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Abstract. World are going to be smart in 2020. With the Darwinism of networking technologies and the require for these to inter-operate and dynamically adapt to user requirements, intelligent networks are to be used. Use of machine learning techniques allows these networks to acclimatize to changing environments and enables them to make decisions while continuing to learn about their environment. In this paper, we survey the various problems of wireless networks that have been solved using machine-learning based prediction techniques and identify additional problems to which forecast can be applied. Solution of the issue for efficient and faster data transfer comes in the form of a new generation network technology called as fifth generation (5G) mobile wireless network.

Keywords: 5G, Machine learning, wireless network.

1 Introduction

The Wireless technologies have indicate a rapid and multidirectional evolution with the float of the analogue cellular systems in 1980s.After that digital wireless communication systems are frequently on a mission to fulfill the growing need of world human beings (1G,2G,3G,4G…., or now 5G). 5G is expected to radically our lives. 5G is now a growing telecom industry. Analysts predict that 5G products and services will grow exponentially in next years. By 2020. Establishment of wireless technology happened in 1970s. Technological improvement in mobile wireless technology is classified into different generation. All of it started from first generation technology soon followed by second generation technology in which analog signal communication is put back with digital signal communication. Wireless networks are key enablers of ever-present communication.. 5G is next generation mobile Communication network which has been suggest to bring together the existing wireless and wired communication into an all Internet protocol high execution worldwide network. First generationwas introduced in the year 1980, based on cellular technology which follows analog technology for making calls. Dawn of cellular technology solve the problem of limited number of users for fixed frequency band, that means same frequency can be used by number of users which in turn enhances throughput of network. All allotment of frequency take place at base station. To solve single way transmission i.e. half duplex problem, every call has pair of dedicated channels. Packet switched network is responsible for data transmission in 1G. In different geographical location

various standards were followed like Advance Mobile Phone Service, Nordic Mobile Telephone (NMT) and Total access Communication System (TACS) . Considering ill effect of analog communication such as security and noise gave inspiration to Researcher for next generation mobile communication Sample Heading (Third Level).Only two levels of headings should be numbered. Lower level headings remain unnumbered; they are formatted as run-in headings.

1.1 5G Mobile Communication Network:

The ever grow number of smart network devices may reach up to 20 billion in year 2020 as stated in the recent survey by a magazine. Fifth generation (5G) is next generation mobile Communication network which has been put forward to bring together the existing wireless and wired communication into an all Internet protocol great performance worldwide network This may obsolete the current 4G technology for handling smart bandwidth allocation to such a large number of devices. In order to cope the challenging need for fast and efficient data transfer over these devices, demands next generation mobile network technology. In literature 5G technology has been suggested that offers appropriate solution to the above issues. 5G is a futuristic technology that would solve many problem of day to day life. By using 5G high data rates can be achieved in the range of Gbps with minimal latency. But the question is how to make such futuristic technology realistic. This can be done by efficiently utilizing the bandwidth in the allotted spectrum. Despite numerous benefits, 5G may critically suffer from tedious implementation problems that have been discussed in this paper. Cognitive radio (CR) is an intelligent radio that works on the principle of dynamic spectrum allocation. Cognitive Radio is capable of learning and adapting to external environment and reuses the frequency when primary user is absent.

Next-generation wireless networks are expected to support extremely high data rates and radically new applications, which require a new wireless radio technology paradigm. The challenge is that of assisting the radio in intelligent adaptive learning and decision making, so that the diverse requirements of next-generation wireless networks can be satisfied. Machine learning is one of the most promising artificial intelligence tools, conceived to support smart radio terminals. Future smart 5G mobile terminals are expected to autonomously access the most meritorious spectral bands with the aid of sophisticated spectral efficiency learning and inference, in order to control the transmission power, while relying on energy efficiency learning/inference and simultaneously adjusting the transmission protocols with the aid of quality of service learning/inference. Hence we briefly review the rudimentary concepts of machine learning and propose their employment in the compelling applications of 5G networks, including cognitive radios, massive MIMOs, femto/small cells, heterogeneous networks, smart grid, energy harvesting, device-to device communications, and so on. Our goal is to assist the readers in refining the motivation,problem formulation, and methodology of powerful machine learning algorithms in the context of future networks in order to tap into hitherto unexplored applications and services.

Table 1. Table captions should be placed above the tables.

Network	Data Speed
1G	2.4 Kb/sec
2G	64Kb/sec
3G	2Mb/sec
4G	100Mb/sec
5G	1Gb/sec and More

2.Machine Learning Application

Machine learning deals with algorithms that give computers the skill to learn, in much the same way as humans. This means that given a set of data, an algorithm infers information about the characteristics of the data, allowing it to make prophecy about other data it may see in the future. The main focus of machine learning is the design of algorithms that acknowledge patterns and make decisions based on input data. Mechine learning has found uses in areas like biotechnology, fraud detection, wireless networks, stock market analysis and national security.
Machine learning algorithms can be categorized into:
2.1 Supervised learning: these set of algorithms use training data to generate a function that maps the inputs to desired outputs (also called labels). For example, in a classification problem, the system looks at example data and uses it to arrive at a function mapping input data into classes. Artificial neural networks, radial basis function networks and decision trees are forms of supervised learning.
2.2 Unsupervised learning: these set of algorithms work without previously labeled data. The main purpose of these algorithms is to find the common patterns in previously unseen data. Clustering is the most popular form of unsupervised learning. Hidden Markov models and self-organizing maps are other forms of Unsupervised Learning.
2.3 Semi-supervised learning: as the name indicates, these algorithms combine labeled and unlabeled data to generate an appropriate mapping function or classifier. Artificial neural networks are extremely popular in the field of prediction in wireless networks. The other techniques like decision tress and unsupervised learning are used much lesser. Experiments prove that using a combination of techniques instead of a single one provides the best results
2.4 Reinforcement Learning : Reinforcement learning method aims at using observations gathered from the interaction with the environment to take actions that would maximize the reward or minimize the risk. Reinforcement learning algorithm (called the agent) continuously learns from the environment in an iterative fashion. In the process, the agent learns from its experiences of the environment until it explores the full range of possible states. Reinforcement Learning is a type of Machine Learning,

and thereby also a branch of Artificial Intelligence. It allows machines and software agents to automatically determine the ideal behavior within a specific context, in order to maximize its performance. Simple reward feedback is required for the agent to learn its behavior; this is known as the reinforcement signal.

Table 2. Comparative Chart of Machine Learning Algorithms

Algorithm	**Learning techniques**	**5G Application**
Supervised machine learning algorithms.	Regression models	Energy learning
	K-nearest neighbor	
	Support vector machines	MIMO channel learning
	Bayesian learning	
Unsupervised machine learning algorithms.	K-means clustering	Heterogeneous
	Principal component analysis	Smart grid
	Independent component analysis	Spectrum learning in cognitive radio
Reinforcement machine learning algorithms	Bellman equation maximization	Energy harvesting
	Unknown system transition model Q-function maximization	Femto and small cells
	Exploration vs. exploitation Multi-armed bandit game	Device-to-device Networks

3. Use of machine learning algorithms

In Communication Networks Routing has a notable impact on the network's performance. Machine learning methods have been used to different types of routing problems in the past, including tiny path routing, adaptive routing and multicasting routing. The authors of proposed an algorithm for package routing in firmly changing networks based on reinforcement learning. This algorithm learns a routing policy which balances between the route length and the possibility of congestion along the popular routes. Extensions on this idea have been proposed. Other researchers approached the routing problem with genetic algorithms. Here alternative routes are created by crossover and mutation of the existing routes. Several works have also used machine learning techniques for throughput or traffic prediction in communication
networks. This is an important topic as with a dynamic throughput control and allocation one can fulfill the quality of service (QoS) requirements while efficiently utilizing the network resources. For instance, the authors of applied neural networks for variable-bit-rate video traffic prediction in order to dynamically allocate throughput
for real-time video applications. Traffic identification is another important topic for network operators as it helps them to manage their networks, to assure the QoS and to deploy security measures. Here, machine learning methods recognize
statistical patterns in the traffic data by analyzing packet header and flow-level information.

Finally, all machine learning models are laboriously dependent on the availability of actual datasets. Today, there are few datasets available and these are used by researchers to validate their experiments. The usability and ease of deployment of machine learning prediction techniques will be determined by how well the models have been trained and tuned. Having impractical models can lead to side-effects on the network causing service disruption and wastage of resources. Concentrated research effort thus needs to be spent on determining how realistic datasets can be generated or how these can be captured from the network without side-effects to the user and the network operator.

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