CLIMATE CHANGE IS NOT A JOKE
CAPP 122 Course Project | Winter 2023
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ABSTRACT

The 2015 Paris Agreement (ratified in Nov 2016) on climate change was a historic step forward in the global effort to combat the impacts of climate change. Multilateral development banks (MDBs) have an important role to play in supporting the implementation of the Paris Agreement, specifically in the Asia Pacific region, which is particularly vulnerable to the impacts of climate change. MDBs have a critical role to play in providing financial and technical assistance to developing countries to support the implementation of the Paris Agreement. This project aims to identify patterns on the financing of Climate projects in the developing countries in Asia Pacific, before and after the 2015 Paris Agreement, from two different MDBs: the World Bank and the Asian Development Bank (ADB). The scope of the data is from 2011-2023, broken down into two: 2011-2016 as Pre-Paris Agreement, and 2016-2023 as Post-Paris Agreement. The main metric considered in this project is *commitment amount*. This is the signed funding amount for a project.

We used Regression Discontinuity Analysis (RDA) to assess the effects of the Paris Agreement on climate-related financial patterns. Overall, based on the results, we can conclude that there is no statistically significant evidence at 5% significance level to suggest that the Paris Agreement had a significant impact on climate-related funding provided by the World Bank to countries in the Asia Pacific region. If we interpret the results at 10% significance level, then we can state there is a positive impact on climate related financing after the Paris Agreement. However, considering the convention of using 5% significance level, we fail to reject the null hypothesis of no effect. While it's the opposite results for the Asian Development Bank, there may be a negative effect of the Paris Agreement on climate-related financing provided by the ADB to countries in the Asia Pacific.

However, it is important to note that these findings are based on the assumptions and limitations of the RDA method and the specific data and model used in this analysis. Therefore, caution should be exercised in interpreting these results and drawing broad conclusions about the impact of the Paris Agreement on climate finance. For one, there were limitations in getting all climate-related projects and another layer of analysis through tokenization was done. Documentation of this process can be found here. And the detailed statistical analysis results is here.

PROJECT STRUCTURE

The data is loaded from two different portals, then cleaned and aggregated, and added to a dashboard module and backend database. The dashboard produces the visualization shown on the right (Diagram 1)

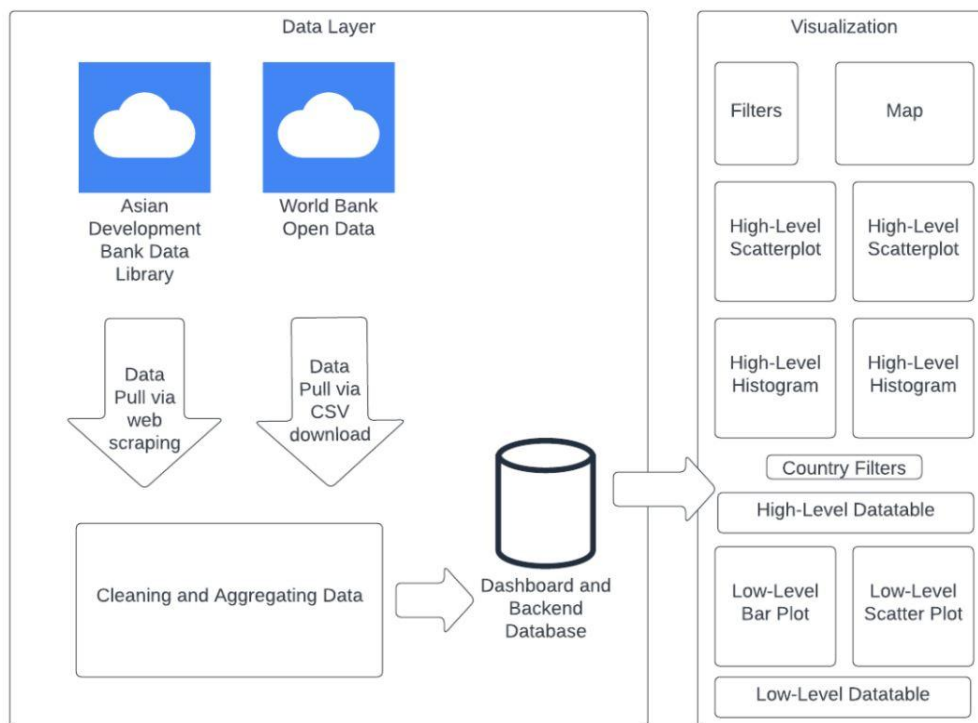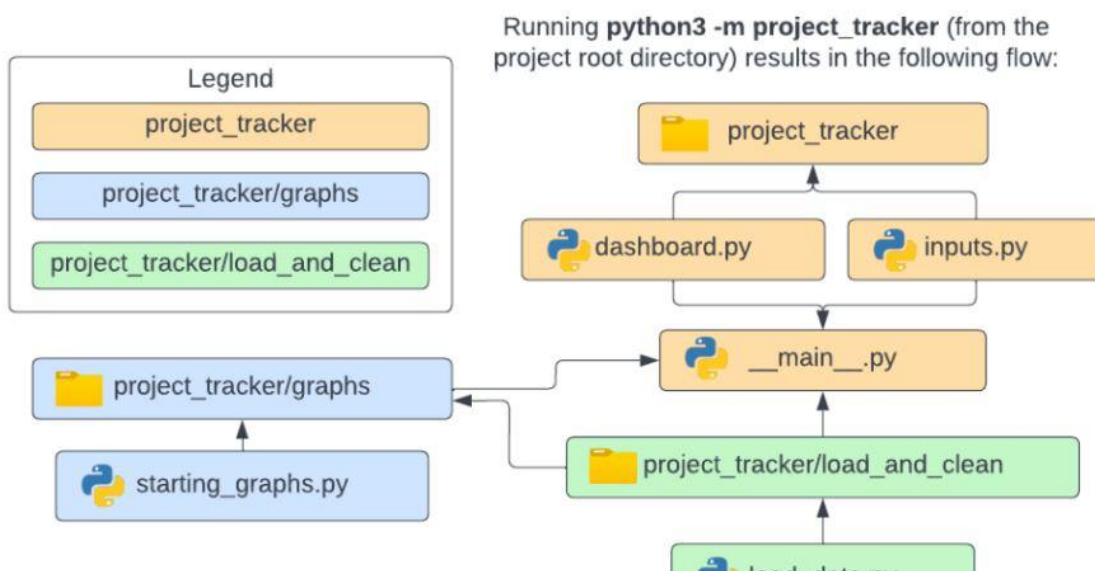Diagram 1. Software Architecture

Diagram 2 shows the application structure. It features three different pathways (project_tracker, graphs, and load_and_clean) that all connect to the __main__.py module, which runs the dashboard application.

Diagram 2. Application Architecture

INSTRUCTIONS TO RUN THE CODE

NOTE: All codes to be run from within the project root directory

Setting up Virtual Environment and installing required packages:

1. Clone this repo
2. From within project root directory 30122-project-climate_change_is_not_a_joke run `poetry install` (takes ~2 minutes for all packages to install)
3. Activate the virtual environment through `poetry shell`

Viewing WebApp:

1. Run `python3 -m project_tracker` (takes ~30 seconds)
2. Follow the generated URL link (eg: http://0.0.0.0:3004/) by clicking Open in Browser or by copying and pasting in your browser (On Mac, use ⌘ and click Follow link on the link generated)
3. The website may take a few seconds to load all figures

(Optional) Scraping Data from the Asian Development Bank Data Library:

To view sample data web-scrape from the ADB Data Library:

1. Run `python3 -m project_tracker.load_and_clean.draft_crawler`
2. Sample dataset created is stored in project_tracker/data/raw/adb_projects.json

INTERACTING WITH THE DASHBOARD

1. Interactive map - shows the summarized information per country. Details will be shown when the user hovers through the map on the right. Filters on the left side allow user to view different metrics (count, funding amount, climate funding proportion) based on funding source source and the time interval (pre/post Paris Agreement)
2. Regression Plots -examine the effects of the Paris Agreement on Climate related project investments. Detailed Statistical analysis results can be found in the Statistical Model and Comparative Data Analysis file
3. Histogram -shows the distribution of commitment amount and project count

4. Country Level Deep dive -this includes total cumulative funding amount per country, with GDP per capita and GAIN index information. To compare values between two countries, select the country name on the filters
5. Project-level graphs -shows the overall project details of the selected in Country Level filter. This has breakdown of project status between pre and post Paris agreement, and a plot showing the count and funding amount over time
6. Data Table -shows the individual project details of the selected country, user can also be directed to the project page through the project url and keywords for search

RESPONSIBILITIES OF THE MEMBERS

Name	Modules/Task	Brief Description	Files (if applicable)
Kayecee	draft_crawler.py	Scraped all needed data from ADB website (1 page) Output: list of dictionaries	adb_projects.json
	Cleaner.py	Cleaned the scraped data to the desired format Output: cleaned list of dictionaries	clean_df.csv
	Data cleaning	Helped with World Bank data cleaning	
	Research and Documentation	Did initial research on how to go about the project; documentation	README.md
Rob	draft_crawler.py	Scraped data from ADB website (crawl to next pages) and while loop. Able to be called on the command line Output: list of dictionaries	adb_projects.json
	Cleaner.py	Identified climate-related data among all scraped data using known climate projects (using tokens). Able to be called on the command line Output: new field indicating if a project is climate-related or not; new field for tokens that can be searched in the dashboard	clean_df.csv
	Exploratory data analysis notebook	Exploratory analysis on the process of tagging and assumptions made on categorizing data	climate_tag_exploration.ipynb

Nadir	web_process.py	Collected and cleaned World Bank's climate data on countries (low and high level, data on gdp per capita and ND-Gain index. Also conducted some descriptive analysis and plotting	wb_data.csv, gain_cleaned.csv, gdp_cleaned.csv, gdp_percapita.csv, gain.csv
	reg_plots.py	Created multiple functions to manipulate pulled data to run statistical analysis and create graphs, regression plots and histograms	
	dataviz.py	Explored new statistical package 'rdd' to run regression discontinuity analysis and create plots using plotly	
	Documentation and Research	Researched ideas to run meaningful statistical analysis on datasets. Generated detailed statistical analysis while documenting the assumptions and insights and creating appropriate visualizations	Statistical Model and Comparative Data Analysis.pdf
Bobby	load_data.py	Constructed and merged Pandas dataframes from cleaned ADB and World Bank CSV data. Applied minor structuring changes for working in the dashboard.	
	__main__.py	Used Dash to construct a webpage with interactive visualizations and multi-layered dropdowns to showcase the World Bank and ADB data in a clear and concise manner.	
	starting_graphs.py	Constructed starting Plotly figures to be used in the dashboard. This also loaded the statistical plots that Nadir worked on.	
	inputs.py	Created a series of style dictionaries and filter-option lists for easier readability with the dashboard constructor.	
	dashboard.py	Constructed a basic app using Dash. This app was called on in the __main__.py module.	