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“Updated Sat Vision AI: Satellite Image Analysis & Change Detection using AI”

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Abstract-- Nowadays, monitoring the environment as well as parameters such as unemployment rate, GDP, agriculture, and forest cover is difficult to measure accurately and easily, as many technical objects and machines are available but very few of them are accurate, precise, and easy to use. For a particular country, it is very important to know about the above-mentioned parameters for its overall development and to remain competitive.

This project helps in achieving these requirements easily, accurately, and more precisely. It is easy for a common person as well as scientists to use this project for research and analysis purposes.

Keywords-- Satellite imagery, pixel change analysis, artificial intelligence, API calling, image processing, realtime data analysis, historical data analysis

I. INTRODUCTION

This project aims to develop a website that uses different APIs and integrates them to provide information about temperature, humidity, air pressure, moisture, land area change, GDP, inflation, unemployment, industrial GDP, population, agricultural land, and forest area of a particular location at a particular date and time. This information can be real-time as well as historical, as per the user’s need. The information is shown in the form of line graphs, cards, satellite images, and maps. The map is used to validate whether the location entered by the user is valid or not. There are different sources such as OpenWeather, WorldMap, and Mapbox (API services) through which the data is fetched and displayed to the user. Instead of visiting multiple sources, the user gets all the required information at one place in a clear and understandable format. This information is real and accurate, and references are provided at the end of the webpage to verify it. The project is not limited only to India; it works for any city inside or outside India. The data is also updated with time.

II. LITERATURE REVIEW

Paper 1: DASNet: Dual-Attention Siamese Network for High-Resolution Change Detection Detecting meaningful changes in remote-sensing images is a fundamental task in environmental analysis. Traditional methods often fail to filter out irrelevant changes, producing false positives.

DASNet, a dualattention fully convolutional Siamese network, addresses these challenges by capturing longrange dependencies and producing discriminative feature maps to distinguish real changes from pseudo-changes. The study also proposes a weighted double-margin contrastive loss to handle the imbalance between unchanged and changed samples. Experiments on the CDD and BCDD datasets demonstrated F1-score improvements of 2.1% and 3.6% over baseline methods. arXiv:2003.03608

Paper 2: Unsupervised Change Detection with GAN- Based Coregistration

High-resolution satellite images improve detail but make image alignment more challenging, often causing misinterpretation of changes. This work introduces an unsupervised GAN framework to produce better-aligned image pairs before detecting changes. By training the GAN on expanded datasets with custom loss functions, it generates “coregistered” images that reduce false positives. Change maps produced from these images accurately capture true differences. arXiv:2009.03630

III. METHODOLOGY

This project is a website that has two main parts: frontend and backend. The frontend contains the parts of the website that are visible to the end user, such as user input fields, buttons, advertisements, graphs, satellite images, image cards, parameter maps, project name, webpage design and color scheme, and webpage layout (left, right, top, bottom margins, etc.). In this project, there is a user input box that takes the location name in which the user is interested. There are two additional boxes for start date and end date, which allow the user to enter two different or similar dates to compare changes in temperature, humidity, air pressure, moisture, land area change, GDP, inflation, unemployment, industrial GDP, population, agriculture, and forest area of that particular location. Below the date input boxes, there is an Analyze button. When clicked, it generates the output containing information about the 12 parameters. The values for the user and also sends these values to another value-collecting API executed using Python. Retrieving values from app.py and displaying them to the end user (script.js)

The backend is completely created using Python, and the frontend is developed using HTML, CSS, and JavaScript. JavaScript is used to fetch data from the backend and display it on the frontend.

Backend process, which is not visible to the end user, executes this task. The backend integrates different APIs and processes the data to generate the desired output. It converts the collected data into readable

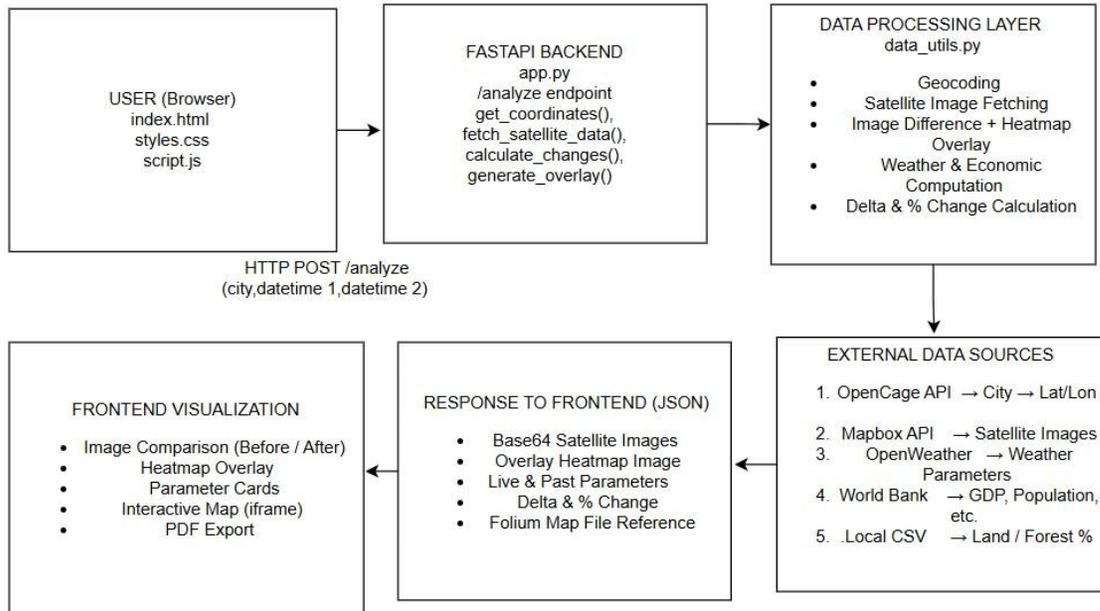


Fig 3.1

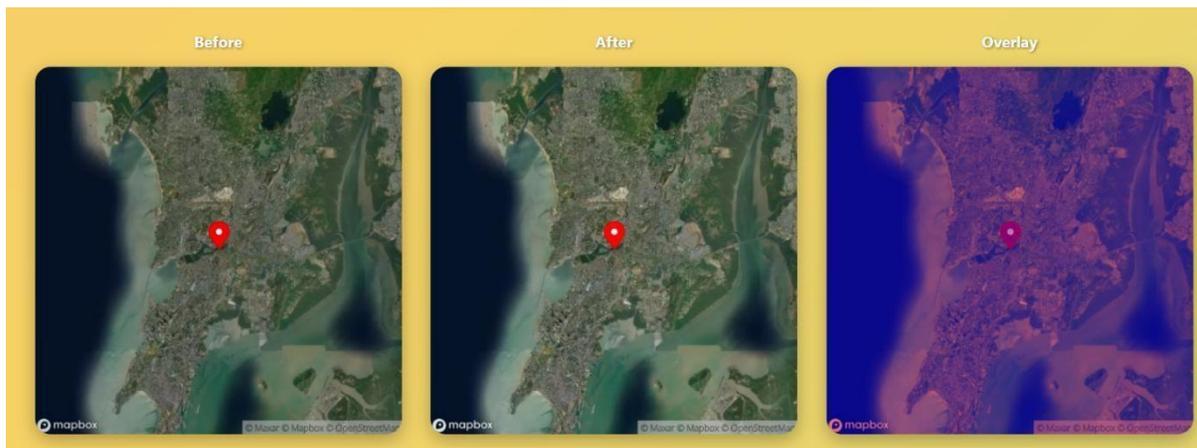


Fig 3.2

Parameter Map

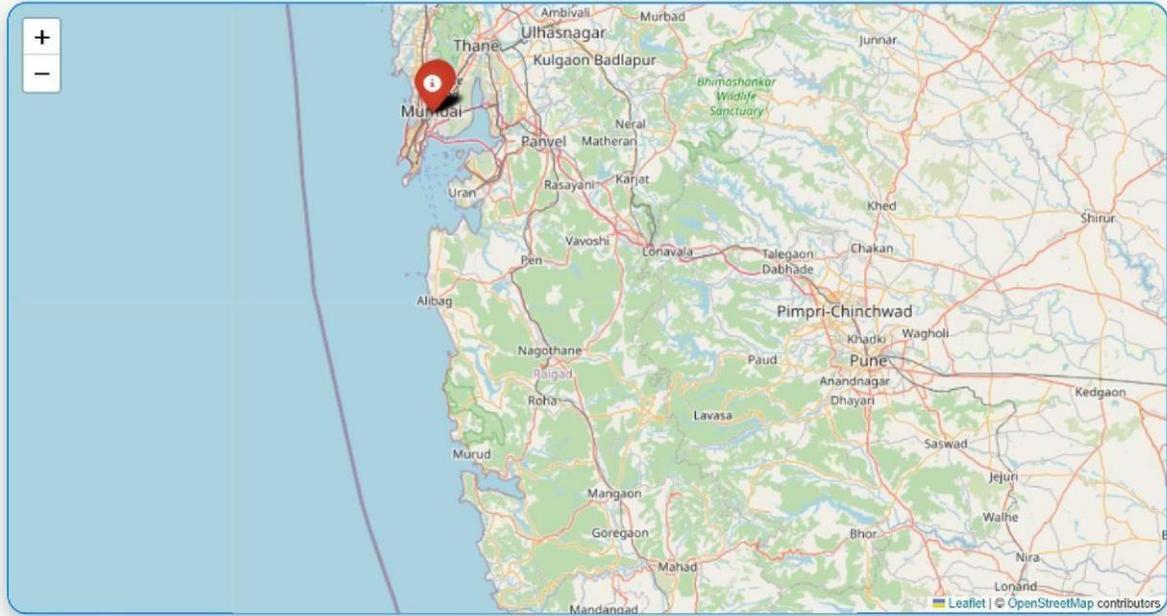


Fig 3.3



Fig 3.4

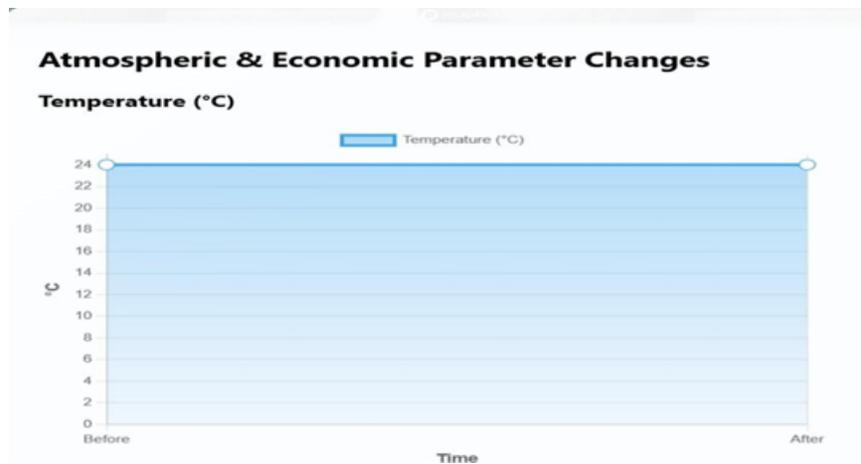


Fig 3.5
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Fig 3.6

IV. RESULTS AND DISCUSSION

Humidity, air pressure, moisture, land area change, GDP, inflation, unemployment, industrial GDP, population, agriculture, and forest cover of a particular location. If these parameters are not visible on the map, graphical representations are shown to display changes for two different or similar dates at a particular location and time.

The output of this project consists of three satellite images and 4 other images that show changes in parameters such as temperature. The system also supports real-time and historical analysis. Suppose the user enters the location Mumbai for two different dates, 27-01-2026 and 28-01-2026 at 9:49 pm. The data for the following 12 parameters is displayed in tabular form.

Parameter	Value	Actual Value
Temperature	24.02 C	24.00 C
Humidity	57.00%	57.00%
Air Pressure	1015.00 hPa	1015.00hPa
Moisture	0.00 mm	0.00 mm
Land area change	0.00%	0.00%
GDP	390989533858.08 USD	390989533858.08 USD
Inflation	4.95%	4.95%
Unemployment	4.20%	4.20%
Industry GDP	12.61%	12.61%
Population	14,509,357.00	14,509,357.00
Agriculture	33.13	33.13
Forest	47.40%	47.40%

Fig 4.1



V. CONCLUSION

In this project, we implemented a system to depict changes in parameters such as temperature, humidity, air pressure, moisture, land area change, GDP, inflation, unemployment, industrial GDP, population, agriculture, and forest area of a particular location at a specific time. The system presents information in an accurate, precise, and easy-to-understand manner using maps, satellite images, graphs, and tables. It helps users analyze real-time and historical data efficiently and provides a unified platform for environmental and socio-economic analysis.

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