

ANALYSING WEATHER AND LASSA FEVER DATA FOR BUILDING DEEP LEARNING ENSEMBLE PREDICTIVE MODEL



Iyanu Adegun

Department of Computer Science, Federal University of Technology Akure, Nigeria

iyanupelumi22@gmail.com



INTRODUCTION

- Lassa fever (LF)– a deadly viral haemorrhagic disease caused by multi-mammate rat (*mastomys natalensis*)
- A public health challenge for many communities in Sub-Saharan West Africa.
- Infects between 100,000 and 300,000 people in West Africa annually with about 5,000 deaths (CDC, 2019)
- Building predictive models for Forecasting future Lassa fever cases – essential for strategic interventions.



Figure 1: Regions with Lassa fever in Africa

- LF is closely associated with meteorological factors.
- This study analyses relationship between Lassa fever cases and 3 weather elements (temperature, precipitation and humidity)

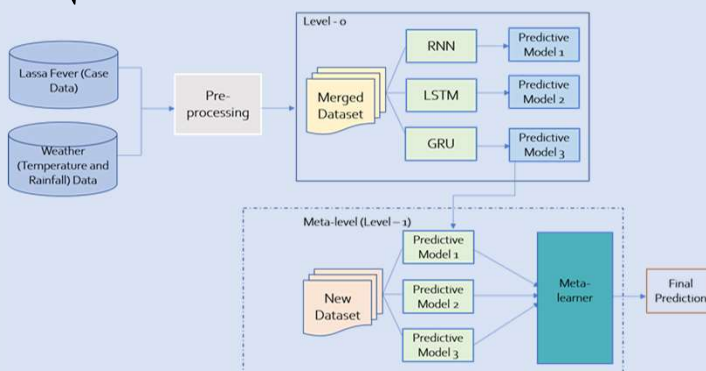
DATA COLLECTION

- LF cases from the Nigeria Center for Diseases Control (NCDC) - weekly epidemiological report (WER) LF cases in Nigeria
- Focus – LF Cases for four Local Governments (Alkaleri, Bauchi, Bogoro and Dass) in Bauchi State , Northern Nigeria (2017-2020)
- Weather data - European Center for Medium-Range Weather Forecast (ECMWF-ERA5) website (Jan 2017 – Dec 2020).

METHODOLOGY

Pearson correlation- used to measure the degree of the relationship between the two variables Given the bivariate set $(x_1, y_1), (x_2, y_2), \dots, (x_n, y_n)$, the Pearson's Product Moment Correlation Coefficient (r) is defined in equation (1) as:

$$r = \frac{N \sum xy - (\sum x)(\sum y)}{\sqrt{\{N \sum x^2 - (\sum x)^2\} \{N \sum y^2 - (\sum y)^2\}}} \quad (1)$$



RESULTS

	value	Temperature	Precipitation	Relative Humidity
value	1.000000	0.059880	-0.016995	-0.025034
Temperature	0.059880	1.000000	0.294480	0.529227
Precipitation	-0.016995	0.294480	1.000000	0.606959
Relative Humidity	-0.025034	0.529227	0.606959	1.000000

	value	Precipitation	Relative Humidity	Temperature
value	1.000000	-0.014266	0.008931	0.239226
Precipitation	-0.014266	1.000000	0.503418	0.300689
Relative Humidity	0.008931	0.503418	1.000000	0.532194
Temperature	0.239226	0.300689	0.532194	1.000000

	value	precipitation	Relative Humidity	temperature
value	1.000000	-0.025138	-0.010456	0.064511
precipitation	-0.025138	1.000000	0.562579	0.302425
Relative Humidity	-0.010456	0.562579	1.000000	0.531939
temperature	0.064511	0.302425	0.531939	1.000000

	value	Precipitation	Temperature	Relative Humidity
value	1.000000	-0.009959	0.067736	0.030234
Precipitation	-0.009959	1.000000	0.299954	0.599720
Temperature	0.067736	0.299954	1.000000	0.531918
Relative Humidity	0.030234	0.599720	0.531918	1.000000

Figure 2: Correlation Analysis for Alakeri, Bauchi, Bogoro and Dass Local Governments respectively

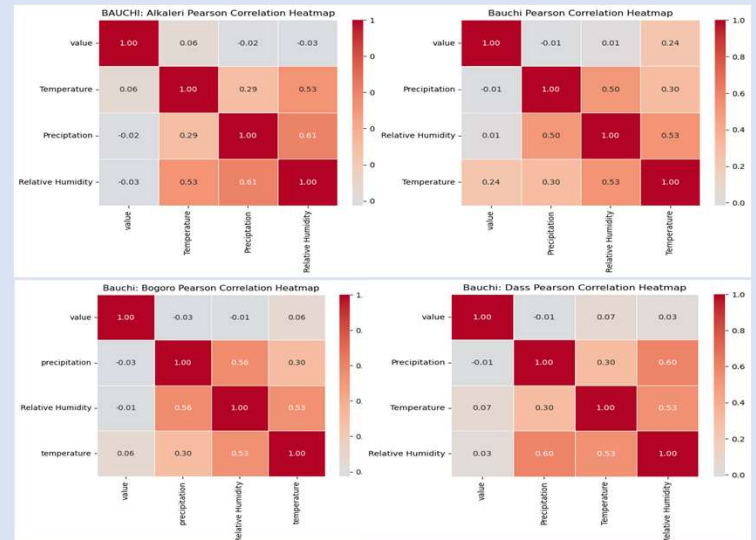


Figure 3: Correlation Heatmap for Alakeri, Bauchi, Bogoro and Dass Local Governments respectively

DISCUSSION AND FURTHER RESEARCH

- Temperature-** Positive correlation between Lassa fever cases and temperature except for Alkaleri LG
- Precipitation** – Negative correlation between Lassa fever cases and precipitation for all four (4) Local Governments considered.
- Relative Humidity** – Negative correlative discovered in Alkaleri and Bogoro LG while positive correlation in Bauchi and Dass LG.
- Further research-** combining Lassa fever cases data with Temperature data to build a deep learning ensemble model for forecasting