Water Enhancement Project

Aqua Partners

Stakeholders & Objective

- **Main Stakeholder:** Mr. Gerson Lwenge, Minister of Water and Irrigation, Government of Tanzania

- **Problematic:** Improving the water pump system in Tanzania by identifying the optimal features of installment

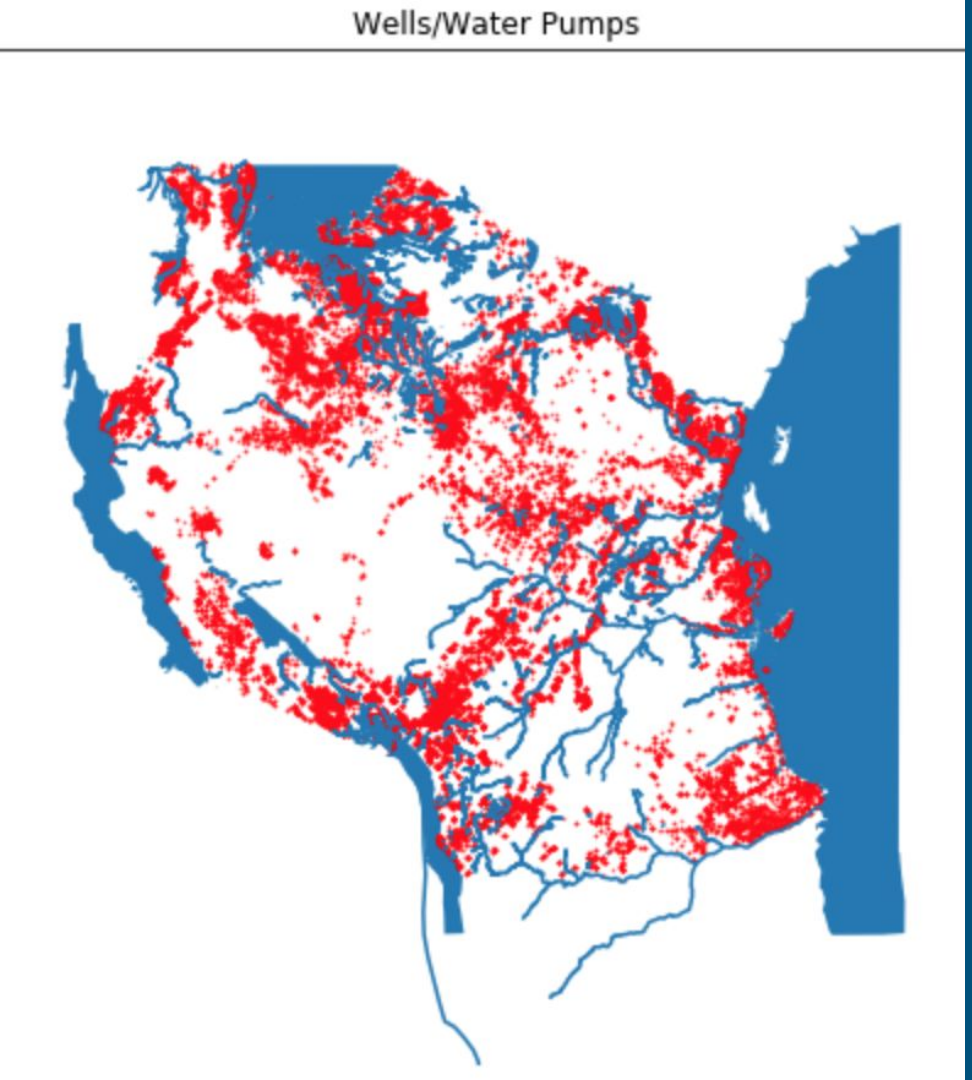
- **Approach:** Utilisation of classification algorithms to predict if new water pumps will be functional

Premise

- **Country Population:** 58 million people

- **Water Access:** 25 million people lack access to a safe water source and 40 million lack access to improved sanitation

- **Economy:** 6-7% of GDP growth, one of the fastest growing in Africa. Water access is key to sustain the growth and improve people's lives



Data details

- Approx. 60,000 water pumps installed
- Target: functional/non-functional assessment
- 29 binary & continuous features
- Example:
  - Date of installation
  - Water quality
  - Region
  - Installing
  - Organisation
  - Source type
  - Nearest water bassin
  - Length of operation (feature engineered)

Model Process

- **Measure Metric:**
  - Accuracy
- **Rationale:**
  - Accuracy will enable us to assess the quality of our model for predicting the status of water pumps
- **Validation format:**
  - Five-fold Stratified random sampling
- **Initial Model Eval:**
  - *Best performing:* Decision Tree adjusted using GridSearch CV
  - *Most constant across train/validation:* Logistic Regression
  - Prevalence

Model interpretation & Results

- **Baseline Model (Train/Val):**
  - Decision Tree: 0.96 / 0.78
  - Logistic Regression: 0.78 / 0.77
- **Secondary Models (Train/Val/Test):**
  - Random Forests: 0.77 / 0.76
  - Support Vector Machines: 0.61 / 0.60
  - K-nearest neighbors: 0.71 / 0.69
  - Ensemble methods:
    - Decision Tree with parameter optimization: 0.90 / 0.86 / 0.88
    - Threshold of 0.45

Feature Importance