National Footprint Accounts

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Data Mining

INTRODUCTION

- Earth is facing an environmental crisis
  - Global temperature rising
  - Ocean getting warmer
  - Ice sheets shrinking
  - Sea levels rising
  - Many other extreme events

INTRODUCTION

- Humans contribution to greenhouse effect is leading cause to global warming
- Greenhouse effect: warming that results from gases radiating from Earth that are trapped in atmosphere
  - Water vapor
  - Methane
  - Nitrous oxide
  - Carbon dioxide
- Since Industrial Revolution, humans have increased atmospheric carbon dioxide concentration by 1/3

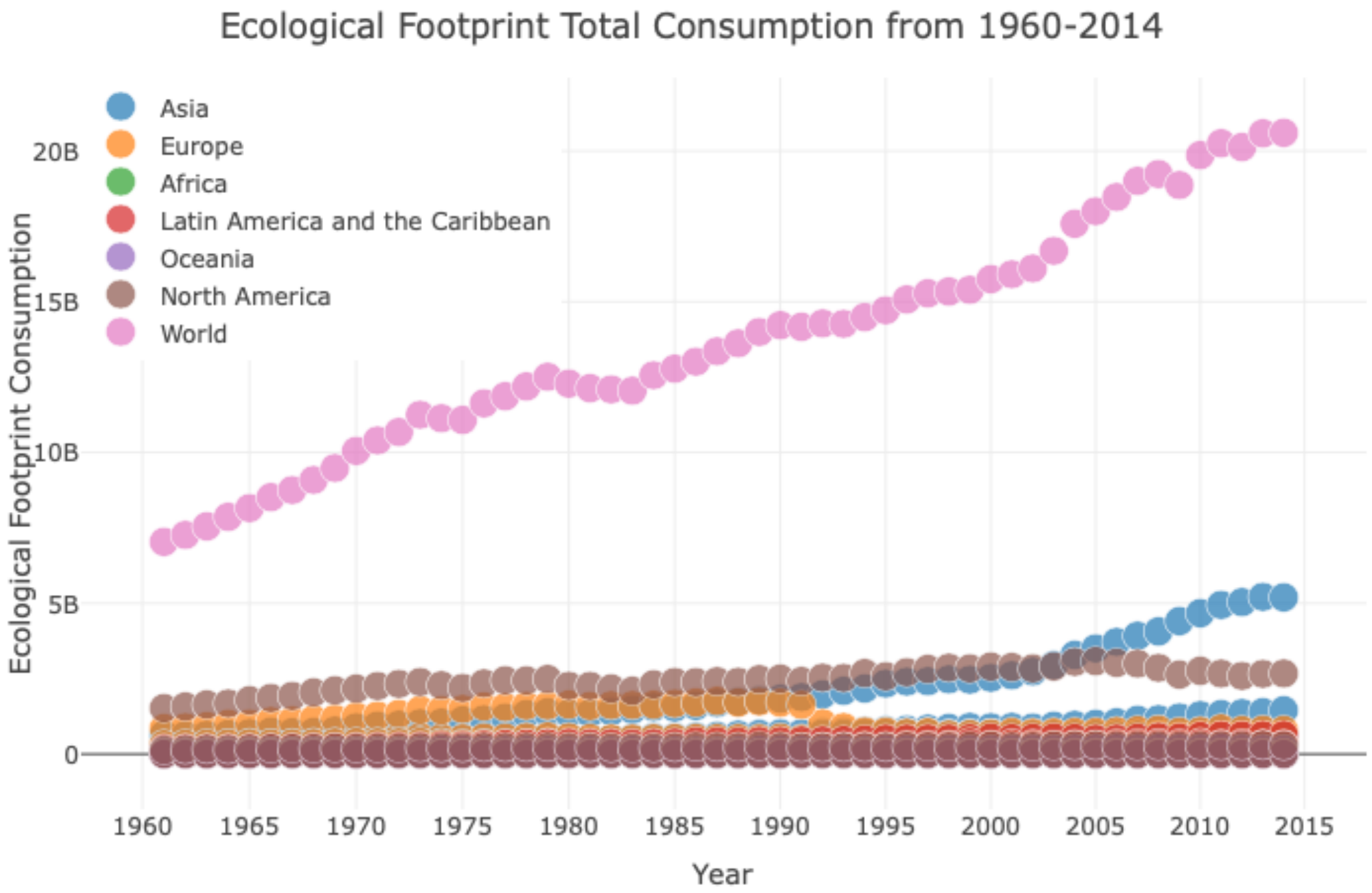
INTRODUCTION

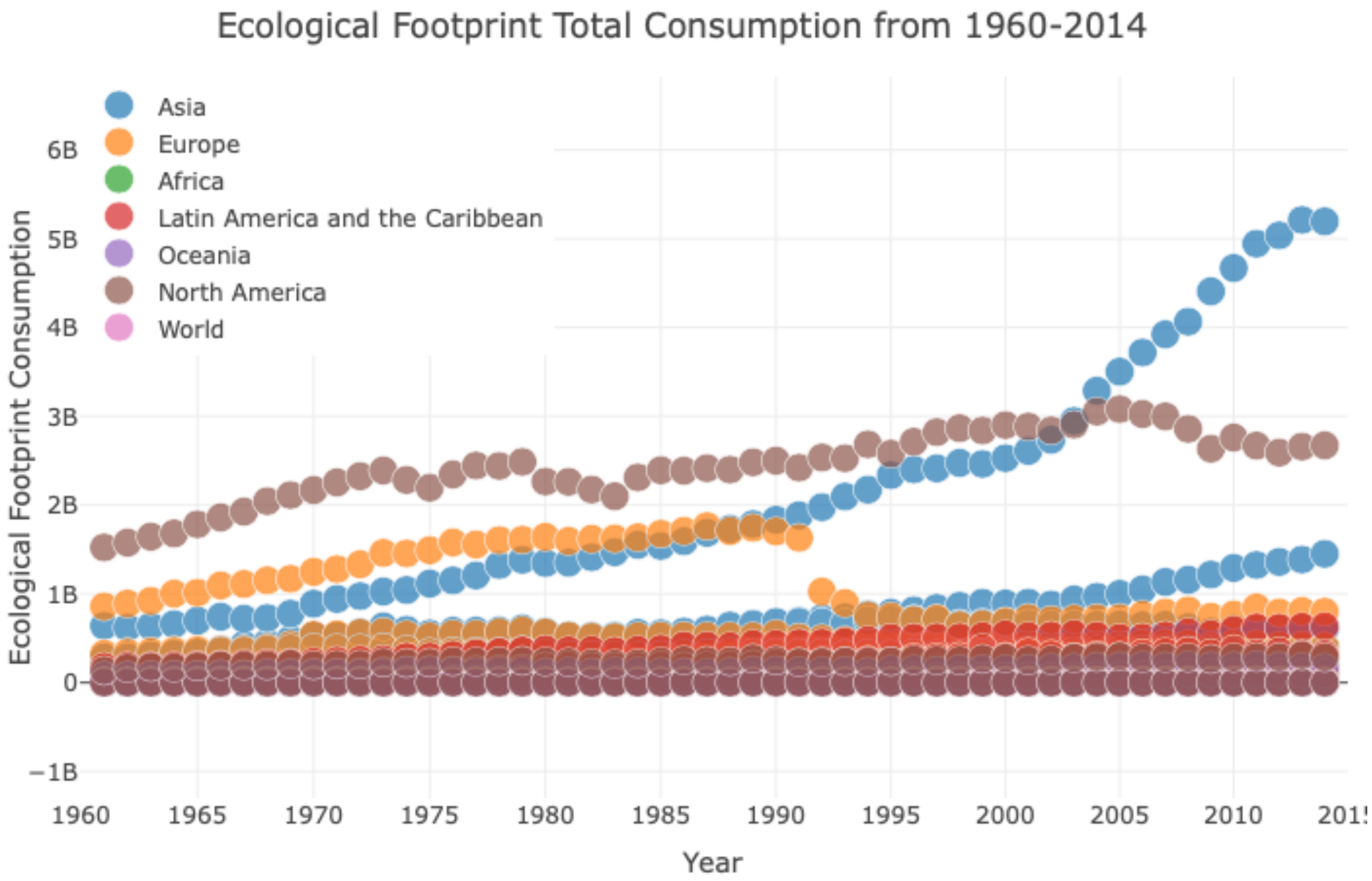
- In US, primary sources of greenhouse gases: transportation, electricity production, industry, commercial and residential, agriculture, land use forestry
- Earth is struggling to absorb carbon dioxide from humanity's increasing use of natural resources
- Earth in ecological deficit
  - Using equivalent of 1.7 Earths to provide our resources and absorb our waste

How is the amount of carbon emission affected by a country’s land use?

DESCRIPTION OF DATASET

- Global Footprint Network dataset from Kaggle
- 1,305,300 observations
- 15 features: country, ISO alpha-3 code, UN region, UN subregion, year, record, crop land, grazing land, forest land, fishing ground, built up land, carbon, total, Percapita GDP (2010 USD), population


Ecological Footprint Total Consumption from 1960-2014
Asia
Europe
Africa
Latin America and the Caribbean
Oceania
North America
World
20B
15B
10B
5B
0
Ecological Footprint Consumption
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
Year


Ecological Footprint Total Consumption from 1960-2014
Asia
Europe
Africa
Latin America and the Caribbean
Oceania
North America
World
Ecological Footprint Consumption
6B
5B
4B
3B
2B
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1960
1965
1970
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1980
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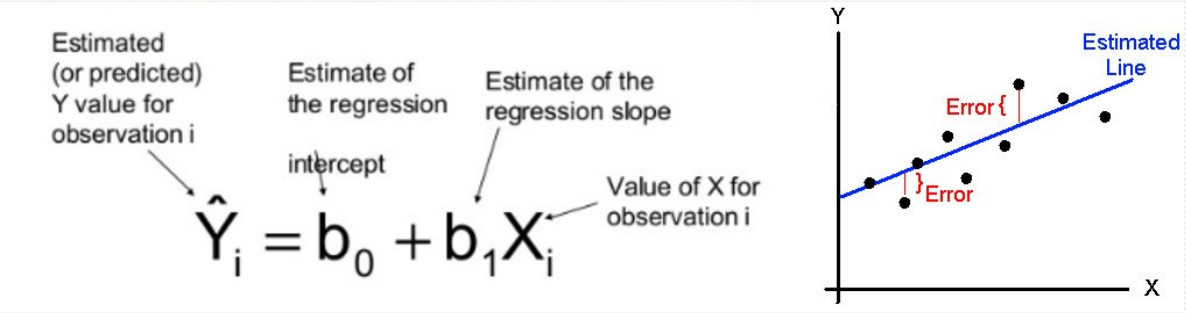
2000
2005
2010
Year

LINEAR REGRESSION



- Target variable (Y): Carbon
- Predictors(X): crop land, grazing land, forest land, fishing ground, built-up land, population

DATA PREPROCESSING

- Instance Selection: subset observations with ‘record’ == ‘EFConsTotGHA’
- Dropped countries with no data before 2014
- Dropped observations from ‘World’
- Filled the remaining empty cells with 0 for imputation
- Split data into X and Y

DATA PREPROCESSING

- Train test split 70/30
- Impute missing values with mean
- Scale Min-Max with Max = 1

FITTING TO MODEL

- model = LinearRegression(normalize=True)
  model.fit(scaled_x_train, scaled_y_train)
- carbon_y_pred = model.predict(scaled_x_test)

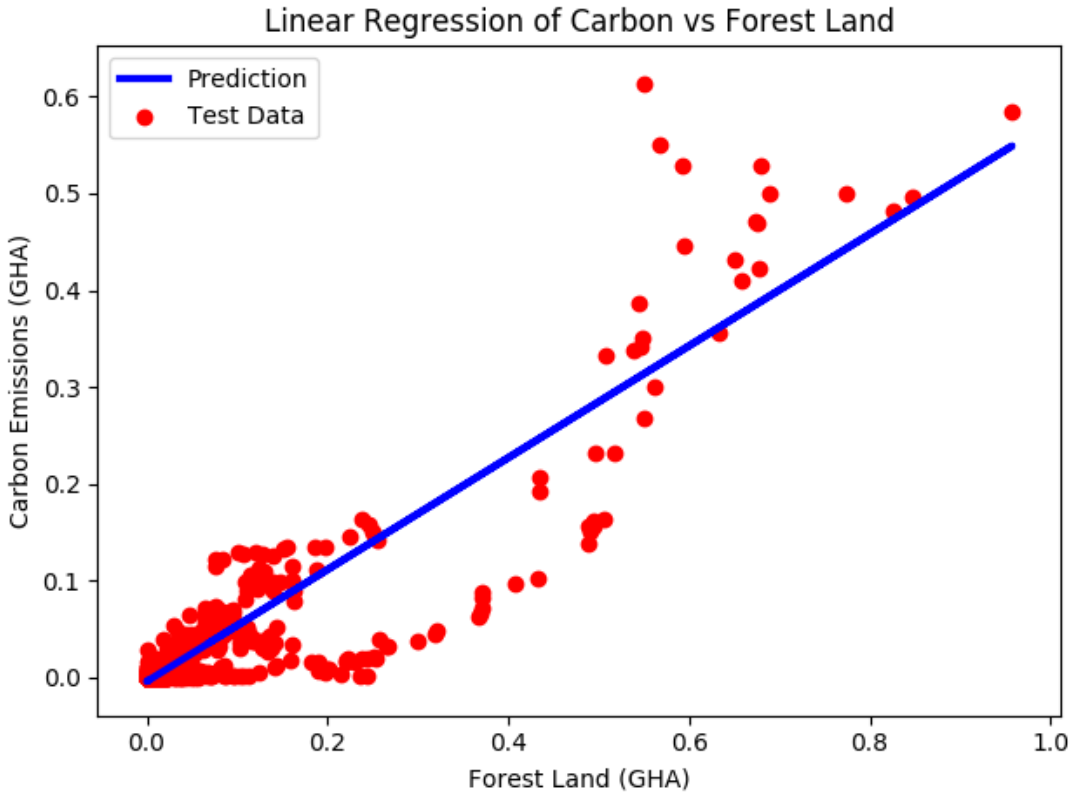
PERFORMANCE OF MODEL

- Predictor: Crop Land
  - R2 = 0.5934701180950691, error= 0.0011722386322388484
- Predictor: Grazing Land
  - R2 = 0.469128358229027, error= 0.00153078106910115 72
- Predictor: Forest Land
  - R2 = 0.809989879557301 7, error= 0.0005478987243338134
- Predictor: Fishing Grounds
  - R2 = 0.438491342289863, error= 0.0016191236369146695
- Predictor: Built up Land
  - R2 = 0.3542730057375448 3, error= 0.0018619692235340745

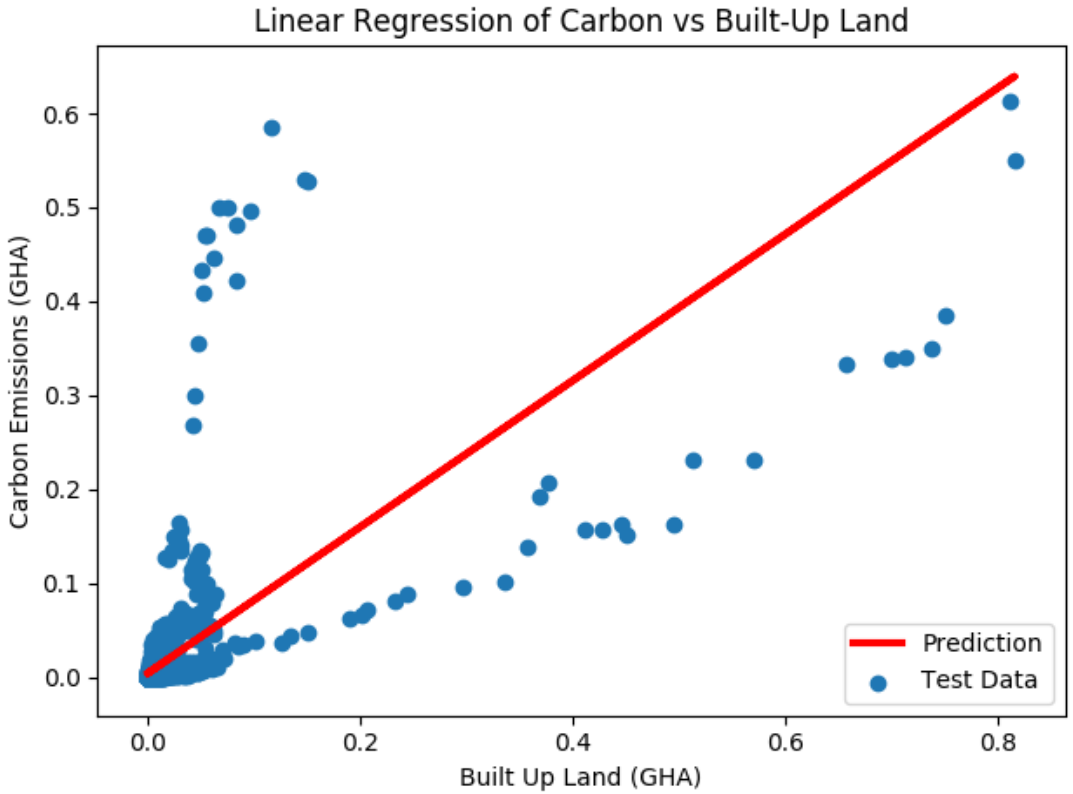
RESULTS

- Best Model : Predictor: **Forest Land**
  - R2 = 0.809898795573017
  - error= 0.0005478987243338134
  - Y = 0.57807228x + (-0.00440467) + error
- Worst Model: Predictor: **Built Up Land**
  - R2 = 0.35427300573754483
  - error= 0.0018619692235340745
  - Y = 0.77867656x + 0.00451244 + error

- Predictor: **Forest Land**
  - R2 = 0.8099898795573017
  - MSE= 0.00054789872433384134
  - Y = 0.57807228x + (-0.00440467)



- Predictor: **Built-Up Land**
  - R2 = 0.3542730057375448 3
  - MSE= 0.0018619692235340 745
  - Y = 0.7786x +0.0045



CONCLUSION

- Global hectares of forest land is the best predictor of amount of carbon emissions from each country
  - Followed by crop land, grazing land, fishing grounds, and built up land in descending order
- Increasing forest land use is increasing the amount of carbon emissions
- Built up land model has the smallest r-squared score, but highest coefficient

REFERENCES

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