#### INTELLILIGHT : IOT INTEGRATED ML BASED SMART STREET LIGHTING SYSTEM

#### ABSTRACT

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The evolution of street lighting systems has seen a significant shift towards energy efficiency and sustainability, driven by the growing need to reduce electricity consumption and minimize operational costs in urban areas. A key innovation in this domain is the ability to adjust the brightness of streetlights based on ambient sunlight levels. This approach, which dynamically regulates the intensity of streetlights, offers a powerful solution to reduce energy consumption while maintaining safety and visibility for the public. Traditional street lighting systems operate at a constant brightness, regardless of the time of day or ambient light conditions. This results in excessive energy use, particularly during daylight hours when natural sunlight is sufficient to illuminate the environment. In contrast, modern adaptive street lighting systems adjust the brightness of the streetlights in response to the amount of sunlight available. During the day, when sunlight is abundant, the system reduces the brightness of streetlights to a lower level, conserving energy. As the sun sets and natural light decreases, the system automatically increases the brightness to ensure adequate lighting for roads and public spaces. The primary advantage of brightness adjustment based on sunlight levels is energy efficiency. By dynamically regulating the light intensity, the system ensures that electricity is used only when necessary. This adjustment is typically performed using a system that continuously monitors the ambient light levels, and based on the detected sunlight intensity, adjusts the output of the streetlights. The finer the control over brightness, the more energy can be saved, especially in areas where streetlights are not required to be fully illuminated during brighter times of the day. Furthermore, this approach significantly reduces operational costs for municipalities. By ensuring that streetlights are dimmed or brightened in direct response to natural light, cities can drastically reduce the amount of energy used for public lighting, particularly during times of the day when it is not required. As a result, these systems can lead to substantial savings on electricity bills, which can be reinvested in other public infrastructure projects. The environmental impact of brightness-adjustable street lighting is also noteworthy. With reduced energy consumption, carbon emissions associated with electricity generation can be minimized, contributing to the overall reduction of a city’s carbon footprint. This aligns with the global movement towards sustainability and the creation of smarter, greener cities. Moreover, the adjustment of streetlight brightness based on sunlight helps improve the overall urban environment. It provides adequate lighting during low-light conditions, ensuring safety for pedestrians and vehicles while avoiding over-illumination during periods of sufficient daylight. This balance not only enhances safety but also reduces light pollution, which has become an increasingly recognized environmental issue. Brightness adjustment of streetlights based on sunlight levels presents a highly effective solution for enhancing urban energy efficiency and sustainability.