Microsoft

The Rescueators

AI Project

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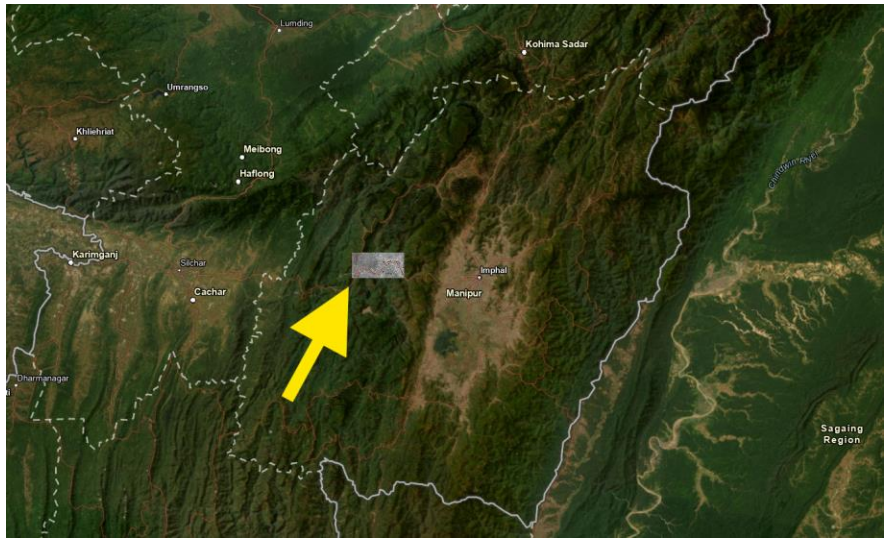
The Opportunity

- Growing impact of climate change on tectonic plate activity

- Earthquakes cause massive losses to both civilian life and economic prosperity
- 2016 Imphal Earthquake in Manipur Region (6.7 on Richter scale) impacted over 250,000 people, many in high mountainous and remote areas leaving over 10 dead. This is just one example of what is possible with machine learning and satellite imagery to help with disaster resilience and emergency response.

Study Area



Manipur and its main city Imphal is in northeast India and experienced a devastating earthquake in 2016. We study a mountainous outer lying area.

Solution

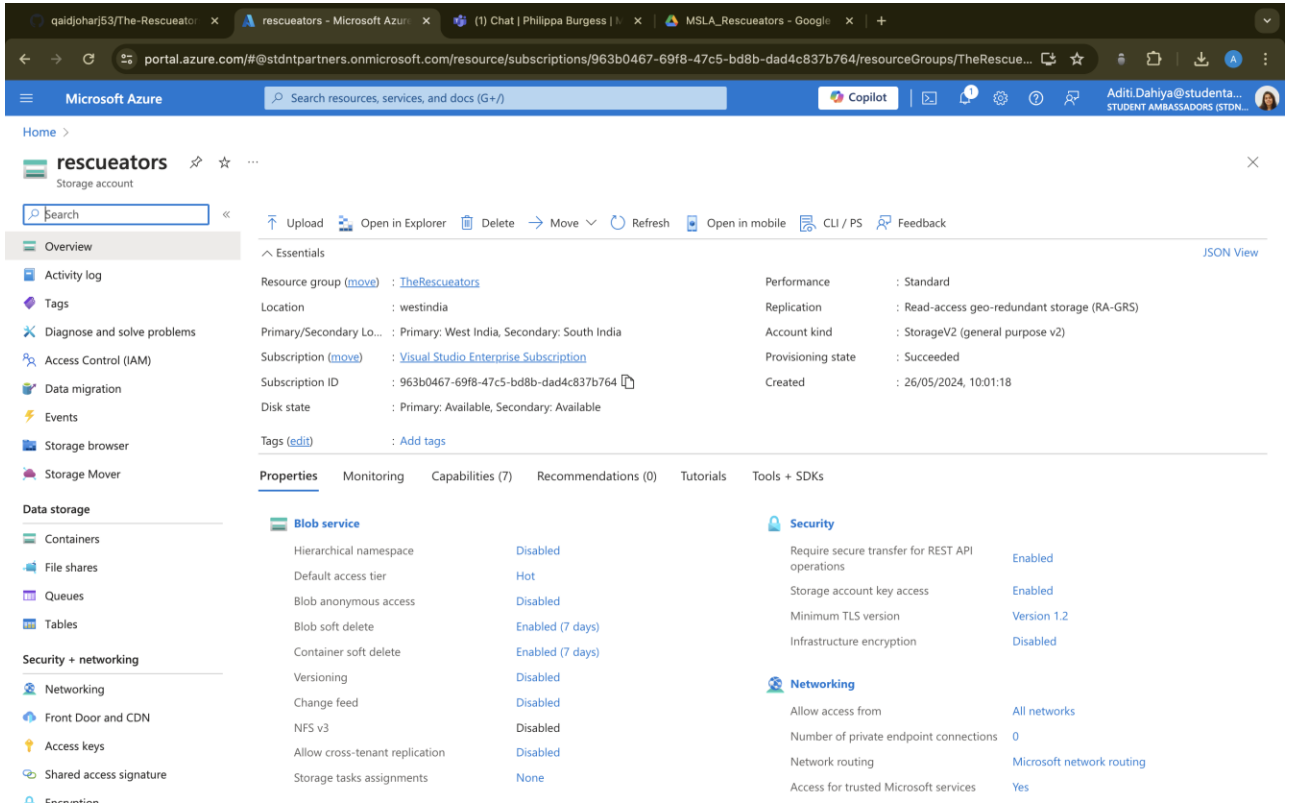
Our solution combines remote sensing data from Sentinel-2 satellites with machine learning algorithms to analyze the impact of the *2016 Imphal earthquake*. By comparing pre and post-earthquake imagery, we can accurately assess the extent of the damage to infrastructure, livelihoods, and the natural environment. This detailed analysis supports ongoing recovery efforts and enhances future disaster preparedness.

Key features of our solution include:

- High-resolution damage maps for targeted relief efforts.
- Continuous monitoring to track recovery progress.
- Predictive analytics to improve future disaster response planning.

Technologies

- Sentinel-2 Satellite Imagery
- Azure Storage Blob
- Azure Machine Learning Studio
- Python Notebook
- GitHub
- Microsoft Teams



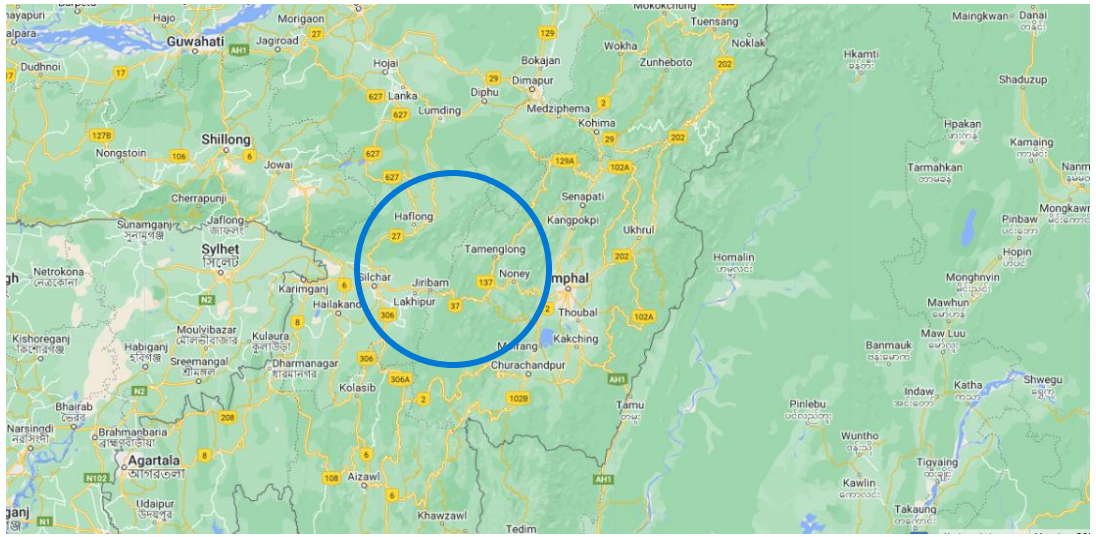
Example of Code in AzureML Notebook

```python
# Install the required library
!pip install azure-storage-blob

# Import the required libraries
from azure.storage.blob import BlobServiceClient, BlobClient, ContainerClient
import os
import pandas as pd

# Set up your Azure Storage Blob client
# Copy your connection string from the Azure portal
connect_str = "DefaultEndpointsProtocol=https;AccountName=mslateamprojects;AccountKey=h9F1fsRxlmSfBsEfTwS/FSzJDkmaxPb8fNwH36hRr+VMMVxv5oiHPcZRsSKV2wU
container_name = "rescueators"  # Container name for your project

blob_service_client = BlobServiceClient.from_connection_string(connect_str)
container_client = blob_service_client.get_container_client(container_name)

# Function to download a blob to your local directory
def download_blob(blob_name, download_file_path):
    blob_client = blob_service_client.get_blob_client(container=container_name, blob=blob_name)

    with open(download_file_path, "wb") as download_file:
        download_file.write(blob_client.download_blob().readall())

# List the blobs in your container (optional)
blob_list = container_client.list_blobs()
for blob in blob_list:
    print(blob.name)
```

[1] ✓

```
Earthquake_NC/Sentinel2_NaturalColor_2015_12.tif
Earthquake_NC/Sentinel2_NaturalColor_2016_01_06_to_2016_02_06.tif
Earthquake_NC/Sentinel2_NaturalColor_2016_11.tif
Earthquake_NC/Sentinel2_NaturalColor_2016_2.tif
Earthquake_NC/Sentinel2_NaturalColor_2016_5.tif
Earthquake_NC/Sentinel2_NaturalColor_2017_11.tif
Earthquake_NC/Sentinel2_NaturalColor_2017_5.tif
Earthquake_NC/Sentinel2_NaturalColor_2018_11.tif
Earthquake_NC/Sentinel2_NaturalColor_2018_5.tif
Earthquake_NC/Sentinel2_NaturalColor_2019_11.tif
Earthquake_NC/Sentinel2_NaturalColor_2019_5.tif
```

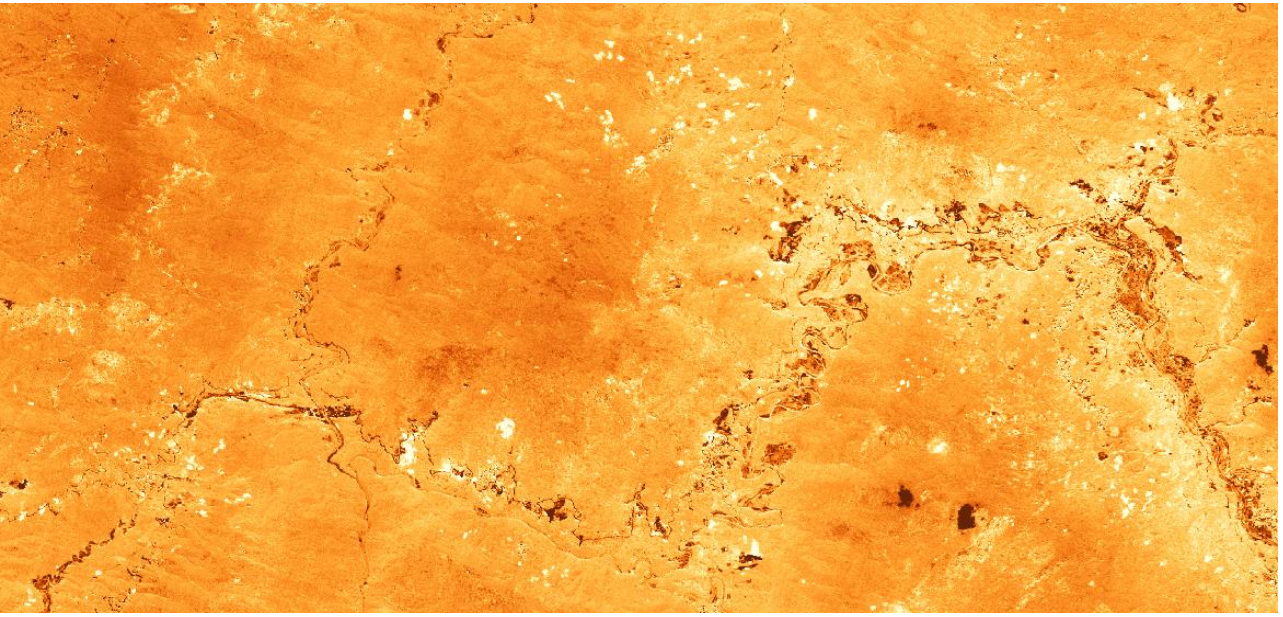
Location is Mountainous and Remote

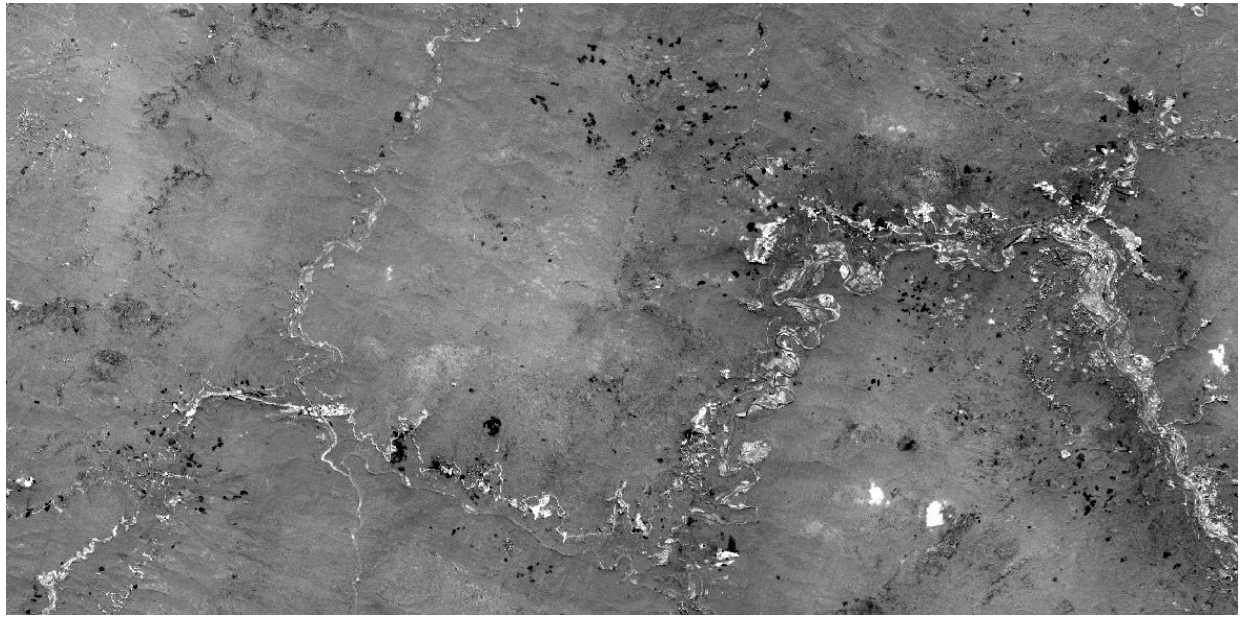


Natural Color Imagery After the Earthquake

Change Detection of Natural Color Imagery

Before and After Images Compared Showed in Color Grade and Black & White





Dark lines over orange show damage of left while white shows damage over grey

Takeaways

Transforming Disaster Management

- **Start Utilizing Advanced Technologies**: Embrace the power of remote sensing and machine learning to enhance disaster response capabilities.
- **Stop Relying on Outdated Methods**: Traditional damage assessment methods are often slow and imprecise. Our solution offers a faster, more accurate alternative.
- **Accelerate Recovery Efforts**: By providing detailed, real-time data on the affected areas, our solution helps speed up recovery processes, ensuring that aid reaches those in need more quickly.
- **Future-proof Disaster Preparedness**: Use our insights to develop more robust disaster management strategies, reducing the impact of future earthquakes and other natural disasters.