Smart Energy Forecasting: Predicting Power Demand

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Abstract: This paper examines the application of machine learning technology in Smart energy applications that perform prediction through analytics. We explore the effectiveness a nd challenges of machine learning demand prediction through case studies, examples, and comparative studies for predicting electricity demand. Accurate prediction of electricity demand is important for improving energy production and ensuring grid stability. This project is designed to develop a forecasting model that uses historical data to accurately predict electricity demand. Using machine learning algorithms such as Artificial Neural Networks - ANN and XGBOOST, the model will take into account important elements such as weather and season to improve energy production and ensure reliability in the grid.

Theme : Artificial Intelligence and Machine Learning.

Problem Statement: Lack of demand for electricity leads to competition for power line operators and utilities, which leads to poor power production and lack of competence in the grid. Accurate forecasting is essential to ensure supply and demand are balanced, reduce operating costs and prevent failures. To generate electricity and ensure safety, energy demand must be accurately predicted. By using machine learning By using machine learning. Electricity demand is affected by many factors such as time of day, weather, seasonal change s and market conditions, making it difficult to predict.

Proposed Solution: The project aims to create predictive models using advanced machine learning algorithms such as Artificial Neural Networks - ANN and XGBOOST, using historical energy data together with other factors such as temperature, humidity and time based features. The aim is to develop reliable measurement tools that will help energy consumers and energy suppliers predict future demand, reduce operating costs and increase the efficiency of using all electricity. Finally, the project will promote better energy management and prevent power outages or redundancies.

Uses of Vultr Services :

Vultr Computation will be used to train machine learning models for ANN and XGBOOST, leveraging scalable infrastructure to perform complex computations. For data storage, storage devices will store historical energy demand data, weather data, and output models, making access and management easier. Additionally, mass storage can be used to quickly store big data during model training and evaluation. Vultr networking and security features will protect data and provide secure access to resources, making it a perfect platform for energy demand forecasting projects. electricity production, balance supply and demand, and make the plan sustainable. Teach management and decision making. Data: Get great data from Kaggle's power history. Integration: Integrate forecasts into applications through cloud solutions (Vultr Cloud Services).

Target Audience:

- **Energy Providers and Grid Operators**: These professionals need accurate demand forecasts to manage power generation, balance supply and demand and ensure grid stability.
- **Utility Companies**: They can use the predictions to their energy procurement strategies and reduce operational costs.
- **Energy Analysts and Consultants**: They can leverage the forecasting models to advise on energy management and policy decisions.
- **Regulatory Agencies**: They can benefit from improved forecasting for better planning and regulatory compliance in the energy sector.

Feasibility Analysis:

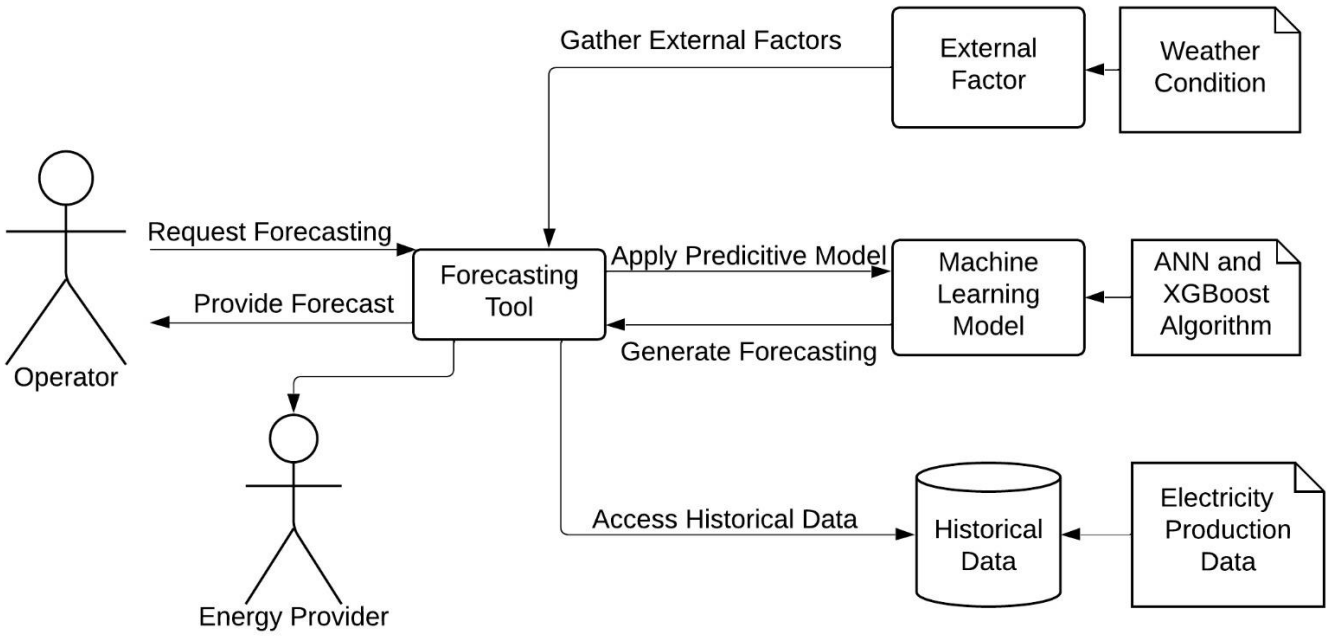
Technical Feasibility:

- **Data:** Access to high-quality historical electricity from Kaggle.
- **Model Complexity:** Advanced models like ANN and XGBOOST require significant computational power which can be managed using Vultr scalable cloud resources.
- **Integration:** Integrating forecasts into applications is feasible with cloud-based solutions (Vultr cloud service).

Resource Feasibility:

- **Computational Needs**: Vultr compute and storage services can handle the demands of model training and data management.
  Expertise: Data scientists are needed training and support may be required.

Preliminary Diagram:
UML Diagram:



Expected Outcome:

Improved energy efficiency Use more efficient energy products, reduce waste, and encourage renewable energy use by better aligning production with demand. Weather forecast models such as seasonal changes intemperature, humidity, and economic trends to increase forecast reliability. Demand and information can be modified in these electronic products development goals.