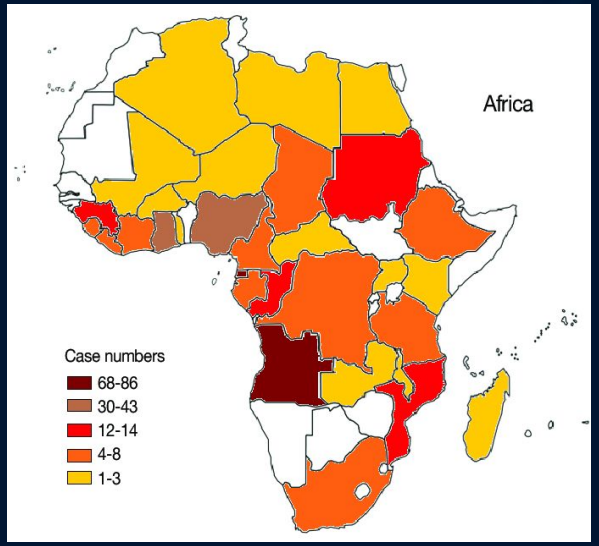
Malaria In Africa



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AGENDA

- Problem Context
- Problem Breakdown
- Data Analysis
- Observations
- Solution

PROBLEM CONTEXT

- UNICEF reports that Malaria kills a child under five years every two minutes. Globally , the WHO African region has been affected by Malaria which has led to over 384, 000 preventable malaria deaths according to WHO Regional Director for Africa, Dr. Matshidiso Moeti.

- This calls for action since there are several challenges faced in the prevention of the disease such as:
    a. The parasite that causes malaria is developing resistance to the drug
    b. The mosquito vector is developing resistance to the insecticides
- With data on possible infection rates, pharmaceutical companies would be prepared to produce the right amount of medication to treat cases in the early stages to serve the community.

Problem Statement

With 94% of global malaria cases in the **WHO African Region** which is an estimated 290 million cases and 409,000 deaths[7] **over the past ten years**, how can we use **AI-driven solutions** to **predict** the possible number of malaria cases ,so that Governments and Health Institutions can use our analysis and findings to **drive better data-driven decisions on ways to mitigate the issue?**

Analysis Questions

- Which country in Africa has the highest number of Malaria cases?
- Which year had the highest number of malaria cases?
- What is the correlation between the incidences of malaria and malaria cases reported?
- What is the predicted number of malaria incidences ?

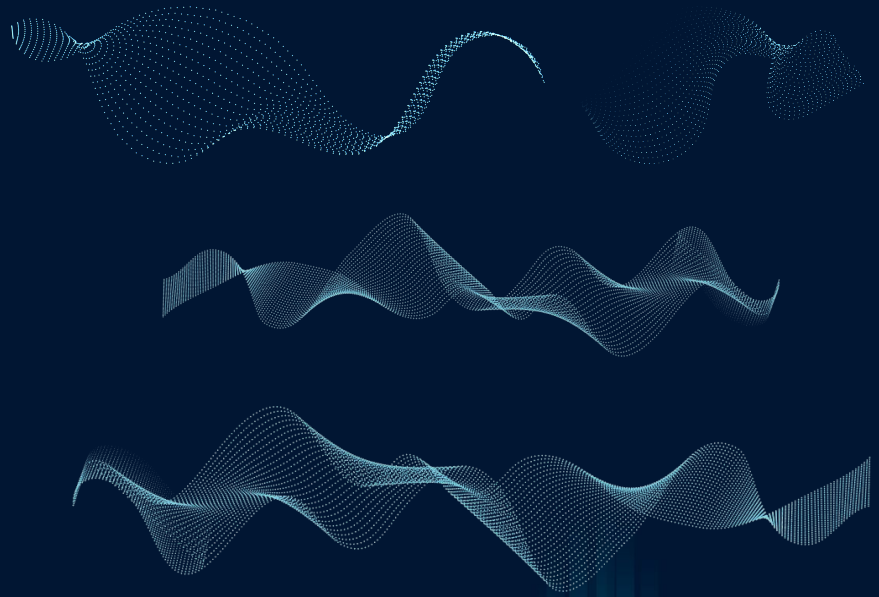
Solution Artefact

- Our solution is an AI model that predicts the number of people that will be affected by Malaria in the following year when data is inputted into the model
- This model will help the government know the amount of medicine that is needed to be manufactured because of the exact number of people that are affected
- Furthermore it will help the government plan about the steps that are needed to be taken to prevent malaria

Data Cleaning Strategies

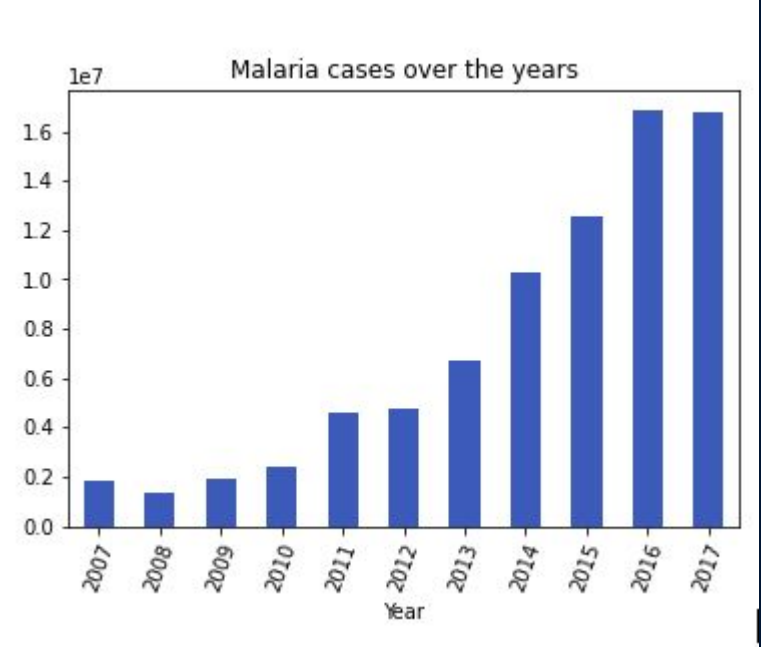
- Dropping null values to remove outliers that would interfere with our analysis
- Checked the types of data to ensure consistency across columns
- Dropped unwanted columns that would not be relevant during the analysis
- Replaced missing values with average values to avoid skewing the results of the analysis
- Changed non numerical values to numerals so as to help with the modelling.

Analysis Libraries



- Numpy
- Pandas
- Matplotlib
- Seaborn
- Sklearn
- Sklearn.utils
- Sklearn.svm
- Xg boost

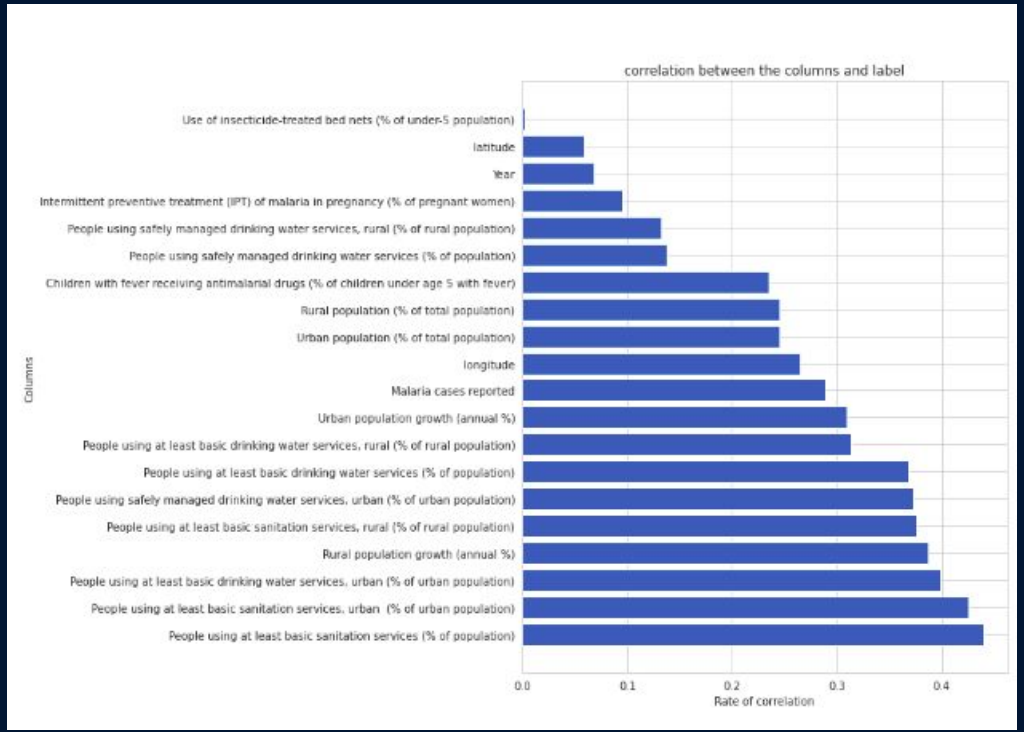
Malaria Cases



The graph reveals that the malaria cases over the years has been rising in the african countries.

This increase shows an Exponential Growth in the malaria cases happening in each year

Correlation



The correlation graph enabled us to pick the features we were going to use for our model. The features that had a strong positive correlation with the label were used for modelling..

Analysis Observations

- The data follows an Exponential Growth because of how malaria cases are increasing each year
- Congo Democratic Republic had the most Malaria incidences that totaled to 16,821,130 cases
- 2016 had the highest number of Malaria cases
- Basic sanitation strongly influences the malaria incidences

MODEL OBSERVATIONS

- The algorithm chosen for our model was linear regression reason being we wanted to predict the incidences of malaria cases ,which is our target prediction value based on independent values that we used as the features.
- Our model had an accuracy of **0.940659526450512**
- From our model we were able to derive predicted values based on our features and came up with with a table to compare the two.
- To test for specific situations ,we printed out our test data with the actual incidence at the end and the predicted at the beginning.

TEST DATA WITH SPECIFIC PREDICTIONS

The image below represents the test data with the actual incidence at the end and the predicted at the beginning.

```
354.51254 [ 2.2000000e+01  2.0110000e+03  3.9000000e+01  4.5619810e+06
  4.2900000e+01  2.9300000e+01  1.1500000e+01  2.8390000e+01
  1.0675000e+01  5.1365000e+01  5.9460000e+01  2.4500000e+00
  4.0540000e+01  4.6600000e+00  4.0080000e+01  2.0420000e+01
  6.8900000e+01  2.0490000e+01  1.8700000e+01  2.3120000e+01
 -4.0383330e+00  2.1758664e+01] 399.59
371.17593 [2.400000e+01 2.017000e+03 2.300000e+01 1.774022e+06 4.290000e+01
 2.930000e+01 1.150000e+01 2.839000e+01 1.067500e+01 5.136500e+01
 5.323000e+01 1.740000e+00 4.677000e+01 3.910000e+00 6.641000e+01
 5.822000e+01 7.575000e+01 1.645000e+01 7.620000e+00 2.651000e+01
 9.307690e+00 2.315834e+00] 399.56
221.65535 [ 2.8000000e+01  2.0170000e+03  1.8000000e+01  9.8926010e+06
  4.2900000e+01  2.9300000e+01  1.1500000e+01  2.8390000e+01
  1.0675000e+01  5.1365000e+01  6.4550000e+01  2.0800000e+00
  3.5460000e+01  4.4000000e+00  5.5690000e+01  3.9960000e+01
  8.4350000e+01  2.9360000e+01  1.6760000e+01  5.2290000e+01
 -1.8665695e+01  3.5529562e+01] 326.4
355.08615 [   9.       2009.          8.          0.         42.9        29.3
   11.5        28.39       10.675      51.365      64.8         2.04
   35.2         5.55       64.57       53.55       84.84       27.35
   18.49       43.66       17.570692   -3.996166] 374.56
```

MODEL OBSERVATIONS

The following are observations from our model. With the this we can see that there is need to find methods of lowering the incidences of malaria in Africa within the next year by deploying different protective measures.
Below is a representation of the current incidences of malaria and the prediction from the model.

	Country Name	Year	Country Code	Incidence of malaria (per 1,000 population at risk)
0	Algeria	2007	DZA	0.01
1	Angola	2007	AGO	286.72
2	Benin	2007	BEN	480.24
3	Botswana	2007	BWA	1.03
4	Burkina Faso	2007	BFA	503.80

	Actual_value
0	0.01
1	286.72
2	480.24
3	1.03
4	503.80

	predicted
0	-0.027329
1	373.342316
2	400.018829
3	14.838162
4	184.205795

Recommendations

According to our predictions in our dataset we came up with the following recommendations that need to be implemented by December 2021

- Clearing Stagnant water around places that humans live so as to disrupt mosquito breeding grounds
- Working with local Government communities and hospitals to provide mosquito nets for the community to act as barrier nets from vectors especially children who can't defend themselves.
- Encouraging the Government to partner with pharmaceutical companies to provide malaria drugs in Congo since it is the country with the largest number of malaria cases
- Educating the public on ways to mitigate the issue by encouraging the use of mosquito repellents and spraying insecticides in their homes so as to make them more informed and educated on their health choices.

REFERENCE DOCUMENTATION

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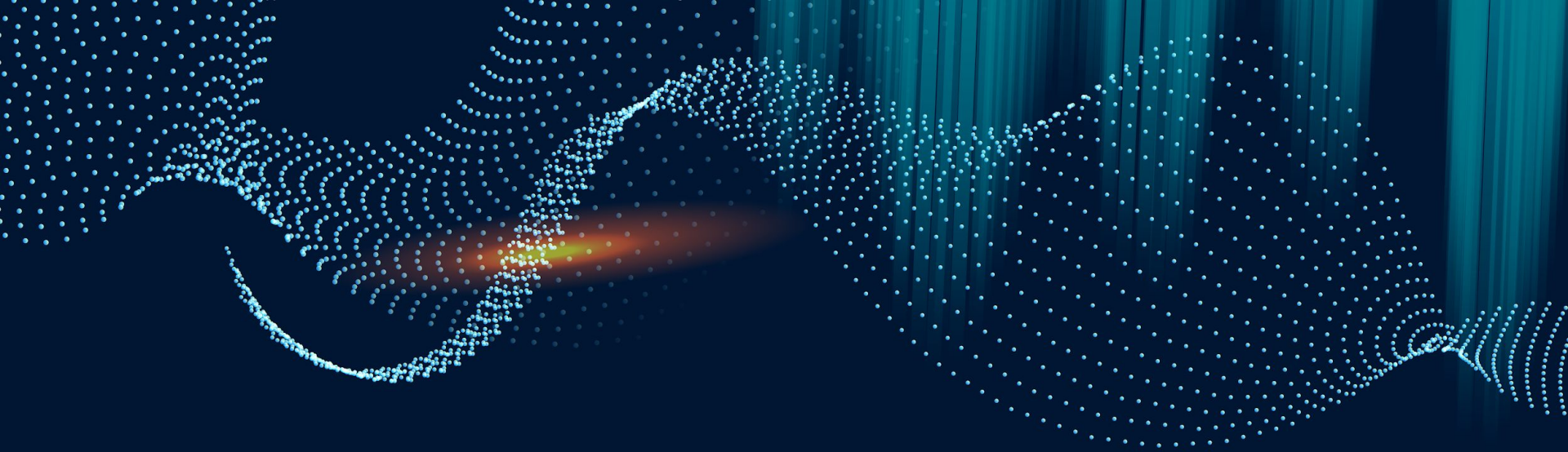
- [7]"Message from the WHO Regional Director for Africa, Dr. Matshidiso Moeti, on World Malaria Day 2021 - World", *ReliefWeb*, 2021. [Online]. Available: https://reliefweb.int/report/world/message-who-regional-director-africa-dr-matshidiso-moeti-world-malaria-day-2021. [Accessed: 28- Apr- 2021].



The End!!!