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ENGL 21007
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As a future electrical engineer with a focus on power systems, I view artificial intelligence as something much more basic, even though software, chatbots, and automation are commonly associated with it. Instead of being a tool on a computer screen, it has the potential to be incorporated directly into the physical infrastructure that provides electricity to millions of people. In my future profession, I see artificial intelligence (AI) as a system-level improvement that can significantly boost the resilience, efficiency, and dependability of modern smart power systems grids—not as a replacement for human judgment.

One crucial use of artificial intelligence that is expected to greatly improve the architecture and functioning of intricate electrical systems and grids is predictive maintenance. Electrical grids, for example, must continuously maintain voltage and frequency stability, balance power generation and demand, and continue to operate dependably even in the face of demand fluctuations and environmental disruptions. Engineers may be able to predict equipment failures or system disruptions before they happen if artificial intelligence (AI) is incorporated into an electrical grid. However, because AI models are inherently flawed and may malfunction in odd or unexpected situations, relying too much on such predictive capabilities could be dangerous.

Expanding on this concept, conventional systems isolate problematic grid segments using protective relays; however, complete maintenance frequently still necessitates manual intervention. As I previously stated, smart grids could use AI to automatically reorganize power flows in response to fault signals, such as transient voltage sags or current spikes, in order to restore service more rapidly. I could help create protection plans that differentiate between temporary disruptions and long-term failures using AI-based classifiers. Customers would benefit from less needless downtime and increased dependability overall.

AI can be useful in smaller but no less significant areas of power engineering than large-scale grid operations. It could improve power quality monitoring systems, detect energy theft in distribution networks, optimize capacitor bank switching for voltage regulation, and support harmonic distortion analysis for non-linear industrial loads. These illustrations demonstrate that AI can enhance the functionality of individual grid components in addition to directing high-level decisions.

But there are also significant concerns regarding cybersecurity and ethical application when incorporating AI into electrical infrastructure. A grid that relies on data-driven automation needs to be shielded from manipulation and cyberattacks, which are becoming more frequent and pose a serious risk. As a future engineer, it would be my duty to assist in making sure AI-based control systems are built with redundancy, robust encryption, and fail-safe mechanisms. AI should only be used sparingly, under close human supervision, and in accordance with rigorous ethical and technical guidelines. Specialized licenses and training in ethics, failure modes, and system operation may also be necessary when working with such systems.

I don't believe artificial intelligence will ever replace an electrical engineer. Instead, I see it as a means of enhancing our potential. Engineers are still required to build the physical infrastructure, communication networks, sensors, and security measures that allow intelligent decision-making, even though AI can process massive amounts of data in a matter of seconds. Future electrical grids will be able to anticipate, adapt, and respond intelligently to changing conditions in addition to providing electricity.