

**Energy Consumption Optimization by using Machine Learning to Predict Energy Usage Patterns.**

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**SUSTAINABLE TECHNOLOGY**

Sustainable Technology is a general term for activities and innovations that consider ecological resources, promote economic growth and social development. Sustainable Technology prevents negative impacts on the ecosystem and preserves natural resources for future generation.

**ENERGY OPTIMIZATION**

This simply means using less energy in buildings by deliberate means; this is one of the ways in which modern technology can make our society sustainable.

**OPTIMIZING ENERGY CONSUMPTION IN BUILDINGS USING MACHINE LEARNING ALGORITHMS**

Global energy consumption has increased drastically in recent years and it is predicted to continue increasing. Power consumption is projected to triple by 2050 as living standard increases. (Mcksinsey.com).

**TOOLS USED AND WHY**

**PYTHON:** is used because it is an open source programming language, easy and flexible to use, it is reliable and close to human language

**Data Sourcing And Exploration** - data sourcing and exploration, The first step is data sourcing and exploration to study trends and patterns and uncover insights relating to the problem at hand.

**Data Preprocessing and Analysis –** wrangling of raw data (preparation and cleaning into usable and meaning form

**MACHINE LEARNING:** This isa form of AI, which enables computer system to learn from data and improve overtime.

When applied to building operations, machine learning can help to optimize energy consumption by analyzing data from sources like weather forecast, energy consumption data, sensors etc. Data is splitted into test then the tested data is used to trained the remaining dataset.

**POWER BI:** This is a business intelligence data visualization tool, developed by Microsoft. It was used because it can be used to create interactive charts and graph, it is based on Microsoft Excel and it is an easy to use tool. Visuals created using power Bi can be shared easily with stakeholders.

**HOW MACHINE LEARNING CAN OPTIMIZE ENERGY CONSUMPTION IN BUILDINGS**

**PREDICTIVE MODELING:** Machine-learning algorithm can analyze past and recurrent data to predict energy demand and consumption patterns in advance; this helps facility managers to optimize building systems to optimize energy consumption.

**PREDICTIVE MAINTENANCE:** Machine-learning algorithm can use past and recurrent building data to identify potential equipment failure before it occurs and predicting when maintenance will be needed, this in turn reduces downtime.

**OCCUPANCY AND BEHAVIOUR:** By analyzing occupancy and behavior, machine learning can predict where and when people can be in the building and adjust its heating, ventilation and cooling system, this in turn helps reduce energy usage when buildings are not in use or when fewer people occupies the building.

**FAULT DETECTION AND DIAGNOSIS:** Machine learning algorithm can detect faultsin building systems and alert facility managers to take corrective actions

**RECOMMENDATION**

1. Sensitization / Marketing: this is outreaching the masses on the importance, technical know-how of energy optimization and how it contributes to good living by the ministry of works via communication medium and sensitization project

2. Innovation of smart buildings: Smart buildings uses advanced technology and automation to optimize it’s operation to improve occupant’s safety, comfort and reduce high energy consumption and environmental impact. Through AI and PIR automation to enable a smart building to regulate it’s HVAC and lighting system to optimize energy consumption.

3. Renewable Energy: This is the utilization of alternative natural sources of energy, which are eco-friendly, renewable and available for a long time. These are wind, hydro, solar, geothermal and biomass energy.

4. Introducing simple readable digital energy meter that enables occupants to understand, translate and compare energy consumptions and use such readings to predict future usage and deliberately work towards energy optimization

5. Use of Eco-Friendly electrical products over conventional ones e.g led lights, low wattage appliances such as fans, television, cooling gadgets etc.