**Section 1 : Topic Submission Form**

This form should be submitted by the mentioned deadline.

Name:  Sarat Shankar

Student Number:   **1175510**

Course:  LMJU Master’s in Data Science January 2025                  \_\_\_\_\_\_ \_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_

**Fill your topic/s below**

Project Title/Area 1: Predictive Maintenance for

Single Stage Air Compressors Using Advanced Machine Learning

Dataset:    [Air compressor dataset](https://www.kaggle.com/datasets/alamintokdershoukhin/air-compressor-dataset)

https://www.neuraldesigner.com/wp-content/uploads/2023/10/aircompressor.csv

Description:

Maintaining operational efficiency and reliability of all Compressors (and other industrial systems) are mandatory to minimize downtime and preventing failures. I would like to research on parameters effecting operational efficiency of compressor and accurately predict the key parameters which will be crucial for developing an effective predictive maintenance system, which can proactively prevent failures and can be used to optimize compressor performance.

Project Title/Area 2: Energy Consumption Forecasting for Smart Buildings using deep learning techniques

Dataset: [Simple Exploration Notebook - ASHRAE](https://www.kaggle.com/code/sudalairajkumar/simple-exploration-notebook-ashrae#Distribution-of-Meter-Readings-over-time)

[Appliances Energy Prediction - UCI Machine Learning Repository](https://archive.ics.uci.edu/dataset/374/appliances+energy+prediction)

Description: Urbanization increases electricity demand due to population growth and economic activity. To meet consumer’s demands at all times, it is necessary to predict the future building energy consumption. Building energy consumption prediction is fundamental for improved decision-making towards regulating or decreasing energy usage.

Research will focus on building forecasting model which can be used for small and medium size of commercial buildings with limited automation inplace.

Project Title/Area 3:   Solar Energy Forecasting using advanced Machine Learning techniques.

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Dataset:     [Solar Power Generation Data](https://www.kaggle.com/datasets/anikannal/solar-power-generation-data)  ,                                                                            \_\_

Weather API - [GitHub - ShagunDwivedi/IndianWeatherAPI: API for India Meteorological Department Weather Data](https://github.com/ShagunDwivedi/IndianWeatherAPI)

Description: Solar power plants offer a healthy substitute for traditional thermal power plants. However, the management and quality of power in the current energy grids are threatened by the environmental effects of relying too much on solar power.

Research will be focusing on forcasting model which can provide:

* Short term (48–72 h) forecasting of energy generation is useful for decision making related to power system operation.
* A week ahead (medium term) forecasting of energy generation is useful for scheduling maintenance of solar PV plants.
* A long term (up to months to years) prediction is useful for solar energy assessment and planning of PV plant

**Fill in this section if a member of staff has agreed to be your supervisor:**

Member of Staff:                                                                                   \_\_\_\_

If you have found a supervisor, then you and the member of staff who agreed to supervise your project should sign below.

A signature on a white background

AI-generated content may be incorrect.                                          Nirav Bhatt (approved over Email)

Student Signature                                                                         Supervisor Signature

11th April 2025                                                                      11th April 2025

Date                                                                                                Date

**Section 2 : Topic Selection Research**

**Table 1:** Predictive Maintenance for

Single Stage Air Compressors Using Advanced Machine Learning

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Title** | **Link to the Paper** | **Understanding of the Dataset** | **Understanding the Methodology Used** | **Dataset Link** |
| **A Machine Learning Implementation to Predictive Maintenance and Monitoring of Industrial Compressors** | [A Machine Learning Implementation to Predictive Maintenance and Monitoring of Industrial Compressors](https://www.mdpi.com/1424-8220/25/4/1006) | Pressure, Temperature, Flow , Power Consumption etc | Linear Regression | Not Available |
| Prediction of air compressor faults with feature fusion and machine learning | [Prediction of air compressor faults with feature fusion and machine learning - ScienceDirect](https://www.sciencedirect.com/science/article/pii/S0950705124011535) | Vibration signals | Feature fusion (Statistical+Histogram+ARMA) | https://github.com/Sangharatna786/Air-compressor-Vibration-Signals.git |
| Predictive Maintenance System for Screw Compressors Using Machine Learning: A Comparative Study | [(PDF) Predictive Maintenance System for Screw Compressors Using Machine Learning: A Comparative Study](https://www.researchgate.net/publication/385309992_Predictive_Maintenance_System_for_Screw_Compressors_Using_Machine_Learning_A_Comparative_Study) | Temperature, Outlet pressure, Ambient temperature | Linear Regression, K-Nearest Neighbors (KNN), Support Vector Machine (SVM), and Gradient Boosting Machine | Not Available |
| **Compressor Health Prediction Based on Multi-Source Information Fusion and LSTM** | [**Compressor Health Prediction Based on Multi-Source Information Fusion and LSTM | IEEE Conference Publication | IEEE Xplore**](https://ieeexplore.ieee.org/document/9455490) | vibration signal | MSIF-LCD-LSTM method | Not Available |
| **Predictive Maintenance in Twin Screw Air Compressors: a Case Study** | [Predictive Maintenance in Twin Screw Air Compressors: a Case Study | IEEE Conference Publication | IEEE Xplore](https://ieeexplore.ieee.org/document/10178961) | Temperature, relative humidity of the intake air, air pressure ,air flow rate | Ensemble Bagged Trees, Principal Component Analysis (PCA) and correlationmatrix computation | Not Available |

**Table 2 :** Energy Consumption Forecasting for Smart Buildings using deep learning techniques

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Title** | **Link to the Paper** | **Understanding of the Dataset** | **Understanding the Methodology Used** | **Dataset Link** |
| Sustainable AI Applications in Building Energy Management -An Analysis of Environmental Impact through Machine Learning Predictions | [(PDF) Sustainable AI Applications in Building Energy Management -An Analysis of Environmental Impact through Machine Learning Predictions](https://www.researchgate.net/publication/388678518_Sustainable_AI_Applications_in_Building_Energy_Management_-An_Analysis_of_Environmental_Impact_through_Machine_Learning_Predictions) | To monitor appliance consumption,  Temperature sensors  Humidity sensors  Utilization of weather data | Random Forest algorithm is used for machine learning methodology | [Appliances Energy Prediction - UCI Machine Learning Repository](https://archive.ics.uci.edu/dataset/374/appliances+energy+prediction) |
| A Review of Research on Building Energy Consumption Prediction Models Based on Artificial Neural Networks | [A Review of Research on Building Energy Consumption Prediction Models Based on Artificial Neural Networks](https://www.mdpi.com/2071-1050/16/17/7805) | Type of building, heat load, cool load, energy consumption etc | Artificial Neural Networks | Not Available |
| Building energy consumption prediction using deep learning | [Building\_energy\_consumption\_prediction\_using\_deep\_learning.pdf](https://uhra.herts.ac.uk/bitstream/handle/2299/25787/Building_energy_consumption_prediction_using_deep_learning.pdf?sequence=1) | Temperature, Wind speed, Pressure, Floor, Area, no of Windows, Energy Consumption etc | ANN, SVM, and DT | Not Available |
| Univariate Energy Consumption Forecasting in Smart Buildings using RNN & LSTM | [Univariate Energy Consumption Forecasting in Smart Buildings using RNN & LSTM | IEEE Conference Publication | IEEE Xplore](https://ieeexplore.ieee.org/document/10868169) | Temperature, Wind speed, Pressure, Floor, Area, no of Windows, Energy Consumption etc | Simple recurrent neural network (RNN) and long short-term memory network (LSTM) model | Not Available |
| **Intelligent deep learning techniques for energy consumption forecasting in smart buildings** | [Intelligent deep learning techniques for energy consumption forecasting in smart buildings: a review | Artificial Intelligence Review](https://link.springer.com/article/10.1007/s10462-023-10660-8) | data from smart meters and temperature, humidity, wind speed, and wind speed precipitation | Simple recurrent neural network (RNN) and long short-term memory network (LSTM) model | Not Available |

**Table 3 :** Solar Energy Forecasting using advanced Machine Learning techniques.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Title** | **Link to the Paper** | **Understanding of the Dataset** | **Understanding the Methodology Used** | **Dataset Link** |
| Analysis Of Solar Power Generation Forecasting Using Machine Learning Techniques | [(PDF) Analysis Of Solar Power Generation Forecasting Using Machine Learning Techniques](https://www.researchgate.net/publication/355120881_Analysis_Of_Solar_Power_Generation_Forecasting_Using_Machine_Learning_Techniques) | Hourly weather parameter values and power output | Regression techniques- SVM Random Forest and Linear regression | Not Available |
| SOLAR ENERGY FORECASTING USING MACHINE LEARNING | [JETIR2108426.pdf](https://www.jetir.org/papers/JETIR2108426.pdf) | Visibility ; Temperature ; Dew Point ; Relative Humidity ; Wind Speed ; Station Pressure ; Altimeter | A tensorflow sequential model algorithm is used to predict solar energy forecasting | Not Available |
| Short term forecasting of solar radiation and power output | [Short term forecasting of solar radiation and power output of 89.6kWp solar PV power plant - ScienceDirect](https://www.sciencedirect.com/science/article/abs/pii/S2214785320363215) | Weather data as features & and power output as labels. | The persistence model is used as the basic reference model | Not Available |
| A Comprehensive Review on Ensemble Solar Power Forecasting Algorithms | [A Comprehensive Review on Ensemble Solar Power Forecasting Algorithms | Journal of Electrical Engineering & Technology](https://link.springer.com/article/10.1007/s42835-023-01378-2) | Weather data as features & and power output as labels. | Solar irradiance forecasting using ensemble models including competitive and cooperative forecasting methods | Not Available |
| Forecasting rooftop photovoltaic solar power using machine learning techniques | [Forecasting rooftop photovoltaic solar power using machine learning techniques - ScienceDirect](https://www.sciencedirect.com/science/article/pii/S2352484725001490) | Dataset from Commercial building and weather data | ET and Ranndom Forest, along with two promising ML algorithms, KNN and xGBoost. | Not Available |