



Financial Inclusion in Africa

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Team	Diana Pokee & Doga Cetinkaya
Context Problem	What is the problem to be approached? Can we predict who in Africa is most likely to have a bank account?
EDA	Let's explore the dataset!
Models	Baseline model, KNN, Random Forest, XGBoost
Hypertuning and Final Model	XGBoost
Error Analysis	Where did the model failed?
Conclusions	Suggested Model

References:

<https://zindi.africa/competitions/financial-inclusion-in-africa>

Evaluating: FINANCIAL INCLUSION



Financial inclusion remains one of the main obstacles to economic and human development in Africa.

Financial inclusion is measured in three dimension [1]:

(i) access to financial services;

(ii) usage of financial services;

(iii) the quality of the products and the service delivery.

AIM : ML model to predict which individuals are most likely to have or use a bank account.



[1] "G20 Financial Inclusion Indicators" Global Partnership for Financial Inclusion. [Link](#).



01

EDA

Exploratory Data Analysis

DATASET

23 524

Observations

4

Number of countries in Africa
(Kenya, Rwanda, Tanzania, and Uganda)

12

Features/ Information types





Analysed Features

12 Features

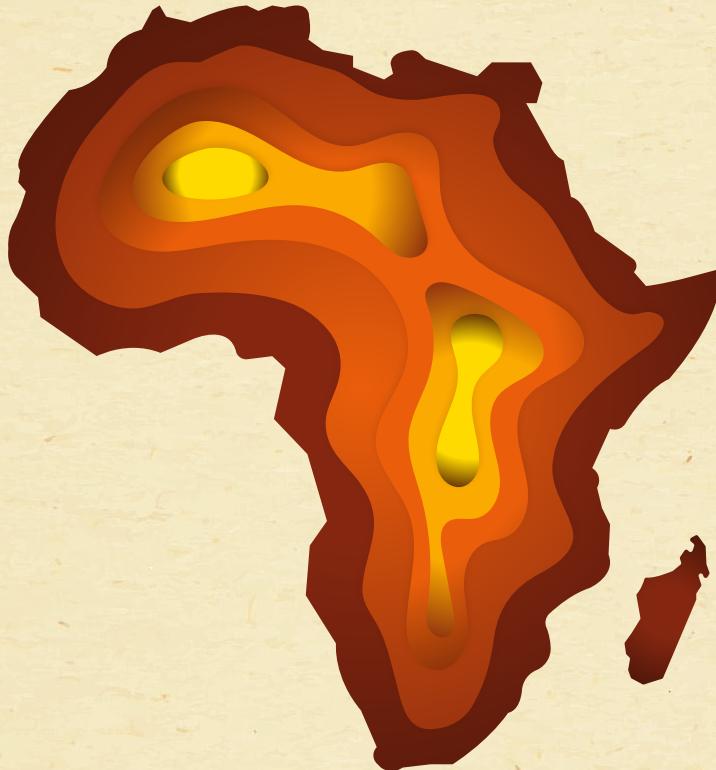
- Year
- ID of individual
- Location (Rural or Urban)
- Cell phone access
- Household size
- Age of respondent
- Gender of respondent (F/M)
- Relationship to head of Household
- Marital status
- Education Level
- Job type

1 Target

- Bank account (Y/N)



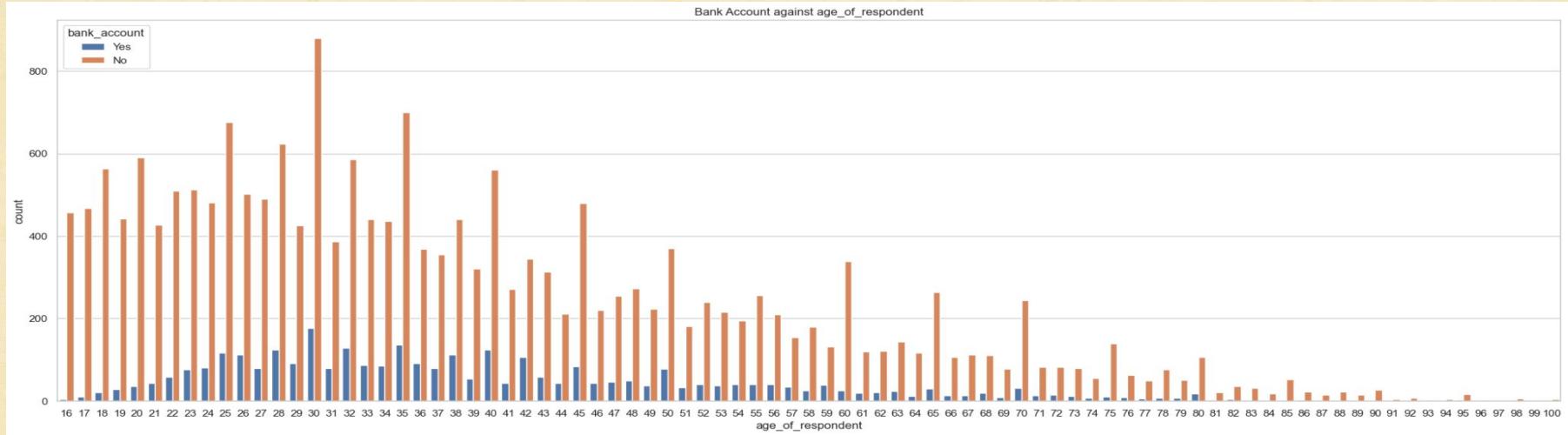
Across Kenya, Rwanda, Tanzania, and Uganda, 3312 individuals



14%

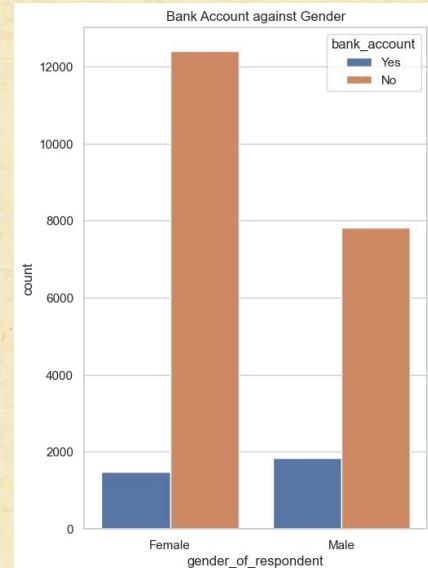
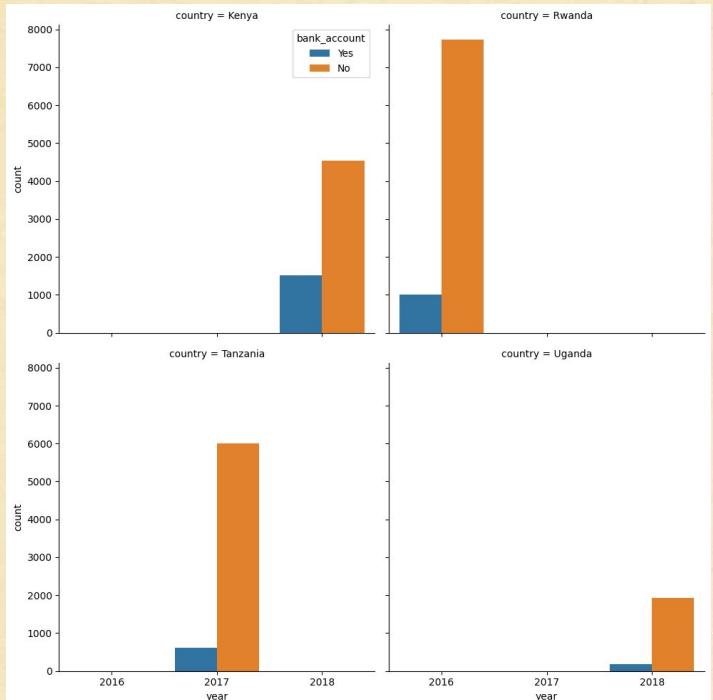
have access to or use a commercial
bank account.

AGE



The most people having a bank account are 30 years old.

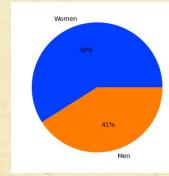
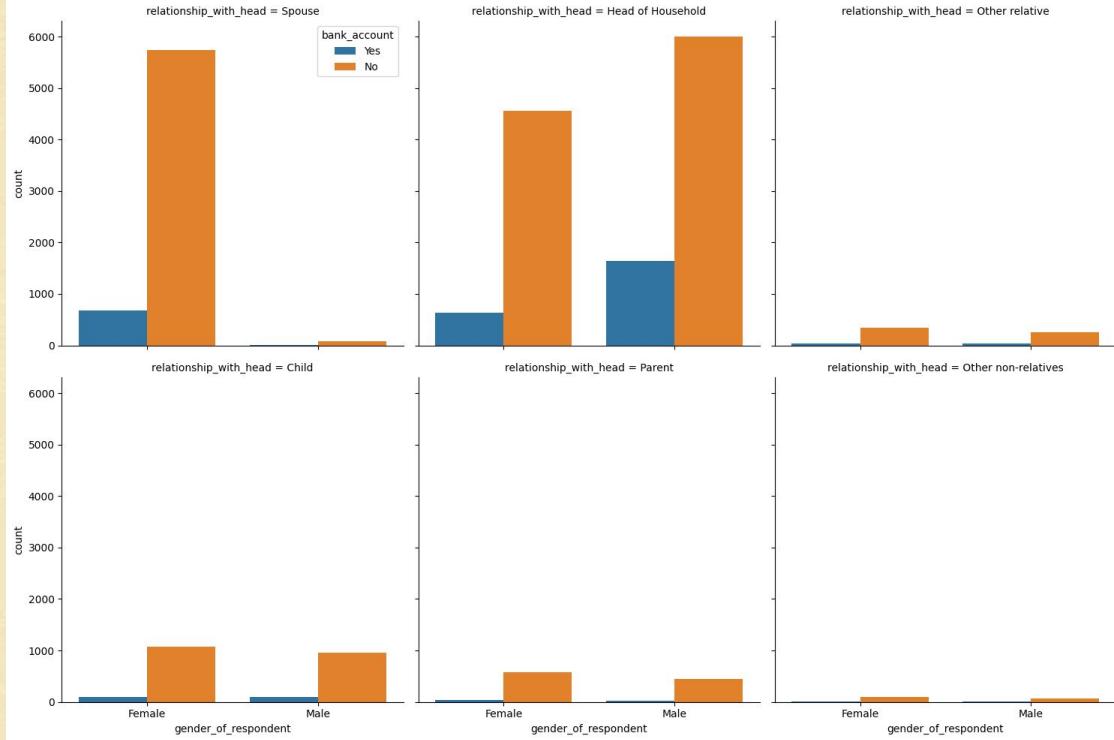
Country and Gender



59% of respondents were women

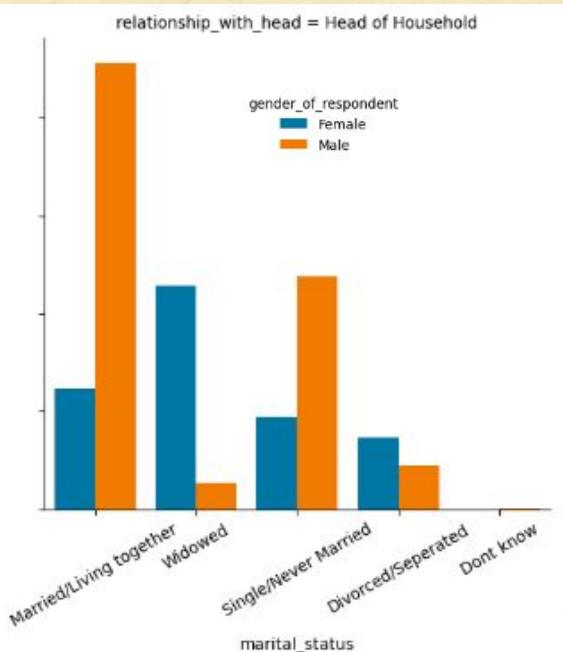
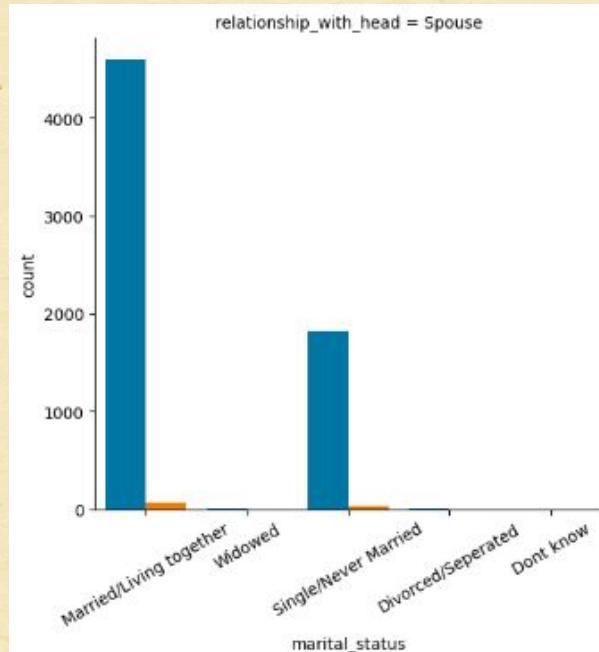


Gender and Head of household



- 1) For males, the majority are Head of households
- 2) For females, the majority are spouse or the head of household
- 3) Being a spouse or the head of Household is a strong indicator to have a bank account

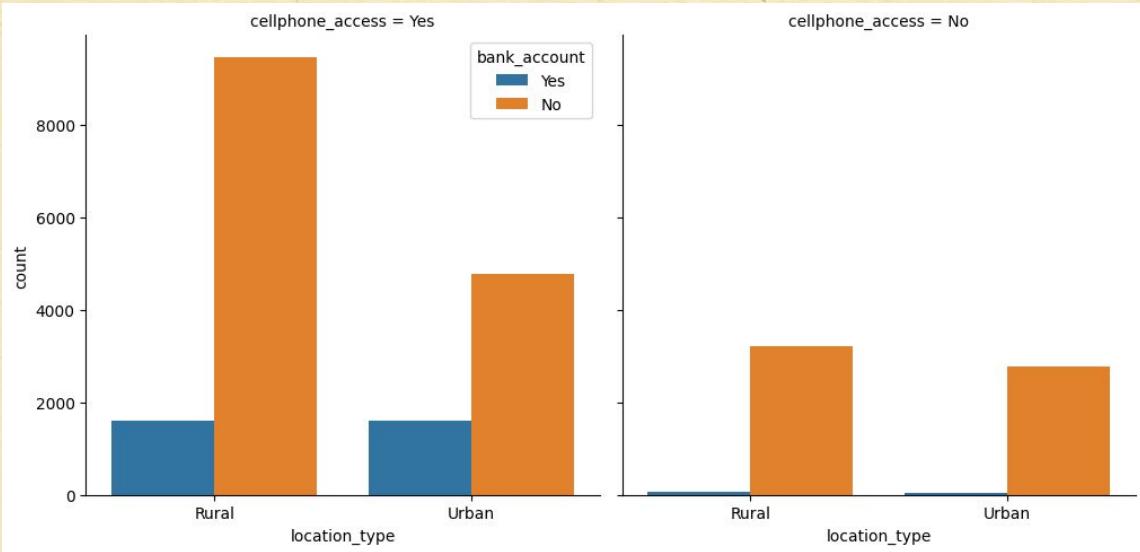
Marital Status and Head of Household(HH)



When women are the spouse, they are mainly married/living together or they are single/never married.

When women are the HH, they are mainly married/living together, followed by single.

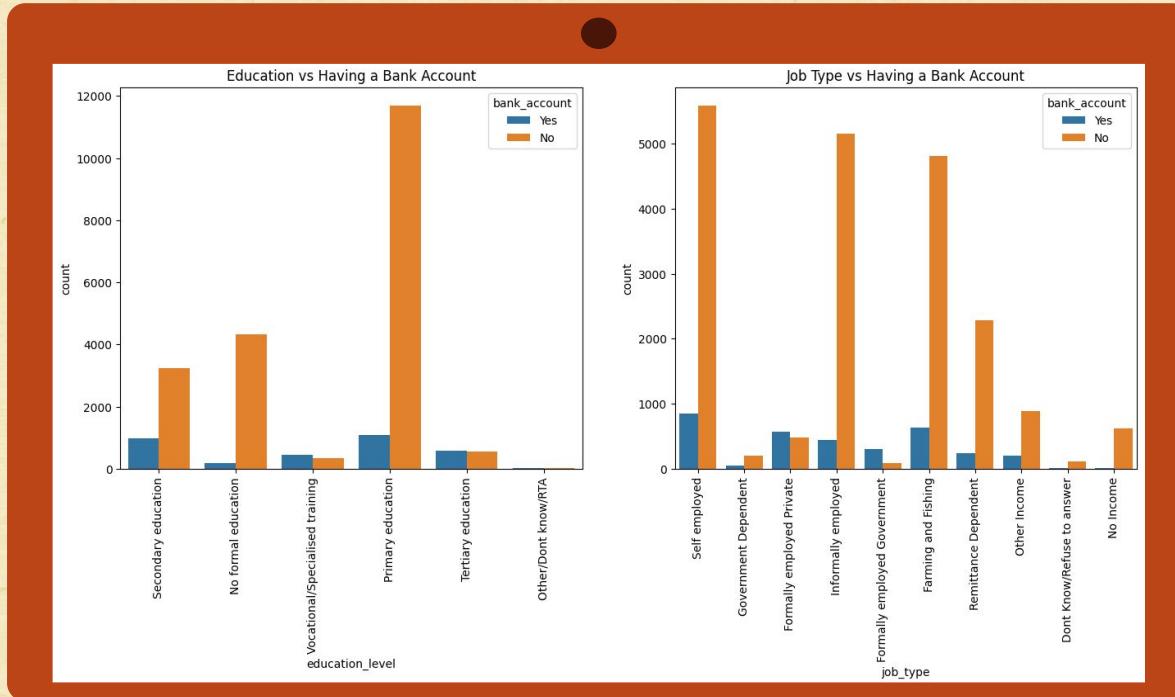
Cell phone Access and Location



- 1) The majority of people with bank account do have cell phone access.
- 2) Location does not have much influence in access to bank account



Education and Job Type



>Having specialised training and tertiary education have a higher impact in bank access. Most people without BA have no formal education or primary education.

>Being employed by the Gov and privately have higher chance to have BA.



02

Models

KNN/RandomForest/XGBoost

Models

Baseline Model

F1-Score: 0.26
Accuracy: 0.61
(Rural/Urban)

Random Forest

F1-Score: 0.46
Accuracy: 0.86



KNN

F1-Score: 0.46
Accuracy: 0.87

XGBoost

F1-Score: 0.47
Accuracy: 0.88

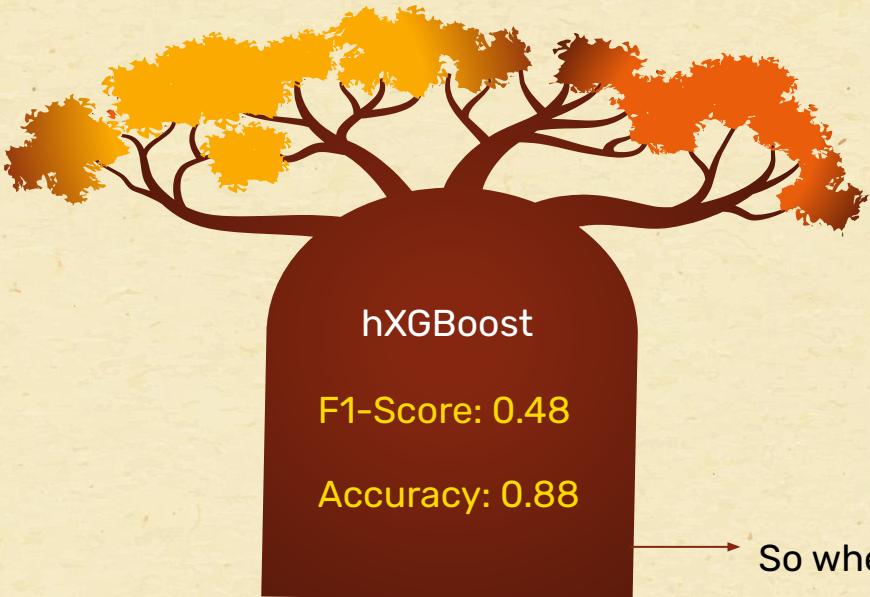


03

Final Model

Hypertunning the XGBoost model

Final Model



So where does it fail?



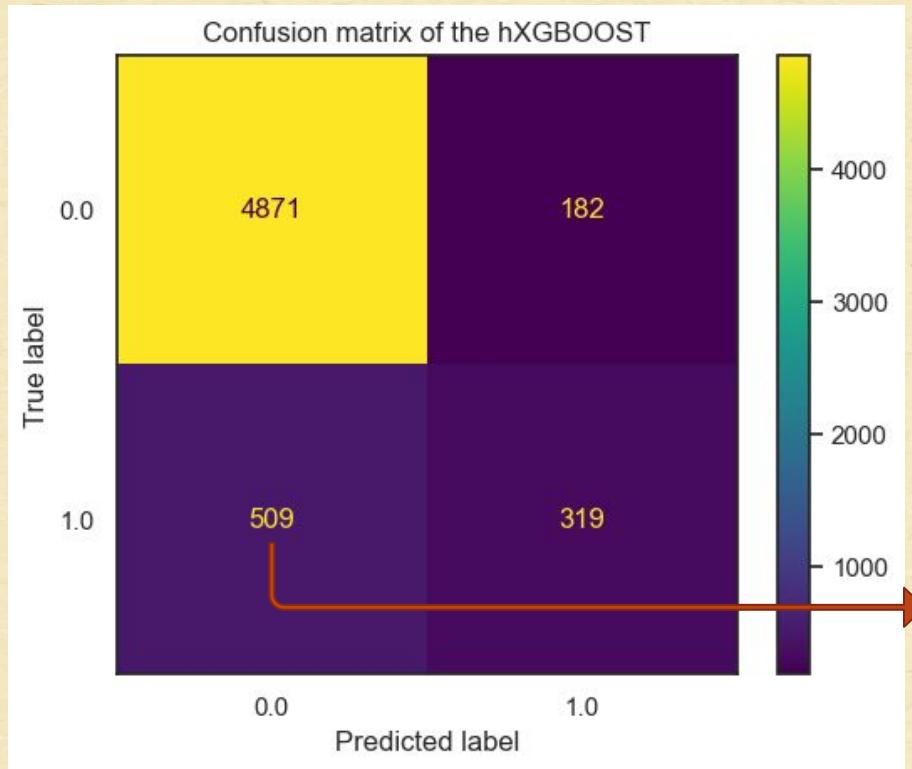


04

Error Analysis

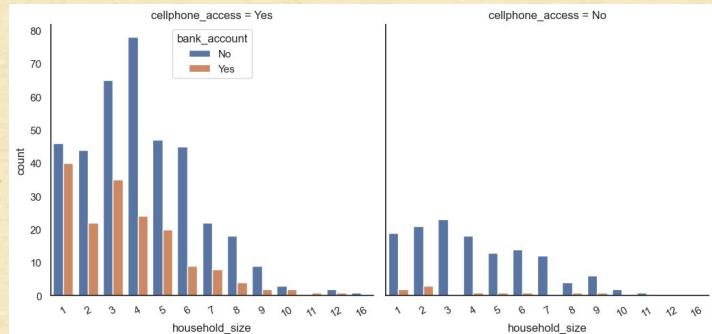
KNN/RandomForest/XGBoost

Error Analysis



education_level	cellphone_access	bank_account
No formal education	No	4
	Yes	1
Primary education	Yes	48
	No	6
Secondary education	No	61
	Yes	24
Tertiary education	Yes	34
	No	
Vocational/Specialised training	Yes	

> Education type and cellphone access are crucial parameters for lowering model error.



CONCLUSIONS

- > The hXGBOOST model predicts with 88% accuracy each of the classes (with f1-score of 0.48) and may be used has one of the predictors to financial inclusion.
- > We take metrics that take into account the whole dataset
- > From the different recollected information, the technological factor with cellphone access, which demonstrates a greater correlation with the target variable of the dataset.
- > Stating some conditions and further development of the model can bring better predictions.





Thank you for your attention!

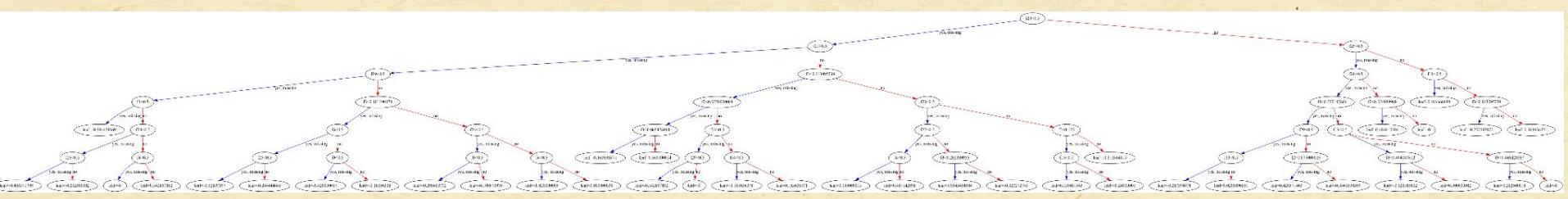




Data Variables

Variable	Definition
country	Represents the surveyed country which is one of: Kenya, Rwanda, Tanzania, and Uganda
year	Year of the survey
uniqueid	Unique id of each person interviewed
bank_account	If interviewee has bank account" yes or no"
location_type	The type of location such as: Rural, Urban
cellphone_access	If the interviewee has cellphone "yes or no"
household_size	Number of persons who live in the same house
age_of_respondent	Interviewee's age
gender_of_respondent	Interviewee's gender" Female or Male"
relationship_with_head	The interviewee person relationship with the head of the house, it has seven choices:" Parent, Head of Household, Spouse, Child, Other relative, Other non-relatives, Don't know"
marital_status	Interviewee marital status, it has five choices: Married/Living together, Divorced/Separated, Widowed, Single/Never Married, Don't know
education_level	The highest level of education, it's six choice: No formal education, Primary education, Secondary education, Vocational /Specialised training, Tertiary education, Other/Dont know/RTA
job_type	The type job of interviewee, it has ten choice: Farming and Fishing, Remittance Dependent, Self employed, Formally employed Private, Formally employed Government, Informally employed, Government Dependent, Other Income, No Income, Don't Know Refuse to answer

EXTRA SLIDES - XGBOOST model



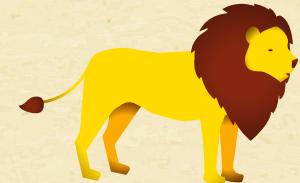
F1 -score across the models

hXGBOOST	0.4801
XGBOOST	0.4729
KNN	0.4672
Random Forest	0.4607
Baseline	0.2601



ALTERNATIVE RESOURCES

Here's an assortment of alternative resources whose style fits that of this template:



AFRICA FLAT ICON PACK



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CELEBRATIONS

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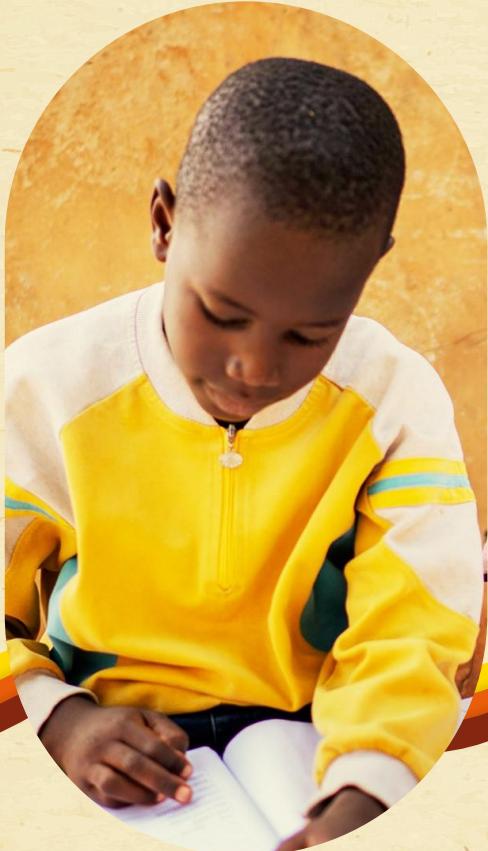


02



OAU

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“This is a quote, words full of wisdom that someone important said and can make the reader get inspired.”

—**SOMEONE FAMOUS**