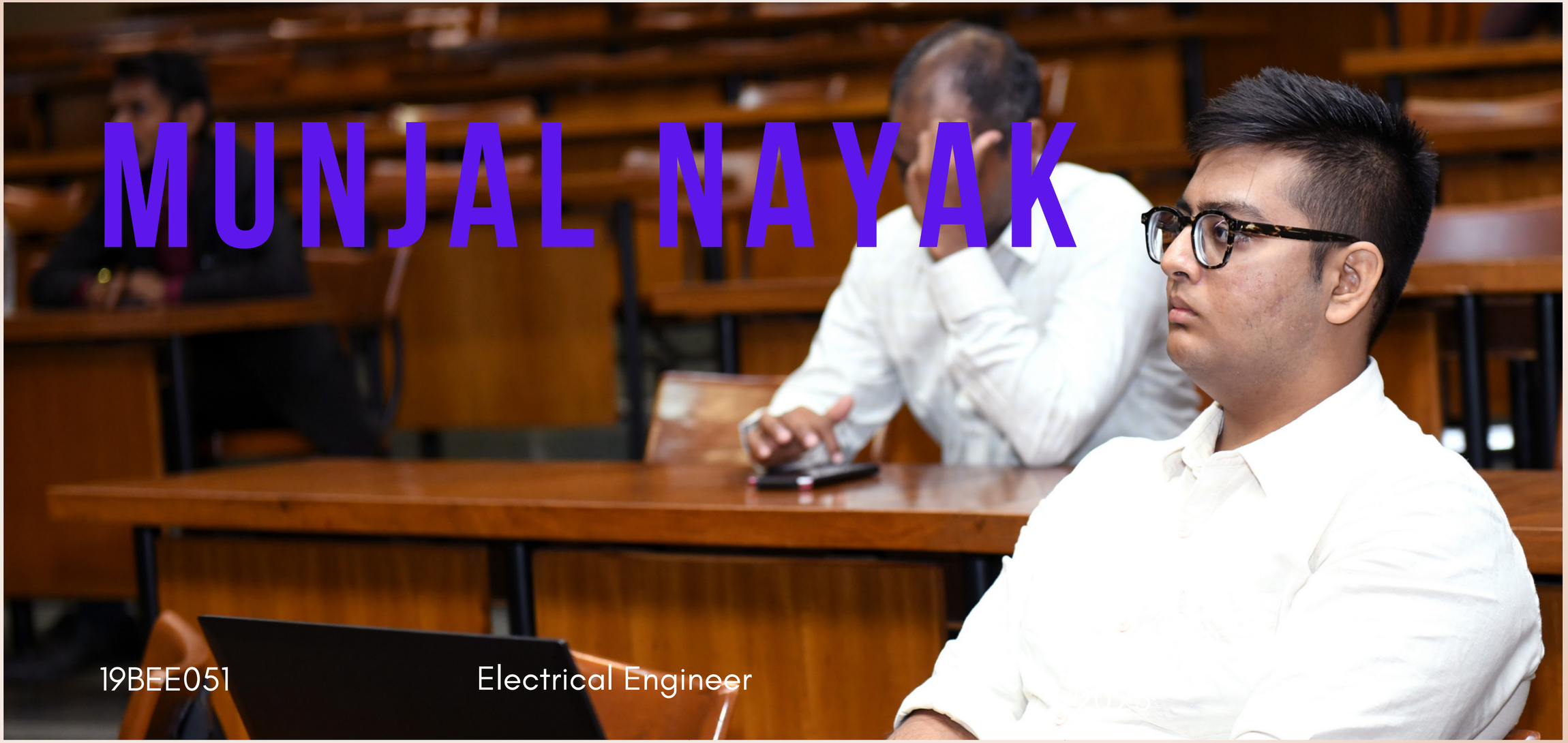
MUNJAL NAYAK



19BEE051

Electrical Engineer

Ph. No. +91 8200883976

Mail Id: munjal@outlook.in

About Me

An enthusiastic, adaptive, and fast-learning person with a broad and acute interest in Electric vehicles, Power converters, and Embedded systems, I particularly enjoy collaborating with teams from different disciplines to develop new skills and solve new challenges.

I like playing tennies, cricket, badminton, carom also fluent in Keyboard, Guitar and Flute.

munjal.ml

www.linkedin.com/in/munjalnayak

1
Intership @ Circuitronix PCB
This Internship was part of the curriculum activity and Learnt about PCB designing and Manufacturing of double-sided PCBs of various material

2
Research Paper
Presented paper on "Predicting performance parameter of polycrystalline PV panels using various gradient based algorithms" at ICSECT-2022

3
Hands'on Experience
STM32, ESP32, Raspberry pi, Arduino microcontrollers.

4
Skills
Matlab, Python, Embedded C, LaTex, PCB Design, PSIM.

5
Certification
Introduction to neural networks and deep learning .
Internet of things, Pantech elearning.
Electric Vehicle Design in Simulink.

PANDIT DEENDAYAL ENERGY UNIVERSITY

Formerly known as

PANDIT DEENDAYAL PETROLEUM UNIVERSITY

Raisan, Gandhinagar – 382 007, Gujarat, INDIA
Fax : +91.79.2327.5030 Website : www.pdpu.ac.in

Recognized by the University Grants Commission u/s 2(f)
NAAC Accrediated 'A' Grade (CGPA 3.39 out of 4.00)

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Mr. Munjal J Nayak** bearing roll no. **19BEE051** has completed an internship with Pandit Deendayal Energy University as an intern in the Electrical Engineering Department from 15 May 2022 to 21 July 2022.

He has worked on Machine Learning And Evolutionary Algorithms Applications in Electrical Engineering under the guidance of Dr. Vipin Shukla. During the internship, he has gained several learning such as Supervised Learning, Unsupervised Learning, Reinforcement Learning, Linear Regression, Gaussian Process Regression, Support Vector Machine (SVM) Regression, and Neural Networks.

Besides showing high comprehension capacity, managing assignments with the utmost expertise, and exhibiting maximal efficiency. He has maintained an outstanding professional demeanour and showcased moral character throughout the internship. He has also written a research paper on "Predicting Performance Parameters of Polycrystalline Solar Panels using Different Training Algorithms" utilising the skill set acquired during the internship and presented the same at the International Conference on Sustainable Energy and Clean Technologies held at PDEU during Sep 2-4, 2022.

I hereby certify his work as excellent to the best of my knowledge.

I wish him the best of luck in his future endeavours.

Thank you.
Sincerely,

SCHOOL OF TECHNOLOGY PDPU

Dr. Vipin Shukla
Assistant Professor - Department of Electrical Engineering
School of Technology
Mobile: +91 9427963637
Email id: Vipin.Shukla@pdpu.ac.in

BENCHMARK®
Benchmark Agencies Pvt. Ltd.

CERTIFICATE
TO WHOM IT MAY CONCERN

Date: 01/05/2022

This letter is to certify that Mr. Munjal Nayak has worked in our organization as Research Engineer. He had started working here on 01/01/2022 and worked till 01/03/2022. He had served three months in our organization. He had been very responsible from the date he had joined.

He had enriched himself with lots of skills and work experiences to date. Apart from his love and devotion he had also been a very good and kind man and always maintained a good relationship with everyone. We are really glad to have such a generous personality among us. We wish him every success in life.

Tarang Mehta
Managing Director

Regd. Office : 1017-18, Sakar IX, Nr. Old RBI Bank, Ashram Road, Ahmedabad.-380 009, Gujarat, INDIA. +91 79 48 95 3001
Sales Office : Basement, 'Shantam' Nr. Havmor, Navrangpura, Ahmedabad-380 009, Gujarat, INDIA, +91 79 26 40 9007
e-mail : sales@benchmarkagencies.com • www.benchmarkagencies.com
GSTIN/UIN: 24AACCB3832C1ZB • CIN: U51109GJ2004PTC44025

CIRCUITRONIX
Manufacturer of Printed Circuit Board (PCB)

Ref: CX/2021-22/008

Dt. 28/06/2021

INDUSTRIAL TRAINING CERTIFICATE

This is to certify that **Mr. Munjal Nayak** , Roll No. 19BEE05, Studying in 4th Semester of Electrical Engineering (in School of Technology, Pandit Deendayal Energy University, Gandhinagar) went through the **Industrial Training** in our plant & under my guidance from Dt.21/06/2021 to 28/06/2021 (7 working days)

He took the training in following .

1. Basic understanding of Printed Circuit Board (PCB) & it's application.
2. Step by Step PCB Manufacturing Processes (Single & Double Layer).
3. PCB Design and validation (CAD-CAM Process)
4. CNC and Testing Machine Operating .
5. Process Improvement & rejection control.

He is hard working person & eager to learn various processes & activities
We wish him for his bright future ahead.

For CIRCUITRONIX

(Jagdish Namera)
Founder & CEO

CIRCUITRONIX GANDHINAGAR

Works & Head office :
Plot No.B-65, GIDC, Electronic Estate, Sector -25, Gandhinagar - 382025. Gujarat. Tel.: +91-79-29289049
E-mail : info@circuitronix.in, Website : www.circuitronix.in

Elite

NPTEL Online Certification

(Funded by the MoE, Govt. of India)

This certificate is awarded to

MUNJAL J NAYAK

for successfully completing the course

Understanding Incubation and Entrepreneurship

with a consolidated score of **60** %

Online Assignments	21.85/25	Proctored Exam	37.74/75

Total number of candidates certified in this course: **341**

Jan-Apr 2022
(12 week course)

Prof. Sridhar Iyer
Head CDEEP & NPTEL Coordinator
IIT Bombay

Indian Institute of Technology Bombay

FREE ONLINE EDUCATION swayam

Roll No:NPTEL22DE08S23040541

To validate and check scores: https://nptel.ac.in/noc

Pantech e Learning
DIGITAL LEARNING SIMPLIFIED

CERTIFICATE OF INTERNSHIP

Skill AP APSSDC

THIS IS TO CERTIFY THAT

munjal nayak

has successfully completed 30 DAYS INTERNET OF THINGS MASTERCLASS
Organized by ANDHRAPRADESH STATE SKILL DEVELOPEMENT CORPORATION
in Association with PANTECH E LEARNING PVT LTD, CHENNAI

DATE: 07/01/2022

M.Malayappan
Director
Pantech e Learning

Dr.Ravi Gujjala
Chief General Manager (Technical)
APSSDC

Prof.Rama Koti Reddy
Executive Director
APSSDC

N.Bangara Raju
Managing Director
APSSDC

Certificate of Completion

Munjal Nayak

has completed

Signal Analyzer Fundamentals - What the RF (EB)

offered by

Keysight Technologies

Issued: July 16, 2020
Certificate No: wvaxty9fnmrs
View: https://verify.skilljar.com/c/wvaxty9fnmrs

KEYSIGHT TECHNOLOGIES

Certificate of Completion

Munjal Nayak

has completed

Essential RF Power Measurements (EB)

offered by

Keysight Technologies

Issued: July 16, 2020
Certificate No: gwq4zhdsw2ht
View: https://verify.skilljar.com/c/gwq4zhdsw2ht

KEYSIGHT TECHNOLOGIES

Predicting Performance Parameters of Polycrystalline Solar Panels using Different Training Algorithms

1st Munjal Nayak
Department of Electrical Engineering,School of Technology
*P*andit Deendayal Energy University
Gandhinagar, India
munjal.nee19@sot.pdpu.ac.in

2nd Vipin Shukla
Department of Electrical Engineering,School of Technology
*P*andit Deendayal Energy University
Gandhinagar, India
vipin.shukla@pdpu.ac.in

3rd Amit Sant
Department of Electrical Engineering,School of Technology
*P*andit Deendayal Energy University
Gandhinagar, India
amit.sant@sot.pdpu.ac

4th Praghnesh Bhatt
Department of Electrical Engineering,School of Technology
*P*andit Deendayal Energy University
Gandhinagar, India
praghnesh.bhatt@sot.pdpu.ac.in

5th Siddharth Joshi
Department of Electrical Engineering,School of Technology
*P*andit Deendayal Energy University
Gandhinagar, India
siddharth.joshi@sot.pdpu.ac.in

***Abstract*—With the focus on sustainable development, grid-connected photovoltaic (PV) systems are increasingly being employed. The performance evaluations of these grid-connected PV plants can aid plant operators and the scientific community in the design, operation, and maintenance of plants for a more efficient and reliable system. Typically, standard statistical procedures are applied for performance evaluations. With the recent advancements in artificial intelligence, artificial neural network (ANN) based approaches are promising for forecasting and monitoring the performance of various PV systems. This work investigates the ANN-based model for estimating polycrystalline PV module technology's short-term performance in tropical environments at Raysan, Gujarat. The proposed model, trained with Levenberg-Marquardt (LM), Bayesian Regularization (BR), Resilient Backpropagation (RBP), Conjugate Gradient with Powell/Beale Restarts (CGP), Gradient Descent (GD), accurately predicts the performance metrics such as final yield (YF), reference yield (YR), power produced/day (PD), performance ratio (PR), and total energy loss (ET) with a 98 percent degree of accuracy. Predicting solar power generation has been an important topic in renewable energy. Prediction improves the planning and operation of photovoltaic systems and yields many economic advantages for electric utilities.**

***Index Terms*—PV module, artificial neural network (ANN), final yield, performance ratio, total energy loss**

I. Introduction

Solar energy is free and abundantly available across most parts of India, barring a few days of rain. Solar energy-based electric power generation has the merits of zero carbon emissions, freedom from fossil fuels, and non-hazardous operation. Moreover, this technology promotes energy access, rural electrification, and India's low-carbon growth [1]. India presented its Intended Nationally Determined Contribution (INDC) to the UNFCCC before COP 21, detailing the nation's post-2020 climate plans. India's INDC has the objective to build 175 gigawatts (GW) of renewable electricity capacity by 2022. Furthermore, it is planned to have a 40 percent share of non-fossil-based installed power capacity by 2030 [2]. Additionally, by increasing the installed solar plant capacity, the INDC pledges to lower the intensity of India's greenhouse gas (GHG) emissions per unit of GDP by 33 to 35 percent below the ones prevalent in 2005. Therefore, the performance evolution of the established PV systems is essential for assessing their capacity, setting the incentives, and collecting reliable forecasts of solar energy and plant output for feasibility analyses and future investments in the clean energy industry.

Several researchers have used machine learning (ML)/deep learning (DL) algorithms to predict PV systems' energy output and performance. Mohana et al. [3] have developed an optimum artificial intelligence (AI) based method for predicting the generated power. The performance of different ML algorithms based on their testing is evaluated. Quansah et al. [4] have developed statistical methodologies for evaluating the performance of "five-sun" PV systems using five distinct solar cell technologies, namely polycrystalline, mono-crystalline, and Copper Indium Disulfide thin-film, Amorphous Silicon, and Heterojunction incorporating thin film.

Using support vector machine techniques to predict and analyze the effect of temperature and voltage on inverter efficiency.

1stMunjal Nayak
Department of Electrical Engineering,School of Technology
Pandit Deendayal Energy University
Gandhinagar, India
munjal.nee19@sot.pdpu.ac.in

2ndVipin Shukla
Department of Electrical Engineering,School of Technology
Pandit Deendayal Energy University
Gandhinagar, India
vipin.shukla@pdpu.ac.in

3rd Hitarthi Pandya
Department of Electrical Engineering,School of Technology
Pandit Deendayal Energy University
Gandhinagar, India
Hitarthi.pee19@sot.pdpu.ac.in

***Abstract*—The Inverter is an integral part of any Photovoltaic (PV) system. A malfunctioning inverter could limit power generation; an inverter consists of several high-power electronic switches, and if one fails, it overloads the remaining switches and reduces efficiency. Predicting the inverter's efficiency at an early stage helps prevent losses due to inverter failure. Prediction with a high degree of accuracy helps estimate actual power generation. Five factors affect an inverter's efficiency, including temperature and voltage levels. In this study, Support Vector Regression (SVR) is used to analyze the impact of temperature and voltage on the efficiency of the inverter. Pearson's correlation matrix is used for Feature Selection. The Kernel functions, including linear, quadratic, cubic, and Gaussian functions, are used to assess the model's performance. The quadratic kernel function has performed best with an R2 value of 0.99 and an RMSE of 0.047536. This short-term analysis will help solar plant operators rectify faults at an early stage, maintain the plant with high efficiency, and reduce generation losses due to inverter.**

***Index Terms*—Power Inverter, Efficiency, Photovoltaic, Semiconductor switches**

I. Introduction

The photovoltaic industry is developing rapidly as a critical driver in the Electric power sector. Therefore, India announces that it aims to reach net-zero emissions by 2070 and meet fifty percent of its electricity requirements from renewable energy. The year 2030 is a hugely significant moment for the global fight against climate change. India is pioneering a new economic development model that could avoid the carbon-intensive approaches that many countries have pursued in the past – and provide a blueprint for other developing economies. India's sheer size and huge scope for growth mean that its energy demand is set to grow more than any other country in the coming decades. In a pathway to net zero emissions by 2070, we estimate that most of the growth in energy demand this decade would already have to be met with low-carbon energy sources. It, therefore, makes sense that the Government of India (GOI) has announced more ambitious targets for 2030, including installing 500GW of renewable energy capacity, reducing the emissions intensity of its economy by 45%, and reducing a billion tons of CO2. [1]. Inverters, the critical factor in designing the PV system, play a vital role in determining the system's overall efficiency. The efficiency of the inverter is of utmost significance considering monetary aspects, including the cost of installation and return on investment accounting for the fact that for every 1% difference in the efficiency, the inverter cost varies by approximately 10% [2]. Therefore, it is essential to analyze the factors like temperature, irradiance, voltage, and input power that affect inverter efficiency.

In 2019, conversion efficiency for cutting-edge solar converters exceeded 98 percent. String inverters are used in residential to medium-sized commercial PV systems, whereas central inverters are used in large commercial and utility-scale PV systems. The market share of central and string inverters is approximately 36% and 61%, respectively, leaving less than 2% for micro-inverters. [3]

Solar inverters use maximum power point tracking (MPPT) to extract the most power from the PV array. The intricate interaction between solar radiation, temperature, and total resistance in solar cells results in a nonlinear output efficiency in the I-V curve. The MPPT system aims to sample the cells' output and figure out a resistance (load) to get the most power possible under any given environmental conditions. [4]

A case study conducted by N. Ketjoy et al. [5] analyzed the impact of 3 different factors - duration of operations, power input, and irradiance distribution on the efficiency of inverters connected to the grid in the lower northern region