The Amazon Rainforest: Is Deforestation Increasing?

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Overview/Business Problem

I am acting as a data scientist with an environmental conservation organization in Brazil to determine if Amazon deforestation is increasing. I want to determine what factors influence the deforestation of the Amazon and on what scale their influence lies. I plan to conclude whether forest fires are correlated with deforestation, and what patterns and information lie within the occurrences of forest fires across a variety of Brazilian states that may impact deforestation.

Data

3 Kaggle Datasets:

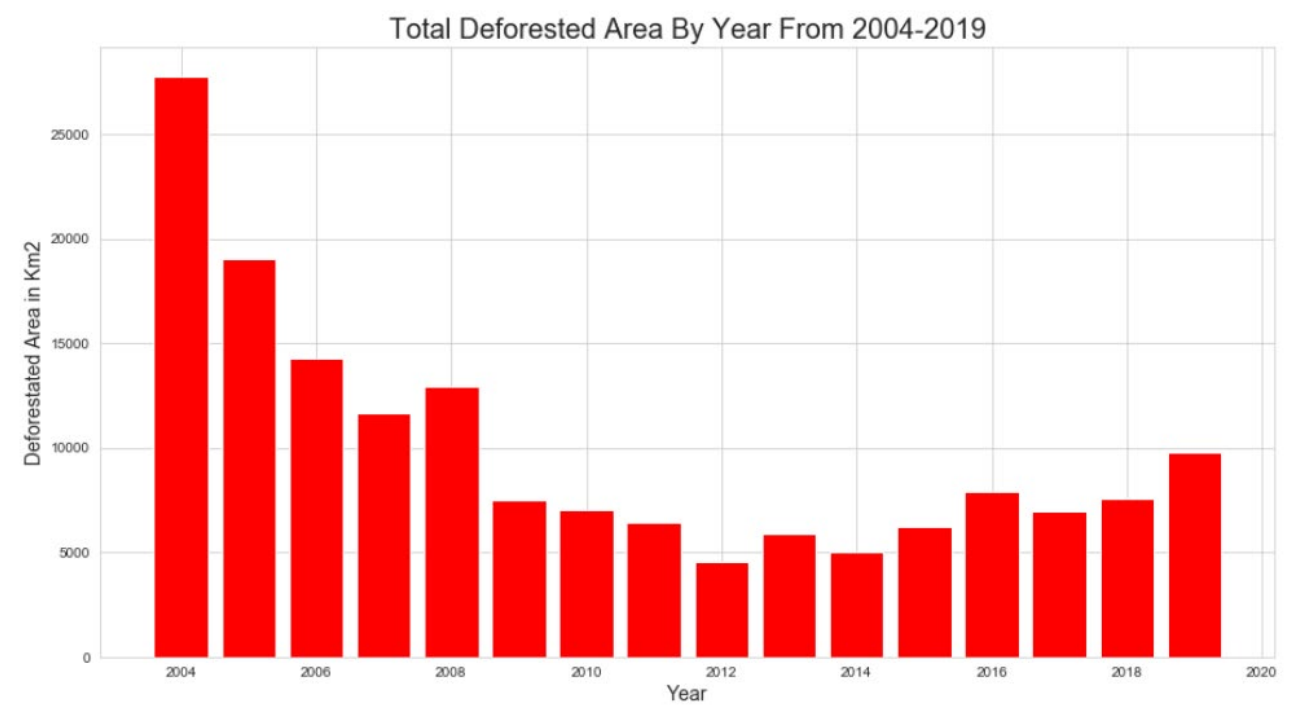
- Deforestation data: The Brazilian Amazon Rainforest Monitoring Program by Satellite (16 rows, 11 columns)
- Fires data: The Fires Database at The National Institute for Space Research (2104 rows, 6 columns)
- Weather data: Golden Gate Weather Services (16 rows, 5 columns)

2 Websites:

- Population statistics from https://www.macrotrends.net/countries/BRA/brazil/population.
- Brazil GDP statistics from The World Bank Group at https://data.worldbank.org/indicator/NY.GDP.PCAP.CD?end=2019&locations=BR&start=1960&view=chart.

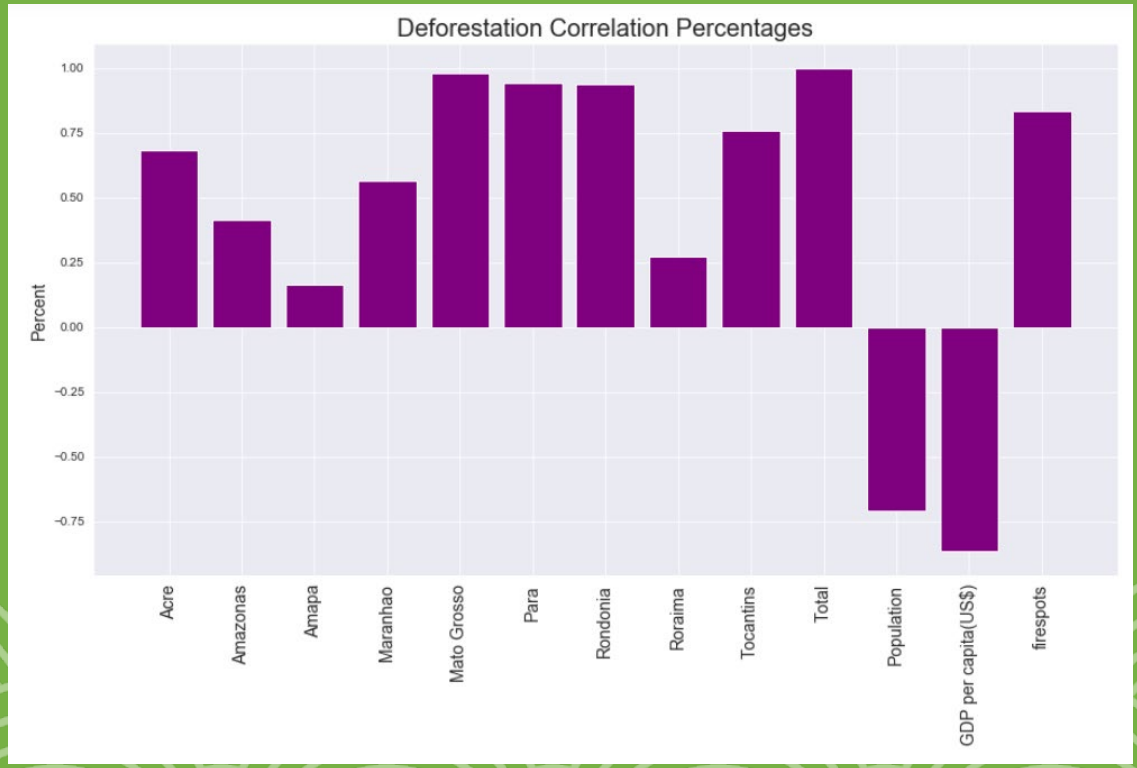
Data Preparation

- Plots of Total Deforested Area Across Brazilian States between 2004-2019 and Correlation Plot
- Deforestation decreased 2004-2012 and then increased



- Weather patterns left out of analysis
- Correlation analysis:

Mato Grosso- 98%
Para- 94%
Rondonia- 93%
Firespots- 83%
Population- -71%
GDP($) per capita- -86%



Data Modeling- Part 1

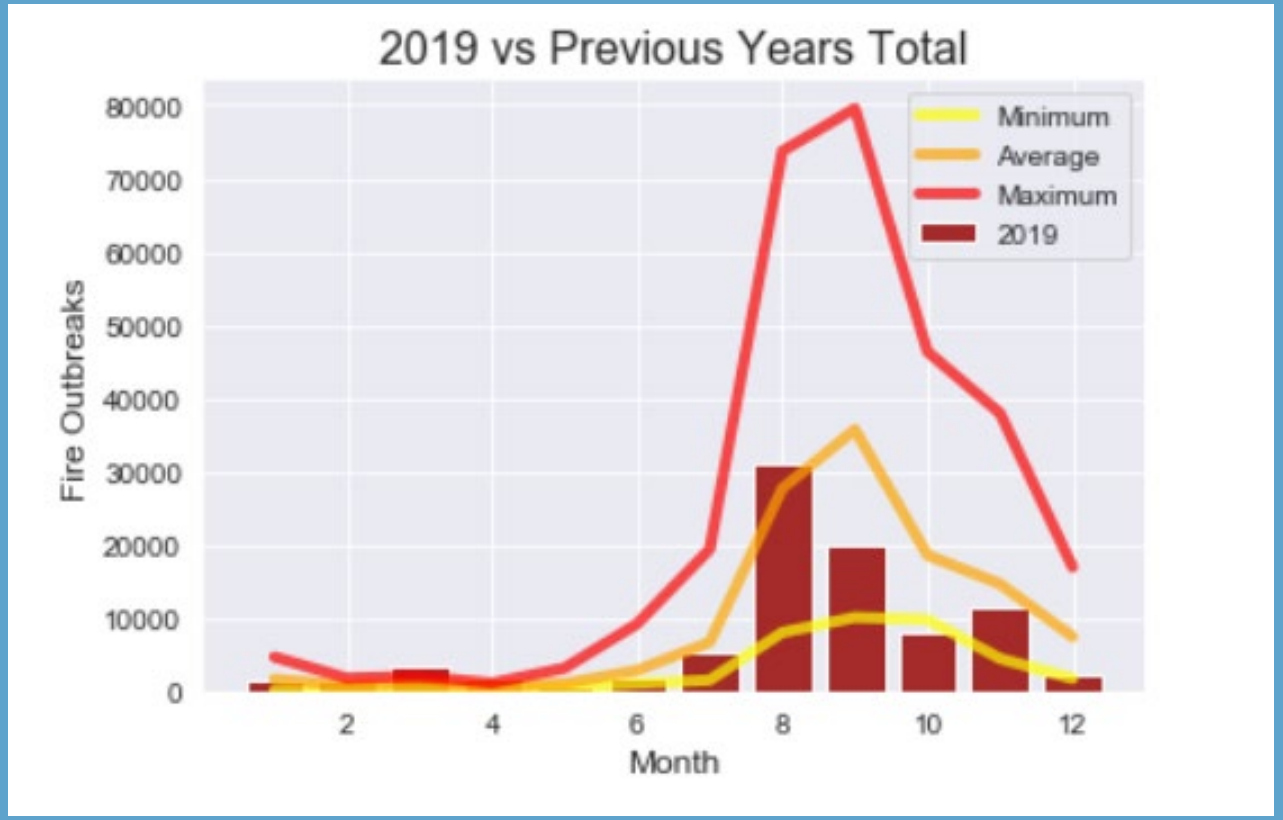
Model 1:

- Linear Regression model
- Population,
  GDP per capita($), and
  Firespots all negative coefficients
- R2 Train- 0.86
  R2 Test- 0.44

Model 2:

- Built out Function for Firespots for a Given Year Compared With Average, Minimum, and Maximum Firespots for Previous Years

- Year 2019 had higher than maximum fire outbreaks for months of March and April than previous years

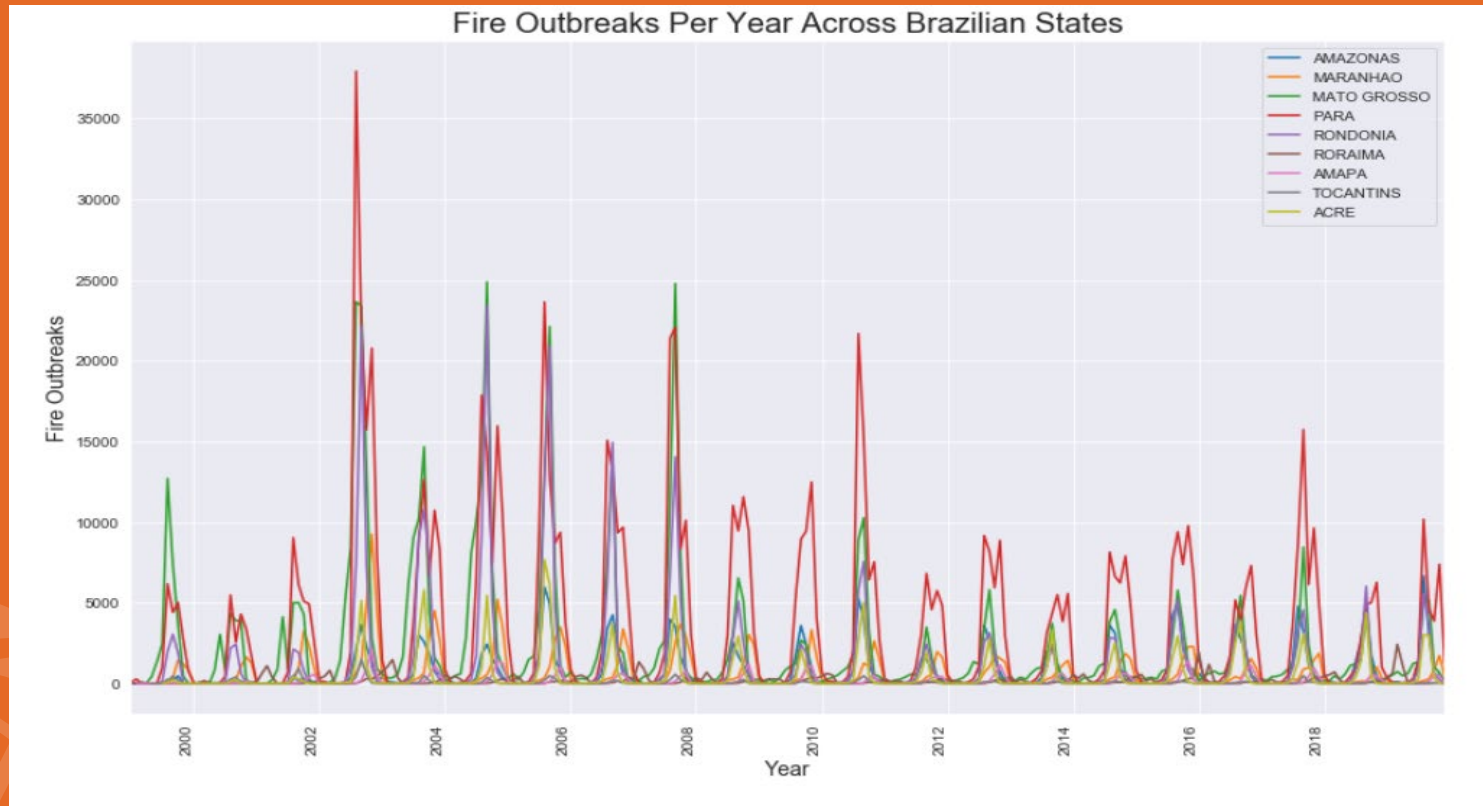


Data Modeling- Continued

State	Amazonas	Maranhao	Mato Grosso	Para	Rondonia	Roraima	Amapa	Tocantins	Acre
Pred Fires	11698	5864	14146	38988	16934	2070	1693	735	7185
Actual Fires	12665	3989	17479	29700	11206	4775	1272	247	6802
R2 Score	0.75	0.40	0.78	0.61	0.55	0.02	0.87	-4.91	0.72

Model 3:

- Arima models for each Brazilian state to predict firespots by month and year in 2019
- Mato Grosso, Para, and Rondonia lead seasonality trends from June to November
- Amazonas and Roraima had an unprecedented high number of firespots for 2019



Conclusions

- Deforestation has not necessarily decreased. Acknowledge high deforestation totals and strong seasonality trends of firespots particularly within the Brazilian states of Mato Grosso, Para, and Rondonia.

- Recognize possible implications of an unprecedented high number of firespots for the months of March and April in 2019 and the states of Amazonas and Roraima in 2019.

- Employ efforts to enforce stronger fire restrictions during strong firespot season to reduce deforestation.

Recommendations for Further Analysis

- Integrate more features in future modeling such as annual soybean yields, annual timber production amounts, and number of cattle ranches in Brazil per year.
- Incorporate and analyze satellite image classification that show different activities related to whether or not deforestation is occurring at given times.

Contact Information

Email:

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Github link:

https://github.com/jmstipanowich/AmazonDeforestation

Picture Source:

https://www.stockholmresilience.org/research/research-news/2020-04-02-amazon-deforestation-leads-to-increasingly-severe-dry-seasons.html

THANK YOU!!!!!!!!