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# Device To Device Communication during the Disaster Situation

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**ABSTRACT:** Device-to-Device (D2D) communication is the key technologies that can help to solve the bandwidth unavailability problem of cellular networks. Device-to-Device (D2D) communication in cellular networks is defined as direct communication between two mobile users without traversing the Base Station (BS) or core network. D2D communication is generally non-transparent to the cellular network and it can occur on the cellular frequencies or unlicensed spectrum. Such technologies help to maintain the necessary communication between user devices in case of natural disasters and traffic hotspot situations. In D2D communications, two or more user equipment directly communicate with each other with a very restricted involvement of the evolved Node B. The main objective is to realize high data rates, low power consumption, low delays and improve the overall spectral efficiency. In order to have a stable communication and uninterrupted service, mobile devices must be within the proximity of base station. Proximity doesn't only refer to physical distance, often referenced as signal strength received at mobile device (UE). In addition to these advantages, D2D communications poses several research challenges in terms of interference and power control, and whether or not D2D communication should be used in a given environment. D2D communication, enabling nearby user equipment (UEs) to directly communicate with each other bypassing the cellular base stations, holds great promise for extending cellular coverage in the case of a network infrastructure failure or a natural disaster

**KEYWORDS** - Medical Image Analysis, Deep Learning, 3D Shearlet Transformation method, Convolutional Neural Networks, Machine Learning, Skin Lesions.

## I. INTRODUCTION

Device-to-device (D2D) communication in mobile networks is defined as direct data transmission between two mobile users without passing through a base station (BS) or core network. Such technologies help maintain the necessary data transmission between user devices in situations of natural disasters and traffic hotspots. In D2D communication, two or more UEs communicate with each other directly, with very limited involvement of the advanced Node B. Proximity is not only about physical distance, which is often called the received signal strength of a mobile unit (UE). In addition to these advantages, D2D communication presents several research problems related to interference and power management and whether D2D communication should be used in a given environment. What follows is an in-depth discussion of the latest solutions proposed in various studies to address the various problems associated with each classification. Device-to-device connectivity is an advanced communication technology developed to increase network efficiency. In LTE-Direct, devices supporting D2D communication can communicate with each other using a secure transport protocol similar to devices communicating with a base station. Device-to-device (D2D) data transfer, which enables direct communication between nearby mobile phones, is an exciting and innovative feature of next-generation mobile networks. This facilitates interoperability between critical public safety networks and ubiquitous business networks. Essentially, leveraging direct communication between nearby mobile devices improves spectrum utilization, overall performance and energy efficiency by enabling new peer-to-peer networks and location-based applications and services. D2D-enabled LTE devices can become competitive for public safety networks that must operate when cellular networks are unavailable or fail.

The deployment of Device-to-Device (D2D) communication within cellular networks serves as a strategic solution to several pressing challenges, including bandwidth scarcity, network congestion, and ensuring reliable connectivity during emergencies or high-demand situations. D2D technology enables direct communication between mobile devices without the need to route data through traditional network infrastructure, such as base stations or core networks. This approach not only optimizes bandwidth usage but also enhances spectral efficiency, resulting in improved

data rates and network performance. The primary objective behind adopting D2D communication is to enhance the overall efficiency and resilience of cellular networks. By enabling direct peer-to-peer communication between nearby devices, D2D technology helps alleviate congestion on the macro network by offloading traffic onto localized connections. This optimization of bandwidth usage is particularly valuable in scenarios where network resources are limited or during peak usage periods. Moreover, D2D communication contributes to increased spectral efficiency by allowing more data to be transmitted within the same bandwidth. By bypassing the traditional network infrastructure, D2D technology minimizes latency and power consumption, as data can be exchanged more directly between devices without intermediaries. This results in not only faster communication but also reduced energy consumption, which is beneficial for both users and network operators. Another crucial objective of implementing D2D communication is to enhance network resilience and redundancy. In the event of network outages, natural disasters, or other emergencies, D2D-enabled devices can continue to communicate with each other, even when traditional network infrastructure is unavailable. This capability ensures that users can maintain essential communication channels, facilitating coordination and response efforts during critical situations.

## II. RELATED WORKS

In the Related Work section, we provide a concise overview of various methods and datasets used for driver monitoring. Researchers have introduced several datasets aimed at understanding driver behavior and attention levels. One dataset, introduced by researchers, comprises a diverse benchmark of video sequences depicting normal, critical, and accidental scenarios outside the vehicle. The dataset aims to predict driving accidents based on driver attention levels.

Another dataset, called DrivFace, contains image sequences of drivers in real-world scenarios, annotated with head pose angles and view direction. Researchers also propose a method for estimating attention levels based on head pose angles. Additionally, the MPIIGaze dataset includes images collected during everyday computer use, focusing on estimating gaze angles to determine attention levels. The DriveAHead dataset provides infrared and depth images of drivers' head poses in real driving situations, along with annotations for head pose labels and facial occlusions.

Furthermore, datasets aim to monitor drowsiness and driver distraction, such as the dataset collected from individuals undergoing experiments with sleep deprivation and another dataset capturing drivers' actions in various driving scenarios using depth cameras. Finally, the Multimodal Spontaneous Expression Heart Rate (MMSE-HR) dataset includes videos and associated heart rate and blood pressure information collected from participants using face and contact sensors. In contrast, our DriverMVT dataset offers detailed annotations for driver health indices, mental state, and head pose estimation, recorded in real driving environments to provide authentic data for a wide range of driver-related tasks.

. Traditional mobile phone networks are designed so that the control and data layers are tightly coupled. The recent growth of data traffic has led to a paradigm shift from voice traffic to data traffic. Cisco surveyed ISPs and predicted that annual global Internet traffic will reach 1.4 petabytes by 2017, more than 528 Exatavus in 2012. This architecture follows the main goal of ubiquitous coverage and spectrally efficient voice-oriented homogeneous services. One factor contributing to the huge growth in internet traffic is the increase in communication between mobile devices and computers. Due to this growth, capacity and coverage requirements have exploded in recent years, and global mobile traffic is expected to exceed 127 EB in 2020. In 2020, wireless communication traffic should grow thousands of times compared to the figures of 2010. the expected number is 50 billion communication devices .A spread of radio collectors tells the center comprehensively about advertising, trendy important management, non-inverse broadcast framework construction and modern wavefields. Completing fewer categories has found extraordinary development in the radio service industry, both for the transformative innovation and its supporters. Especially since the turn of the century, there has been an accepted separation from a stored phone to a phone with exchangeable value. With the exception of the 2010 extinction, there were more than four times as many meandering multicell members as extant communication lines. Portable webmasters and marketers met the magnificence of the mesh with an equally compelling plan. As a result, administrations related to network capabilities and improvements have acquired a distinct direction .Adding LTE D2D or a device to a device's communication capability affects the entire network and is therefore not a trivial addition. Issues such as authorization and authentication are currently being addressed by the network, and the general LTE system should be extended to allow inter-device communication without a significant network presence .Another issue is direct communication between devices subscribed to different operators, although this is unlikely to happen openly for service or emergency services. More and more emergency services use the existing mobile network to provide much better coverage

### III. PROPOSED WORK

With D2D communication, a large amount of data can be quickly transferred between mobile devices over a short distance. This includes autonomous connectivity and communication between devices. A specific application is vehicle-to-vehicle (V2V) communication, where D2D links can be used to share information between neighbouring vehicles. Routing in D2D is done at the network layer. The purpose of routing in D2D is to find a path between source and destination through which packets can be forwarded. Since D2D is a mobile network and the topology of D2D is constantly changing and due to other aspects of the D2D environment, additional demands are placed on the routing algorithm. The D2D routing algorithm should not only find the shortest path between the source and the destination, but it should also be able to adapt to the changing status of the nodes, the changing network conditions, when the load conditions and the environment change. Therefore, most D2Ds are connectionless in nature, as links are not as efficient at providing the QoS required in a rapidly changing D2D environment and incur additional network overhead. D2Ds are also multi-hop in nature, as packets must be transmitted through other nodes to reach their destination. Thus, D2Ds require a redefinition of traditional algorithms to meet these additional requirements. Each D2D routing algorithm has three major components: a route discovery mechanism, a route error correction mechanism, and a route maintenance mechanism. A route discovery mechanism searches for original routes between source and destination nodes, a route maintenance mechanism maintains routes found during packet transmission, and a route error correction mechanism recreates routes when they fail. The first was born in connection with wireless networks.

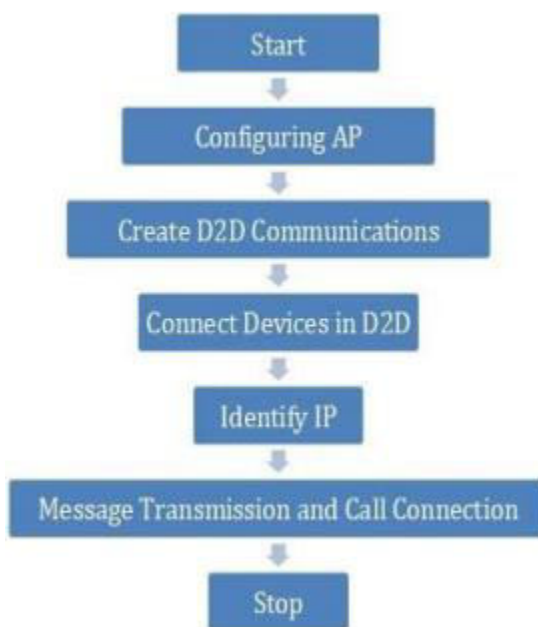


Figure-1 System Architecture

### IV. RESULTS AND DISCUSSION

The results of this paper show that Bayesian learning is an excellent algorithm for optimizing device-to-device (D2D) communication in mobile networks. Its ability to adaptively model uncertainty and make informed decisions, especially in scenarios where network conditions vary, such as natural disasters or high-traffic areas, is superior to other methods. Bayesian learning is excellent for interference control, power management and ensuring stable connections between user equipment (UE). Its efficiency in maximizing data rates, minimizing power consumption and improving



spectrum efficiency highlights its key role in improving overall network performance and flexibility, making it the best choice for optimizing D2D communications

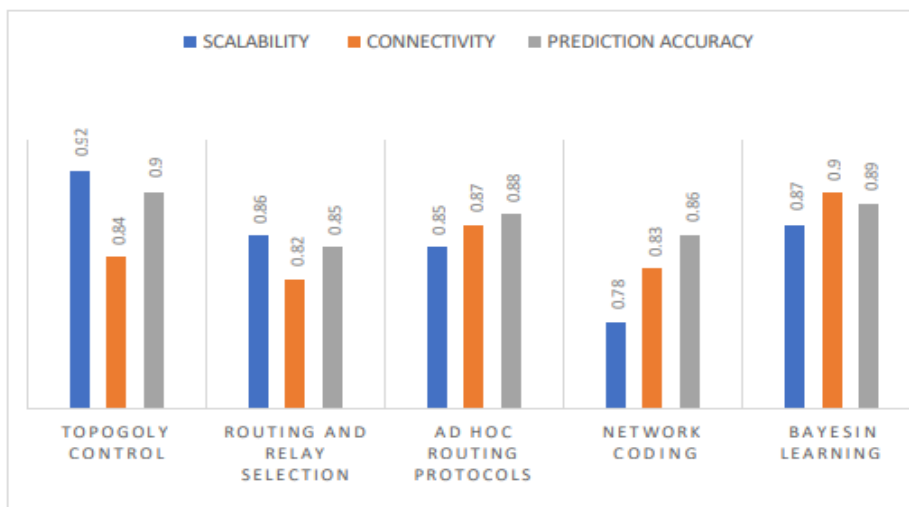


Figure-2 Comparison Results - Performance

### V. CONCLUSION

Device-to-device data transfer is an advanced data transfer technology developed to increase network efficiency. In D2D communication, two or more user devices communicate with each other directly, with very limited involvement of the advanced node. Direct device to-device communication can offer several advantages to users in various applications where devices are in close proximity. Such technologies help maintain the necessary data transmission between user devices in situations of natural disasters and traffic hotspots. D2D communication, which allows nearby user equipment (UE) to communicate directly with each other bypassing mobile network base stations, holds great promise for expanding mobile phone coverage in the event of network infrastructure failure or natural disaster.

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