# Tanzanian Water Wells

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UNICEF
for every child


## Our Mission

Clean water, basic toilets and good hygiene practices are essential for the survival and development of children. For children under five, water- and sanitation-related diseases are one of the leading causes of death. Every day, over 800 children die from preventable diseases caused by poor water, and a lack of sanitation and hygiene. UNICEF's water, sanitation and hygiene (WASH) team works in over 100 countries worldwide to improve water and sanitation services, as well as basic hygiene practices. Last year, UNICEF's efforts provided nearly 14 million people with clean water and over 11 million with basic toilets. Our current mission is to predict the condition of water wells in Tanzania, as they are facing a massive water crisis. Here are some alarming statistics about the Tanzanian water crisis.

### 01 24 Million

People are impacted by the United Republic of Tanzania's water crisis; that's almost half the population of Tanzania

### 02 43%

Of the Tanzanian population are relying on water that does not meet their standard

### 03 17%

Of the Tanzanian population have no place to wash their hands. Without hand washing at critical times, such as after using the bathroom, people are more prone to get sick.

# Process

OSEM

## 01

### Obtain the Data

- Import the Tanzanian_data_set.csv and Tanzanian_labels.csv

## 02

### Scrub the Data

- Cast appropriate data types to predictor variables
- Clean up NA values
- Filter data set to exclude insignificant values
- Convert important categorical variables into numerical ones to use for modelling stage

## 03

### Explore the Data

- Explore relationships between categorical and continuous predictor variables with the target variable 'well condition'
- Observe for any patterns/trends, which indicates that a certain variable may be useful for the final model

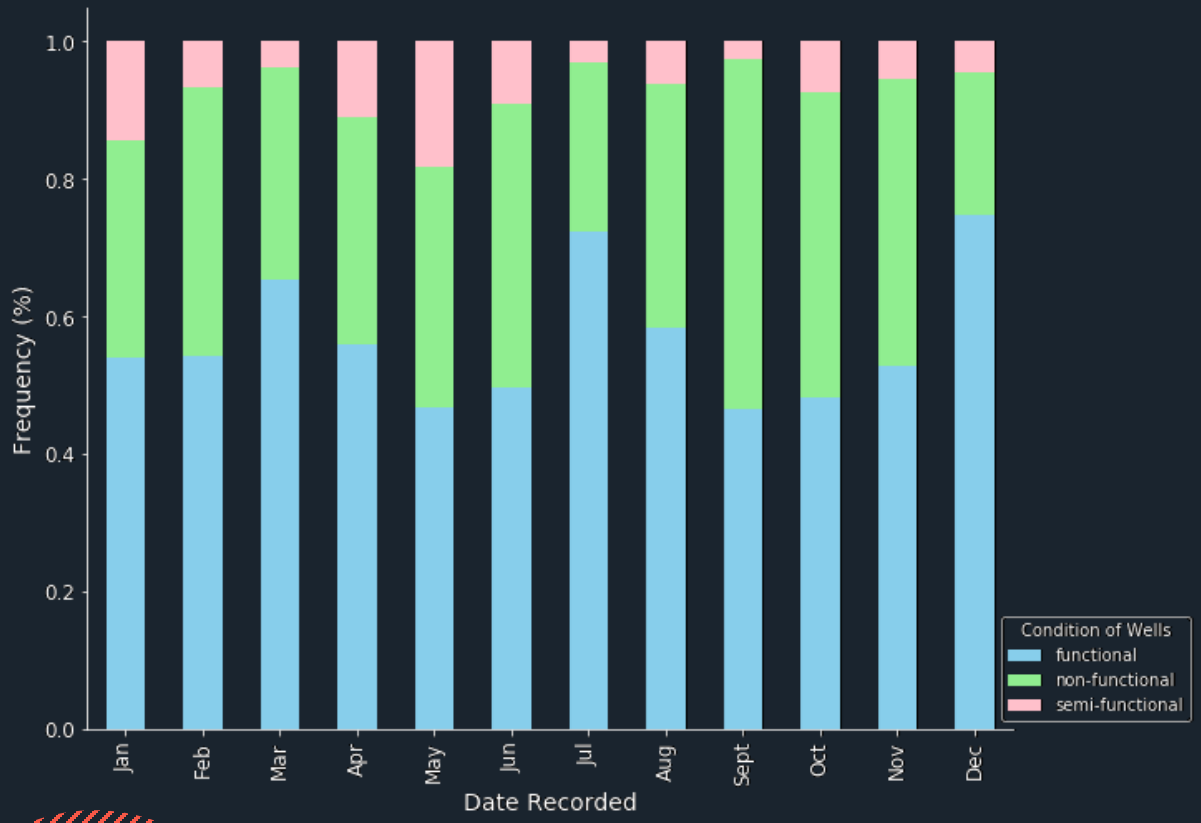
## 04

### Model the Data

- Run 5 different machine learning algorithms:
  - Logistic Regression
  - Decision Tree
  - Random Forest
  - Ada boosting
  - Gradient boosting
- Select best performing algorithm and perform Randomized Search

# Distribution of Well Conditions

**By Date Recorded**

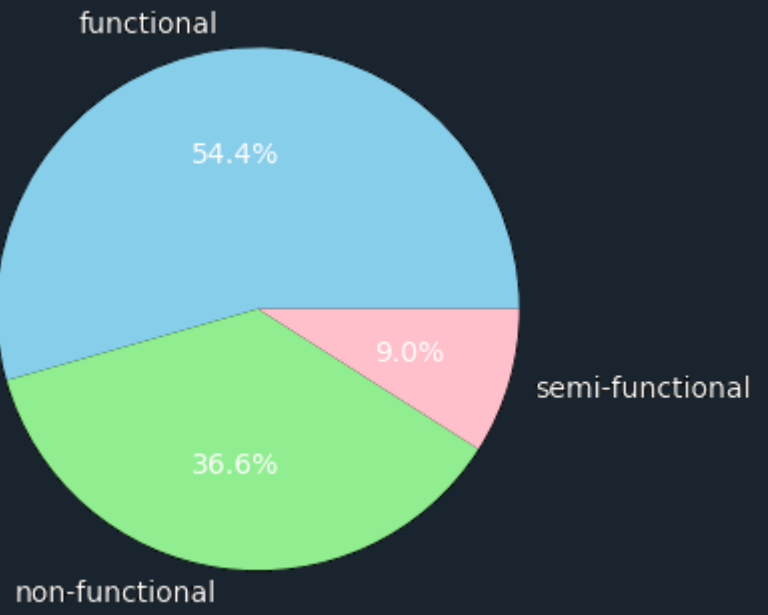



**54.4%**

Of the wells are functional

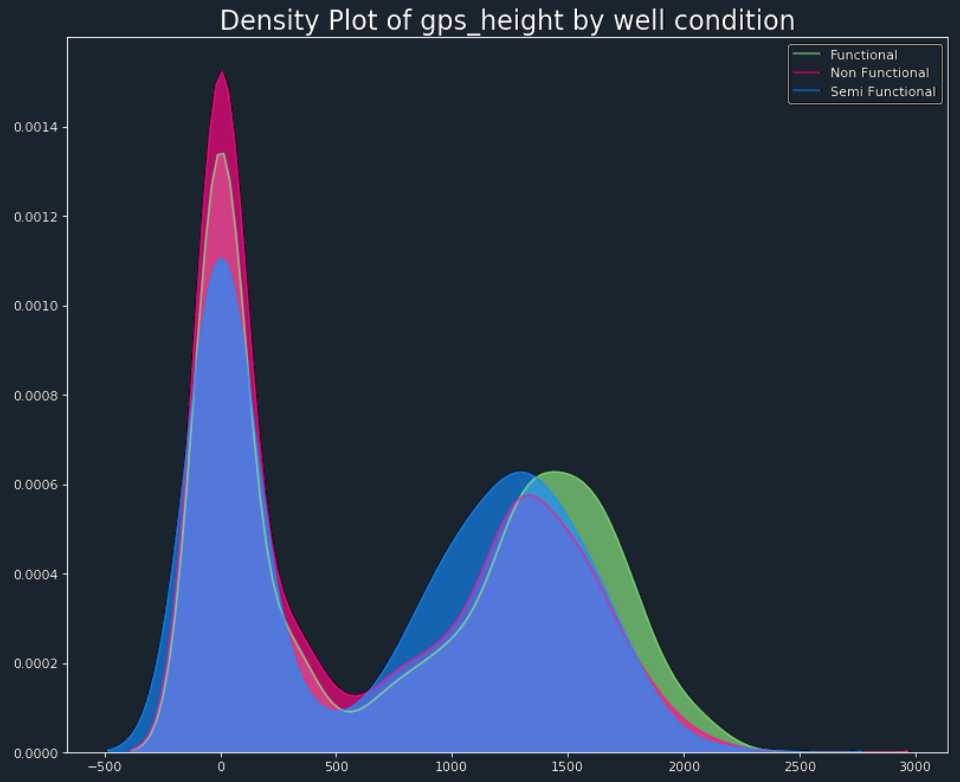
**36.6%**

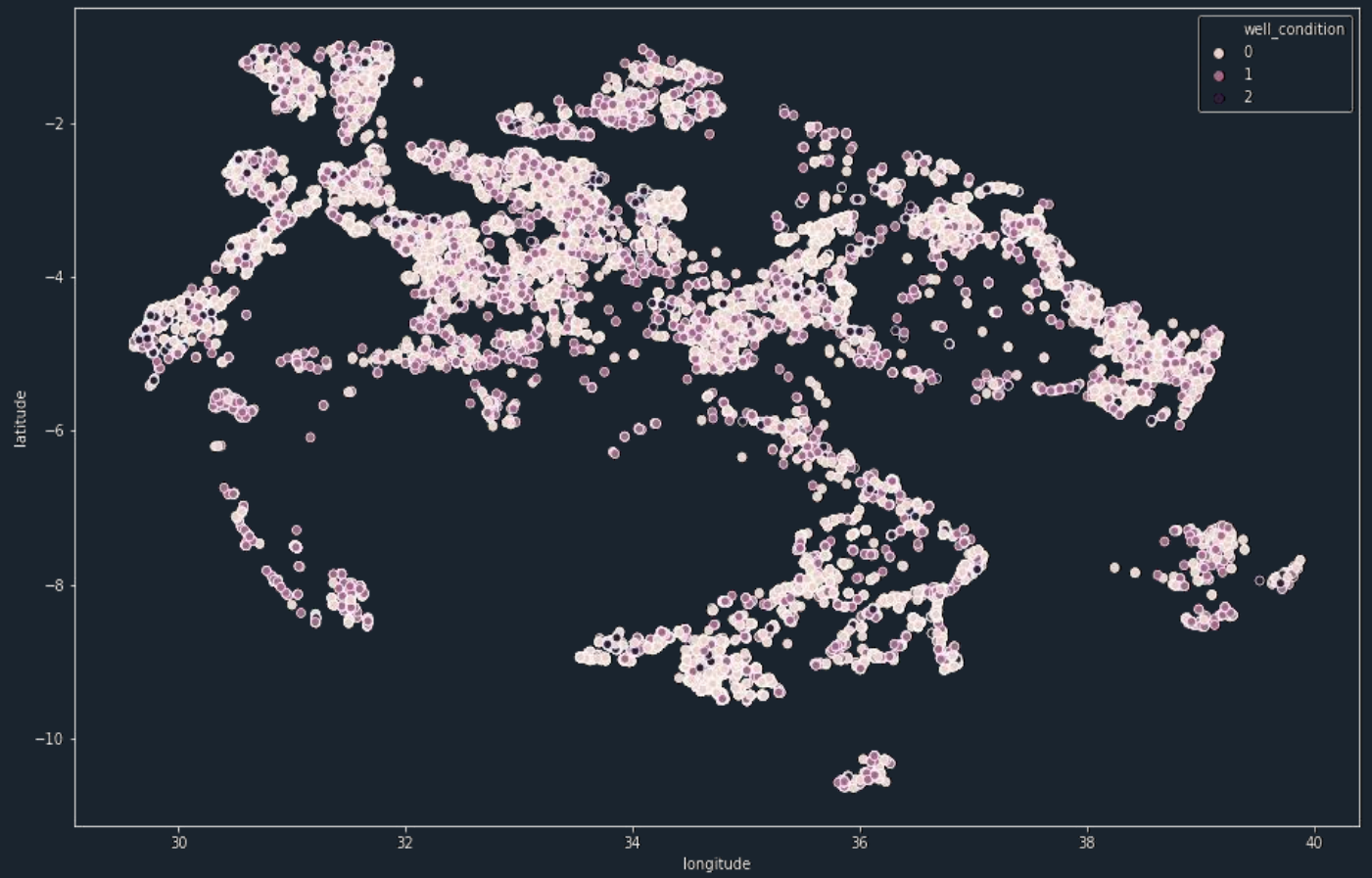
Of the wells are non-functional



# Locations of Wells

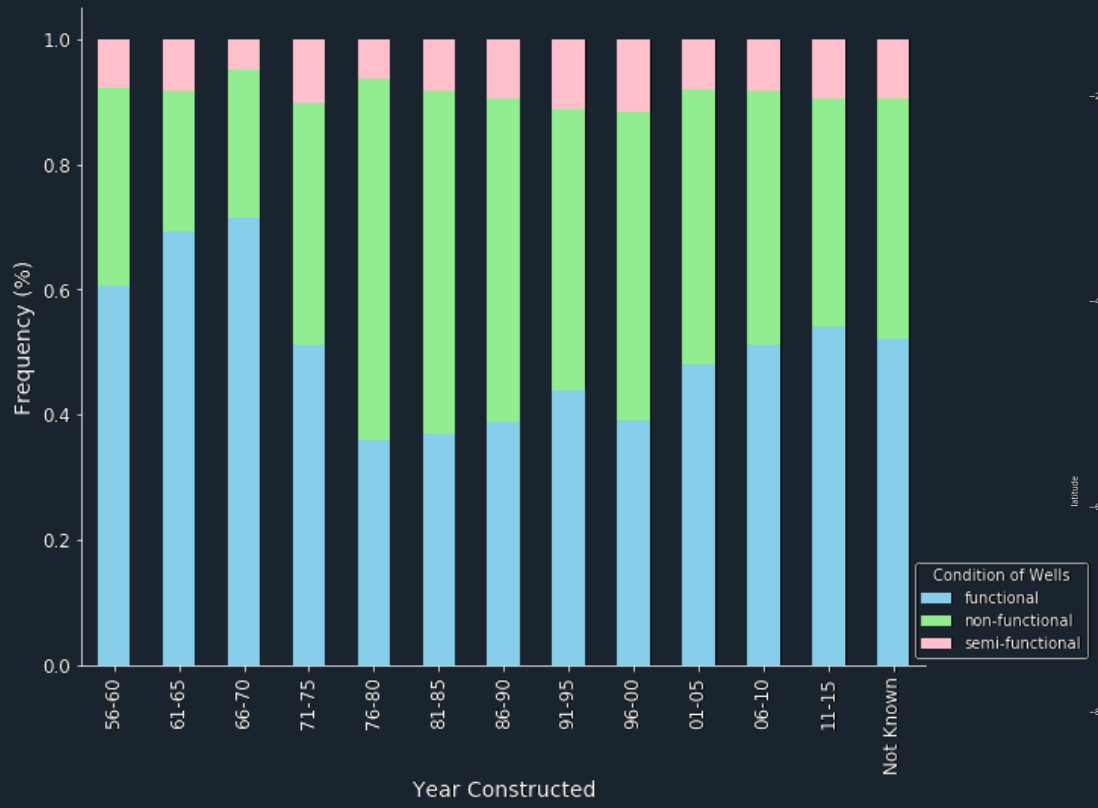
## And the distribution of its altitude

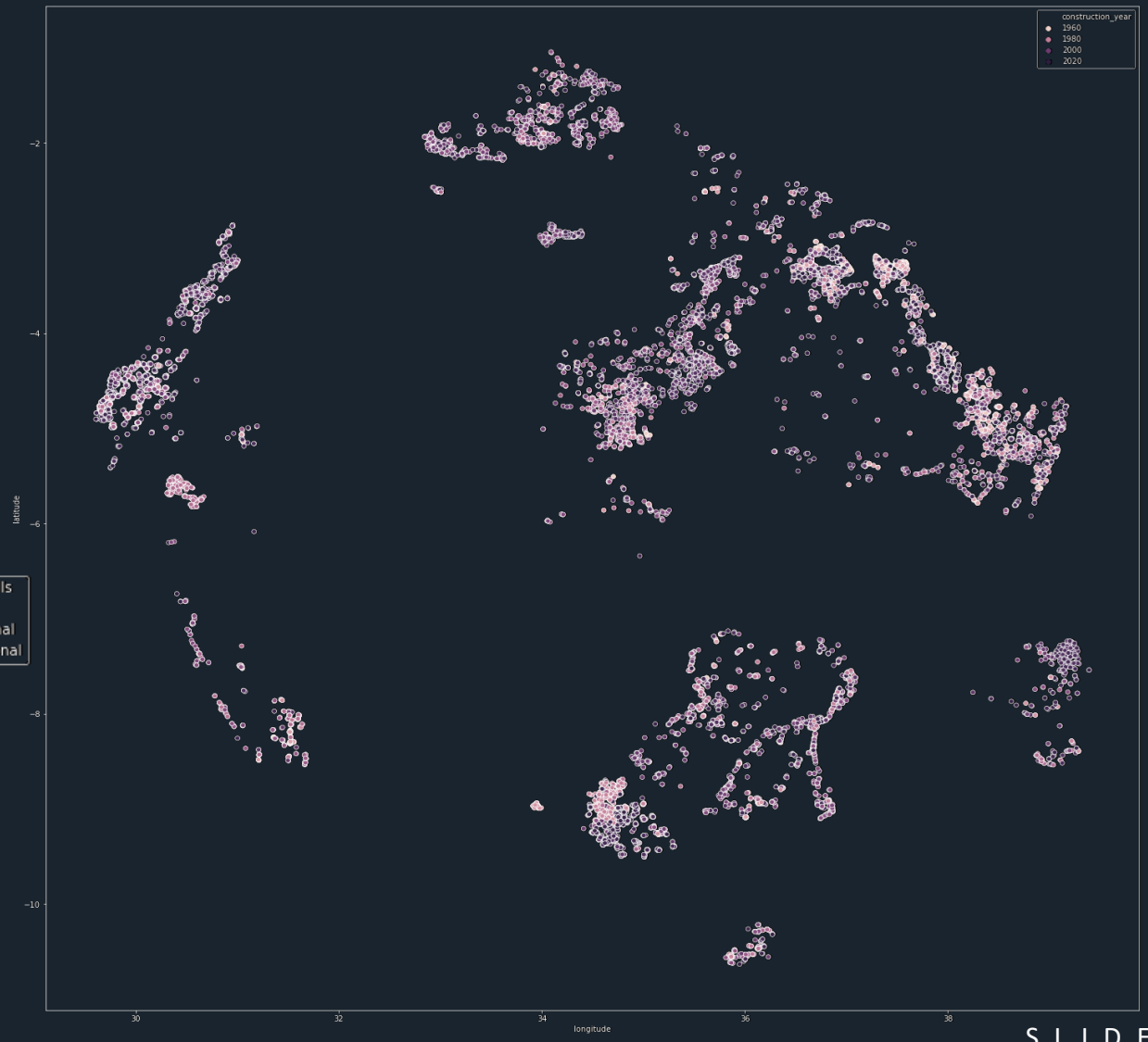


# Construction Years of Wells

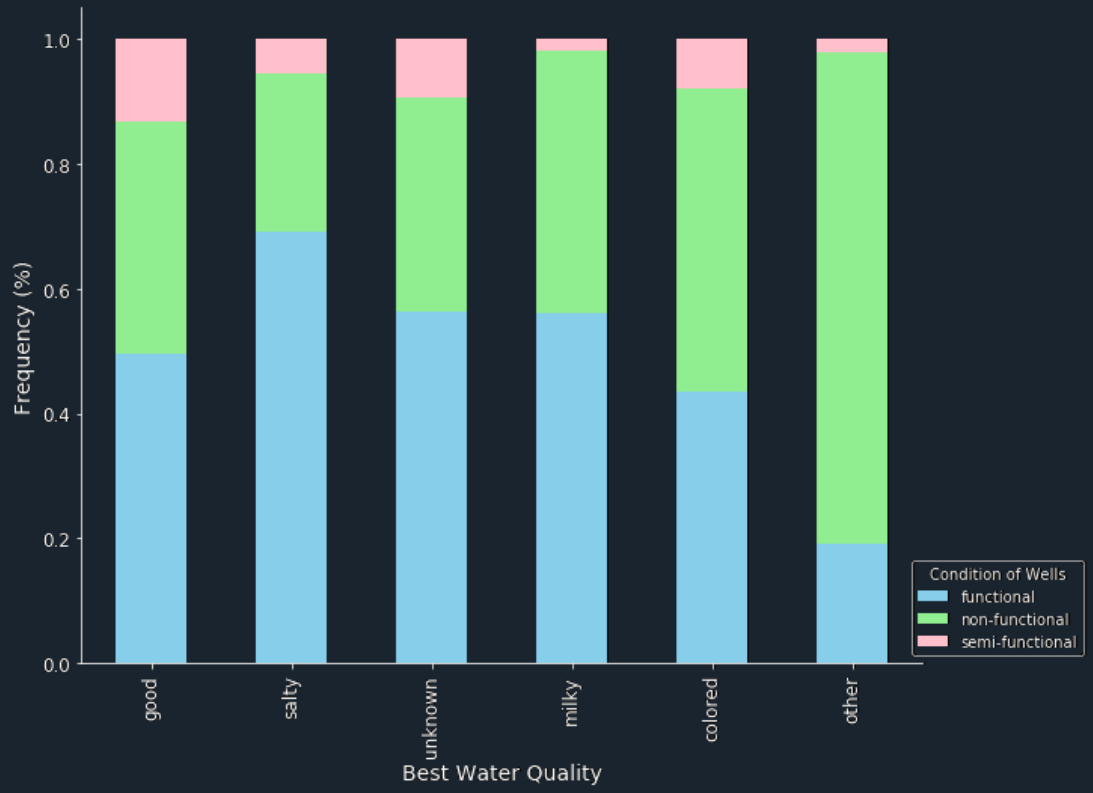
## By Well Condition

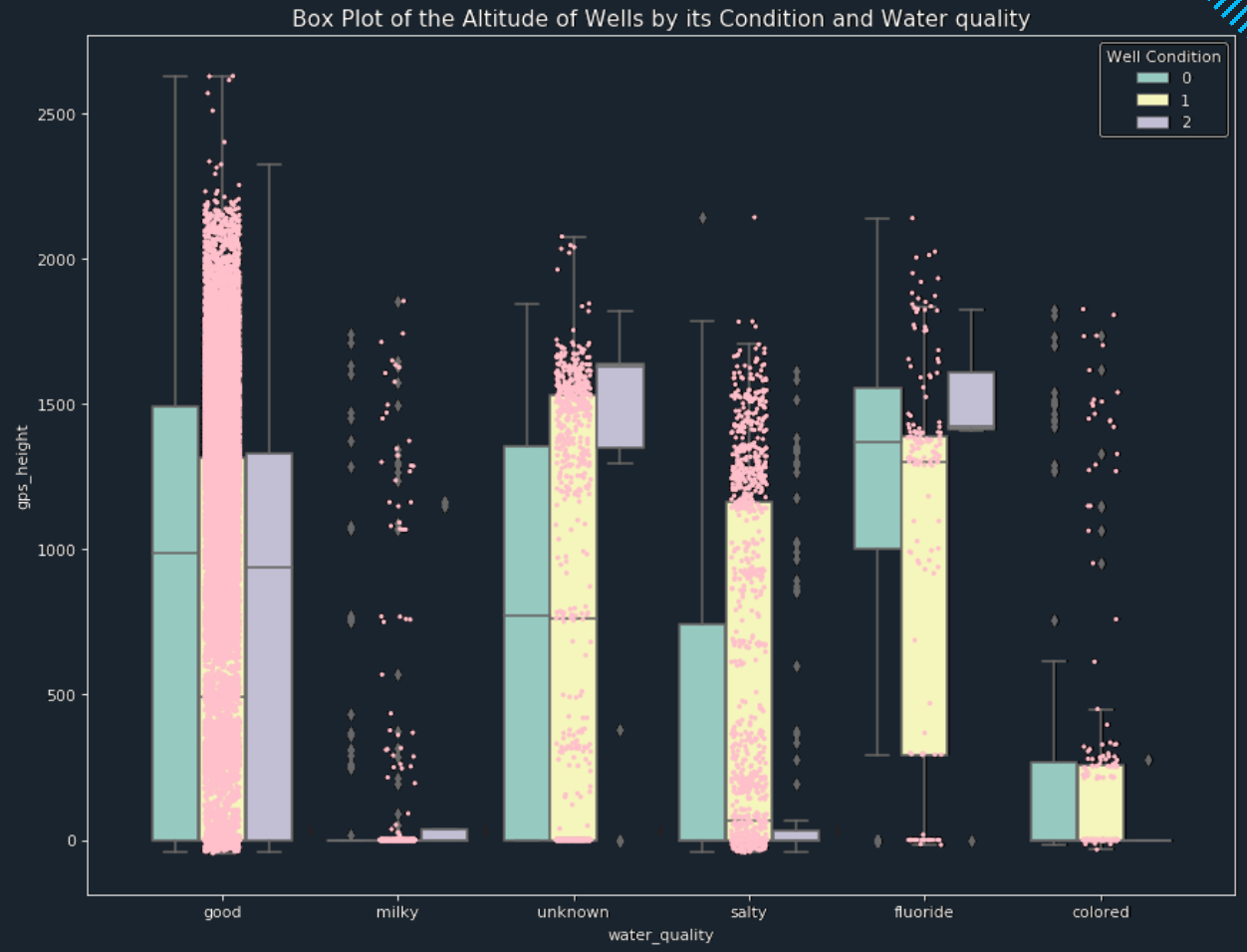


# Best Water Quality

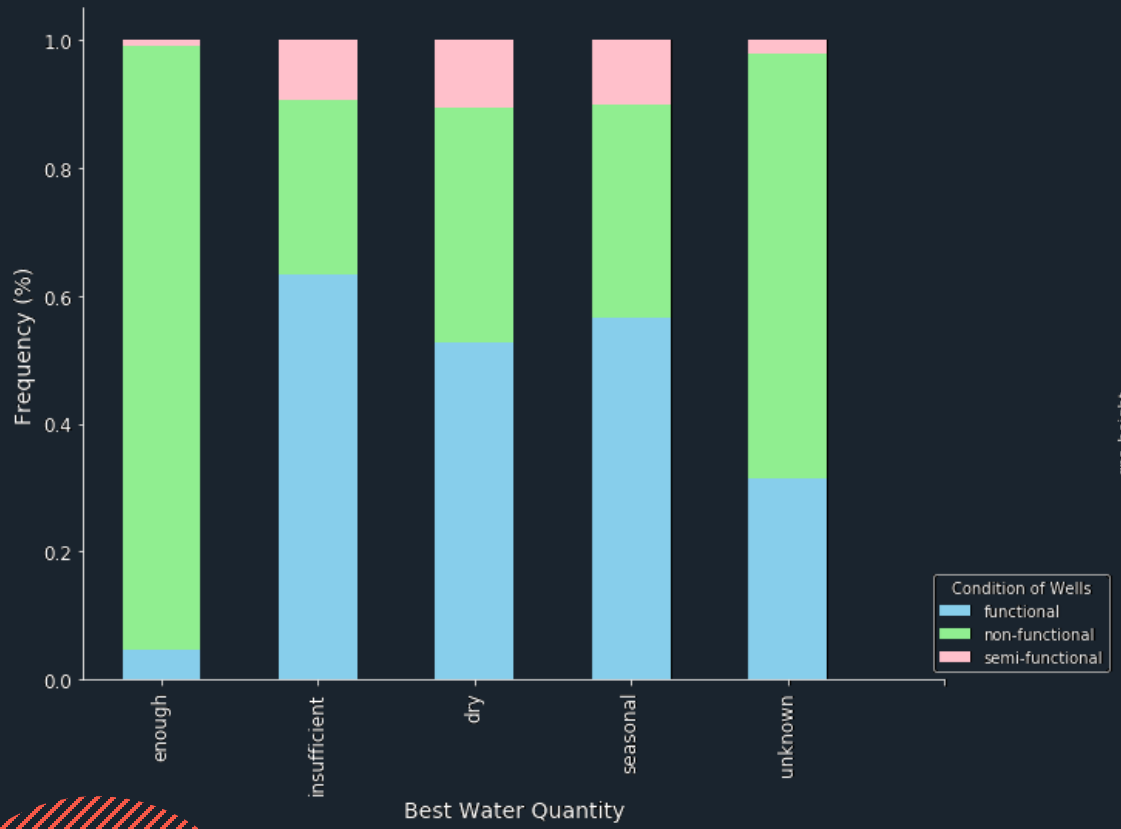
By Well Condition

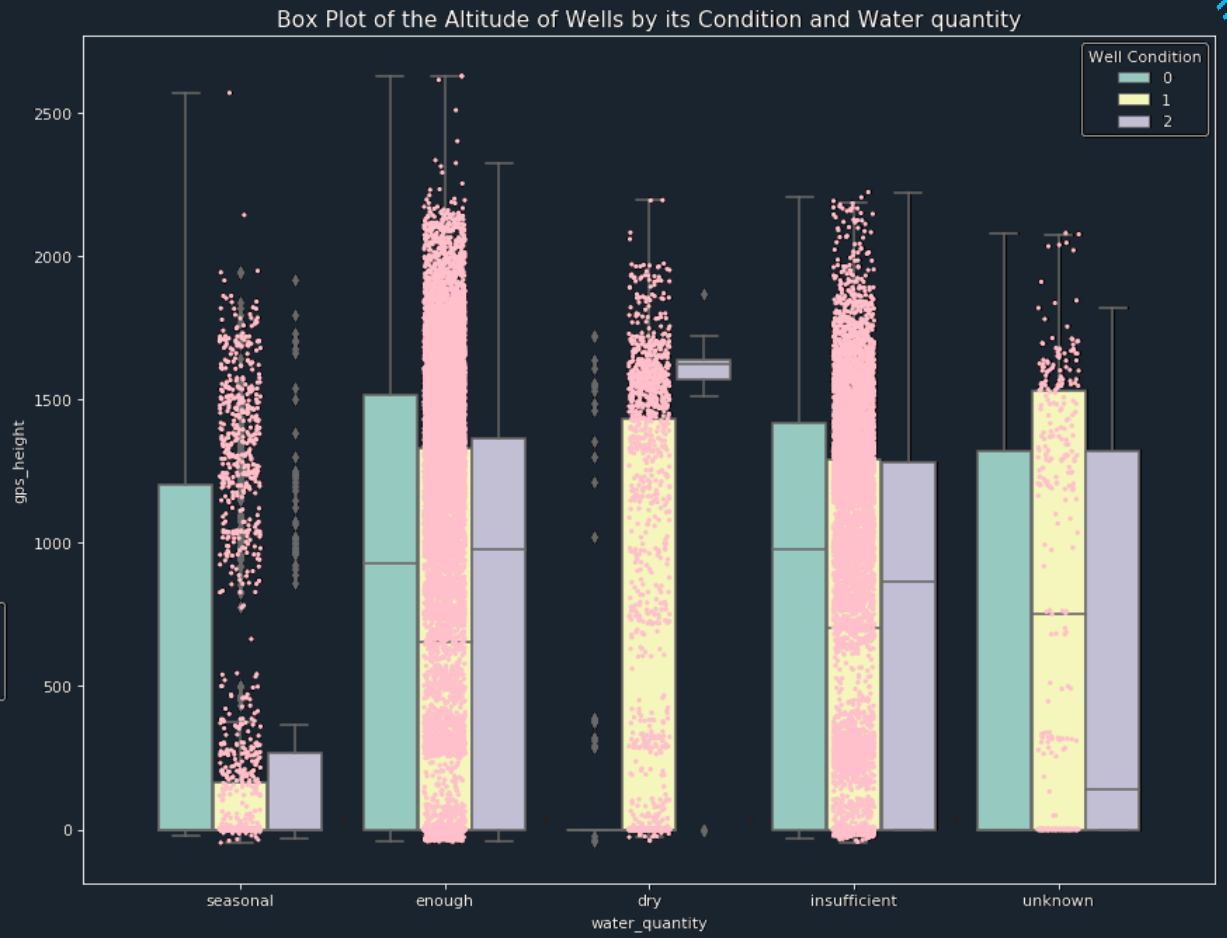


# Best Water Quantity

## By Well Condition



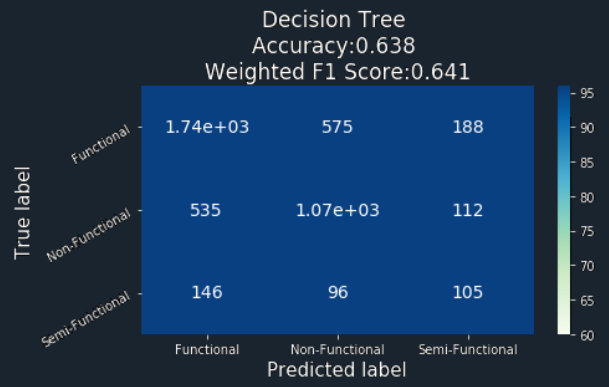
# Model Selection Algorithms

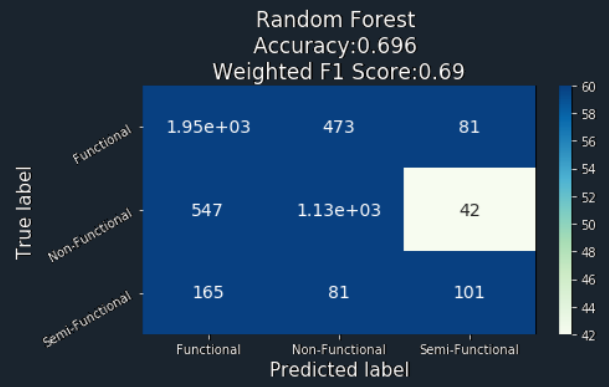
**Logistic Regression, Decision Tree, Random Forest, Ada Boosting, Gradient Boosting**

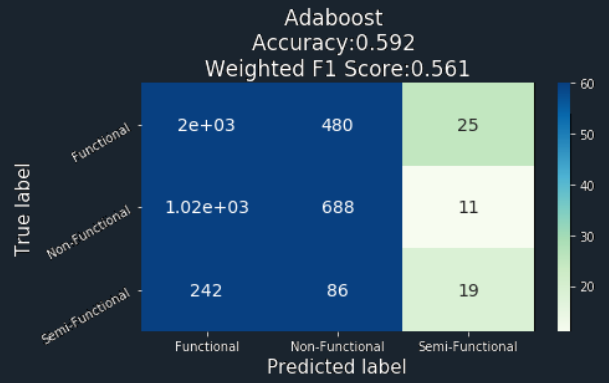
## Best Performing Model: Random Forest

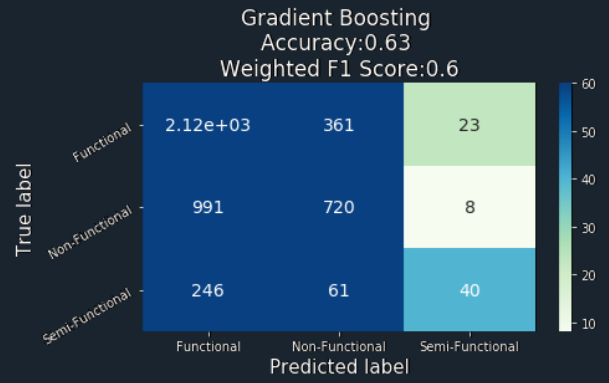
**70.2% Accuracy Score (with hyperparameter tuning)**

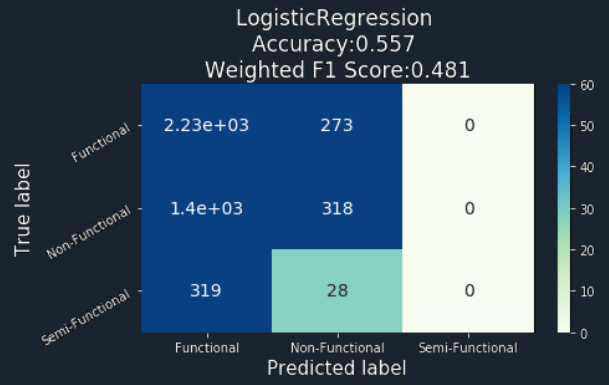
**69.0% F1 Score**

# Recommendations

## Top 10 Features

01 Longitude

02 Latitude

03 Altitude of the Wells

04 Population

05 Total Static Head

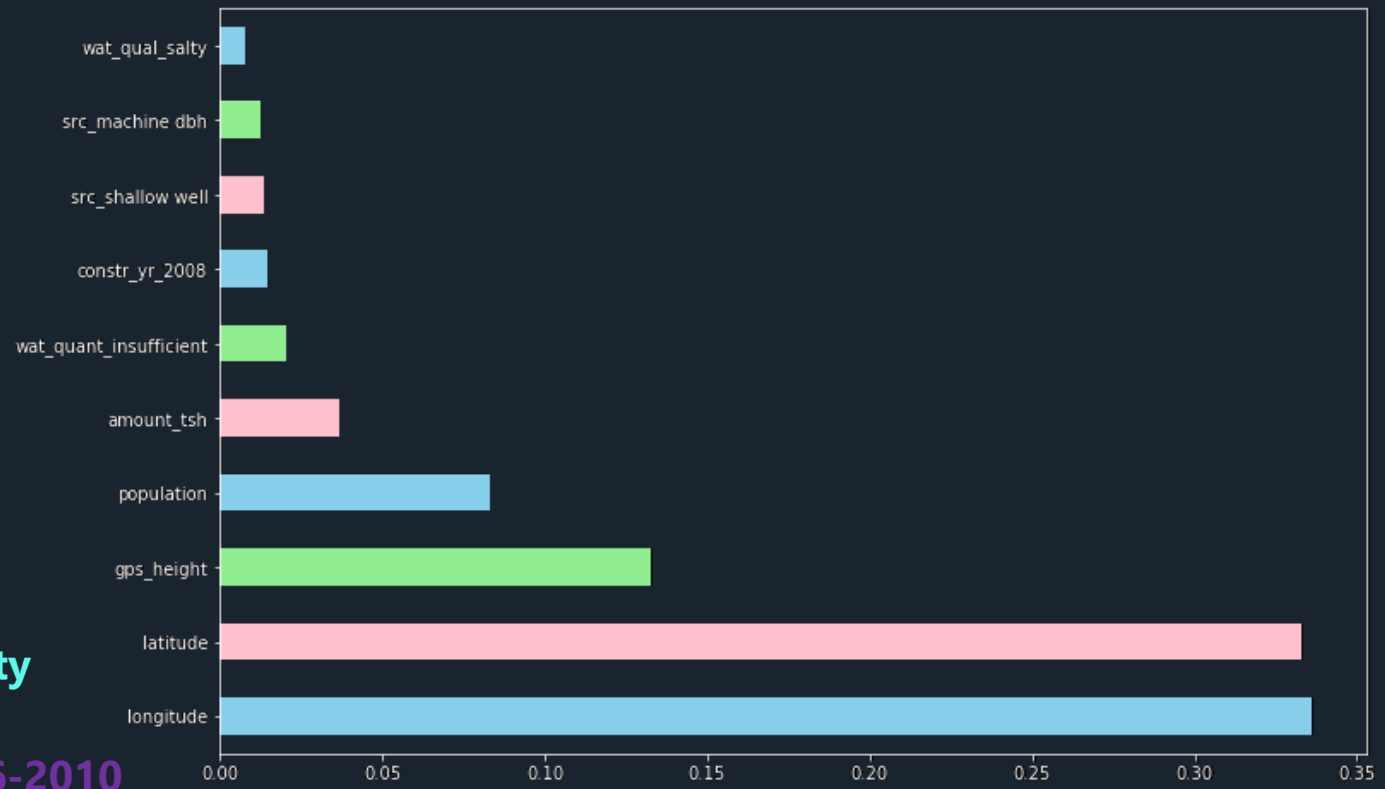
06 Insufficient Water Quantity

07 Wells Constructed in 2006-2010

08 Shallow Well (Water Source)

09 Machine Dbh (Water Source)

10 Salty Water Quality



# Future Work

- Trying different data cleaning methods
- Having more time to play around with combining unused features together
- Collect more data to train the model
- Transforming more categorical variables into numerical ones for modelling purposes
- Making predictions with another modelling algorithm such as XGBoost

# Thank You

**Flatiron School Online Data Science Bootcamp**