network for system: Using findalldev() and openlive() Function with the help of machine learning algorithm

Step 2: System Status: Checks the number of active users in the network and their Ip and Mac address

Step 3: ARP request is send using pcap_sendpacket() and reply is received using pcap_next_ex().

Step 4: Machine Name: Computer name is retrieved from the system using Winsock function

Step 5: Testing initiation: We did unit testing on our various sub units of the program.

Step 6: The function pcap_findalldevs() was tested for the various networks that can be opened.

Step 7: The function Pcap_open_live() was tested to check the working which was to open the live capture function.

Step 8: Pcap_setfilter() was tested to check the association of the filter to a capture.

Step 9: Integration Testing: The integration testing produced errors as Unit testing was not a success.

Step 10: System Testing: The system testing will be done once we get favorable outcomes from the Integration testing.

Step 11: Comparison Testing: The comparison testing will be done and the output of the software will be tested with the software which is available in the market.

In the case, an error occurs on the page of the mobile phone (or any other mobile device). Try sending the device to restart and try calling again. If the symptoms are repeated on other SIM cards, the case will definitely be on the phone. It should be taken to a repair shop (or handed over under warranty), where experienced professionals will take care of it. The "Network not found" error on the megaphone can occur in roaming, especially internationally. Sometimes foreign operators do not register the SIM card automatically with the help of machine learning. The reasons may be different, but there is only one solution - you should try the manual network selection on mobile systems. A similar problem is solved in intranet roaming (but mostly everything works fine here).

5. RESULTS AND DISCUSSION

The proposed optimal machine learning algorithm (OMLA) compared with the existing smart collaborative charging algorithm (SCCA), Dynamic spectrum leasing and service selection (DSLSS). We have taken up a network of 12 users in total; here are the Parameters we use, BS – Base Station, U – Set of all User Equipments. Each User Equipment has 8 Seconds timing Intervals between each device. During this 8 Seconds Interval $N_f{*}N_t$ time periods available for Discovery Signal Transmission. The function of the proximity-aware network makes a significant contribution to the detection of proximity devices but its feasibility is tested only by the following parameters in the proximity-aware network.

5.1 HIGH POWER EFFICIENCY

Sometimes the waiting time of user Equipment is very long while searching another User Equipment in our networks. In such times, our device's batteries must be capable of large waiting times otherwise our devices may face the following problems,

- The connection devices may not be detected in Networks. The connection may not be able to form between two devices
- Other devices may not be able to pair even connected in Networks. Even if the two devices are paired, there may be no exchange of information between them
- Even if the two devices exchange information, their time is too long

The Table.1 presents the analysis of power efficiency between existing SCCA, DSLSS, and proposed OMLA.

Table.1. Analysis of power efficiency

Users	Power Efficiency (%)		
	SCCA	DSLSS	OMLA
1000	63.15	77.76	89.01
2000	61.49	71.9	95.85
3000	61.04	73.04	97.14
4000	65.62	71.9	99.28
5000	66.12	71.02	97.71
6000	65.96	69.82	96.09
7000	65.22	68.17	94.29

5.2 RANGE OF DISCOVERY

In this factor, identification and interconnect of remote devices are a difficult task. So, the communication devices must define its boundaries. Perhaps if the boundaries are not defined, our devices will face the following problems,

- We may need to switch off the nearest network and connect to the network devices
- Maybe we need to spend more time and power interacting with other network devices
- When interacting with unwanted devices, unwanted information, unreliable information, or viruses may infect our device
- Perhaps other devices can only interact with our communication borders when they are with moving equipment.

The Table.2 presents the analysis of range discovery between existing SCCA, DSLSS, and proposed OMLA.

Table.2. Analysis of range discovery

Users	Range Discovery (%)		
	SCCA	DSLSS	OMLA
1000	55.28	63	94.03
2000	55.87	64.87	95.07
3000	56.85	65.7	95.2
4000	58.06	66.61	96.16
5000	59.2	67.53	95.73
6000	60.31	68.86	96.97
7000	61.01	69.73	97.08

5.3 AUTONOMOUS DETECTION

Arbitrary communication means that our device seamlessly connects to another device on our network and attempts to communicate with that device. We have to deal with very serious problems when our device spontaneously communicating with other devices in our Network. Some of the problems listed below,

- Devices on our network are more likely to steal our information when spontaneously communicating
- Other network devices are more likely to interfere with our current system and delay or stop our work.

The Table.3 presents the analysis of autonomous detection between existing SCCA, DSLSS, and proposed OMLA.

Table.3. Analysis of autonomous detection

Users	Autonomous Detection (%)		
	SCCA	DSLSS	OMLA
1000	55.28	63	94.03
2000	55.87	64.87	95.07
3000	56.85	65.7	95.2
4000	58.06	66.61	96.16
5000	59.2	67.53	95.73
6000	60.31	68.86	96.97
7000	61.01	69.73	97.08

5.4 VIRTUAL IP CONNECTION

The IP address of a device can only refer to a limited volume of a Network and can help you get information about where certain planned functions are executed so it is impossible to identify the user who used it or his device. Among these, some of the major problems listed below,

- Verify that the Virtual IP or Autonomous IP is the same IP addresses used by the same device
- Virtual IP or Autonomous IP is same address used by the same device simultaneously and to determine if the location of the device is correct
- Regular connection times and different browsing Habits. In such a private network it can be tracked with the help of Dynamic Host Configuration Protocol (DHCP)
- Some of the parameters like identifying system and its requirements consolidated the regular Network logging files, Security logs and Transmission details tracking methods are very rare to collect.

The Table.4 presents the analysis of virtual IP detection between existing SCCA, DSLSS, and proposed OMLA.

Table.4. Analysis of virtual IP detection

Users	Virtual IP detection (%)		
	SCCA	DSLSS	OMLA
1000	78.21	82.58	92.14
2000	79.84	83.98	93.47
3000	80.25	84.45	94.87
4000	81.14	85.32	95.55
5000	82.64	86.14	96.67
6000	83.71	87.88	97.12
7000	84.58	88.12	98.22

6. CONCLUSION

The growth of wireless personal area networks with the help of machine learning has been growing rapidly over the past few years. The significant growth of data-driven smart devices has become an important component of today's modern technology. For wireless devices; information sharing from one device to another is the most important task especially finding the right devices and connecting them is very critical factor of Data Communication Networks.

In this paper we have done an autonomous device detection model with the help of machine learning of some of the complex networks and identify their device discovery ranges. This algorithm performs with the help of artificial intelligence for making different decisions. The performance matrices are compared with different algorithms and the results are demonstrated. In general, the losses was occur when one device interacts with another device affect the energy and bandwidth of that device.

Also, device-to-device communication improves its reliability and speed if optimized. This shows the proposed model. As the use of devices in direct contact increases, so does the energy used. Through this a large amount of information is exchanged using guru energy. Hence the proposed system model was reliable and energy efficient.

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