Tree Cover Loss Analysis and Prediction:

How It Will Impact Our World and What We Should Do

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Data Sets

- [Link](#) for our data sets.
- Includes three .csv files
- Covers tree loss and CO2 emissions by region, by country and main drivers.

|	CountryCode	Year	TreeCoverLoss_ha	GrossEmissions_Co2_all_gases_Mg
0	AGO	2001	4957.597965	3.021078e+06
1	ARG	2001	5979.947498	2.253298e+06
2	AUS	2001	0.075922	2.885012e+01
3	BDI	2001	6.222930	3.288072e+03
4	BES	2001	0.146932	6.125723e+01
...	...	...	...	...
1858	VNM	2020	32619.892720	2.396140e+07
1859	VUT	2020	1674.549459	1.014267e+06
1860	ZAF	2020	879.927136	5.434708e+05
1861	ZMB	2020	2143.134178	1.009848e+06
1862	ZWE	2020	37.885391	2.188695e+04

1863 rows × 4 columns

Data Sets

- Tree Loss measure in Hectares (10,000 square meters)

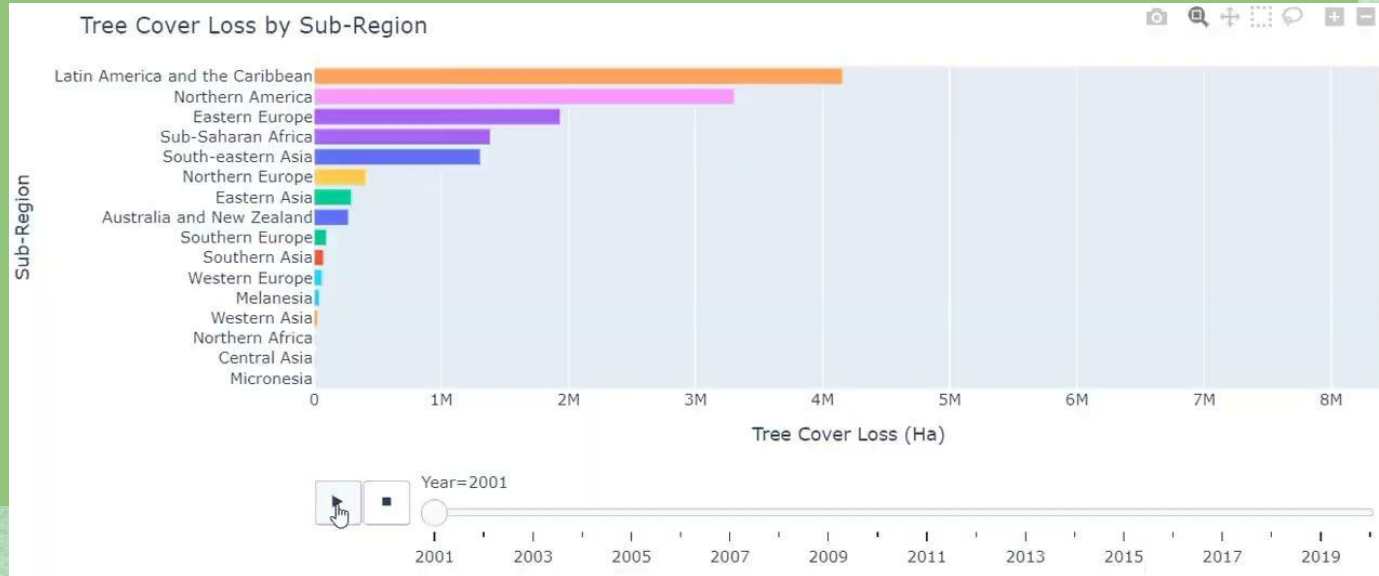- CO2 Emisiosn measure in Megagrams, (2,205 pounds)

1 metric ton carbon dioxide gas

10.07 m (33 ft)
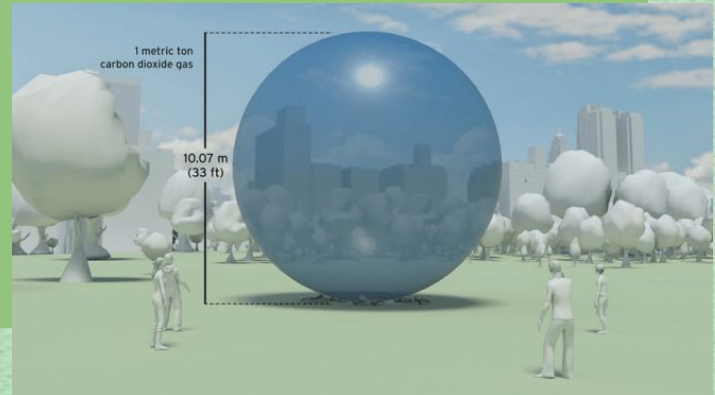
Trends in Tree Loss

- See an overall increase in tree cover loss
- Darker reds illustrate more tree loss
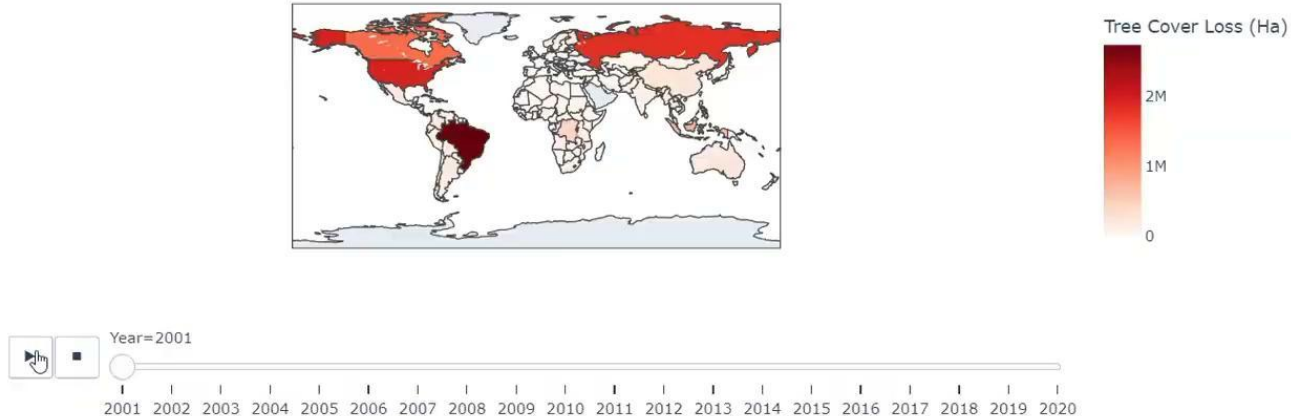
Trends in Tree Loss

- Again see increase in tree loss
- Tree loss across all continents

Trends in Tree Loss

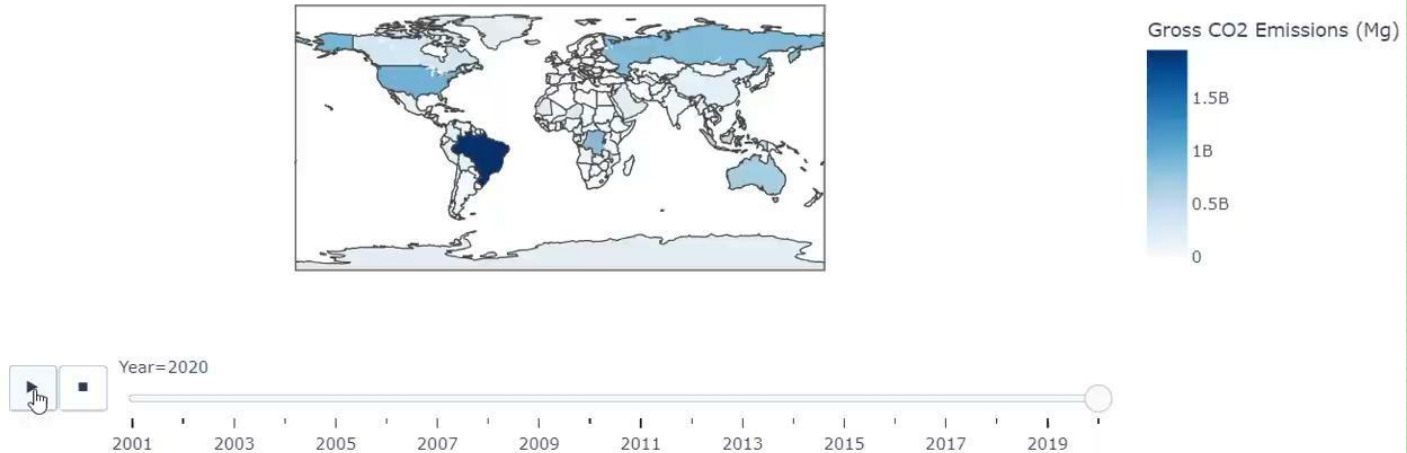- Globally we see an increase in tree loss.
- Not a consistent increase, but not decreasing.

Total Tree Cover Loss Worldwide by Year
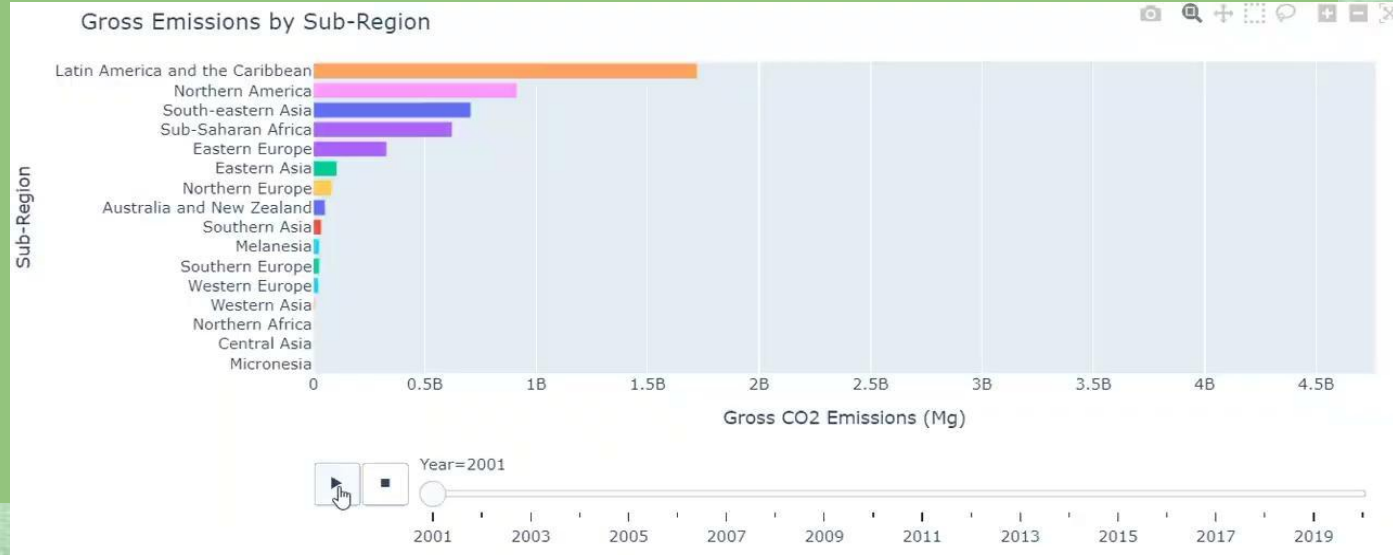
Trends in CO2 Emissions

- Darker blue indicate more CO2 emissions.
- Global increased CO2 emissions trend.

Global Gross Emissions by Country

Trends in CO2 Emissions

- See increased average CO2 emissions
- Same regions have the highest tree loss and CO2 emissions
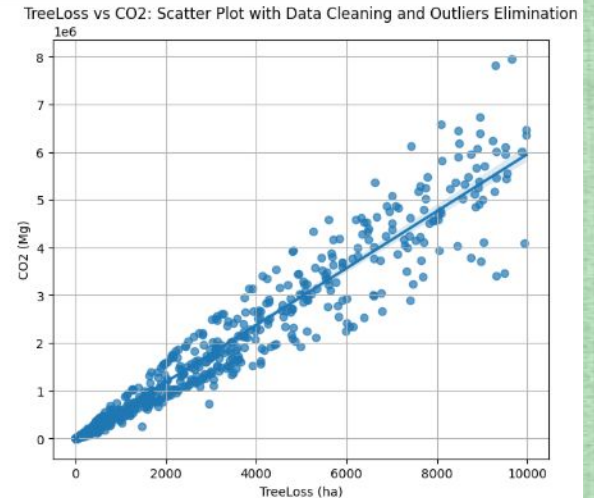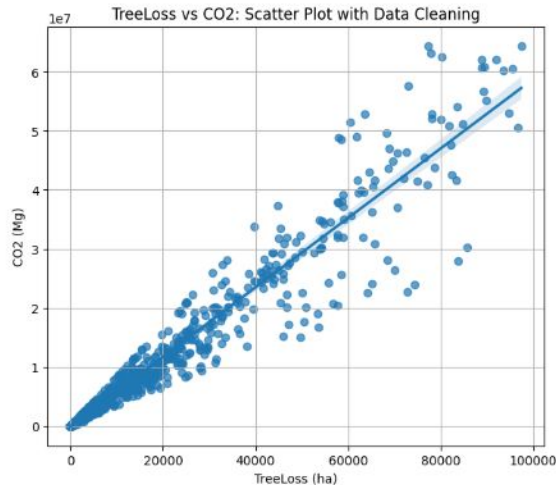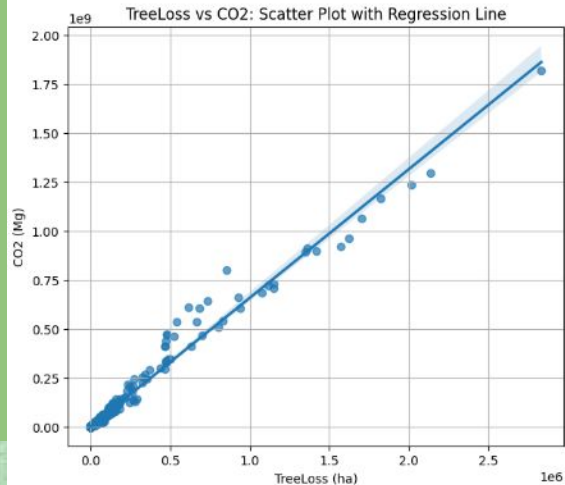

Gross Emissions by Sub-Region

Trends in CO2 Emissions

- Similar to tree loss trends, increased emissions
- Again, not at its peak, but not improving

Total Gross Emissions Worldwide by Year
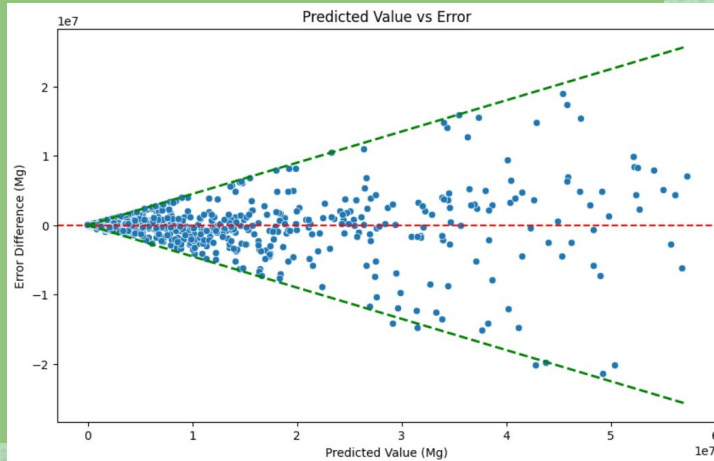
Correlations between CO2 and Tree Loss

- Strong positive linearity relationship between CO2 and Tree Loss
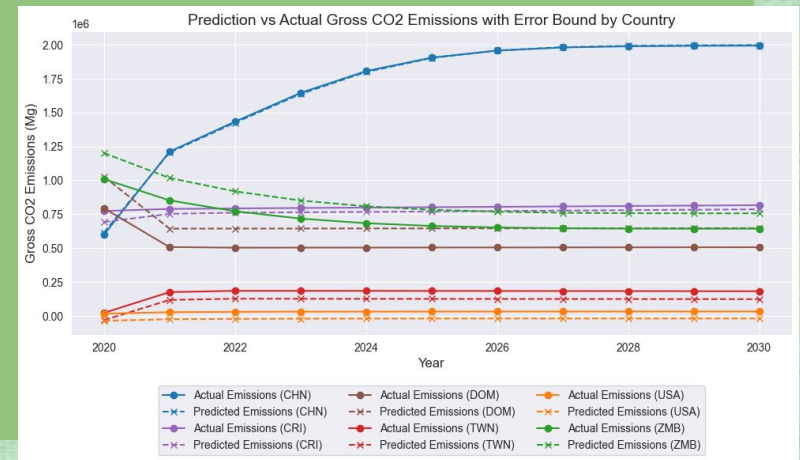- CO2 (Mg) = -59112.48 + 588.21 * Tree_Loss (Ha)

Correlations between CO2 and Tree Loss

- Tree Loss and CO2 relationship established with OLS regression

The difference between actual and predicted CO2 emissions is bounded by 0.45 * predicted emissions.
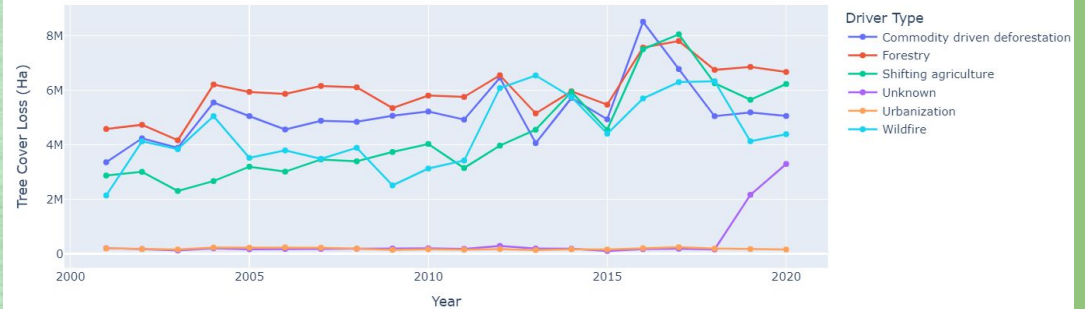

Comparing predicted vs actual CO2 emissions for six representative countries and regions

Tree Loss and CO2 Drivers

- See humans cause most tree loss
- Natural tree loss (Wildfires), do not cause as much CO2 emissions
- Overall increase in human tree loss

Tree Cover Loss by Dominant Deforestation Drivers from 2001 to 2020

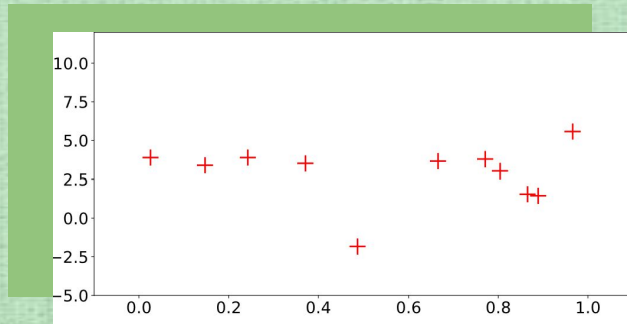Gross Emissions of CO2 by Dominant Drivers
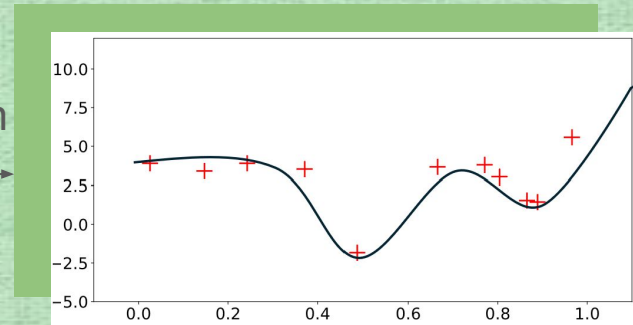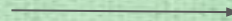
Methodology

- Objective:

  We aim to predict the tree cover loss for future years.

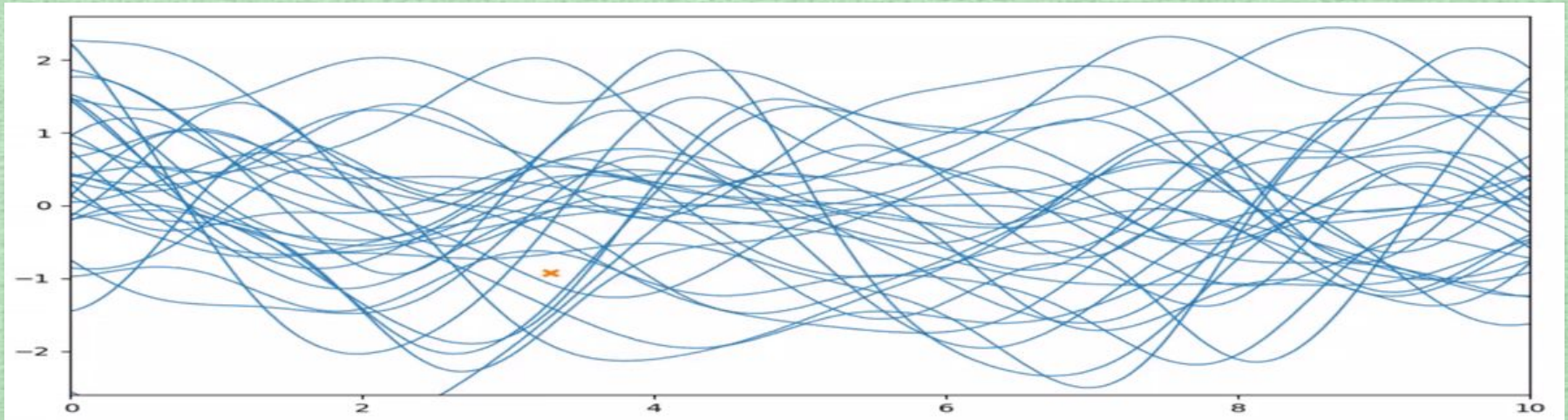 This can be viewed as a regression task.

Observed data

Regression

A curve to fit the observed data

J. Wang, "An intuitive tutorial to Gaussian processes regression," Computing in Science & Engineering, IEEE, 2023.

Methodology

- Example

  The model is more confident in a region with more consistent or more dense data points.

J. Wang, "An intuitive tutorial to Gaussian processes regression," Computing in Science & Engineering, IEEE, 2023.

Future Tree Loss Prediction

- Used Gaussian Regression to predict future tree loss.
- The model was trained using years from 2001-2020
- Shows steady drop then constant tree loss.
- Recorded values are blue, predicted are in red.

Global Tree Loss with Predicted Loss from 2020-2030
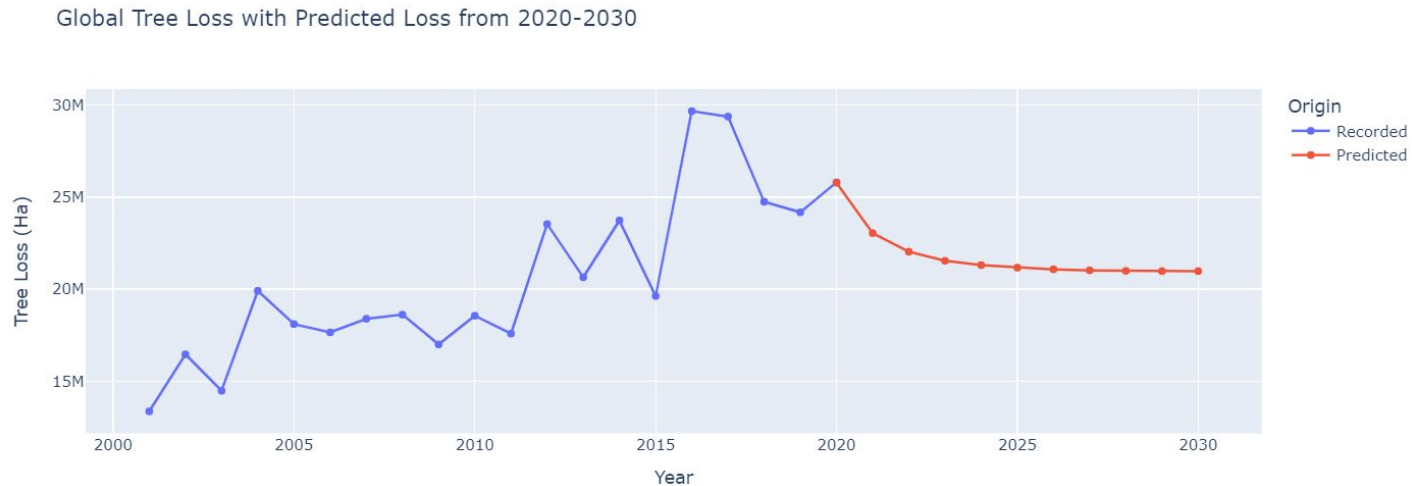
Summary and Future Work

- Future tree loss may slow down, but is still higher than previous decades
- Tree loss can be directly correlated to the emissions of CO_2 gasses.
- Human driven tree loss also increases CO_2 emissions more than natural tree loss

Thank you!

Any Questions?