MACHINE LEARNING AND ANALYSIS: DATA SCIENCE

TANZANIAN WATER PUMP PROJECT

ORLANDO VILAR, DEC 2022

INTRODUCTION

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- 1/6 of the world population lack access to safe water;
- The average African uses 5 gallon of water daily;
- How can we predict whether a Tanzanian water pump is functional or not?
- **Relevance**: overall implication to public policy, governmental agencies, NGOs, general public.

DATA AND ANALYSIS

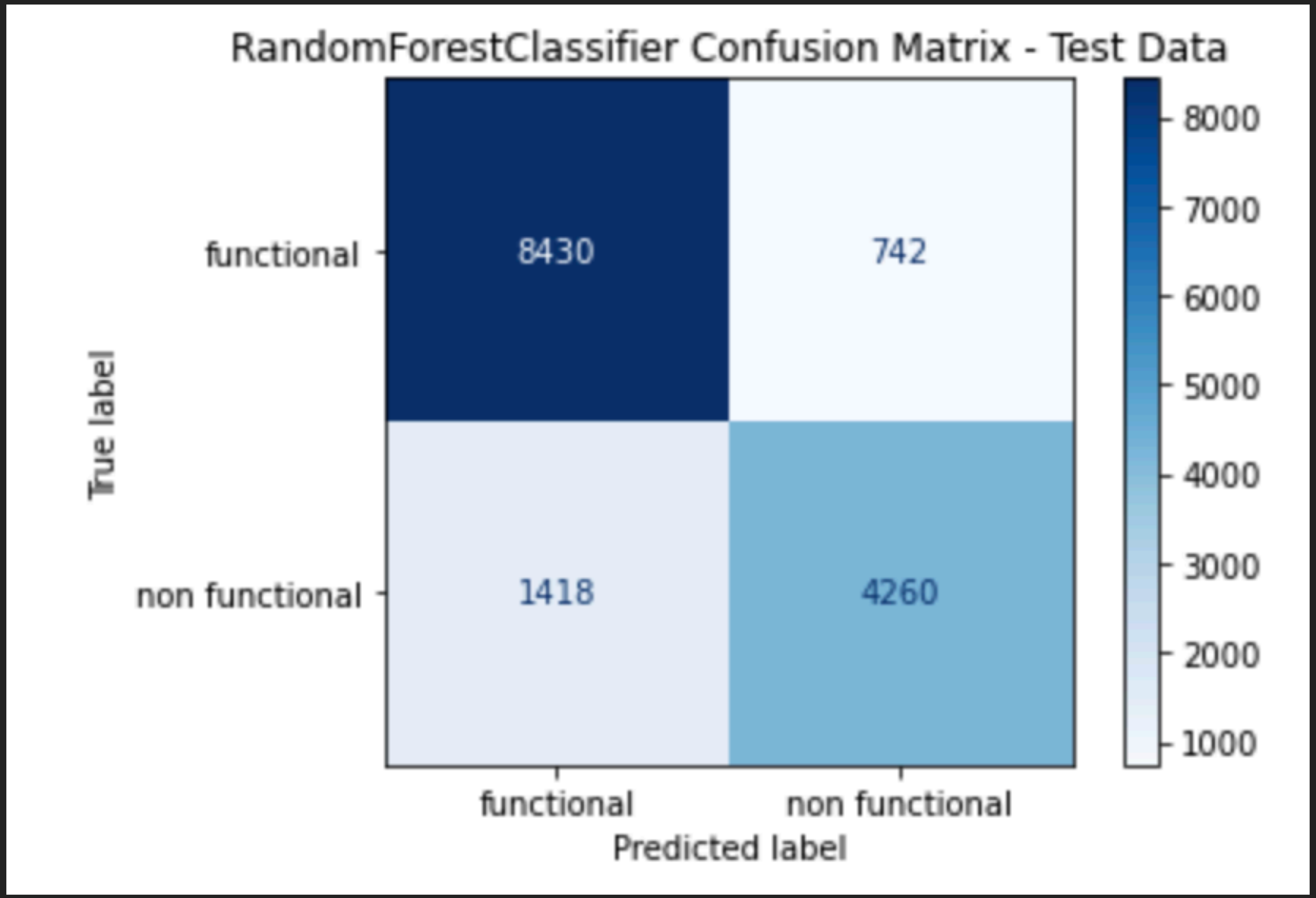
DATA UNDERSTANDING

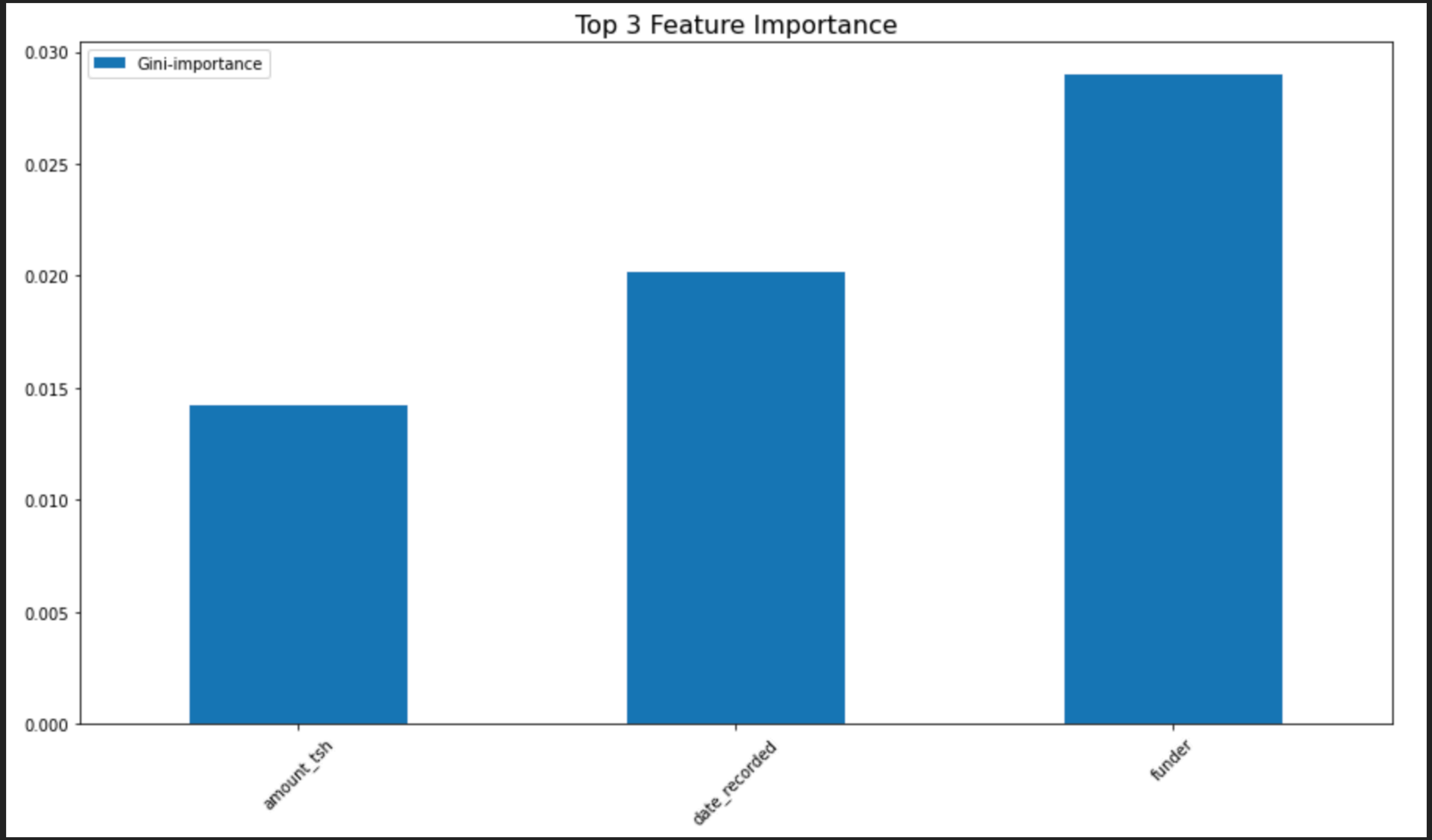
- Databases
  - Taarifa and Tanzanian Ministry of Water (from DrivenData);
    - Construction years from 1960-2013, with 59,400 rows;
- Variables
  - Status, location, extraction type, source, quantity, construction year, management, etc.
- Additional feature
    - Geo-plotting of water pumps by status.

MACHINE LEARNING

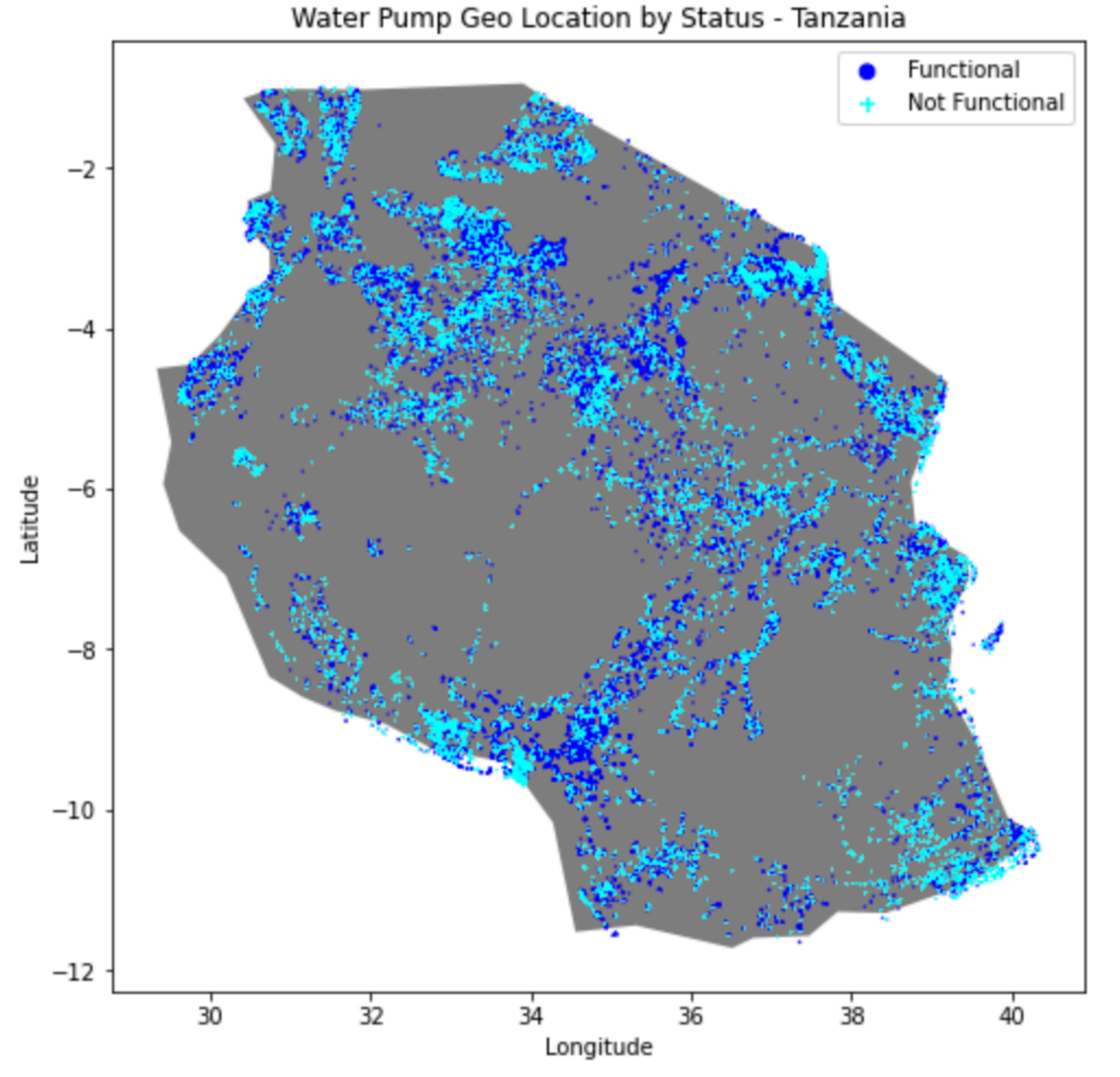
- Three models
  - logistic regression (baseline), decision tree and random forest;
- Key metric
  - Balance of false positives and false negatives (f1-score);
    - RandomForestClassifier ~85% score for both accuracy and f1-score;
- Feature Importances
  - Funder, date recorded and amount of water available.

CONFUSION MATRIX AND FEATURE IMPORTANCE





TANZANIAN WATER PUMP BY STATUS



CLOSING REMARKS

STRATEGIES

- **Prophylactic:** the best model is able to predict whether a pump is working or not by 90%;
    - This can lead to better planning on when to fix functional pumps;
        - Funder, date recorded and water amount are the strongest predictors;
- **Expansion:** areas with less pumps can be used for expansion and diminishing traveling distance/time.

LIMITATIONS

- Adding demographic data about each specific area;
- Predicting pumps that are functional and need repair;
- Matching with more robust numerical data can improve the models;
  - The data is noisy, discretion and refinement is advised.

Thank you!

https://github.com/ovilar