



TEAM SAP

## GROUP 5

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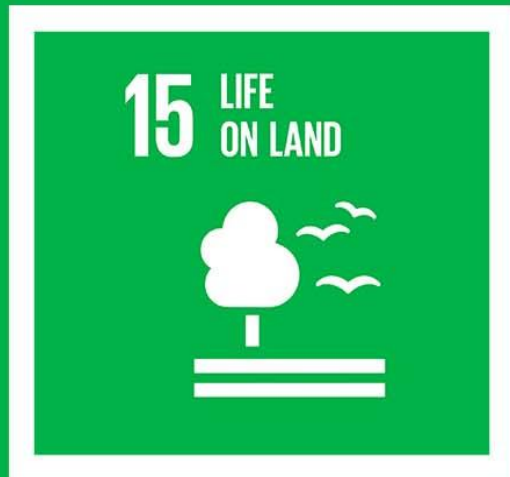
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**SUSTAINABLE  
DEVELOPMENT  
GOALS**

**15** LIFE  
ON LAND

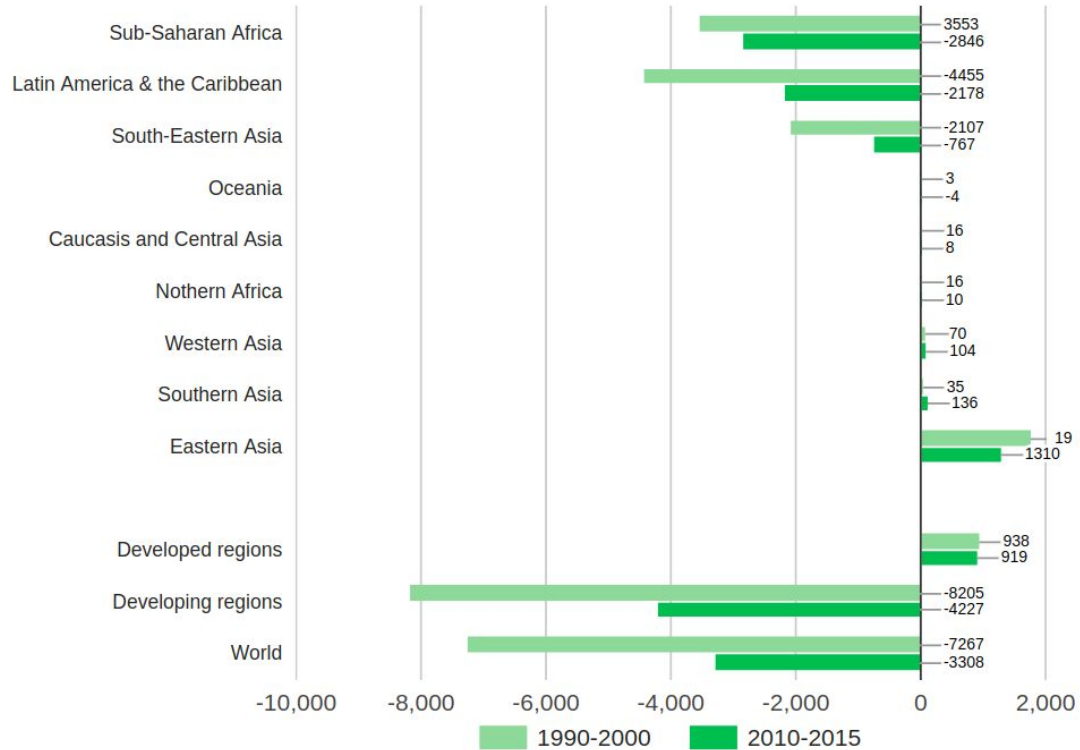




**Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification and halt and reverse land degradation and halt biodiversity loss**

# Introduction - Why?

- Deforestation : Earth's forest areas continue to shrink.
- Biodiversity : Terrestrial conservation
  - protect biodiversity, land productivity
  - curtail the loss of species



# Introduction - What ? Forest Change

- Quantification of tree cover area and deforestation rates from satellite imagery.
- Analyse trends of global forest loss or gain over years 2000 to 2018.
- Find areas with similar deforestation rates and suggest them with similar measures to curb the forest loss.



# Background - Previous research

Research carried out by [Hansen et al](#) :

- Examined global Landsat data at a 30-meter spatial resolution.
- Time-series analysis in characterizing forest extent, loss, and gain from 2000 to 2012.
- Provided Global Forest Cover (GFC) maps of resolution 1296001 x 493200 pixels.
- Single pixel represents 30m x 30m = 900 m<sup>2</sup> area.
- GFC maps capture any plantation taller than 5 metres as a forest.

# Background

GFC maps are composed of several bands (layers). Each layer is a separate image that represents a different piece of information.

- **Treecover2000** :
  - Tree cover in the year 2000,
  - canopy closure for all vegetation taller than 5m in height.
  - Encoded as a percentage per output grid cell, in the range 0–100.
- **Loss** :
  - A change from a forest to non-forest state.
  - Encoded as either 1 (loss) or 0 (no loss).
- **Gain** :
  - A non-forest to forest change entirely within the study period.
  - Encoded as either 1 (gain) or 0 (no gain).

# Method

- **Data** -

- Each image is in **TIFF** format with a size more than 1 GB.
- Analysis on 70 image files covering South America region.
- Satisfies the Large Observation Criteria (option-1).

- **Pipelines** -

- Tracking deforestation rate from 2013 - 2018 using two data pipelines - Spark and Hadoop.
- We will be utilizing the concepts of MapReduce and Deep Neural Networks to perform large data analysis.



# Method

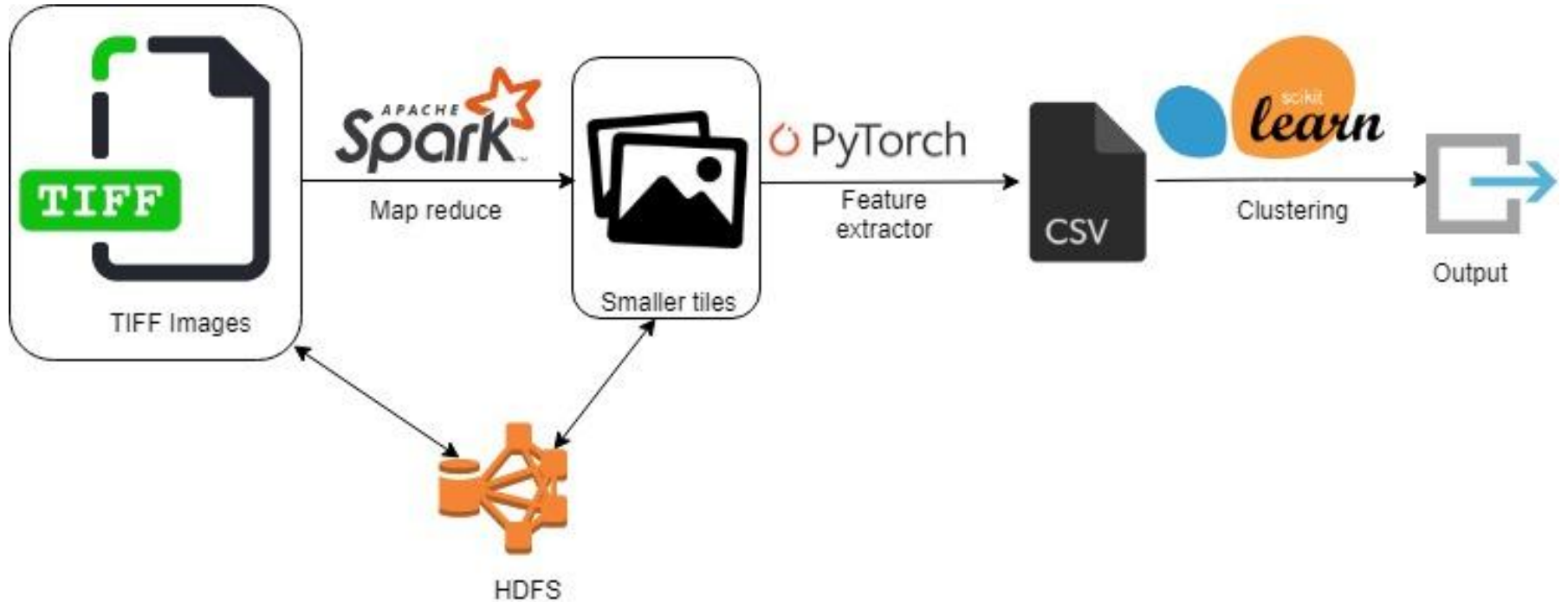


- As the amount of data is huge and every image is 40000 x 40000 pixels, we will map each image to 2000 x 2000 pixels using MapReduce and keep it distributed on HDFS.
  - We calculate the loss by counting the loss pixels and summing it up across all tiles.
  - This will give us the total tree cover loss.
- To find forest areas with similar deforestation rates, we will be using
  - Deep Neural Networks as a feature extractor.
  - Perform clustering over these features.





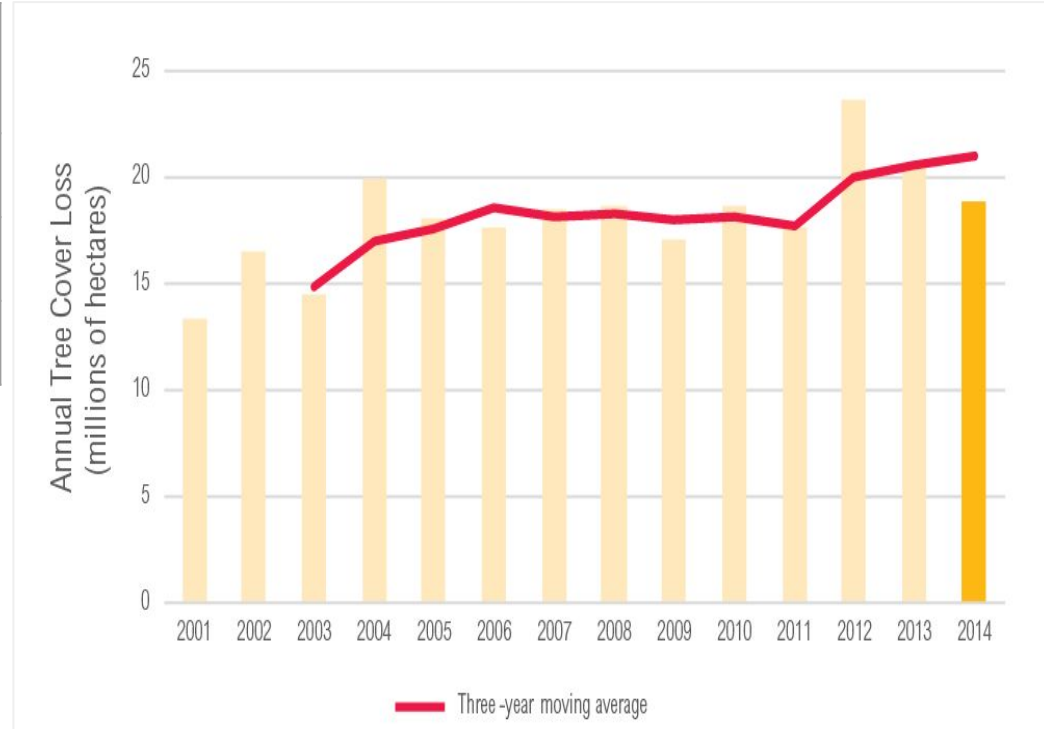
# Data Pipelines and Concepts Used



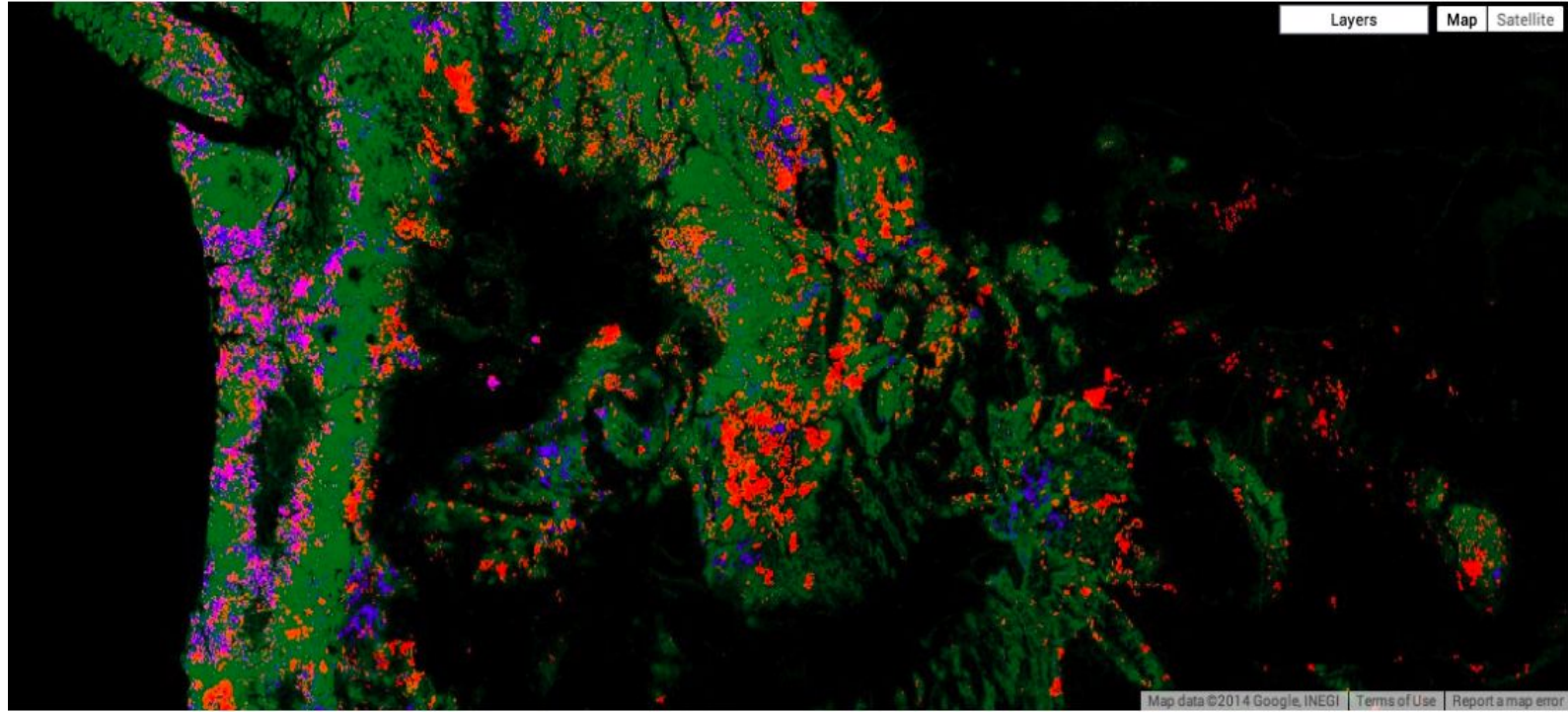
# Mock Results

- Calculate total forest loss for each year separately and plot as tables, bar graphs.

Year	Loss of forest cover (sq. km.)	Gain in forest cover (sq. km.)
2012	1025	100
2013	1150	75
2014	1212	65



# Mock Results - Forest Change (FC) map



US Pacific North West forest loss (red), year 2000 cover (green) and gain (blue).

# Mock Results

- Globally, during the 12-year study period :
  - 2.3 million sq km of forest were lost
  - 0.8 million sq km of new forest were gained
- Tropics exhibited both the greatest losses and the greatest gains
  - through regrowth and plantation
  - losses outstripping gains
- Brazil's reduction in deforestation was offset by increasing forest loss in Indonesia, Malaysia, Paraguay, Bolivia, Zambia, Angola, and elsewhere.

# Conclusion

- Analyse trends of global forest loss or gain over years 2000 to 2018.
- Areas with similar deforestation rates could be suggested with similar measures to curb the forest loss.
- Extensions:
  - From the forest loss one can infer habitat loss for forest-dependent species.
  - We can calculate the forest loss and deforestation rates on the global scale.
  - Relate deforestation rates with tweets regarding deforestation in that particular area.



# References

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