

**MACHINE LEARNING AND ANALYSIS: DATA SCIENCE**

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**TANZANIAN WATER PUMP PROJECT**

# INTRODUCTION

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# INTRODUCTION

- ▶ 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

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# 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

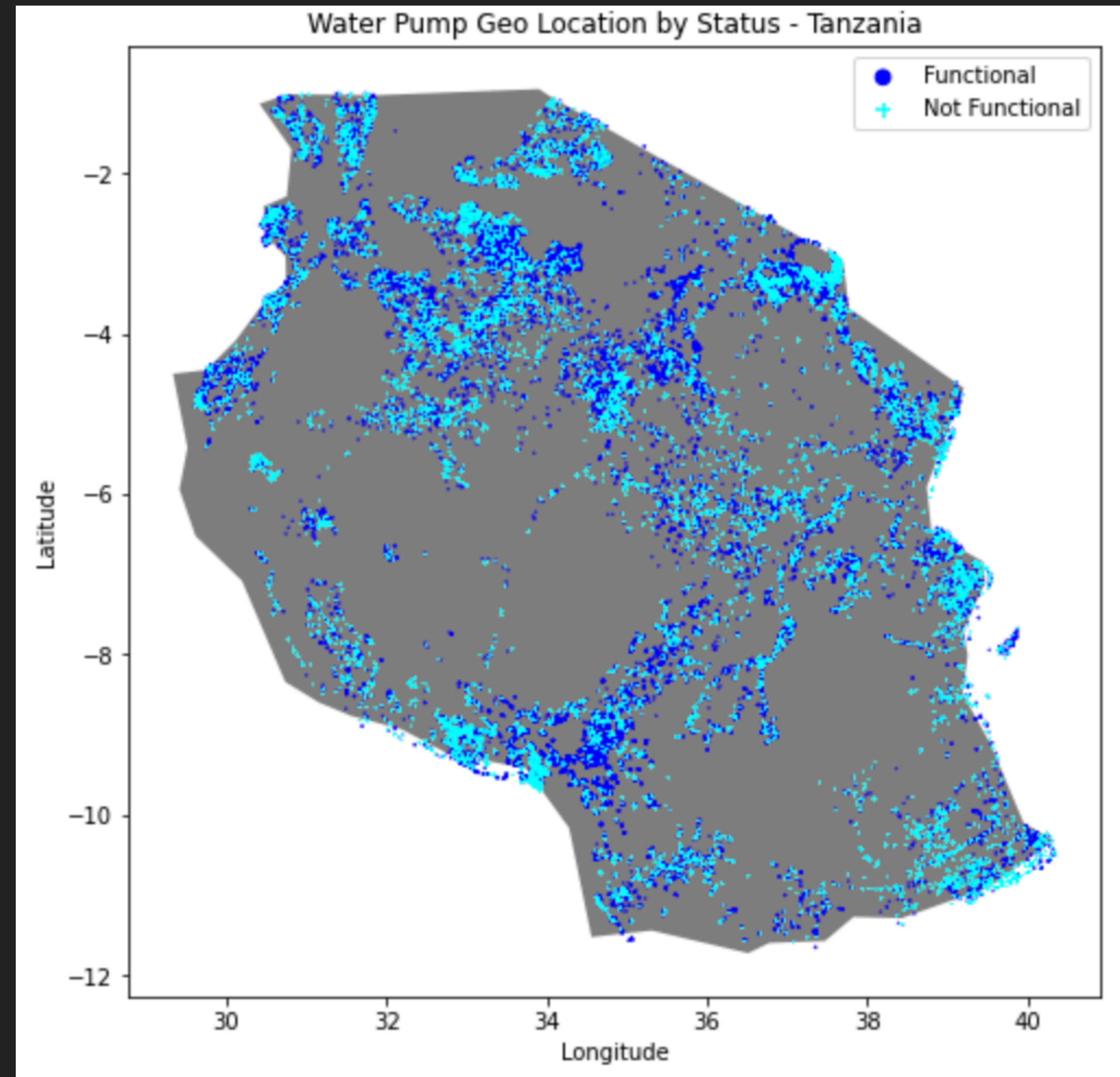
- ▶ Geo-plotting of water pumps by status.

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# MACHINE LEARNING

- ▶ Three models
  - ▶ logistic regression (baseline), decision tree and random forest;
- ▶ Key metric
  - ▶ Balance of false positives and false negatives (f1-score);
    - ▶ RandomForestClassifier has a ~90% weighted f1-score;
- ▶ Feature Importances
  - ▶ Funder, date recorded and amount of water available.

# TANZANIAN WATER PUMP BY STATUS



# CLOSING REMARKS



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## 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.

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## 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.

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# Thank you!

<https://github.com/ovilar>