

ABSTRACT

The main aim of the project is to predict the future temperature in a particular area, specially closed industrial area, using a temperature sensor connected to an Internet-of-Things device, here Arduino Uno.

The sensor fetches the data continuously and sends the data using serial connection and PySerial, to a python program. The program has log-in options as well as a database to store the manager and details of the company. Now using the fetched data and using Algorithms such as ARIMA (Auto Regressive Integrated Moving Average) for machine learning, the program will be able to predict the temperature to the near-future.

This prediction helps in early warning detection systems in case of industries where the main application of the process is concentrated on. The prediction is stored in a database and is again compared with the predicted result to further improve the result.

Whenever there's a breakdown or error in machinery, there can be minute early warning signs that can be too difficult for a normal human to notice. This project helps us to check for it and to help us take preventive measures before a catastrophic failure using the temperature datum.

PROBLEM STATEMENT

There are many industries in the world, which have machines whose operations are crucial and every single second of its performance count. In such a scenario catastrophic failure or non-optimum performance of the machine can result in huge amount of losses in the economy as well as many sectors depending on the system.

These failures can be anything from core of the Nuclear power plant going into a meltdown state or a processor manufacturing device not in a optimum state or a bioreactor not having the correct environmental factors that they need to continue their operation.

The failures of the machines, can be attributed to many causes which point towards both natural and man-made errors.

SOLUTION IMPLEMENTED

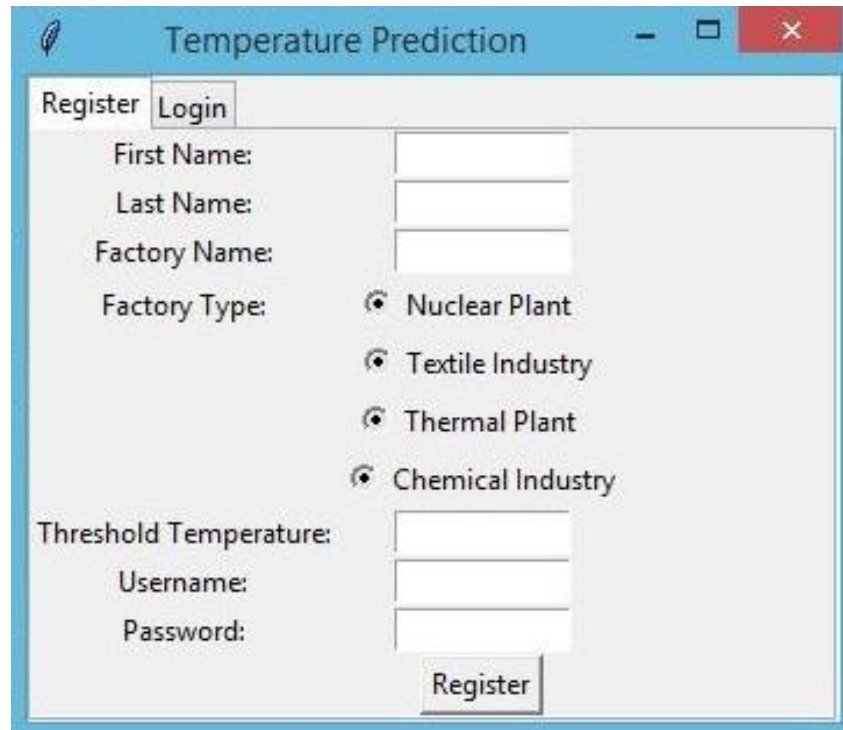
For most of the time, before a machine failure or decrease in performance occurs there are few minute signs that can be analysed to predict the outcome. Our model takes this statement at it's core and implement a python program using machine learning algorithm, ARIMA – Auto Regressive Integrated Moving Average to predict the future data.

We have used the temperature data from the closed machine environment as a factor for prediction. The temperature values are obtained by a temperature sensor connected to an Arduino Uno, which then passes the data serially to the python program. The program then analyses the data and predict the future values.

The program also has a database management, for storing information about the user as well as the industry. The database also stores login credentials and the threshold temperature value which if predicted to be reached will create a warning.

INPUT/OUTPUT SCREENSHOTS:

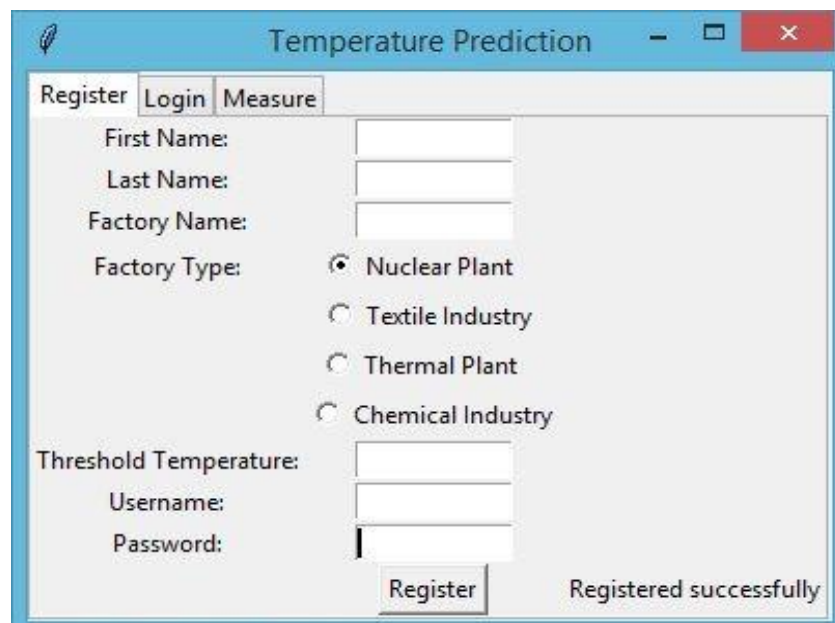
Registration Page:



The screenshot shows a window titled "Temperature Prediction" with a blue header bar. Below the header, there are two tabs: "Register" (selected) and "Login". The form contains the following fields and options:

- First Name:
- Last Name:
- Factory Name:
- Factory Type:
 - ☒ Nuclear Plant
 - ☐ Textile Industry
 - ☐ Thermal Plant
 - ☐ Chemical Industry
- Threshold Temperature:
- Username:
- Password:
-

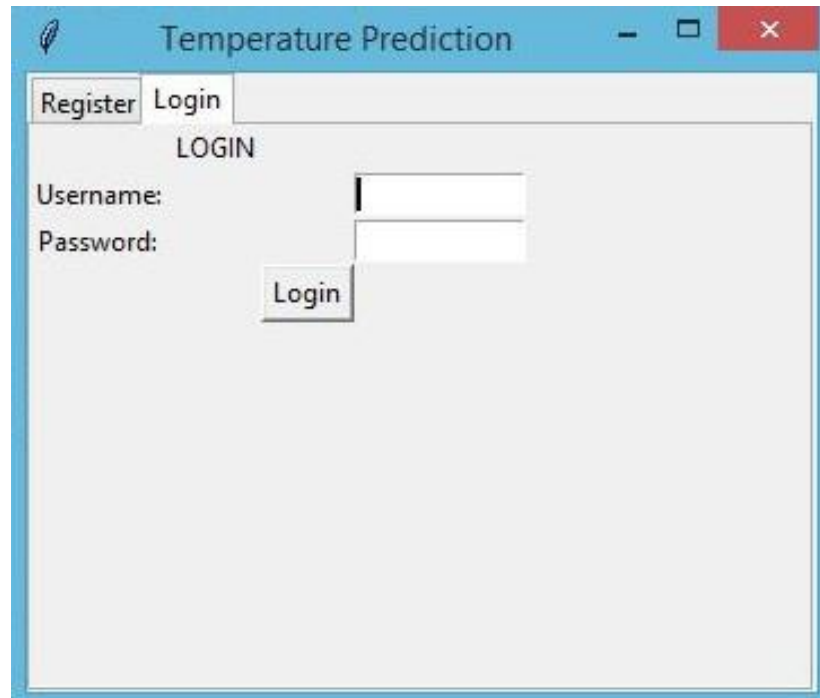
Successful Registration:



The screenshot shows the same "Temperature Prediction" window, but now with three tabs: "Register", "Login", and "Measure". The "Register" tab is still selected. The form fields are the same as in the previous screenshot, but the "Register" button is now disabled. A message "Registered successfully" is displayed at the bottom right of the form area.

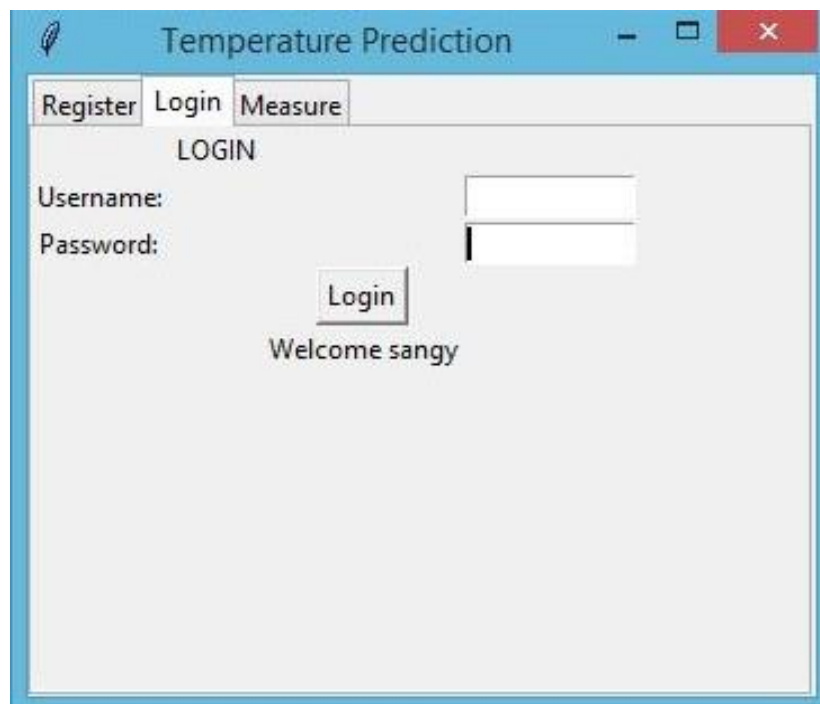
Registered successfully

Login Credentials:



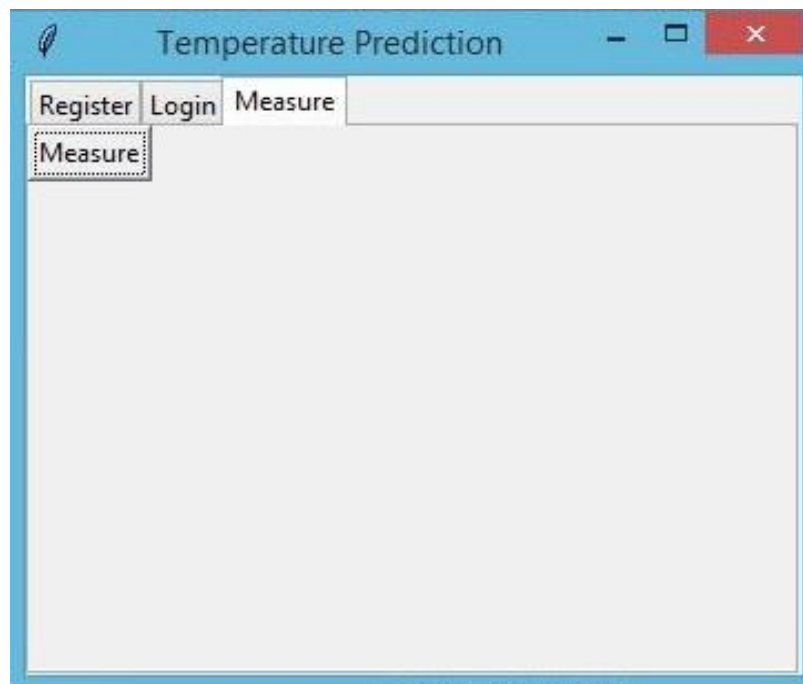
The image shows a window titled "Temperature Prediction" with a blue title bar. Inside the window, there are two tabs: "Register" and "Login". The "Login" tab is selected. Below the tabs, the word "LOGIN" is displayed. There are two input fields: "Username:" and "Password:". The "Username:" field has a cursor in it. Below the "Password:" field, there is a "Login" button.

Successful Login:

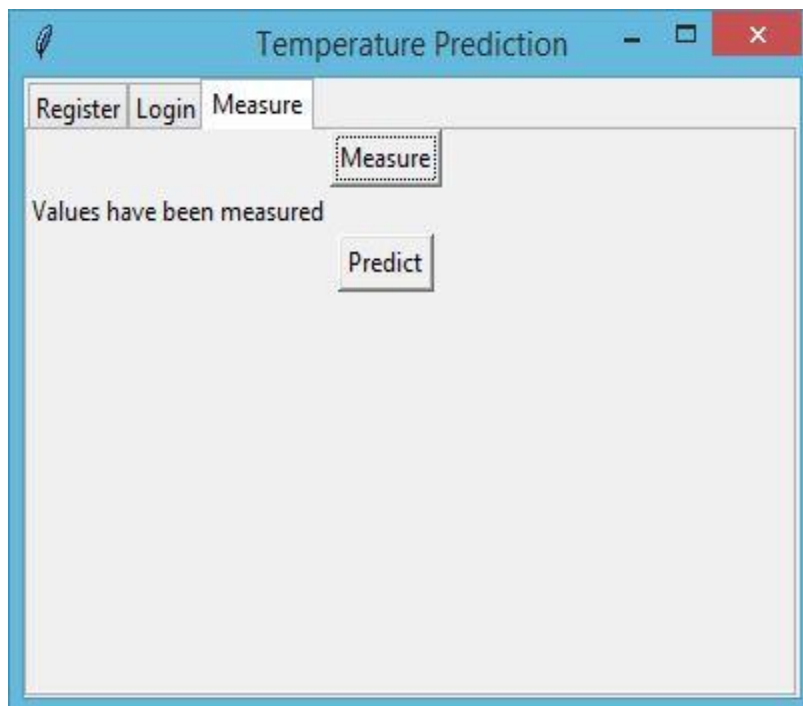


The image shows the same "Temperature Prediction" window, but now the "Measure" tab is selected. The "Login" tab is still visible. Below the tabs, the word "LOGIN" is displayed. There are two input fields: "Username:" and "Password:". The "Password:" field has a cursor in it. Below the "Password:" field, there is a "Login" button. Below the "Login" button, the text "Welcome sangy" is displayed.

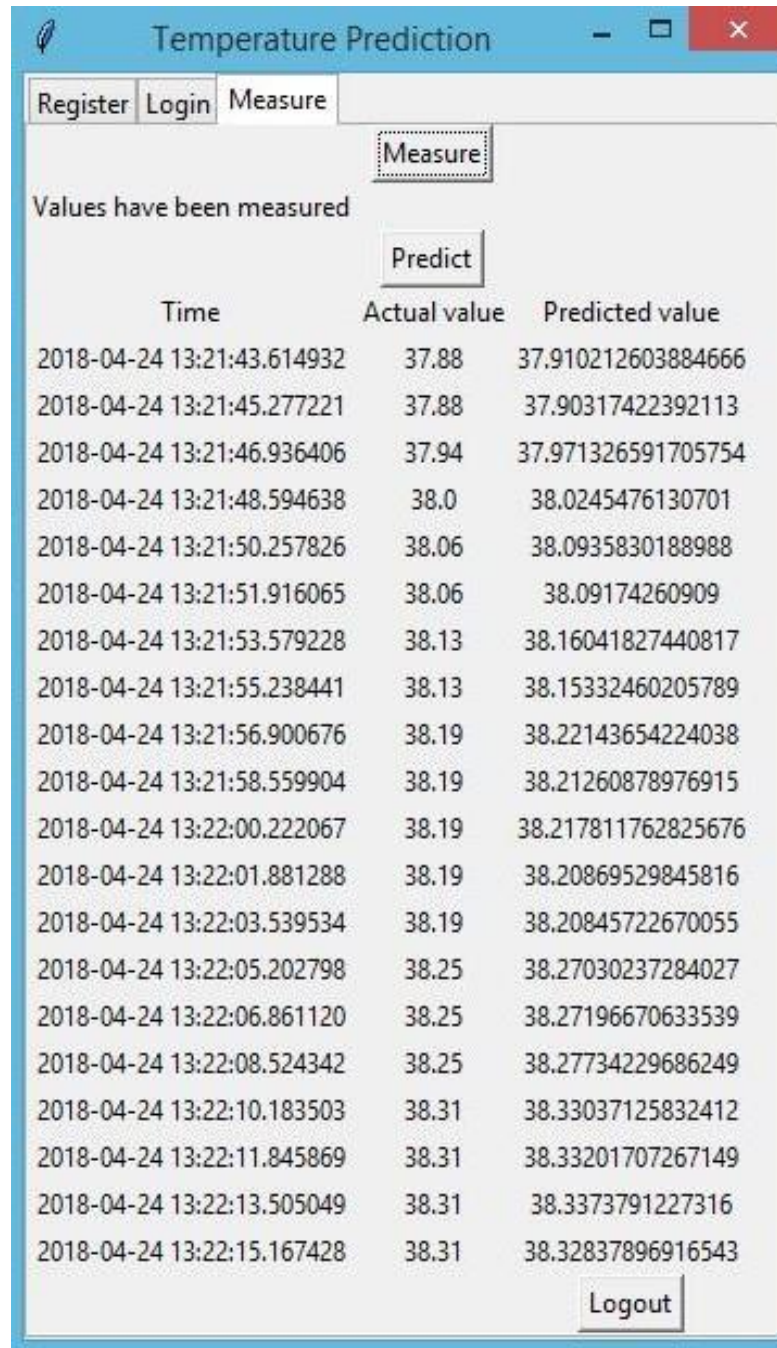
Measure Tab:



After Fetching 100 Values:



Predicted Values:



The screenshot shows a web application window titled "Temperature Prediction". It has three tabs: "Register", "Login", and "Measure". The "Measure" tab is active, and a "Measure" button is visible. Below the tabs, the text "Values have been measured" is displayed. A "Predict" button is located above the table. The table has three columns: "Time", "Actual value", and "Predicted value". It contains 20 rows of data, all from the date 2018-04-24. The "Actual value" column shows values ranging from 37.88 to 38.31, and the "Predicted value" column shows corresponding long decimal values. A "Logout" button is located at the bottom right of the table area.

Time	Actual value	Predicted value
2018-04-24 13:21:43.614932	37.88	37.910212603884666
2018-04-24 13:21:45.277221	37.88	37.90317422392113
2018-04-24 13:21:46.936406	37.94	37.971326591705754
2018-04-24 13:21:48.594638	38.0	38.0245476130701
2018-04-24 13:21:50.257826	38.06	38.0935830188988
2018-04-24 13:21:51.916065	38.06	38.09174260909
2018-04-24 13:21:53.579228	38.13	38.16041827440817
2018-04-24 13:21:55.238441	38.13	38.15332460205789
2018-04-24 13:21:56.900676	38.19	38.22143654224038
2018-04-24 13:21:58.559904	38.19	38.21260878976915
2018-04-24 13:22:00.222067	38.19	38.217811762825676
2018-04-24 13:22:01.881288	38.19	38.20869529845816
2018-04-24 13:22:03.539534	38.19	38.20845722670055
2018-04-24 13:22:05.202798	38.25	38.27030237284027
2018-04-24 13:22:06.861120	38.25	38.27196670633539
2018-04-24 13:22:08.524342	38.25	38.27734229686249
2018-04-24 13:22:10.183503	38.31	38.33037125832412
2018-04-24 13:22:11.845869	38.31	38.33201707267149
2018-04-24 13:22:13.505049	38.31	38.3373791227316
2018-04-24 13:22:15.167428	38.31	38.32837896916543

CONCLUSION

The project can have various applications in the industrial sector. Also, this project can be further expanded to include further attributes such as sound, fan speed, voltage and current values. Also, the database of the project stores a value called threshold value, which if it is predicted to be attained by the program can send a alarm or warning to the end user, so that necessary actions can be taken pre-emptively.