ARTICLE INFORMATION

Article title

Dataset containing daily power demands and weather metrics for all divisions of Bangladesh

Authors

Mohammad Dardaul Hoque*

Fahim Morshed

Kazi Muktadir Ahmed

Affiliations

Institute of Information Technology, University of Dhaka

Corresponding author's email address

Mohammad Dardaul Hoque (bsse1126@iit.du.ac.bd)

Keywords

Linear regression, Correlation, Data normalisation, Feature selection, Soil Temperature, Cloud Cover,

Wind speed, Humidity, Daytime Length, Rainfall, Mean Temperature, Dewpoint

Abstract

Variations in daily weather of a region affect the amount of power consumed by its population. This dataset maps each day's power demand to 10 daily weather metrics, including - mean temperature, relative humidity, daytime length, wind speed, rainfall etc. for 9 divisions of Bangladesh over a time range of January 1, 2016 to September 30, 2023. Data collection process involved web-scraping and invoking a weather API. The dataset should prove to be handy for analysing Bangladesh's power consumption trends, or just as a source of historical weather data for the region.

SPECIFICATIONS TABLE

Subject	Data Science
Specific subject area	Applied Machine Learning
Data format	Raw Filtered (Some daily records are missing due to them being missing from the primary source)
Type of data	.csv files
Data collection	Data collection is comprised of two parts: 1. Scraping the website of Bangladesh Power Development Board

	2. Using the non-commercial *Historical Weather API* from Open Meteo Web scraping was done using the *cheerio* library (version 1.0.0-rc.12).
Data source location	Data was collected for 9 divisions of Bangladesh. These are: 1. Dhaka (latitude: 23.7104, longitude: 90.4074) 2. Chittagong (latitude: 22.3384, longitude: 91.8317) 3. Khulna (latitude: 22.8098, longitude: 89.5644) 4. Rajshahi (latitude: 24.374, longitude: 88.6011) 5. Comilla (latitude: 23.4619, longitude: 91.185) 6. Mymensingh (latitude: 24.7564, longitude: 90.4065) 7. Sylhet (latitude: 24.899, longitude: 91.872) 8. Barisal (latitude: 22.705, longitude: 90.3701) 9. Rangpur (latitude: 25.7466, longitude: 89.2517) Primary data sources: ● Bangladesh Power Development Board: http://119.40.95.168/bpdb/area_wise_demand ● Open Meteo Historical Weather API: https://open-meteo.com/en/docs/historical-weather-api
Data accessibility	Raw data was deposited at https://data.mendeley.com/ with Reserved DOI: *10.17632/xnybj84hv7.1* Instructions for accessing these data: Please extract *annual-division-wise.zip* to view .csv files Alternate data source: https://github.com/rudrOwO/weather-and-power-analysis

VALUE OF THE DATA

- The dataset can provide insight into how daily variations in weather affect a populations' power consumption. This insight may be further useful for predicting power consumption at a specific time of year.
- The dataset may be useful to government or private entities involved in power generation as well as researchers who need access to historical weather and/or power consumption in Bangladesh.
- The dataset can be reused by 3 types of researchers, namely-
    - Researchers who are interested only in the historical power consumption in Bangladesh.
    - Researchers who are interested only in the historical weather of Bangladesh.

- Researchers attempting to gain insights by correlating selected data attributes from the aforementioned two sections.

DATA DESCRIPTION

Stratification

The .csv files are divided by time periods (years) and by locations (divisions of Bangladesh).

Folder Structure

After acquiring the data, the csv files will be arranged as such:

Each folder name represents a division of Bangladesh. Each folder contains 9 files. Among these 8 files contain annual data for the years- 2016 through 2023 For the year 2023, only data up to 30 September is considered.

Each .csv file is named as such: *<starting date>-<ending date>.*csv. The dates are in *yyyy-mm-dd* format.

Description of .csv files

Attribute	Unit/Format	Remarks
Date	yyyy-mm-dd	
Power Demand	Megawatts (MW)	
Load Shed	Megawatts (MW)	
Rainfall	Millimetres (mm)	
Mean Temperature	Degrees Celsius	

Mean Apparent Temperature	Degrees Celsius	Different from Mean Temperature because this is calculated based on human perception of temperature
Relative Humidity	Percentage	Retrieved hourly and then averaged for the day
Wind Speed for 10 metres	Kilometres per hour (Km/h)	Retrieved hourly and then averaged for the day
Wind Speed for 100 metres	Kilometres per hour (Km/h)	Retrieved hourly and then averaged for the day
Daytime Length	Hours	
Dewpoint	Degrees Celsius	Retrieved hourly and then averaged for the day
Cloud Cover	Percentage	Retrieved hourly and then averaged for the day
Soil Temperature	Degrees Celsius	● Upper surface of soil (up to 7 cm) ● Retrieved hourly and then averaged for the day

EXPERIMENTAL DESIGN, MATERIALS AND METHODS

The corresponding author (Mohammad Dardaul Hoque) prepared javascript code for performing various data retrieval tasks. Information regarding data acquisition including various code sections along with a preview snippet are provided here.

Retrieving Power Demand Records

Data regarding power demand was retrieved from Bangladesh Power Development Board (BPDB).

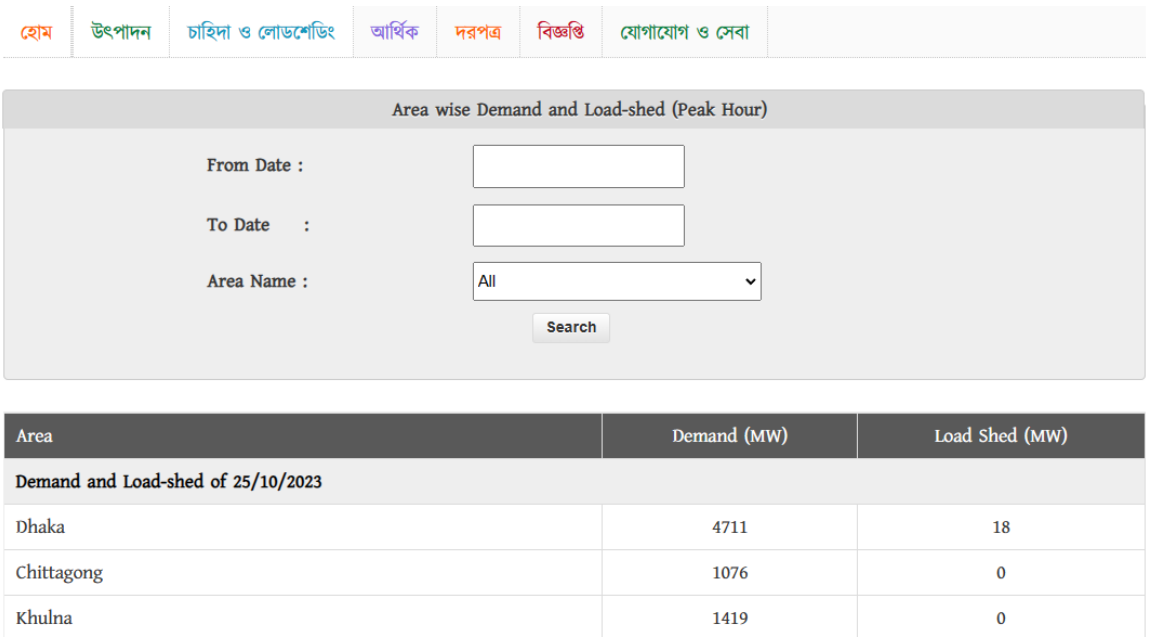

Figure 1: BPDB information retrieval user interface

Due to the lack of a web API, data was scraped using the *cheerio* library (Cheerio).

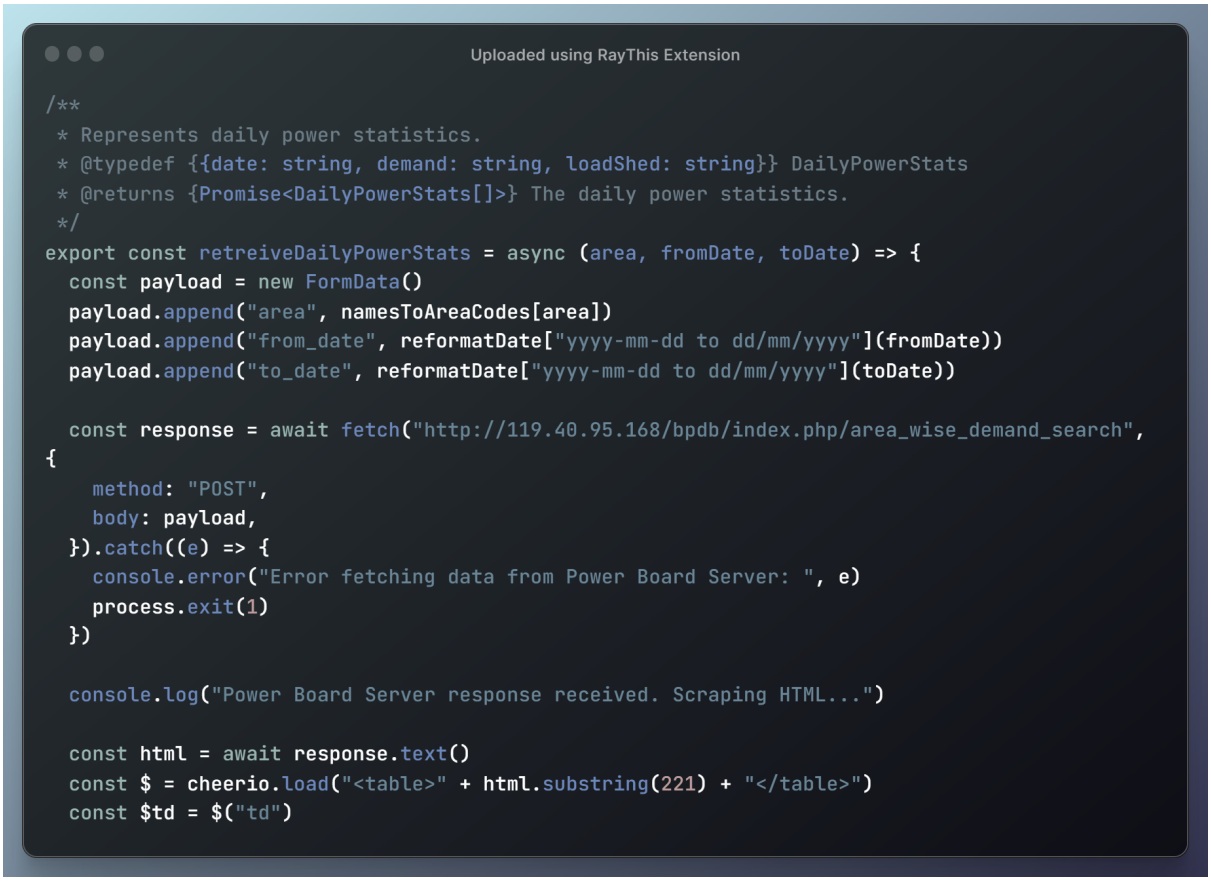

Figure 2: Snippet of code used in web scraping

Full code snippet can be found at:
https://github.com/rudrOwO/weather-and-power-analysis/blob/main/data/retreiver/web.js#L10

Retrieving Weather Records

Open-Meteo's (Open-Meteo) Historical Weather API came in handy for retrieving weather data.

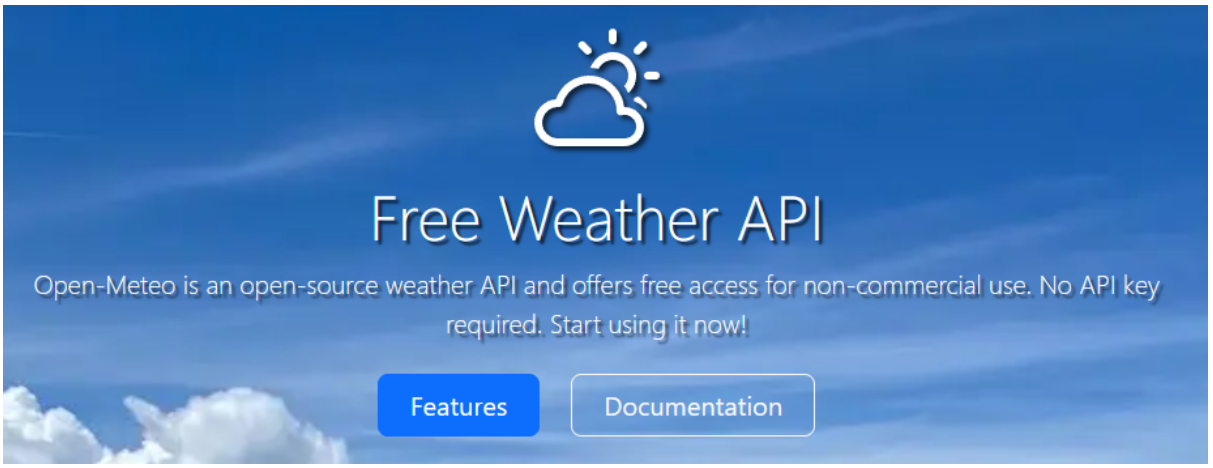

Figure 3: Open-Meteo's Homepage

Once again, javascript was used to programmatically invoke the weather API.

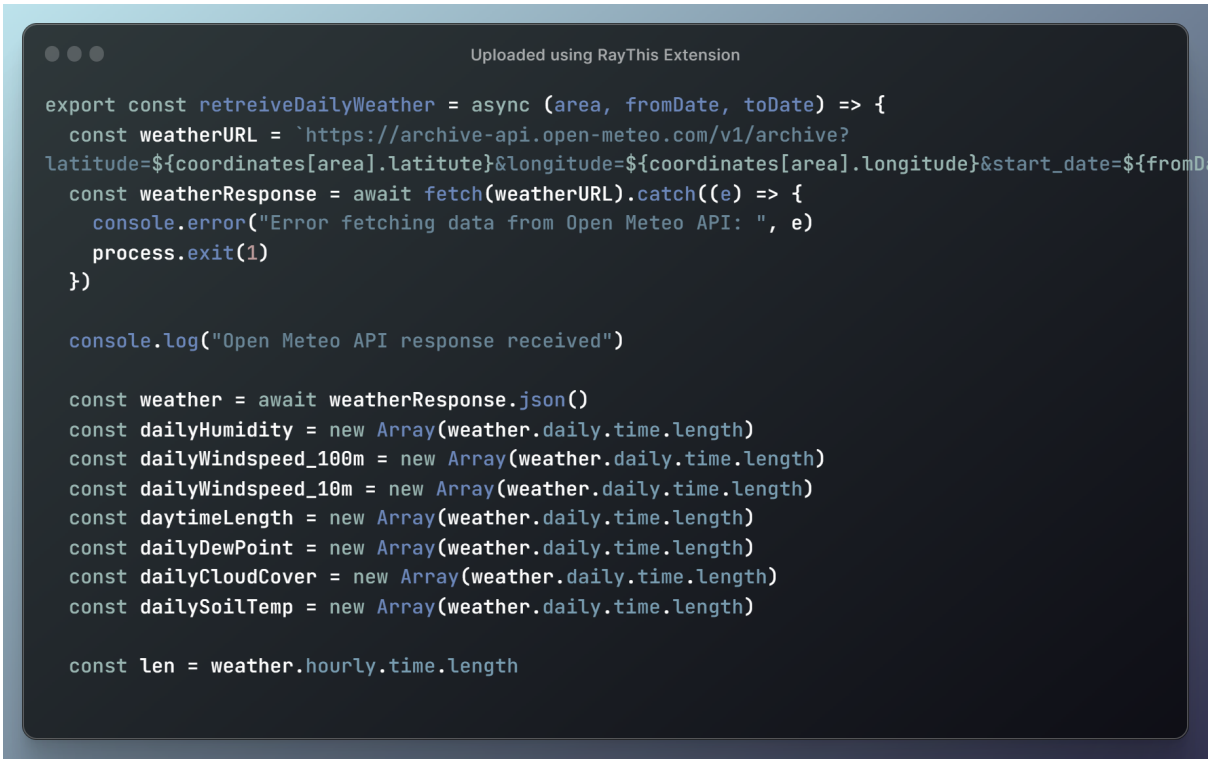

Figure 4: Snippet of code for invoking web API

Full code snippet can be found at:

https://github.com/rudrOwO/weather-and-power-analysis/blob/main/data/retreiver/web.js#L61

Corresponding Daily Power Records with Weather

After retrieving data from multiple aforementioned sources, they were combined row-by-row into a single .csv file. Some days had missing records for power demand. Those days/rows have been omitted in the produced .csv file.

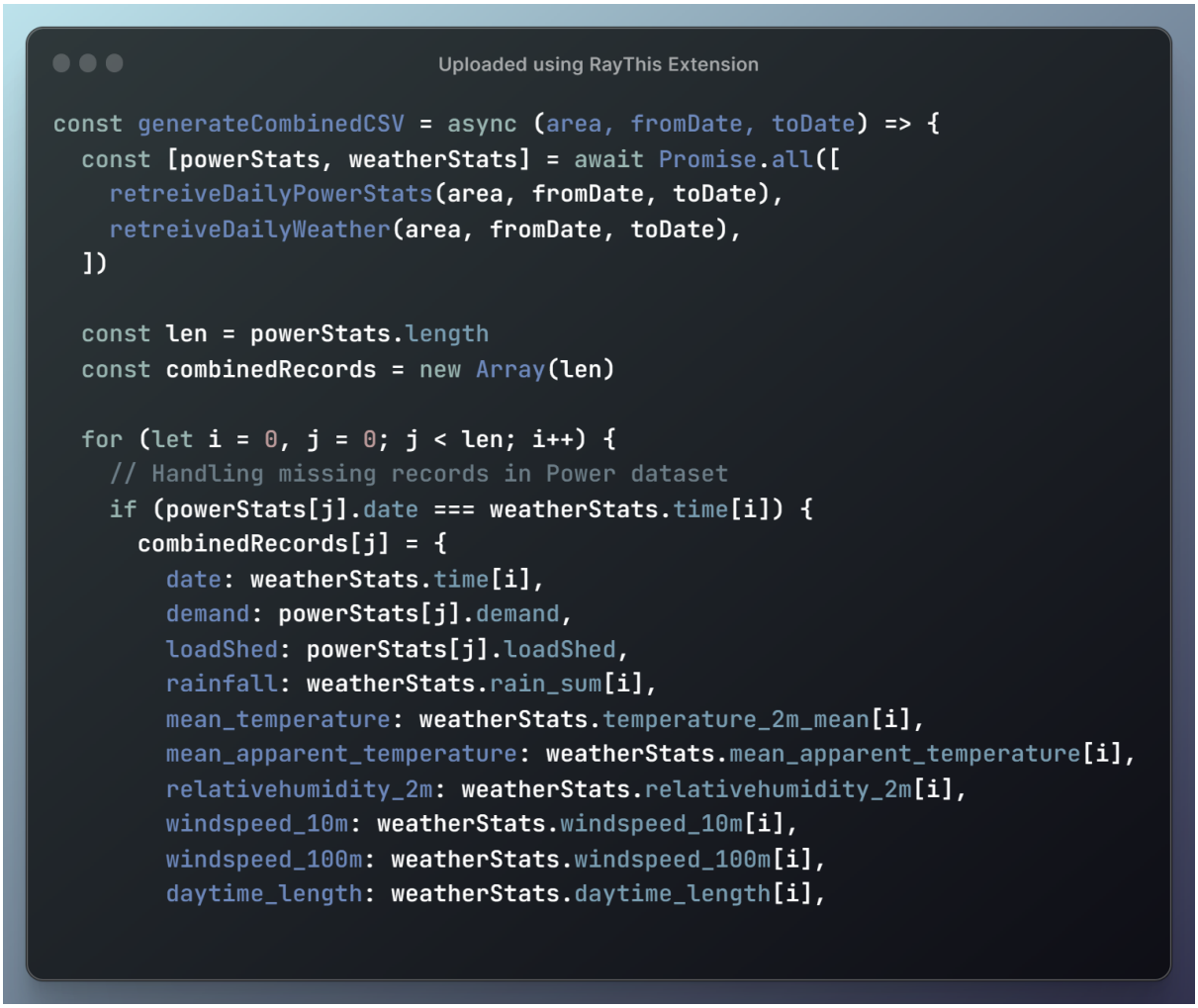

Figure 5: Snippet of code for combining power demand and weather data in one .csv file

Full code snippet can be found at:

https://github.com/rudrOwO/weather-and-power-analysis/blob/main/data/retreiver/generate-csv.js#L8

LIMITATIONS

- Data for power demand before 2016 was not available during the creation of this dataset.
- Records of some specific days had to be omitted due to them being missing from the primary source.
- The credibility of daily power demands retrieved from Bangladesh Power Development Board is questionable due to the site being very poorly maintained.

ETHICS STATEMENT

The authors confirm that they have read and follow the ethical requirements (Elsevier) for publication in Data in Brief and confirm that the current work does not involve human subjects, animal experiments, or any data collected from social media platforms.

CRediT AUTHOR STATEMENT

- Mohammad Dardaul Hoque: Conceptualization, Software, Data curation
- Fahim Morshed: Visualization, Investigation
- Kazi Muktadir Ahmed: Visualization, Investigation

ACKNOWLEDGEMENTS

- The authors express their gratitude to Patrick Zippenfenig (Zippenfenig) for creating the *Open Meteo Historical Weather API* platform- which was immensely useful in generating this dataset.
- This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

DECLARATION OF COMPETING INTERESTS

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

REFERENCES

Cheerio. “cheerio - npm.” *NPM*, 26 June 2022, https://www.npmjs.com/package/cheerio. Accessed 30 October 2023.

Elsevier. “Policies & guidelines.” *Elsevier*, https://www.elsevier.com/authors/journal-authors/policies-and-ethics. Accessed 30 October 2023.

Open-Meteo. *Open-Meteo.com: 🌤 Free Open-Source Weather API*, https://open-meteo.com/. Accessed 30 October 2023.

Zippenfenig, Patrick. “patrick-zippenfenig (Patrick Zippenfenig) · GitHub.” *GitHub*, https://github.com/patrick-zippenfenig. Accessed 30 October 2023.