# GGR335 Project Proposal: Monitoring Deforestation Dynamics in the Amazon: Insights from Remote Sensing Analysis in Rondônia

Annie Chen, Arunima Dey, Michael Shvets, Megh Pathak, Nicholas Phanthasomchit, Olivia Zhou
GGR335H5 Winter 2024

## 1.      BACKGROUND

The Amazon rainforest in the northwestern part of Brazil, which is the largest rainforest in the world, has been a significant contributor to the overall biodiversity of the Earth. However, over the years the forest has experienced a steady decline in the number of trees in the area due to various anthropogenic disturbances which include edge effects, selective logging, fire, and extreme drought that have been intensified due to human activities (Lapola, D et al. 2023). One of the major reasons for this man-made disruption of the forest could be possibly due to farming and agricultural use. Furthermore, the Earth's climate tends to undergo degradation due to these spots resulting in becoming hotspots for CO2 emissions leading the air quality in those areas to be impacted negatively (Lapola, D et al. 2023). By understanding the core reasons of deforestation, can help the concerned authorities and the policy makers to take necessary actions to prevent it.

## 2.      RESEARCH OBJECTIVES

How can remote sensing techniques monitor the rate of deforestation in the Amazon rainforest and provide insights into its impacts and can predictive models be developed to anticipate future deforestation patterns in this region? The goal of this project is to collect information about the spatial and temporal changes in order to facilitate informed conservation activities and land management strategies, scientific informed perspective on government policy, environment management. It is imperative to concern ourselves with these questions to find transferable solutions to countries' investments in counteracting issues such as climate change in advance.

## 3.      PROJECT METHODOLOGY

Data will be primarily acquired from EarthExplorer. Using remote sensing data from EarthExplorer is ideal because it is accessible and accurate for the timeframe we require. All comparisons made to analyze change will correspond to the same WRS paths and rows to ensure precision in later analysis. If possible, we will begin by observing every year starting from 2005 to 2020. The Landsat 4 satellite is the oldest satellite to be used in this research. This project will aim to use Tier 1 category data because it is the highest available data quality. The temporal extent will be focused on January since it is in the middle of the dry season for the Amazon rainforest, therefore minimizing atmospheric scattering and absorption effects,while the site used for analysis will be in and around central-western Brazil. If time allows or January data is unavailable, December and February data will be retrieved for analysis as they are also in the timeframe of the dry season. The classification wizard, change detection, and image differencing tools on red and near-infrared

bands will be used to compare the rate of deforestation from 2005 to 2020, potential causes, and find evidence of potential regrowth and/or restoration efforts.

## 4.    EXPECTED RESULTS & SIGNIFICANCE

This research aims to utilize remote sensing techniques to monitor the rate of deforestation in the Amazon rainforest, providing insights into its impacts and developing predictive models for future deforestation patterns. By analyzing historical and recent satellite imagery, we will map NDVI changes across the region and identify land cover alterations. Notably, there appears to be a decline in deforestation activity post-2005, possibly linked to new conservation policies introduced during those years (Hansen, 2022). This project is crucial for understanding global concerns like climate change, species endangerment, and habitat loss. Investigating these trends will offer insights into potential conservation solutions, aligning with informed conservation activities, land management strategies, and scientific-informed policy-making to address pressing environmental challenges proactively.

## 5.    TIMELINE

| | TODO |
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| **Week 1**<br>Mar 4 - Mar 9 | - Develop research topic and questions/objectives<br>- Determine the spatial and temporal extent/resolution<br>- Collect satellite imagery of the region every 3 years, specifically in January, from 2005 to 2020. |
| **Week 2**<br>Mar 10 - Mar 16 | - Perform atmospheric correction<br>- Classify satellite images using supervised classification<br>- Create change detection maps and conduct change detection analysis |
| **Week 3**<br>Mar 17 - 23 | - Assess the accuracy of the classified maps through an accuracy assessment<br>- Discuss our new understanding of the problem |
| **Week 4**<br>Mar 24 - Mar 25 | - Finalize presentation |
| **Week 5**<br>Mar 26 - Apr 5 | - Present final results and conclusion to class<br>- Assemble data/results into final report |

## 6.    CITATIONS

[1]  Hansen, M.C., (2022). Rondônia, Brazil deforestation rates & statistics: GFW. Forest Monitoring, Land Use & Deforestation Trends.

[2]  Lapola, D et al. The drivers and impacts of Amazon forest degradation. Science 379, eabp8622 (2023). DOI: 10.1126/science.abp8622