Predicting Pump Failure in Tanzanian Water Wells

A project for The Government of Tanzania

Aaron Galbraith • 2023

Background

- 23 million people in Tanzania lack access to safe drinking water
- 59% of government-funded wells fail, compared to 43% of wells funded by other orgs

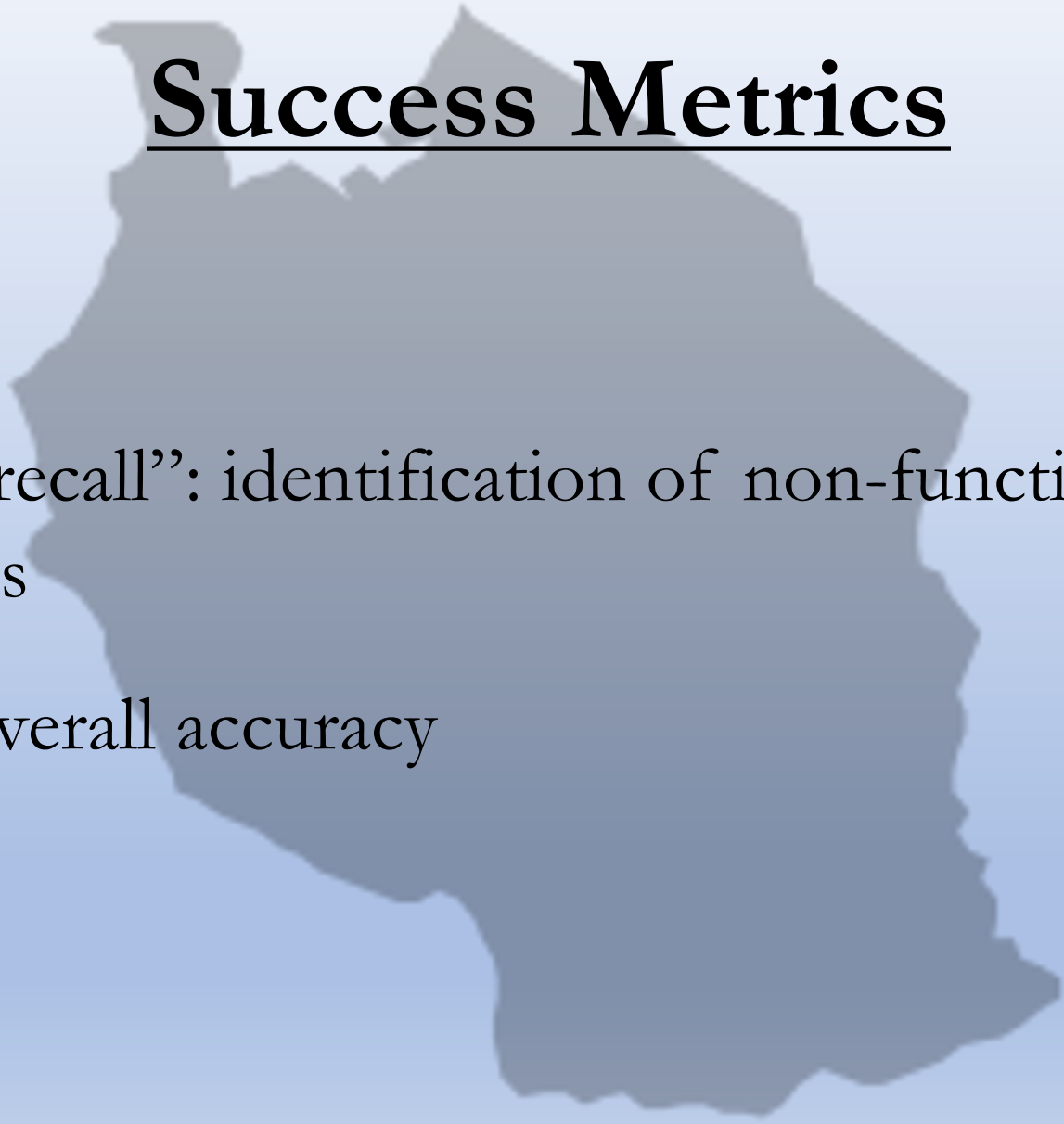
Project Goal

to help the Government of Tanzania identify trends associated with wells that become non-functional

1. adjust plans *before* installation

2. monitor at-risk wells *after* installation

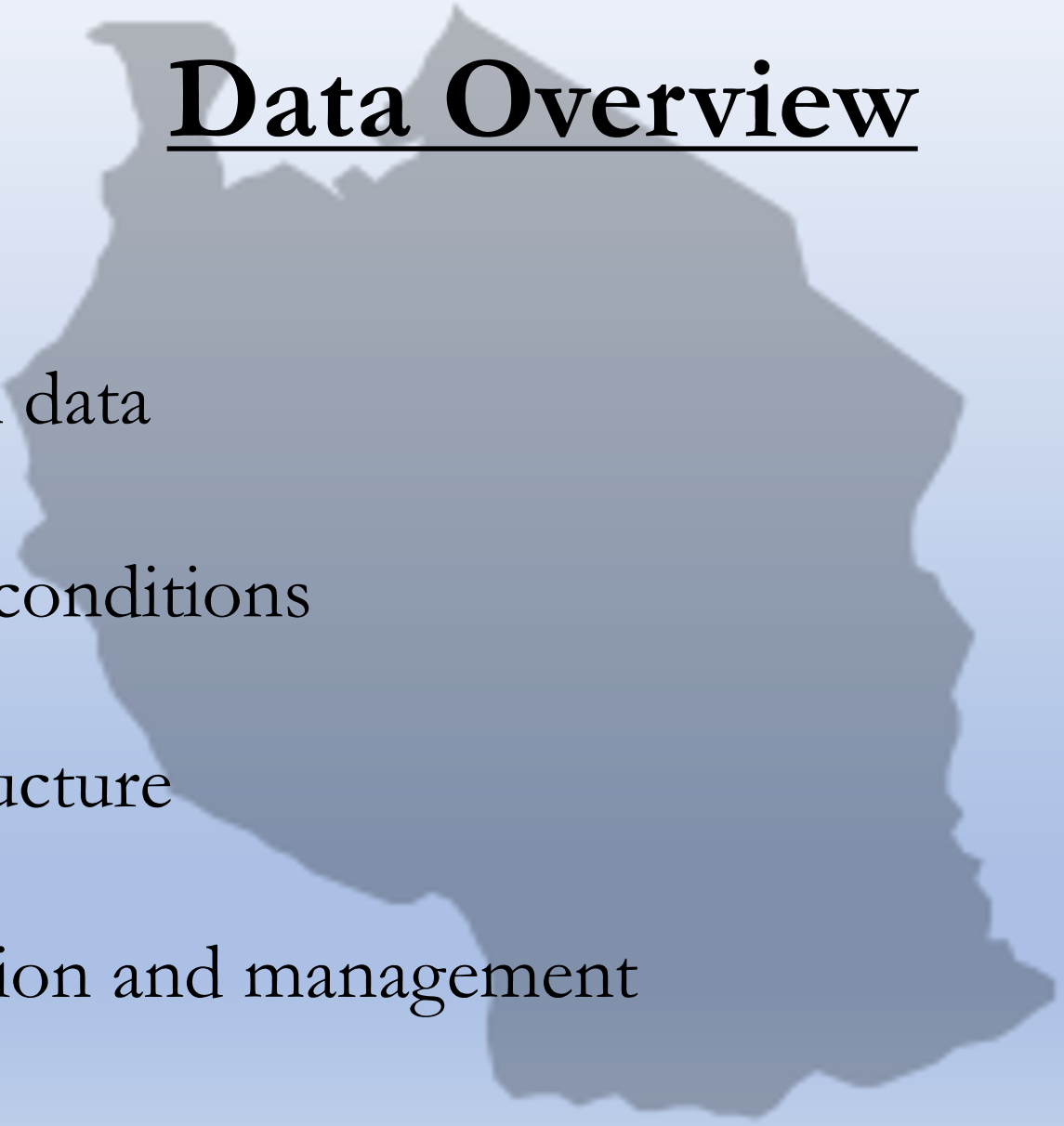
Success Metrics



1. “recall”: identification of non-functional wells

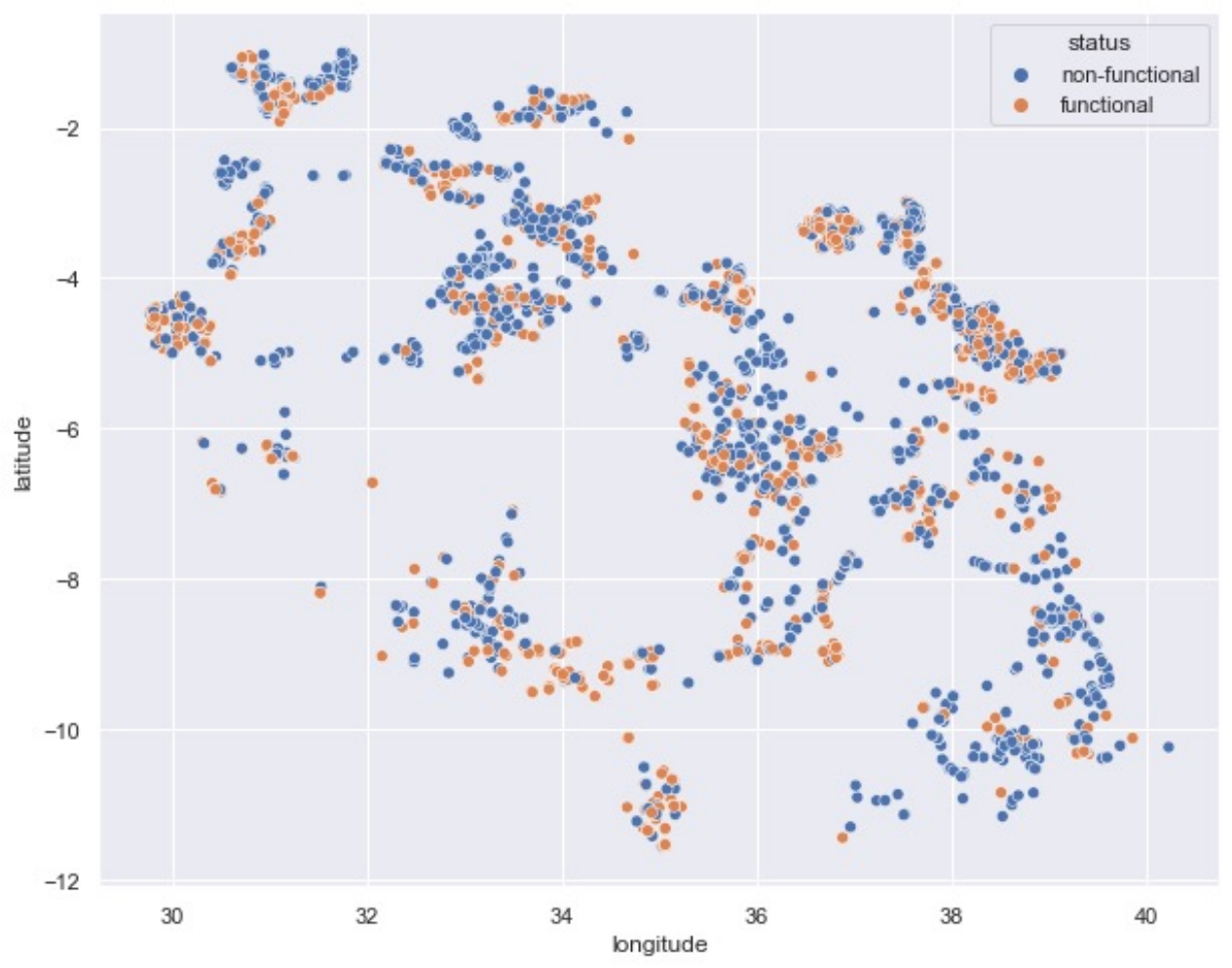
2. overall accuracy

Data Overview



- location data
- natural conditions
- well structure
- installation and management

Data Overview



Data Overview

failure rate over time

Modeling

model	recall	accuracy
logistic	77%	75%
XG boost	78%	78%
random forest	81%	76%

random forest model statistics:

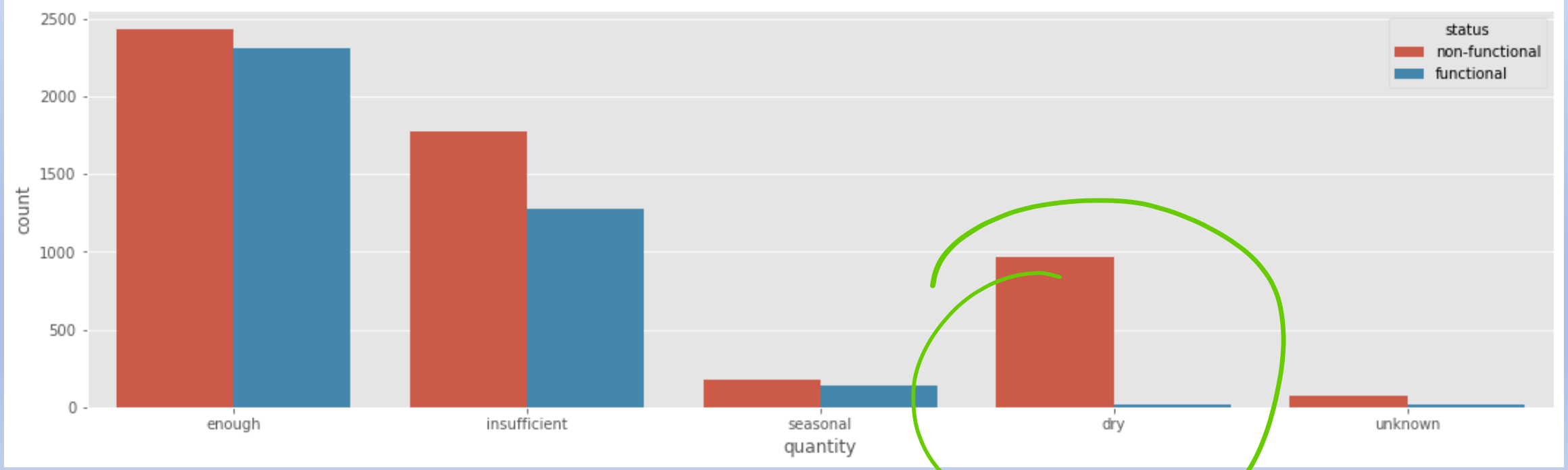
train recall: 83.0%
test recall: 80.9%

train accuracy: 80.2%
test accuracy: 76.3%

Results

most predictive features

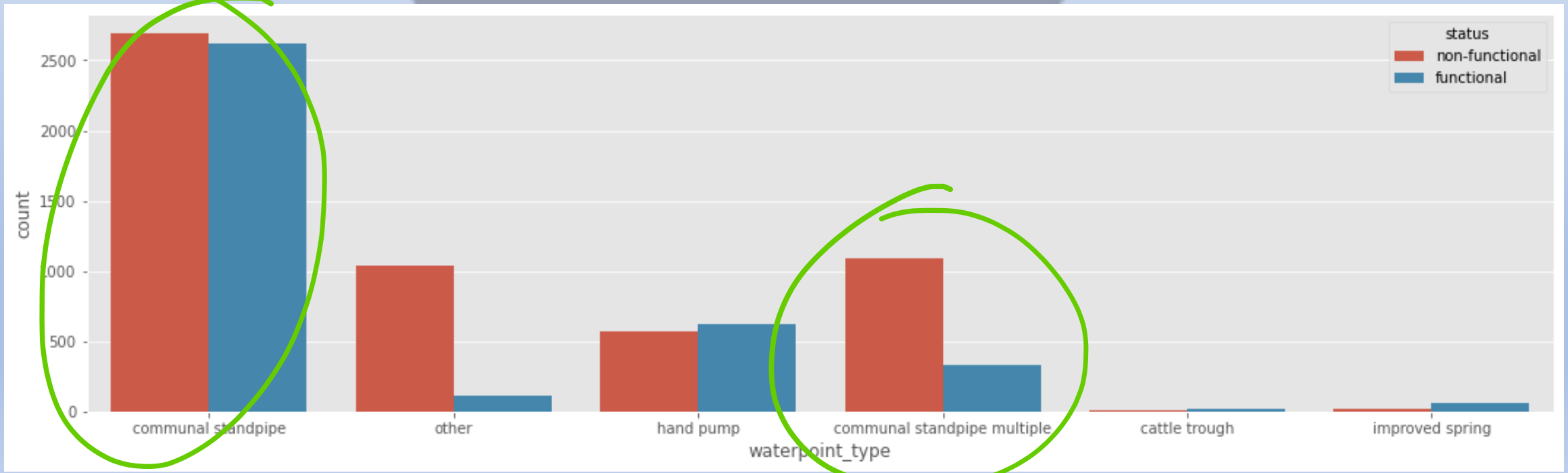
1. water quantity



Results

most predictive features

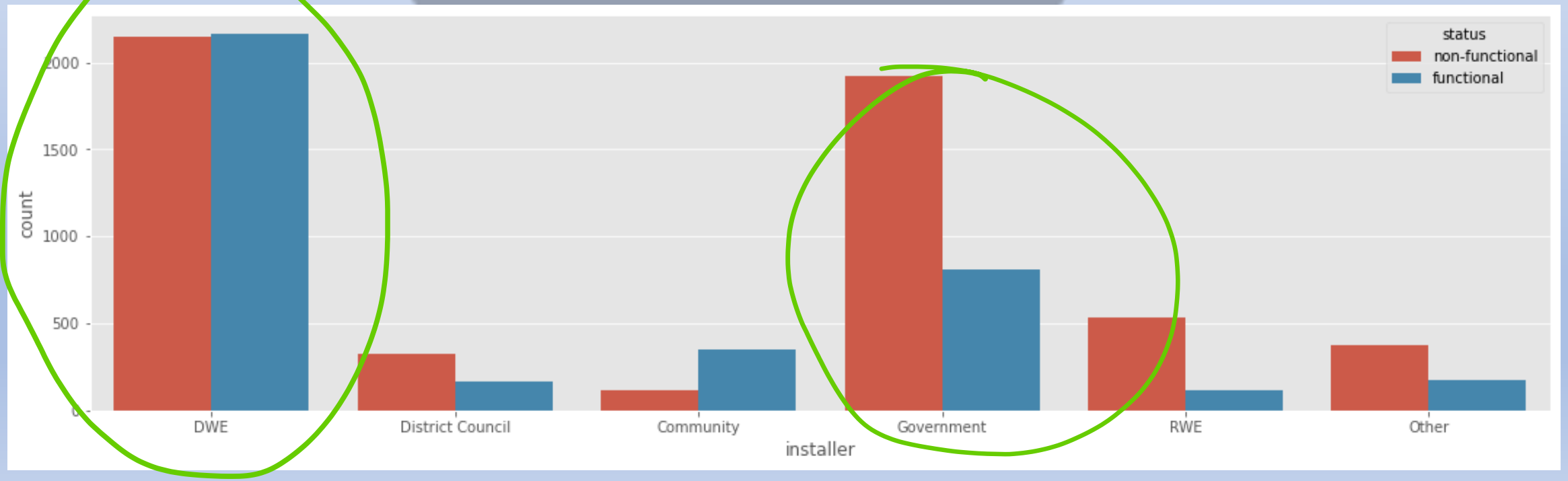
2. waterpoint type



Results

most predictive features

3. installer



Recommendations

1. *before* installing wells, prioritize, if possible

    a. sufficient water quantity

    b. using handpump or communal standpipe

    c. installation by community or DWE

Recommendations

2. *after* installing wells, commit resources to monitoring

    a. wells with low water quantity

    b. communal standpipe *multiple* types

    c. government-installed wells

    d. wells installed before 1985

Further Inquiry

gather more complete data, particularly in water quantity, waterpoint type, and installer identity

acquire data on cost and availability of options

Thank you

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