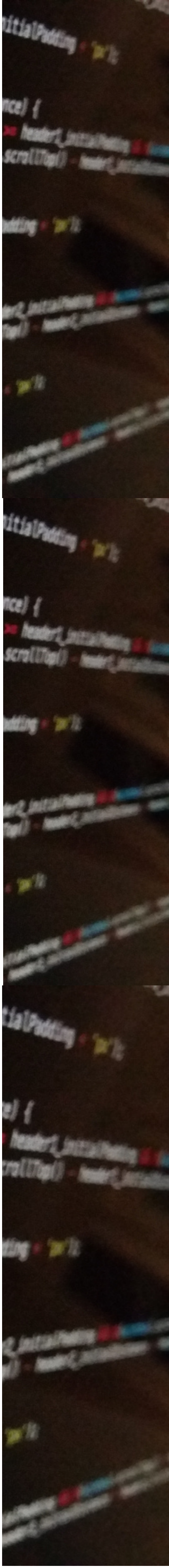
جامعة عفت
EFFAT UNIVERSITY

PROJECT REPORT

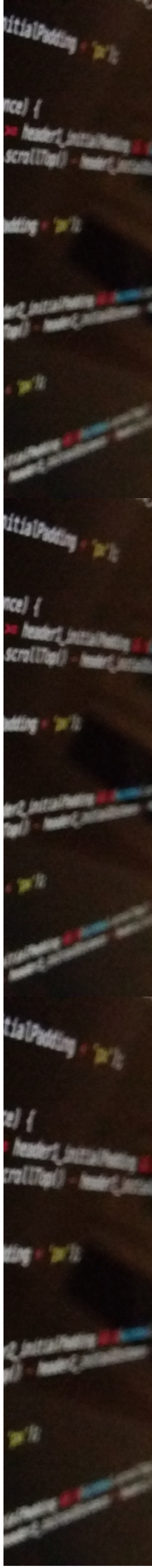
DONE BY: EISSA MUKHTAR - ALHASSAN ALSAGGAF - ABDULLAH MUTAHAR

PROJECT OF 2023



SUPERVISION OF DOCTOR NARJISSE KABBAJ

CONTENT :

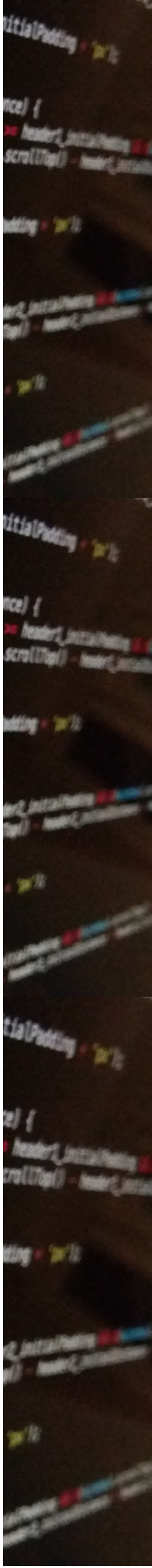


RESEARCH BRIEF

This project provides a tool for analyzing the performance of a solar cell by calculating and plotting the current-voltage (IV) curve based on temperature, irradiance, and other parameters. The program uses the Newton-Raphson method to find the root of a function and generates the IV curve using the gnuplot library. The user can input the time and AM/PM to obtain the temperature and irradiance data from a CSV file. This project is a valuable resource for researchers and engineers working in the field of photovoltaic systems. It offers an interactive interface and a reliable method for analyzing solar cell performance under various environmental conditions

INTRODUCTION

This C++ program calculates the current-voltage (IV) curve of a solar cell at a given temperature and irradiance level, using the Newton-Raphson method. The program reads temperature and irradiance values from a CSV file and plots the IV curve using the Gnuplot library.



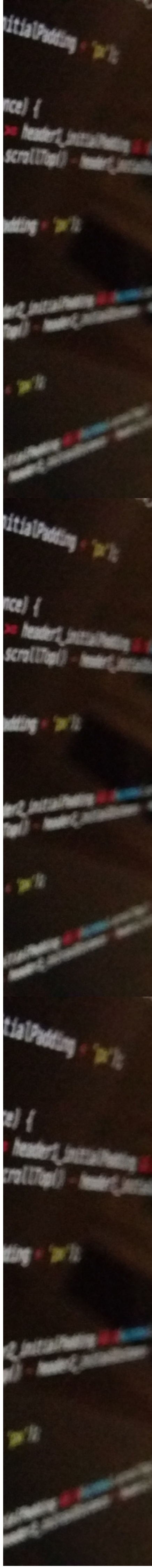
METHODOLOGY AND DESIGN

This project provides a tool for analyzing the performance of a solar cell by calculating and plotting the current-voltage (IV) curve based on temperature, irradiance, and other parameters. The program uses the Newton-Raphson method to find the root of a function and generates the IV curve using the gnuplot library. The user can input the time and AM/PM to obtain the temperature and irradiance data from a CSV file. This project is a valuable resource for researchers and engineers working in the field of photovoltaic systems. It offers an interactive interface and a reliable method for analyzing solar cell performance under various environmental conditions

```
// Newton-Raphson method to find the root of a function
double newton_raphson(double I0, double I_ph, double VNEW, double
    double I_new = 3.8;
    double I_old;
    double epsilon = 1e-5;
    int max_iter = 100;
    int iter = 0;

    double f, df;
    do {
        f = I_new - I_ph + (I0 * (exp ( q * ( VNEW+ (I_new *(Rs))
        df = 1 +  (I0*((( q * Rs)/(n*k*temperature*Ns)) * (exp ((
        I_old = I_new;
        I_new = I_new - f / df;
        iter++;
    } while (abs(I_new - I_old) > epsilon && iter < max_iter);

    return I_new;
}
```



CALCULATION AND OUTPUT

We will Gather solar cell parameters from the datasheet like Isc,
Voc, Rs, Rsh, etc. These are needed to calculate the IV curve.
Then we will implement the single diode model using the Newton-
Raphson method to solve the implicit equation. This will give you the IV
curve for a given irradiance and temperature.
Afterwards we will read the irradiance and temperature data from a CSV
file for different times of the day.
For each time point, calculate the IV curve using the single diode model.
Plot the IV curves for each time point on a graph using Gnuplot. This will
show how the curve changes with irradiance and temperature over the

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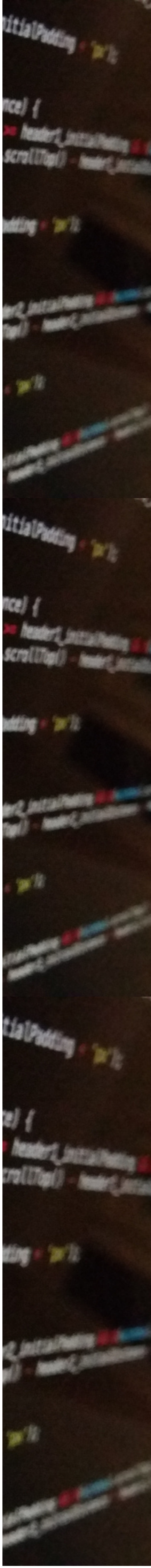
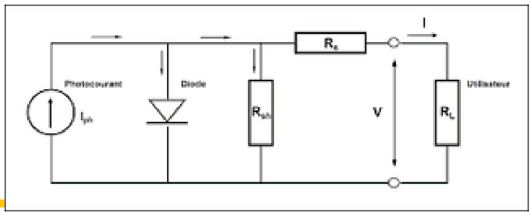


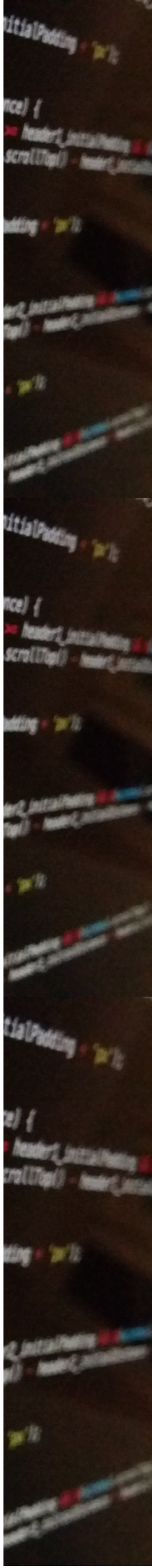
PROJECT DESCRIPTION

This project provides a tool for analyzing the performance of a solar cell by calculating and plotting the current-voltage (IV) curve based on temperature, irradiance, and other parameters. The program uses the Newton-Raphson method to find the root of a function and generates the IV curve using the gnuplot library. The user can input the time and AM/PM to obtain the temperature and irradiance data from a CSV file. This project is a valuable resource for researchers and engineers working in the field of photovoltaic systems. It offers an interactive interface and a reliable method for analyzing solar cell performance under various environmental conditions



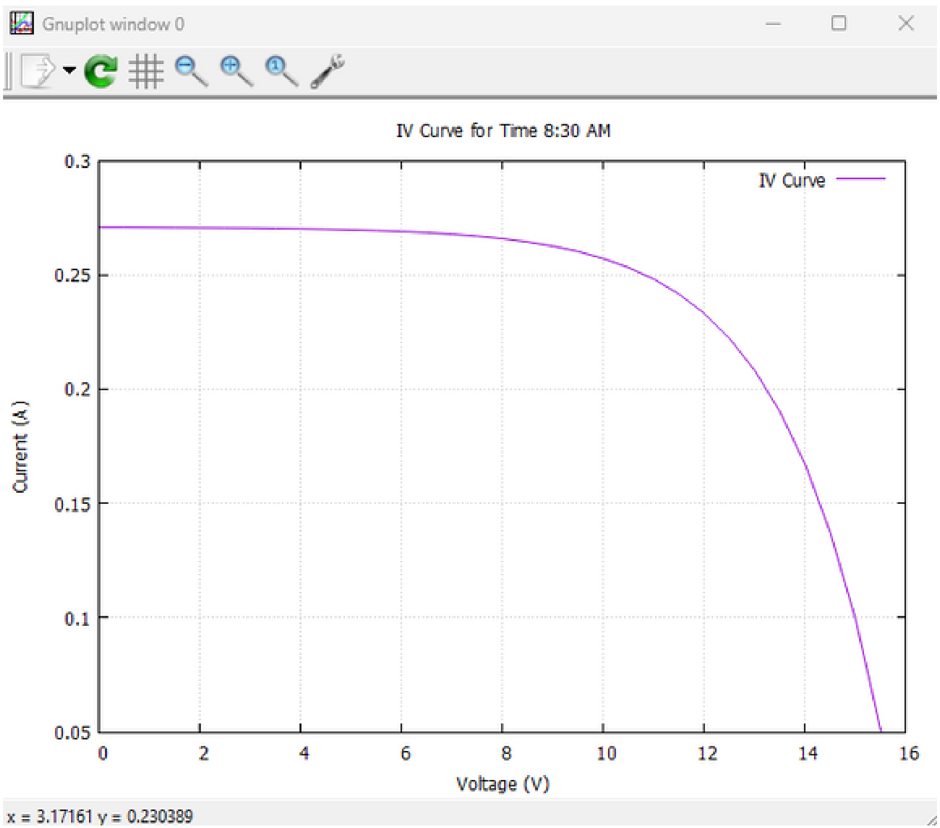
PROJECT GOAL?

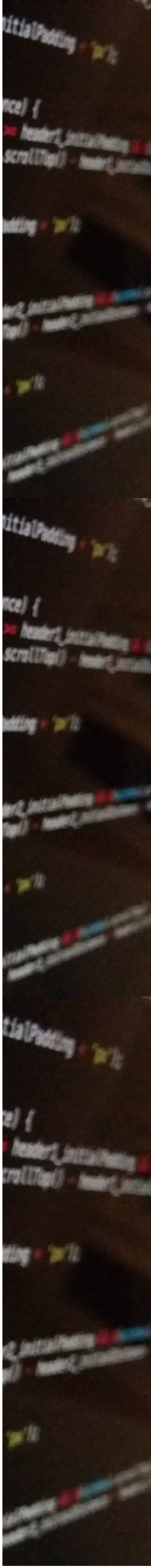
The aim of this project is to develop a comprehensive software tool that can accurately calculate the current-voltage (IV) curve of a solar cell under different environmental conditions. The software will read
temperature and irradiance data from a CSV file and use the Newton-Raphson method to solve the complex equation



IV CURVE OUTPUT

This project provides a tool for analyzing the performance of a solar cell by calculating and plotting the current-voltage (IV) curve based on temperature, irradiance, and other parameters. The program uses the Newton-Raphson method to find the root of a function and generates the IV curve using the gnuplot library. The user can input the time and AM/PM to obtain the temperature and irradiance data from a CSV file. This project is a valuable resource for researchers and engineers working in the field of photovoltaic systems. It offers an interactive interface and a reliable method for analyzing solar cell performance under various environmental conditions

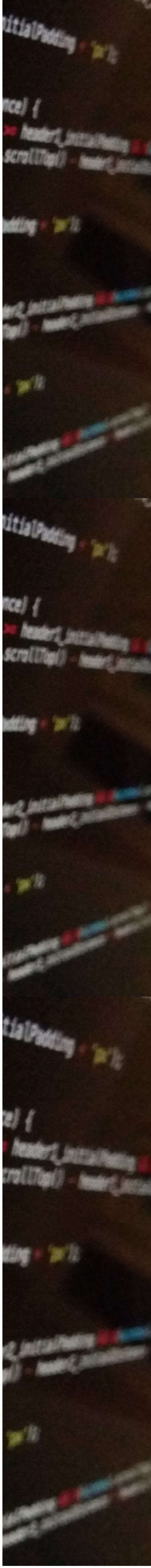




SIGNIFICANT FINDINGS

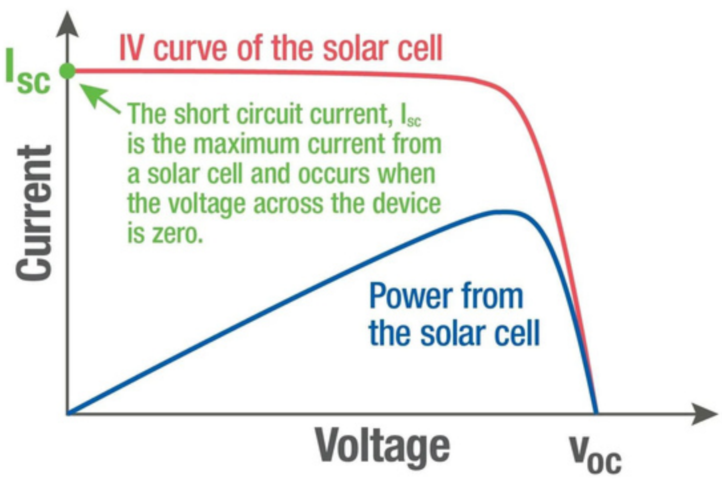
By analyzing IV curves over different irradiance and temperature conditions, we can determine the overall performance and efficiency of the solar cell. The shape of the IV curve also shows if the cell is limited by resistive or diode effects.

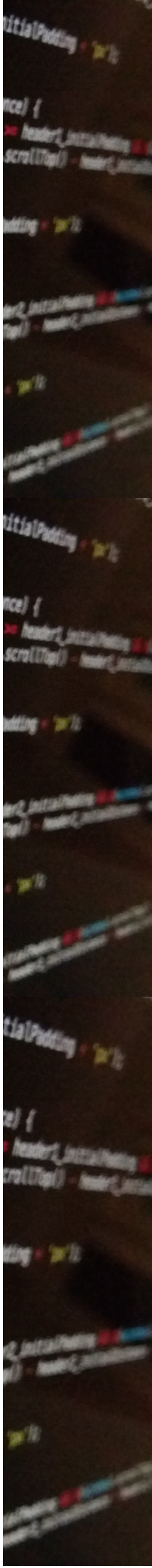
In summary, this code provides a useful tool for characterizing and analyzing the performance of a solar cell under real-world operating conditions by plotting its IV curve. The key solar cell parameters derived from the IV curve give insight into how much power can be generated



CONCLUSION

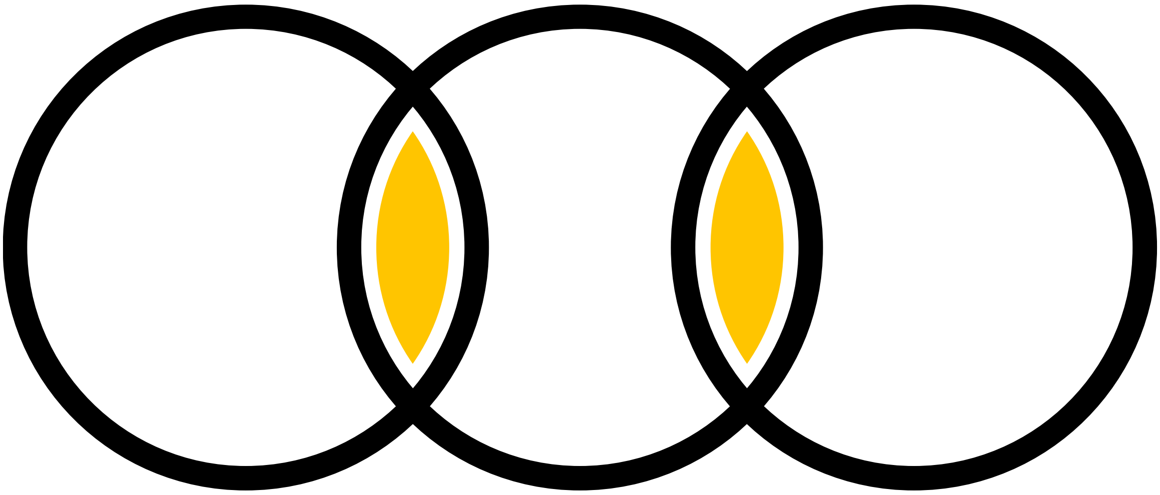
The code successfully models the I-V curve of a solar cell under different environmental conditions such as irradiance and temperature. By analyzing the I-V curve, we can determine the solar cell's performance, efficiency, and power output. This information can be useful in designing and optimizing photovoltaic systems for various applications. However we can enhance the code to calculate additional performance parameters like fill factor, maximum power point (MPP), and solar cell efficiency. Implement a method to interpolate the input data for a more accurate representation of the I-V curve





CODE DISTRIBUTION

this 3d sketch shows the team work



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EISSA	HASSAN	ABDULLAH

OUR FLOWCHART QR CODE!

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