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# Disaster Impact Assessment and Recovery Planning with Alert Dispatcher Using Google Earth Engine

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**Abstract- This project deals with speed detection and the influence of natural disasters using geolocation and satellite remote data measurement data. The feature benefits from Google Earth Engine (GEE) to process high -resolution remote measurement data, including Sentinel -1 Synthetic Aperture Radar (SAR) images and country state optical imagery. Machine learning classifiers such as Random Forest (RF) are used on multi - temporal image data for injury classification and mapping affected areas. The system focuses on disasters, including floods, forest fire, earthquakes and tsunamis, and contains a gentle dispatcher module to provide initial warnings to authorities and communities. Implementation has been tested with integration in government framework for emergency response in the real scenarios. The results show support for a strategic recovery scheme based on effective initial warnings, accurate views on disaster effects and timely geographic analysis with high resolution.**

**Index Terms - Disaster Detection, Geophysical Analysis, Google Earth Engine, Recovery Scheme, Remote Sensing, Warning System**

## 1. INTRODUCTION

Natural disasters such as earthquakes, floods, tsunamis and forest fire have quickly affected local communities worldwide, resulting in significant human, environmental and economic losses. Traditional disaster reaction methods often face challenges related to delayed data collection, limited spatial coverage and inadequate future indication skills. In order to address these boundaries, the project presents an integrated system for real - time disaster recognition, influence evaluation and recovery of schemes using geophysical technologies and distance -sensitive data. The core of the system is built on Google Earth Engine (GEE), a cloud -based Geosyntec processing platform that enables large - scale satellite image analysis. Machine learning classifies and high-resolution data sets such as Sentinel-1 and Landsat images using Gee Power, effectively identifies the disaster-affected areas and evaluates the severity of injury. Including a smart alert broadcast is ensured that initial warnings and real -time updates are immediately distributed to local authorities and risk population, and improves preparations and reactions.

This task not only emphasizes technical implementation, but also demonstrates its integration with the genius of the real world and the contingency framework for satellite -driven disaster analysis. By bridging data analysis with operational alert systems, the platform supports fast decision -making and strategic recovery planning, and eventually contributes to flexibility construction in weak areas,

## 2. LITERATURE REVIEW

The increasing frequency and severity of natural disasters have led to researchers detecting advanced technologies for timely detection, influence evaluation and subsequent recovery plan. Traditional ground -based methods often decrease in spatial access and reaction time, indicating satellite remote measurement and decisions of geosytic analysis.

Recent studies have highlighted the effectiveness of Google Earth Engine (GEE) as a platform for large -scale environmental monitoring and disaster analysis. The cloud - based architecture enables the treatment of large datasets with remote measurement such as Sentinel -1 SAR and Landsat Optical images, which are important for identifying flood extension, firefighters and land deformation due to earthquake activity. Gee is used in Bangladesh flood, detection of forest fire in Australia and

earthquake injury analysis in Turkey, which performs its versatility and speed.
In machine learning, algorithms such as Random Forest (RF) and Support Vector Machines (SVMS) have proven to be effective in classifying damaged versus uneducated areas using signs and temporary satellite functions. These models, when integrated with geophysical platforms, increase accuracy and automation to detect effects.
In addition, studies emphasize the importance of vigilant systems to reduce disaster risk. Research in scattering platforms for early warning has shown that a combination of automated alerts with geophysical intelligence can significantly reduce damage and financial losses. Projects such as GDACs (Global Disaster Alert and Coordination System) and Femes Integrated Public Warning and Warning System (IPAWS) provide basic evidence of the efficiency of the alert mechanism.

## 3. EXISISTING SYSTEM

Current disaster management systems are often fragmented, manual data collection, delayed reporting and limited spatial coverage. Tools such as GDAC and FEMA IPAW provide initial warnings, but usually depend on predefined thresholds and lack integration with satellite - based influence analysis.
While remote target platforms such as Modis, Sentinel and Landsat are used for disaster monitoring, many systems require manual image processing and lack real -time analytic abilities. As a result, timely and accurate assessment during emergency is difficult.
Most existing solutions focus on the extraction of either after the disaster. There is also a lack of automatic alert systems that can work on the basis of real -time geopolitical analysis. It limits the general efficiency of the current disaster action effort.

## 4. PROPOSED SYSTEM

The proposed system provides an integrated, real -time solution for disaster detection, influence evaluation and recycling schemes using Google Earth Engine (GEE) and satellite remote measurement. This machine processes a high-resolution images from Sentinel-1, Landsat and other data sets to identify and classify disaster-affected areas through a machine learning algorithms as a random forest as machine learning algorithms.
A key feature of the system is its warning educator, which automatically informs local authorities and communities based on nonconformities detected in geofaseic data. The platform supports various natural disasters, including floods, fire, earthquakes and tsunamies, and ensures widespread prevention.
Unlike existing systems, this solution combines automated identification in the same interface, tracking of geolocation of real -time and strategic recovery. System decision makers enable the disaster effects to imagine the fields, assess the severity and coordinate emergency reactions quickly and efficiently.
By taking advantage of cloud -based processing and integrating initial warning options, reduces the proposed system response time, increases the status of consciousness and supports the informed plan informed for recovery after the disaster.

## 5. FEASIBILITY STUDY

The proposed system has been found to be feasible in terms of technical, operational, and economic aspects. Technically, it leverages cloud-based platforms and satellite data to ensure accurate and real-time disaster monitoring. Operationally, the system is user-friendly and integrates well with existing emergency response frameworks. Economically, the use of open-source tools and publicly available data significantly reduces costs. The system is also scalable and adaptable to various disaster types and geographic regions, making it suitable for practical, real-world deployment

### I. Technical Feasibility

The system is technically feasible due to the availability of advanced tools and platforms such as Google Earth Engine (GEE), which supports large-scale satellite image processing and geospatial analysis. The integration of Sentinel-1, Landsat, and other publicly available datasets enables accurate monitoring of disaster-prone regions in near real-time.
The use of machine learning algorithms, particularly Random Forest classifiers, enhances the system's ability to classify affected areas with high accuracy. Cloud computing eliminates the need for heavy local infrastructure, while the platform's modular architecture allows easy

integration with alert systems and government response networks.

Furthermore, the system is built using scalable, open-source technologies, ensuring adaptability, performance, and long-term sustainability. This makes the project not only technically sound but also reliable for real-world deployment across different regions and disaster types.

IL. Economic Feasibility

The proposed system is economically possible due to dependence on open source techniques and its dependence on satellite data sets freely available from platforms such as Google Earth Engine, Sentinel and Landsat. This software significantly reduces licensing and data collection costs.

The system requires minimal hardware investments, as treatment is handled in clouds, eliminating the need for expensive local servers or infrastructure. Development and maintenance can be managed with a small technical team, which reduces labour costs.

By providing timely notice and accurate influence assessment, the system helps to reduce disaster -related injury and reaction costs, providing long -term economic benefits to the authorities, not -state organizations and affected communities. Overall, high returns in low initial investments and risk -reducing cost -effective and durable make.

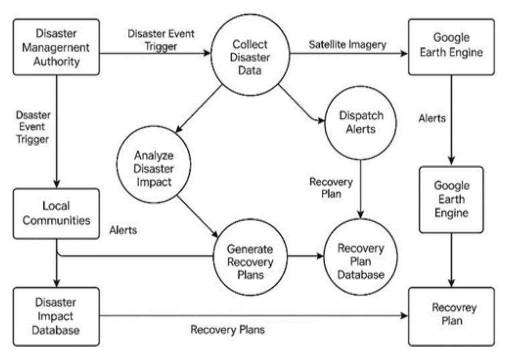
III. Operational Feasibility

The proposed system is strongly in operation due to the user -friendly interface and spontaneous integration with the existing contingency frame. Alert modules, which automate the spread of real -time disaster warning, are designed to be easy to use and use officials, local authorities and emergency teams.

The integration of the system of Google Earth Engine ensures that disaster detection and influence analysis are done effectively without the need for complex manual processing. In addition, the platform's cloud -based nature means that users can access and interact with the system anywhere, which increases its scalability and flexibility during emergencies.

TRAINING FOR USERS is minimal, as the system is comfortable and designed for rapid adoption, which makes it operating on a wide range of disaster administration teams. The platform also supports real-time cooperation, improves coordination during reaction and recovery operations.

6.DATA FLOW DIAGRAM




7. PROBLEM DESCRIPTION

Natural disasters such as earthquakes, floods, fire and tsunami continue to continue important threats for human life, infrastructure and the environment. The existing disaster management system often lacks reactive, fragmented and real -time monitoring skills. Manual data collection and delayed reviews prevent rapid response, causing greater damage and slow recovery.

In addition, many current systems do not integrate geophagic data analysis with automated notification mechanisms or recovery chemistry tools. This disconnection results in poor coordination, ineffective resource allocation and limited status awareness during emergency. The absence of a centralized platform that combines satellite images, automatic detection and notification broadcast, and limits the effectiveness of disaster depletion strategies.

Therefore, an integrated, automated and real -time system is an important requirement that can detect disasters, assess their effects, and Google can help with coordinated recovery forms using advanced technologies such as soil engine and machine learning.

8. NEED FOR SOLUTION

- Real-Time Monitoring: Existing systems often lack the ability to provide real-time disaster updates, leading to delayed response and greater damage.
- Integration of Geospatial Data: There is a need for a unified platform that can process and analyze satellite imagery for accurate

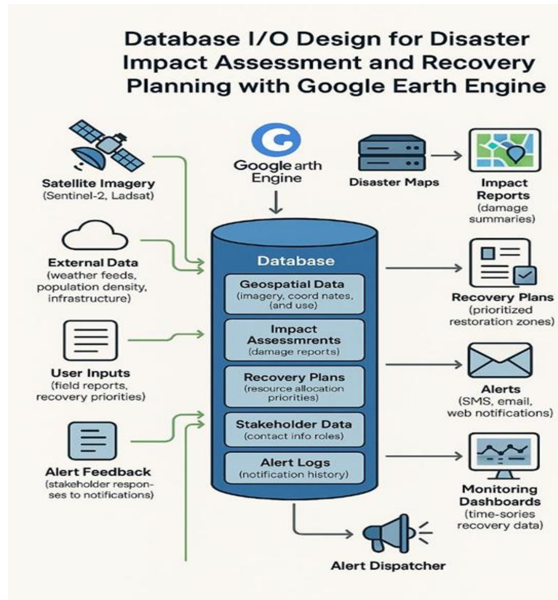
impact assessment.

- Automated Alert Dispatching: Timely alerts are crucial for saving lives, but current systems often rely on manual input or delayed broadcasting.
- Support for Multiple Disaster Types: A versatile system is needed to detect and respond to various disasters such as floods, earthquakes, wildfires, and tsunamis.
- Data-Driven Recovery Planning: Recovery efforts often lack accurate data; integrating satellite analytics can significantly improve post-disaster planning and resource allocation.
- Accessibility and Scalability: A cloud-based solution ensures wider accessibility and can be scaled for different regions and disaster intensities.
- Cost-Effective Implementation: Utilizing free platforms like Google Earth Engine and open-source tools reduces infrastructure and operational costs.

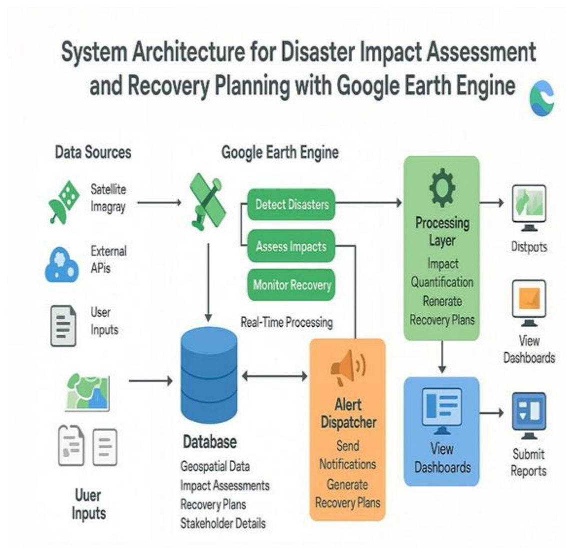
## 9. DESIGN CONCEPTS

- The design of the proposed system is based on modular and scalable architecture, which enables effective disaster decisions, analysis and response. Large design concepts include:
- Modular Architecture: The system is divided into functional modules such as data collection, Preposal, analysis, notification transfer and visualization to ensure flexibility and easy maintenance to the system.
- Cloud -based processing: Google Earth Engine (GEE) is used for the treatment and analysis of large versions of real -time satellite data without the need for local infrastructure.
- Integration of machine learning: Algorithms such as random forest are used to classify and detect disaster-affected areas from satellite images, increase accuracy and automation.
- Automatic alert system: A built -in dispute module sends initial warnings to relevant officers and communities through SMS, e -post.
- User -friendly interface: An online interface provides visualizations such as an online interface, impressive field overlay and recycling proposals for decision makers.
- Geo -location tracking in real time: System uses GPS and spatial metadata from satellite images and monitor the disaster areas accurately and monitors changes dynamically.
- Interoperability: The system is designed to be easily integrated with existing disaster control and GIS platforms for seamless data sharing and coordination.

## 10. DATABASE I/O DESIGN




## 11. SYSTEM ARCHITECTURE DIAGRAM




## 12. CONCLUSIONS

The proposed system effectively addresses the boundaries of traditional disaster management approach by integrating real -time satellite data analysis, machine learning algorithms and an automated alert mechanism. Google uses the power of the soil engine, and quickly detects disasters such as floods, earthquakes, forest fires and tsunamis to enable timely and informed decisions.

Modular architecture allows for scalability, while the use of open sources and cloud -based tools ensures cost defenses and access. Through the exact influence and recovery scheme, the system supports both immediate feedback and long-lasting mitigation strategies, making it a practical and innovative solution for modern disaster management.

Future improvement may include mobile integration, multilingual support and AI-projectable models to improve flexibility and emergency preparedness in disaster-exposed areas.

## 13. FUTURE ENHANCEMENTS

Mobile App Integration – To provide real-time alerts and updates directly to users' smartphones.

AI-Based Prediction Models – To forecast potential disaster risks based on historical and environmental data.

Multi-Language Support – To improve accessibility for users in diverse linguistic regions.

Offline Functionality – To ensure basic features work during network outages in disaster zones.

Expanded Disaster Types – To include man-made disasters such as industrial accidents or pandemics.

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