



THE ANNUAL TECHNO-MANAGEMENT FEST, IIT (BHU) VARANASI

TECHNEX'25

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HACK IT OUT PROBLEM STATEMENT

PROBLEM STATEMENT

1 AI-POWERED RENEWABLE ENERGY FORECASTING (BY NTPC)

Background:

Renewable energy sources like solar and wind are highly unpredictable due to their dependence on weather conditions. This unpredictability can cause fluctuations in energy generation, leading to challenges in balancing power supply and demand. Effective forecasting is crucial for energy grid stability, reducing reliance on fossil fuel-based backup power.

Problem Statement:

Develop a web-based AI-powered forecasting system that predicts solar and wind energy generation using historical weather data such as sunlight intensity, wind speed, and temperature. The system should provide real-time insights to energy companies, grid operators, and businesses, helping them optimize energy planning, reduce power shortages, and improve sustainability.

Expected Features:

- **Web Dashboard:** A user-friendly interface displaying energy generation forecasts with interactive charts and analytics.
- **AI-Powered Predictions:** Uses past weather patterns and machine learning models to predict future solar and wind energy output.
- **Real-Time Data Integration:** Fetches live weather data from APIs for continuous updates.
- **Geographical Adaptability:** Supports different locations by customizing predictions based on local weather conditions.
- **Accuracy Optimization:** Reduces the gap between forecasted and actual power generation using advanced models and error correction techniques.
- **API for Integration:** Allows energy companies to integrate forecasts into their existing energy management systems.

2 AI-ENABLED PREDICTIVE MAINTENANCE FOR RENEWABLE ENERGY PLANTS (BY NTPC)

Renewable energy plants depend on solar panels, wind turbines, and other equipment that can degrade over time, leading to unexpected failures and power outages. Traditional maintenance strategies are either too frequent, increasing operational costs, or reactive, addressing failures only after they cause disruptions.

Web-Based Predictive Maintenance System

A cloud-based predictive maintenance system can continuously monitor equipment health, analyze real-time sensor data, and detect early signs of failure.

Key Features

- **Live Monitoring Dashboard:** A web interface displaying real-time equipment status, failure predictions, and maintenance alerts.
- **Automated Alerts & Reports:** Sends notifications to engineers when potential failures are detected.
- **Optimized Maintenance Scheduling:** Reduces unnecessary maintenance while ensuring critical repairs happen on time.
- **SCADA & Energy Management Integration:** Can connect with existing plant monitoring systems for seamless operation.