

# Utilizing Machine Learning in Predictive Analytics

*An Examination of Lassa Fever Outbreaks in Nigeria*

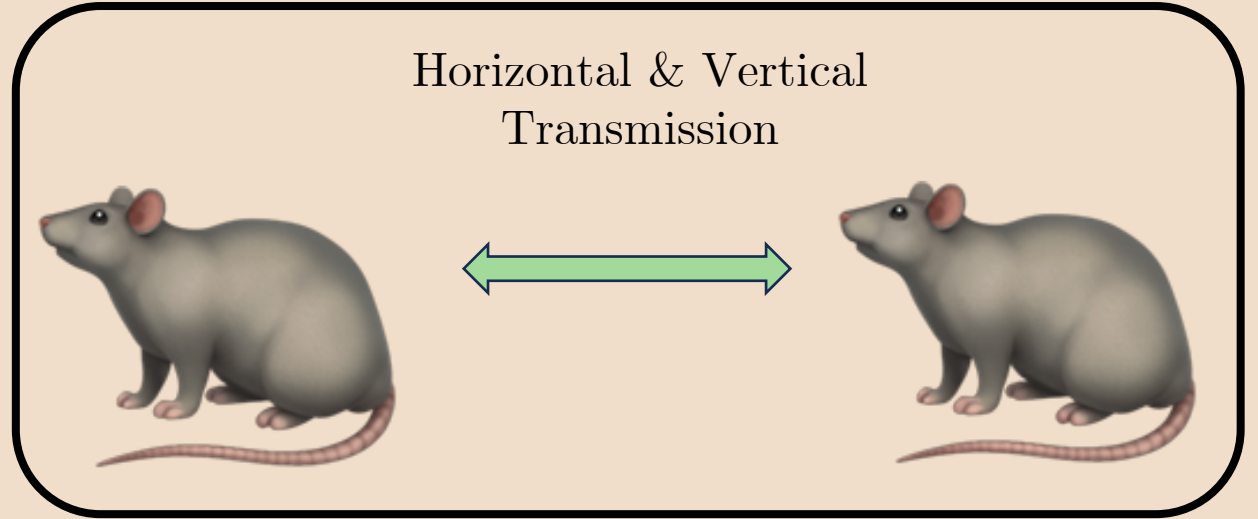
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# Lassa Virus



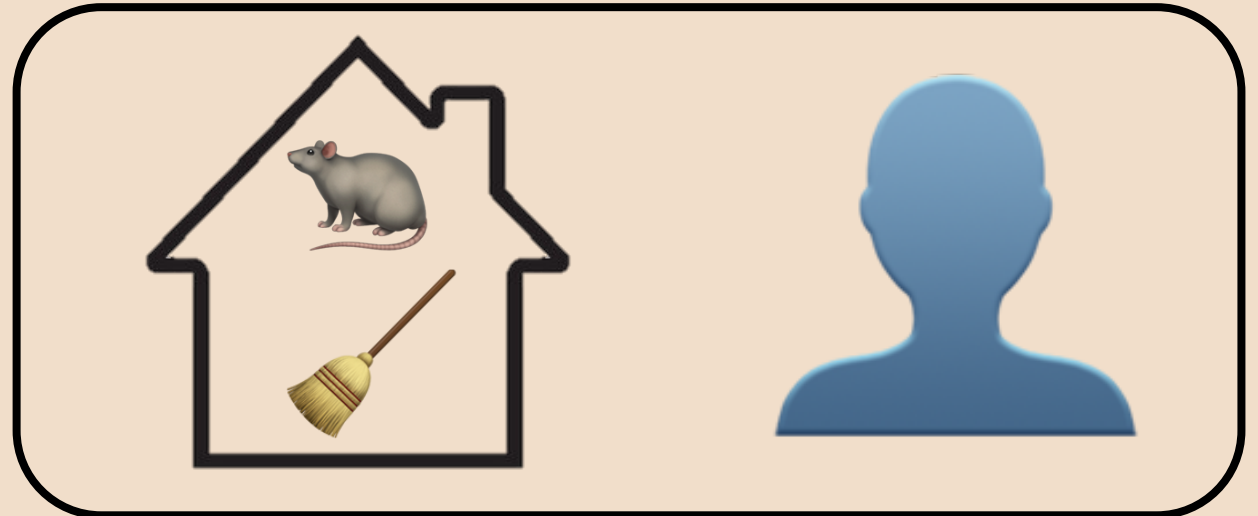
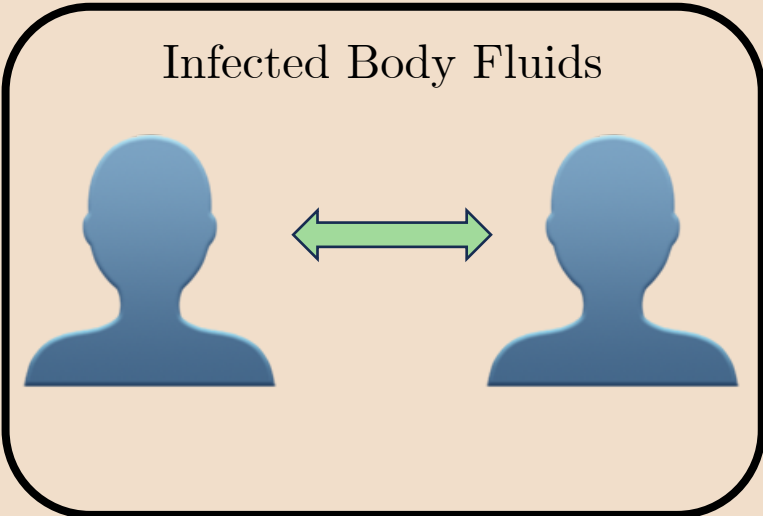
## Primary Reservoir



Zoonotic Spillover

## Secondary Human Infection

Infected Body Fluids

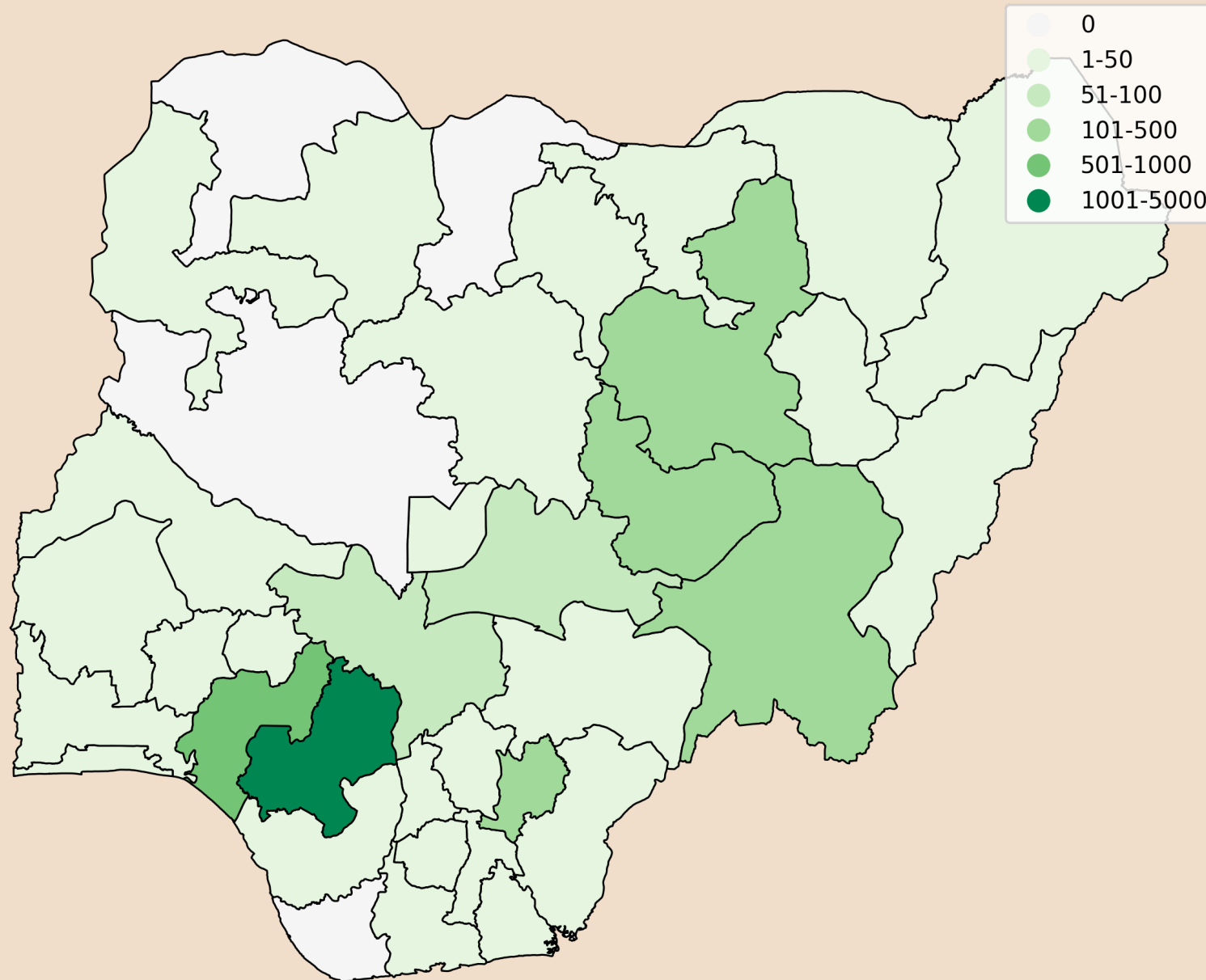


## Primary Human Infection



*Image Source: [1]*

# Confirmed Cases of Lassa Fever in Nigeria (2015-2019)



*Data Source: [2]*

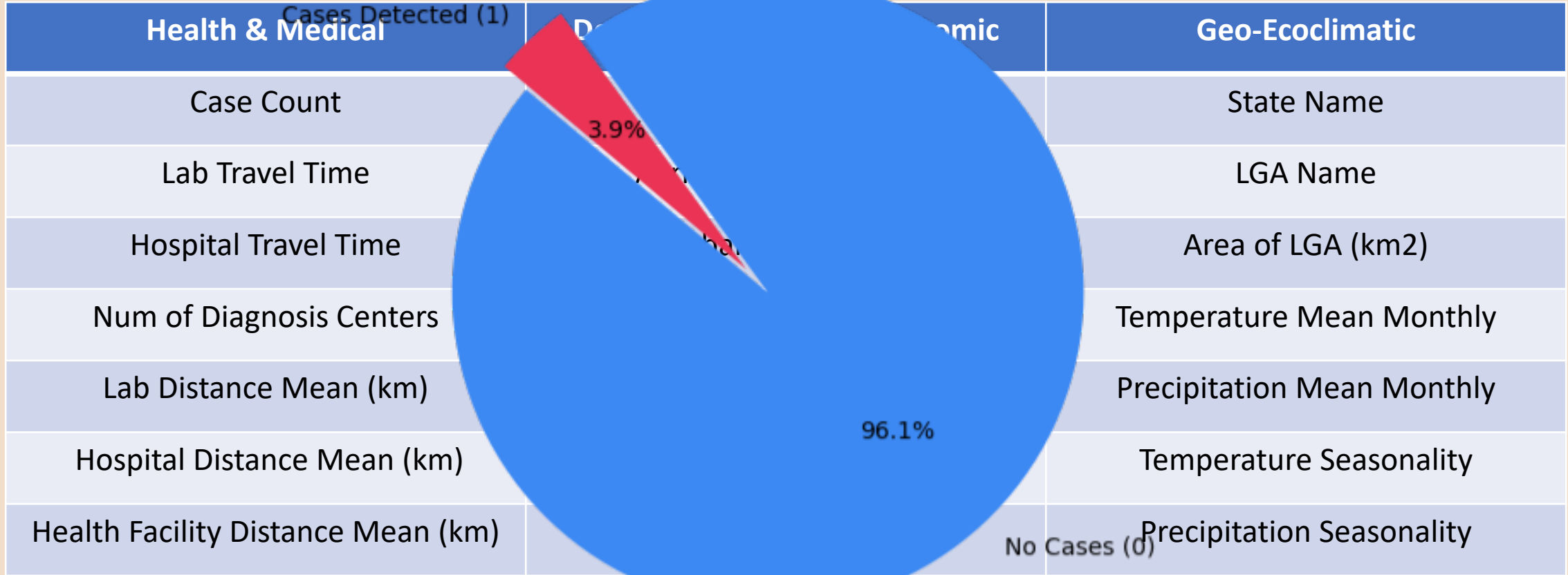
# Objectives

- Assess predictive power of various variables
- Employ Advanced Machine Learning Methods
  - XGBoost
  - Random Forest
- Utilize SHAP for Post-Analysis
  - Identify Key Predictive Drivers
- Enhance Understanding of LF Dynamics

**XGBoost**



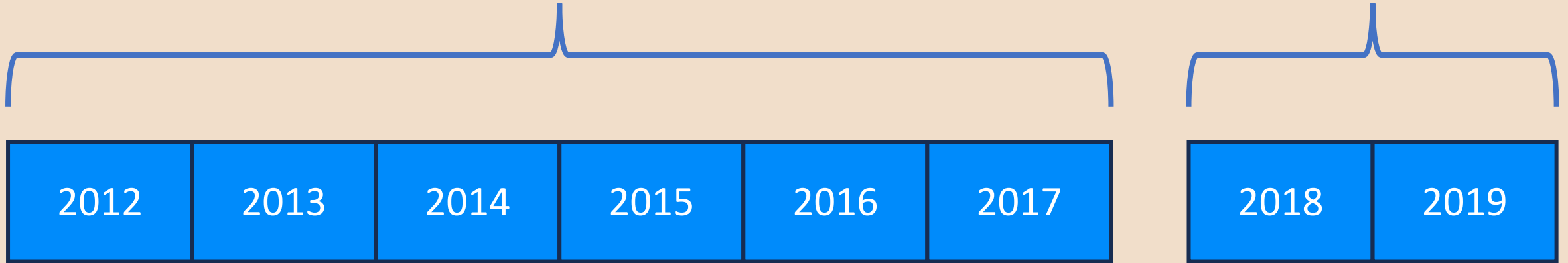
 **Shap**



774 LGAs \* 52 Weeks \* 8 Years  $\cong$  321k records

Training Data

Test Data



Num of Estimators



Max Depth of Trees

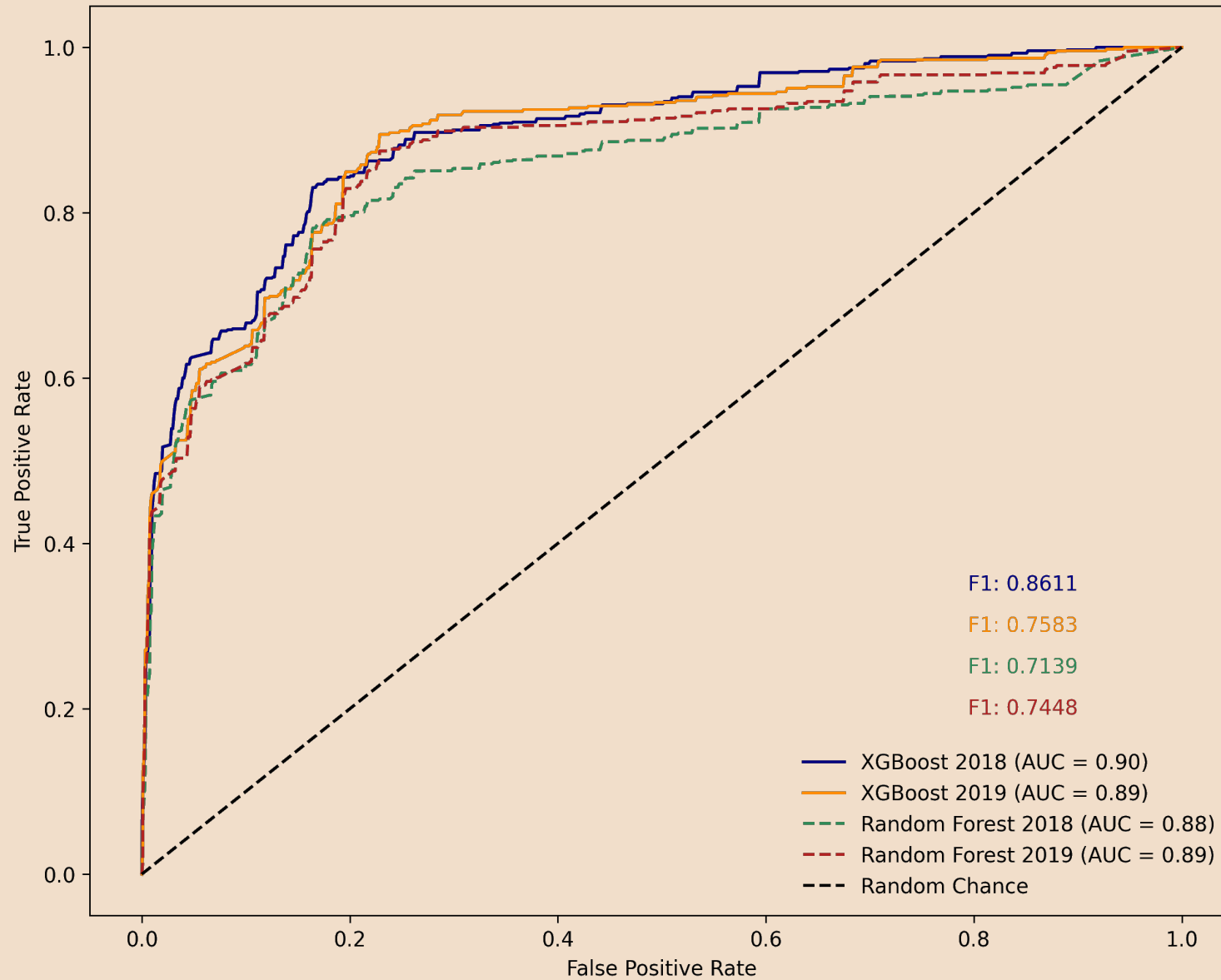


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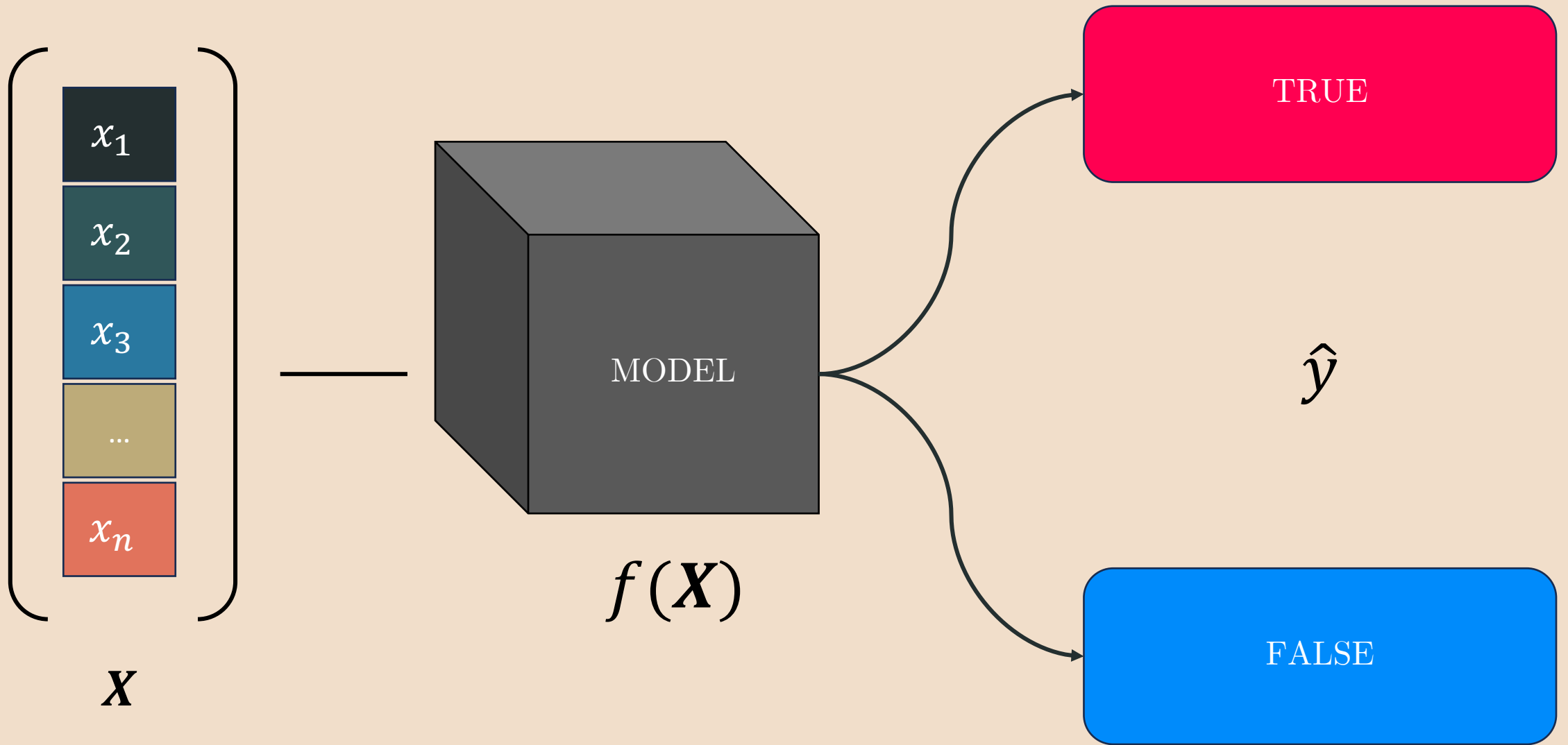
Learning Rate



# ROCAUC Plot for XGBoost and Random Forest Models (2018-2019)

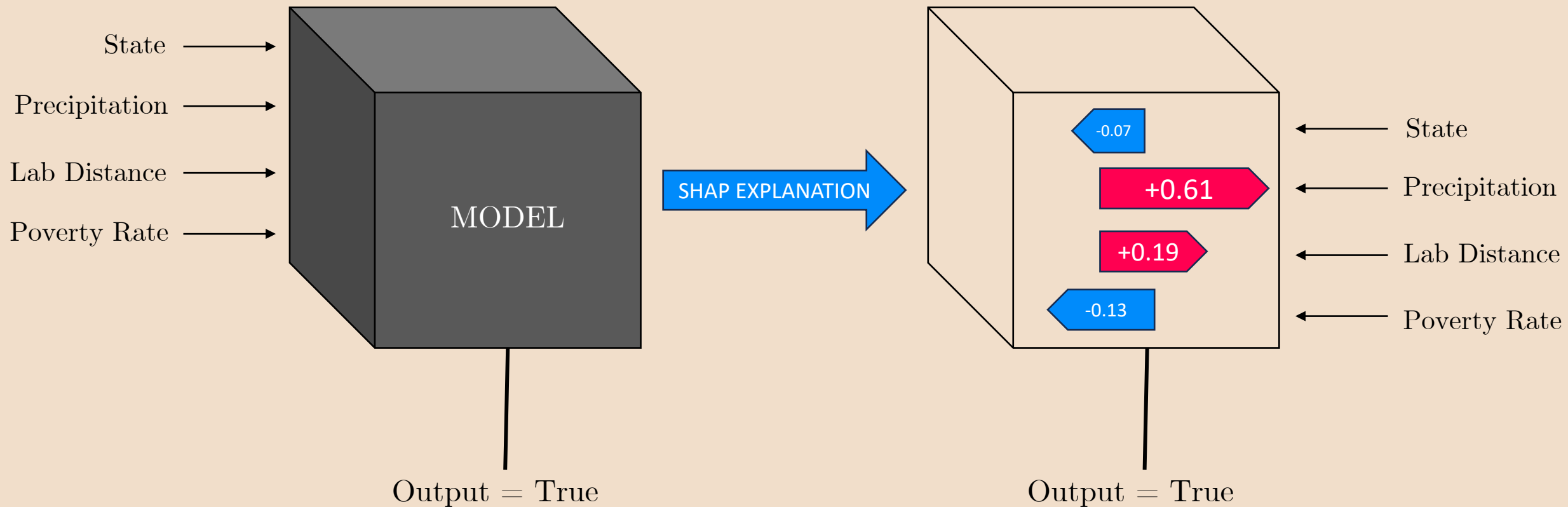




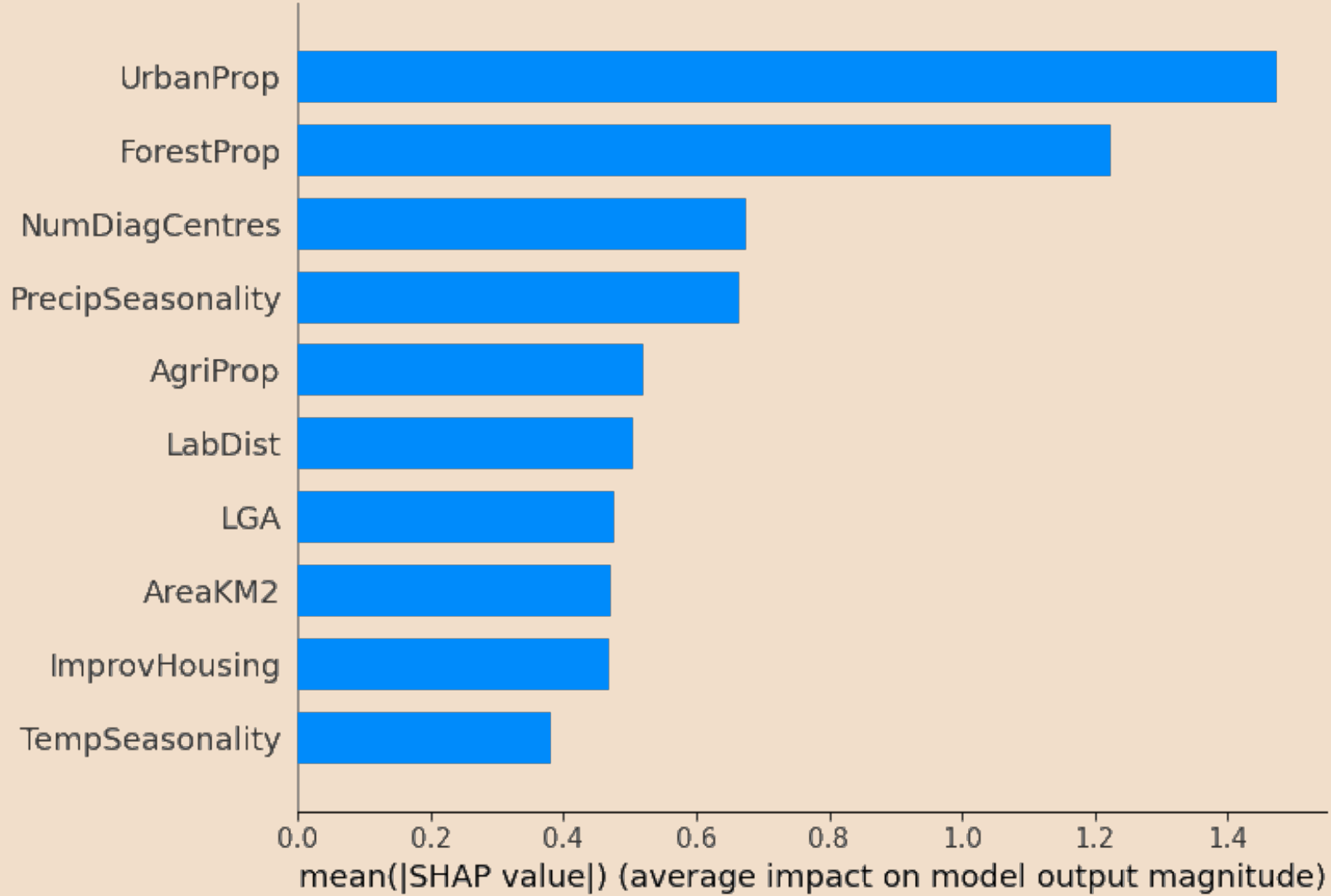




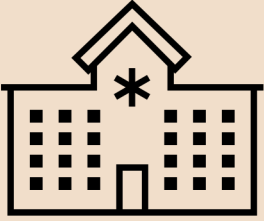
# Shap



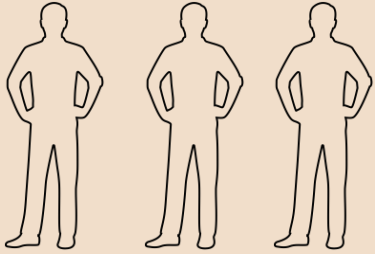
# XGBoost Global SHAP Plot (2018-2019)



Healthcare Providers



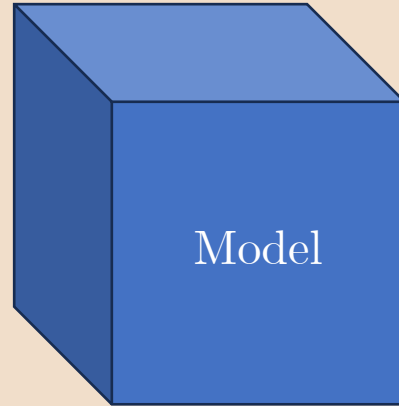
Census Reporters



Weather Stations



Data

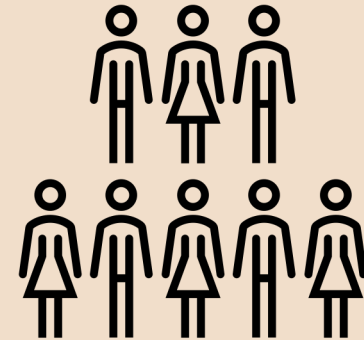


Prediction

Local/Regional  
Public Health  
Authorities



General  
Public



# References:

[1] I. Kaledzi, Image of “Dutch doctor’s treatment in Sierra Leone,” in *Sierra Leone: Dutch doctor dies from Lassa Fever*, Africa Feeds, Nov. 14 2019. [Online]. Available: <https://africafeeds.com/2019/11/24/sierra-leone-dutch-doctor-dies-from-lassa-fever/>. [Accessed: Apr. 9, 2024].

[2] Redding DW, Gibb R, et al. Geographical Drivers and Climate-linked Dynamics of Lassa Fever in Nigeria. *Nature Communications* October 2021;12(1). ISSN 2041-1723.



*Thank you for listening!*

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