# Chapter 2

## Literature Survey

In recent years, the demand for high-performance wireless communication systems has surged dramatically. This surge is primarily driven by the widespread adoption of mobile devices, the rapid expansion of IoT applications, and the emergence of advanced technologies such as 5G. Consequently, there has been a notable increase in research efforts aimed at exploring innovative antenna designs and configurations. The ultimate goal of these endeavors is to enhance the efficiency, reliability, and coverage of wireless networks to meet the growing demands of modern connectivity.

1. In their paper titled "Design of Microstrip Patch Antenna for High-Quality Online Education and 5G Applications at 26 GHz,IEEE 2020" the authors address the need for uninterrupted high-speed online education, particularly in developing countries like India. They propose a microstrip patch antenna designed for 5G millimeter wave bands, operating at 26 GHz. The antenna design includes a rectangular patch with a dielectric constant of 2.2 and a dielectric loss tangent of 0.0010. Using FEKO software for simulation and analysis, the authors achieved impressive results, including a return loss of -33.4 dB, a bandwidth of 3.56 GHz, VSWR less than 2, a high gain of 10 dB, and an antenna radiation efficiency of 99.5%. This design is particularly advantageous during the ongoing global lockdown, offering reliable high-speed connectivity for online education and other 5G applications.
2. Indonesian Journal of Electrical Engineering and Computer Science in January 2020 investigated the utilization of microstrip array antennas with inset-fed for WLAN applications. This study shed light on the potential advantages of array antennas, emphasizing their ability to improve key performance metrics such as gain, directivity, and signal quality. By doing so, these antennas have the potential to significantly enhance the overall efficiency of wireless communication systems. However, the study also underscored concerns regarding the power consumption associated with array antennas. This highlighted the critical importance of meticulous design and configuration to mitigate potential energy inefficiencies.
3. Another significant research endeavor, undertaken by the National Engineers School of Sfax Laboratory of Electronics and Technology of Information (LETI) in March 2016 focused on the design of rectangular microstrip patch antennas. This study emphasized the compact size of these antennas, making them particularly suitable for applications where space is limited, such as mobile devices and small IoT sensors. Despite their compact nature, the study revealed that rectangular patch antennas are susceptible to environmental factors, such as nearby objects, which can have a substantial impact on their performance and reliability. Consequently, the study emphasized the necessity of taking environmental factors into account during the design and deployment of microstrip patch antennas.
4. Furthermore, a study conducted by Madhukant Patel in 2019 delved into the design and analysis of microstrip patch antenna arrays for X-Band applications. Patch antenna arrays offer the significant advantage of high gain, rendering them well-suited for long- range communication applications. However, the study also highlighted the inherent complexity associated with designing and implementing patch antenna arrays with a corporate feed network. This complexity necessitates specialized knowledge and expertise. Nevertheless, despite these challenges, the study emphasized that the high gain achieved by patch antenna arrays makes them a compelling choice for applications requiring extended coverage and reliability.
5. Additionally, a study published in 2015 by Santosh B. Patil, focused on the design and performance analysis of inset feed microstrip square patch antennas for 2.4GHz wireless applications. This study highlighted the ease of integration of these antennas into printed circuit boards (PCBs), thereby reducing the overall footprint of wireless devices. The compact size and seamless integration of inset feed microstrip square patch antennas make them highly versatile, catering to a wide range of wireless applications, including WiFi routers, IoT devices, and wireless sensors.