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Development of Communication Protocol in 6G Network with Quality of Service and Dynamic Resource Allocation through Seamless Connectivity

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ABSTRACT: The development of communication protocol for the 6G network leads to the enhancement of wireless communication technology. They provide various features which include seamless connectivity, quality of service and optimum resource allocation. This is achieved through deep learning techniques accompanied by optimization algorithms. The important aim of the 6G communication network is to provide a wider range of services with optimum applications in diverse fields.The deep learning algorithm helps to handle large amounts of complex data and process them to obtain optimum results in a real-time platform. The use of CNN helps to obtain the appropriate priority of the consumers with optimum resource allocation. They help in providing a higher level of user experience with maximum optimization of the network resources. The temporal processing of data is done through LSTM and RNN. This allows the network to adapt dynamically within the stipulated time interval. This helps in predicting the demands of the user with traffic fluctuations. The congestion points in the network are determined and analyzed using RNN topology. They provide a way to maintain the desired QoS levels. This optimization algorithm helps in the effective allocation through necessary bandwidth and lower latency interconnections. The uninterrupted mobility of improved user experience is achieved through LSTM and RNN. They provide a smoother handover process without reducing the quality of the service. Thus the proposed system is revolutionizing various industries with numerous advantages.

KEYWORDS*:* Communication protocol, Seamless connectivity, Quality of Service, Resource allocation, Deep learning, lower latency.

I. INTRODUCTION

6G or sixth-generation wireless technology provides various advantages such as higher data speed, reduced latency and various innovative capabilities. This is the successor of the fifth-generation wireless communication network [1]. The important need for the development of the 6G communication network is due to the increasing demand for data speed and customers [2]. This tends to provide ultra-high-speed data for various

applications ranging from autonomous vehicles, healthcare systems, and military applications.6G is expected to operate in the terahertz frequency band. This includes various technologies such as massive MIMO and beamforming technology [3].

Artificial intelligence is transforming the wireless communication network in diverse ways. They provide a way for the development of the next-generation communication networks through automation and advanced topologies. This helps in the extraction of full potential to provide the desired outcomes. They help in increasing the network performance with energy-saving parameters.The functioning of 6G protocols is highly complex and needs various advanced tools and optimization techniques to obtain the desired results [4]-[9]. The role of artificial intelligence helpsto reduce interference with increased spectral efficiency.This also includes the use of edge computing. Thus the integration of various AI models is largely used in various applications. The quality of service forms an important part

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of the communication network. This helps to analyze the overall performance of the system with its behavior [10].The quality of service is denoted as the set of principles and protocols that help in the management of the communication network.This is an important part of the modern networking system. The important parameter includes the telecommunication systems [11]-[14]. This is accompanied by various elements to ensure various kinds of applications and devices. They are integrated with the necessary amount of resources in the network. This helps in prioritizing the flow of data based on the necessary conditions. This involves minimal delay with a minimal amount of packet loss.

They can able to tolerate minimal loss and delays in the system. This involves certain traffic classifications and marketing parameters. This also involves bandwidth management and traffic shaping [15].They enable resources based on the service level providers. This helps in obtaining a smooth and flexible user experience through the optimization of network resources. This provides an important role in diverse applications for enhancing the user experience with enhanced reliability in the system.

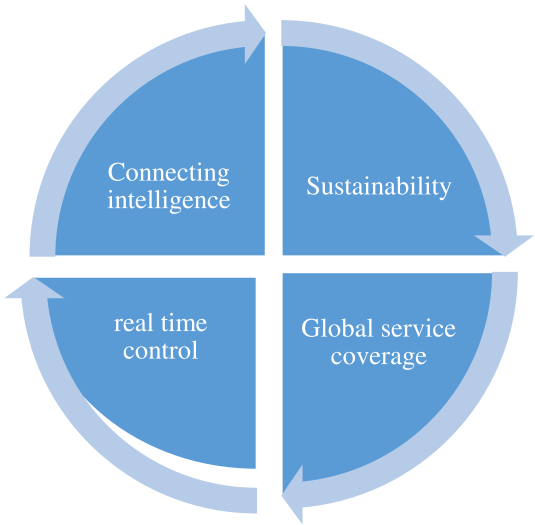

Fig 1: Characteristics of 6G

The figure 1 represents the various characteristics of 6G communication network.

II. EXISTING SYSTEM

The existing system is implemented through the aid of machine learning techniques with LiFi which results in various drawbacks. The numerous drawbacks in the system are listed below in Figure 2.

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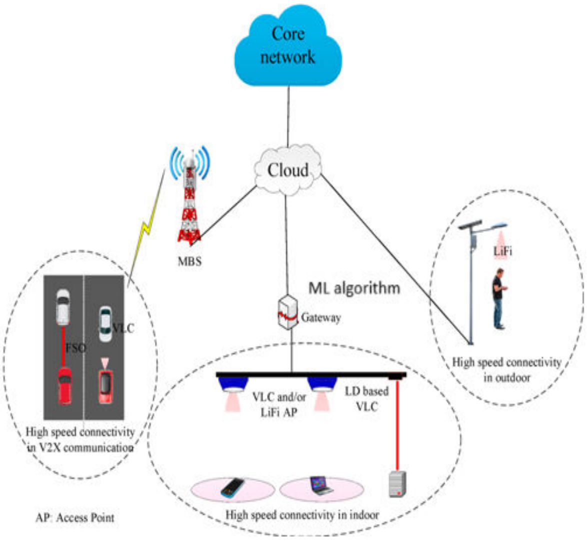

Fig 2: Existing system

- Increased complexity in the system: The integration of multiple protocol such as 6G and dynamic resource allocation in machine learning is highly complicated. The ML algorithm cannot able to extract information from complex environments. The complexity of the system leads to higher development and maintainence cost [15]-[9].
- Resource intensive parameters: The machine learning algorithms are accompanied with resource intensive parameters which cause higher computational power nad energy consumption.
- Numerous security concerns: The machine learning models are vulnerable to various malicious attacks which results in numerous malfunctioning. This causes various significant risk .
- Challenges in training data: The machine learning model depend on large amount of data for the process of training. The collection and managing the data is a complex process which tends to reduce the overall performance of the system.
- Regulatory concerns: The usage of machine learning algorithms in communication protocols may elevate regulatory and ethical issues.
- Cost factor: The implementation of 6G network requires various advanced communication protocols which leads to large amount of initialization cost. This results in major drawbacks for both the users and network providers.

These drawbacks in the existing system are neglected through the aid of deep learning techniques.

III. PROPOSED SYSTEM

The development of communication protocols for 6G networks is a complex structure which aims in providing enhanced connectivity with improved data speed. The important features includes seamless connectivity which provide the connectivity of user without any interruption. The advanced techniques are implemented through the aid of deep learning techniques.

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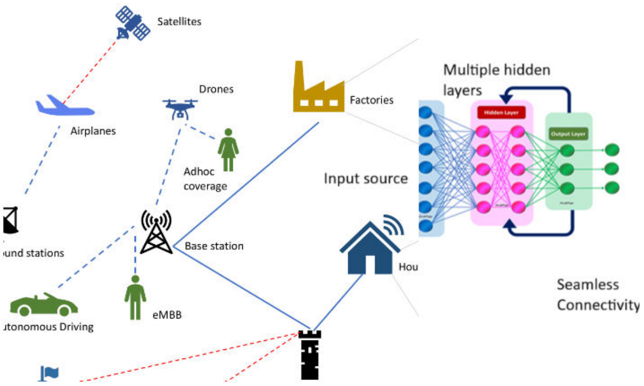

Fig 3: Proposed system

This includes Convolutional Neural Network, Long Short term neural network and Recurrent neural network. The quality of service is a fundamental priority in the 6G communication network as shown in figure 3. This helps in supporting wide range of applications. They includes augmented reality, virtual reality cloud computing and Internet of Things. Figure 4 demonstrates the block diagram of the proposed system. The routing are optimized using CNN. They helps in the analysis of network traffic patterns . The congestion of the network are achieved through LSTM and RNN. These tend to learn from historical anad and adapt with the real time environments. This helps in adopting seamless user experience. The dynamic resource allocation is the another important parameter in the 6G communication system. This helps in adopting optimum allocation of resources in changing demands of the communication network. Thus these techniques helps in adopting wide range of applications.

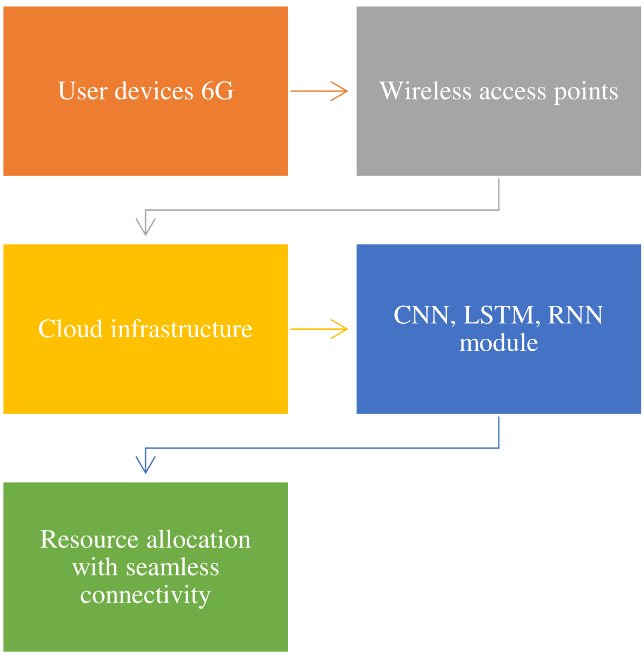

Fig 4: Block diagram

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IV. Implementation of the Proposed System

The proposed system is implemented through various stages as listed below.

Stage 1: Objectives of 6G network

TABLE I: Sample data

Problem Statement	**Objectives**
6G Network Protocol	Ensure ultra-low latency (e.g., <1ms)
QoS and Resource Allocation	Dynamic resource allocation
Seamless Connectivity	Implement LSTM, RNN, and CNN models

Table I demonstrates the sample data.

Stage 2: Research analysis

TABLE II: Existing protocols

Existing Protocols	Challenges
5G, Wi-Fi 6, etc.	Scalability and efficiency issues
Research Papers	Extremely low-latency requirements
Market Trend analysis	Seamless handovers

Table II demonstrates the existing protocols.

Stage 3: Data processing

TABLE III: Requirements

Data	Specific Requirements
QoS Requirements	End-to-end latency: <1ms
Resource Allocation	Dynamic bandwidth allocation
Connectivity Needs	Handover without packet loss or delay

Table III represents the Requirements.

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Stage 4: Architecture design parameters

TABLE IV: Components analysis

Component	Description
Protocol Stack	Layered architecture
LSTM Integration	Sequence prediction and control
RNN Integration	Temporal data handling
CNN Integration	Image processing

Table IV represents the components analysis.

Stage 5: Optimization algorithm

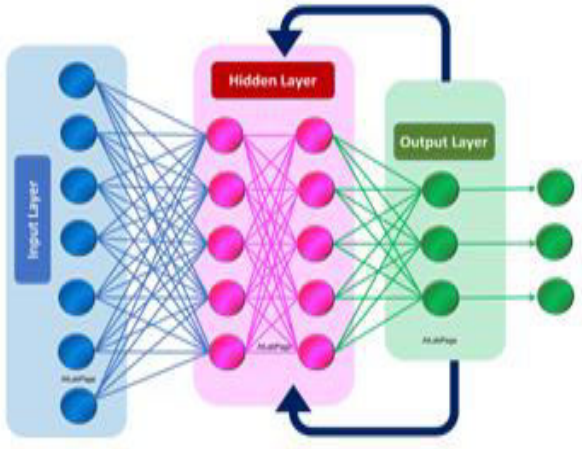

Fig 5: Optimization algorithm

Figure 5 shows the optimization algorithm used in the communication network.

TABLE V: Selected algorithm

Type	Selected algorithm
QoS Control	LSTM Integration
Resource Allocation	RNN Integration
Image processing	CNN Integration

Table V shows the Selected algorithm.

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Stage 6: Data preprocessing

TABLE VI: Training loss

Selected algorithm	Taining loss
LSTM Integration	0.001
RNN Integration	0.0021
CNN Integration	0.00216

Table VI represents the Training loss.

Stage 7: Model training

TABLE VII: Training time

Algorithm	Training time
LSTM Integration	24 hours
RNN Integration	72 hours
CNN Integration	48 hours

Table VII shows the training time.

Stage 8: Data integration

TABLE VIII: Data size

Algorithm	Data size
LSTM Integration	1 TB
RNN Integration	100 GB
CNN Integration	1 TB

Table VIII demonstrates the data size.

Stage 9: Testing and validation

TABLE IX: Validation results

Test	Validation Results
Low-Latency Test	Achieved <1ms latency
Resource allocation	Dynamic allocation successful
Handover Testing	Successfully achieved

Table IX represents the validation results.

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Stage 10: Deployment

TABLE X: Result analysis

Optimization category	Result analysis
Latency Reduction	Achieved <0.5ms latency after optimization
Resource allocation	Dynamic allocation successful
Resource Efficiency	Reduced resource wastage

Table X shows result analysis.

V. SIMULATION RESULT

The performance of the proposed system is evaluated in Matlab Simulink as demonstrated in Figure 6.

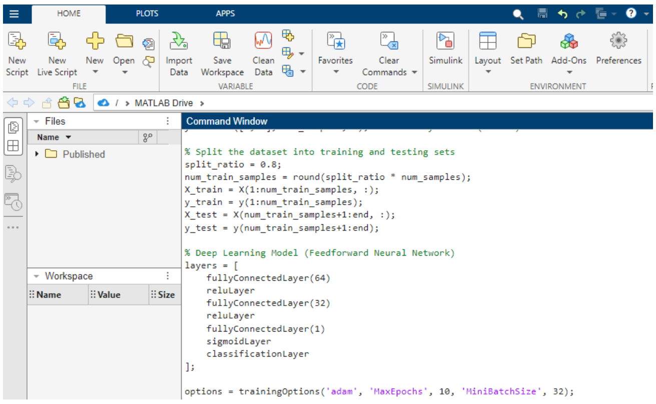

Fig 6: Matlab implementation

Output:
Average QoS over time: 0.86

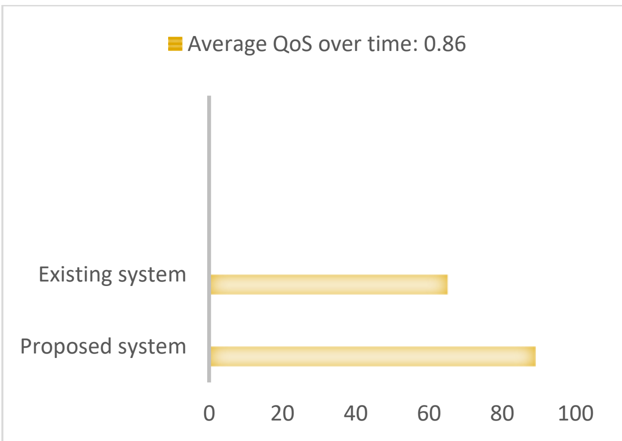

Fig 7: Comparative analysis

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The performance parameter such as Average QoS over time is compared with the existing system with the proposed system as shown in Figure 7.

VI. Conclusion

The development of communication protocol in the 6G network includes improved connectivity with higher transfer data speeds. The integration of quality of service with dynamic resource allocation provides a significant enhancement in the overall system. The 6G network provides seamless connectivity and is largely used for data intensive applications. This integration of these two parameters helps to provide a smart user experience without interruption. They forms an integral part of the interconnected systems. The interrelation helps in optimal resource sharing which results in energy consumption with reduced loss. Thus the optimization algorithm helps in providing stability and reliability of the system. The privacy and security of the system are obtained through cloud computing techniques. Thus the 6G communication protocol provides promise for obtaining speed and reliability in diverse fields ranging from augmented reality, virtual reality, various autonomous vehicles and healthcare systems.

References

[1] Taneja, A., Alqahtani, N., & Alqahtani, A. (2023). Interference Aware Resource Control for 6G-Enabled Expanded IoT Networks. *Sensors*, *23*(12). https://doi.org/10.3390/s23125649

[2] Liu, X., Zhang, H., Sheng, M., Li, W., Al-Rubaye, S., & Long, K. (2023). Ultra dense satellite-enabled 6G networks: Resource optimization and interference management. *China Communications*. https://doi.org/10.23919/JCC.ea.2021-0740.202302

[3] Yang, Y., Tao, X., Aghvami, A. H., Xie, J., Eliassen, F., & Luo, X. (2023). 6G Network AI Architecture for Customized Services and Applications. *IEEE Network*, *37*(2). https://doi.org/10.1109/mnet.2023.10239351

[4] Farajzadeh, A., Khoshkholgh, M. G., Yanikomeroglu, H., & Ercetin, O. (2023). Self-Evolving Integrated Vertical Heterogeneous Networks. *IEEE Open Journal of the Communications Society*, *4*. https://doi.org/10.1109/OJCOMS.2023.3243870

[5] Guo, Q., Tang, F., & Kato, N. (2023). Federated Reinforcement Learning-Based Resource Allocation for D2D-Aided Digital Twin Edge Networks in 6G Industrial IoT. *IEEE Transactions on Industrial Informatics*, *19*(5). https://doi.org/10.1109/TII.2022.3227655

[6] Mishra, P., & Singh, G. (2023). 6G-IoT Framework for Sustainable Smart City: Vision and Challenges. *IEEE Consumer Electronics Magazine*. https://doi.org/10.1109/MCE.2023.3307225

[7] Dong, F., Liu, F., Cui, Y., Wang, W., Han, K., & Wang, Z. (2023). Sensing as a Service in 6G Perceptive Networks: A Unified Framework for ISAC Resource Allocation. *IEEE Transactions on Wireless Communications*, *22*(5). https://doi.org/10.1109/TWC.2022.3219463

[8] Jia, P., & Wang, X. (2023). A New Virtual Network Topology based Digital Twin for Spatial-Temporal Load-Balanced User Association in 6G HetNets. *IEEE Journal on Selected Areas in Communications*. https://doi.org/10.1109/JSAC.2023.3310104

[9] Ashwin, M., Alqahtani, A. S., Mubarakali, A., & Sivakumar, B. (2023). Efficient resource management in 6G communication networks using hybrid quantum deep learning model. *Computers and Electrical Engineering*, *106*. https://doi.org/10.1016/j.compeleceng.2022.108565

[10] Uysal, D. T., Yoo, P. D., & Taha, K. (2023). Data-Driven Malware Detection for 6G Networks: A Survey From the Perspective of Continuous Learning and Explainability via Visualisation. *IEEE Open Journal of Vehicular Technology*, *4*. https://doi.org/10.1109/OJVT.2022.3219898

[11] Ren, Z., Li, X., Jiang, Q., Wang, Y., Ma, J., & Miao, C. (2023). Network Slicing in 6G: An Authentication Framework for Unattended Terminals. *IEEE Network*, *37*(1). https://doi.org/10.1109/MNET.112.2100738

[12] Liu, Y., Deng, Y., Nallanathan, A., & Yuan, J. (2023). Machine Learning for 6G Enhanced Ultra-Reliable and Low-Latency Services. *IEEE Wireless Communications*, *30*(2). https://doi.org/10.1109/MWC.006.2200407

[13] Sirisha, M., & Abdul Khayum, P. (2023). Using a Software-Defined Air Interface Algorithm to Improve Service Quality. *Intelligent Automation and Soft Computing*, *35*(2). https://doi.org/10.32604/iasc.2023.025980

[14] Singh, O., Singh, N., Singh, A., & R, V. (2023). 6G and Blockchain Communication: Applications, Challenges, and Predictions. *International Journal of Computer Applications Technology and Research*. https://doi.org/10.7753/ijcatr1204.1007

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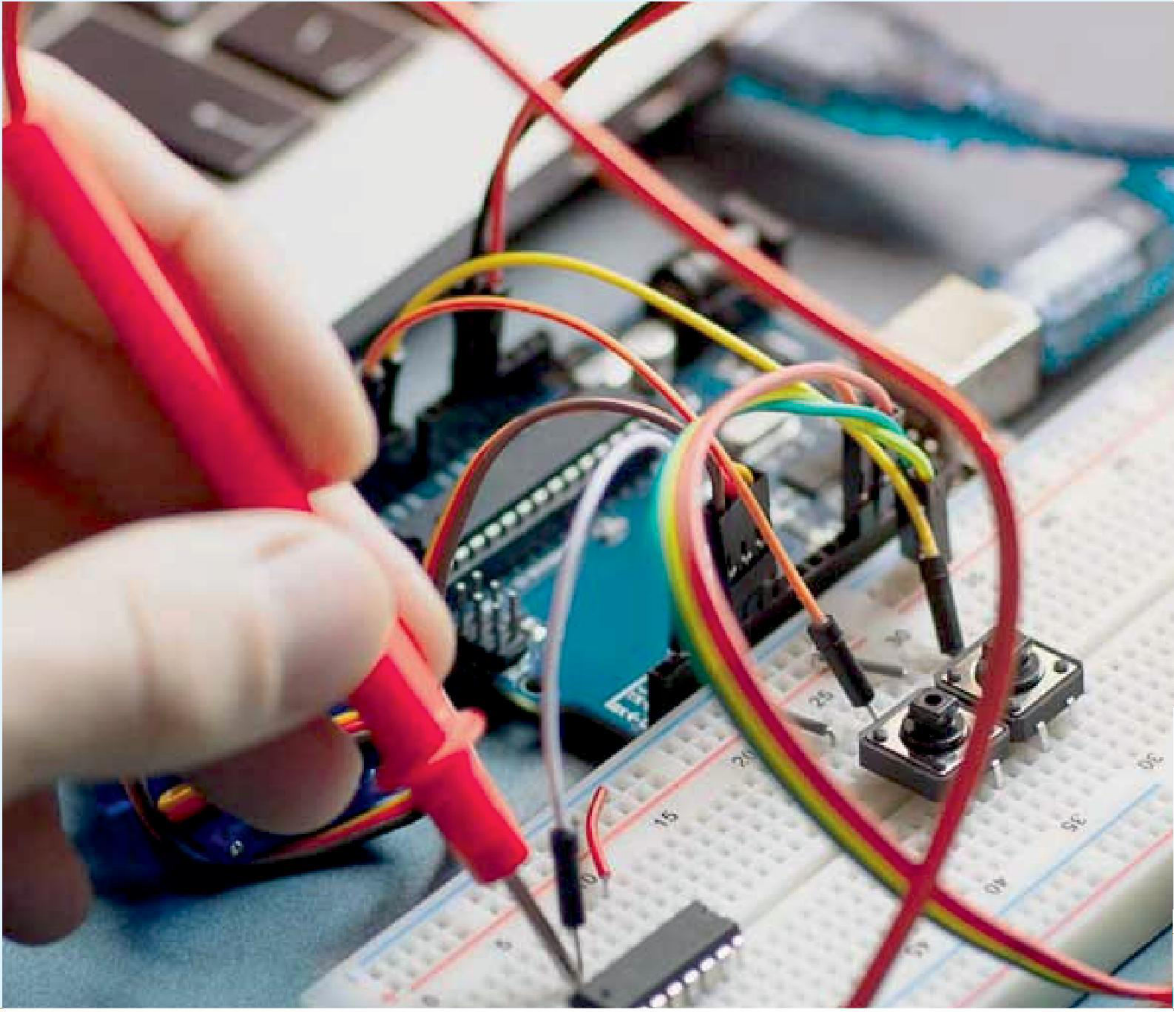
[15] Reifert, R. J., Roth, S., Ahmad, A. A., & Sezgin, A. (2023). Comeback Kid: Resilience for Mixed-Critical Wireless Network Resource Management. *IEEE Transactions on Vehicular Technology*. https://doi.org/10.1109/TVT.2023.3296977



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