PREDICTING FAULTY PUMPS

DATA MINING FOR SUSTAINABLE WATER MANAGEMENT

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INTRODUCTION

- Project to predict the status of water pumps in Tanzania
- Objectives of the analysis:
  - Classify pumps in Tanzania as functional, or non-functional
  - Improve water access in Tanzania

STAKEHOLDERS

- Government agencies and NGOs
- Tanzanian government and international development organizations

BUSINESS CASE

Core objective:

1. Enable the identification of functional and non-functional pumps in Tanzania

Results implications:

1. Guide decisions on maintenance, investments, and resource allocation

2. Support sustainable water management in Tanzania

DATA

DATASET OVERVIEW

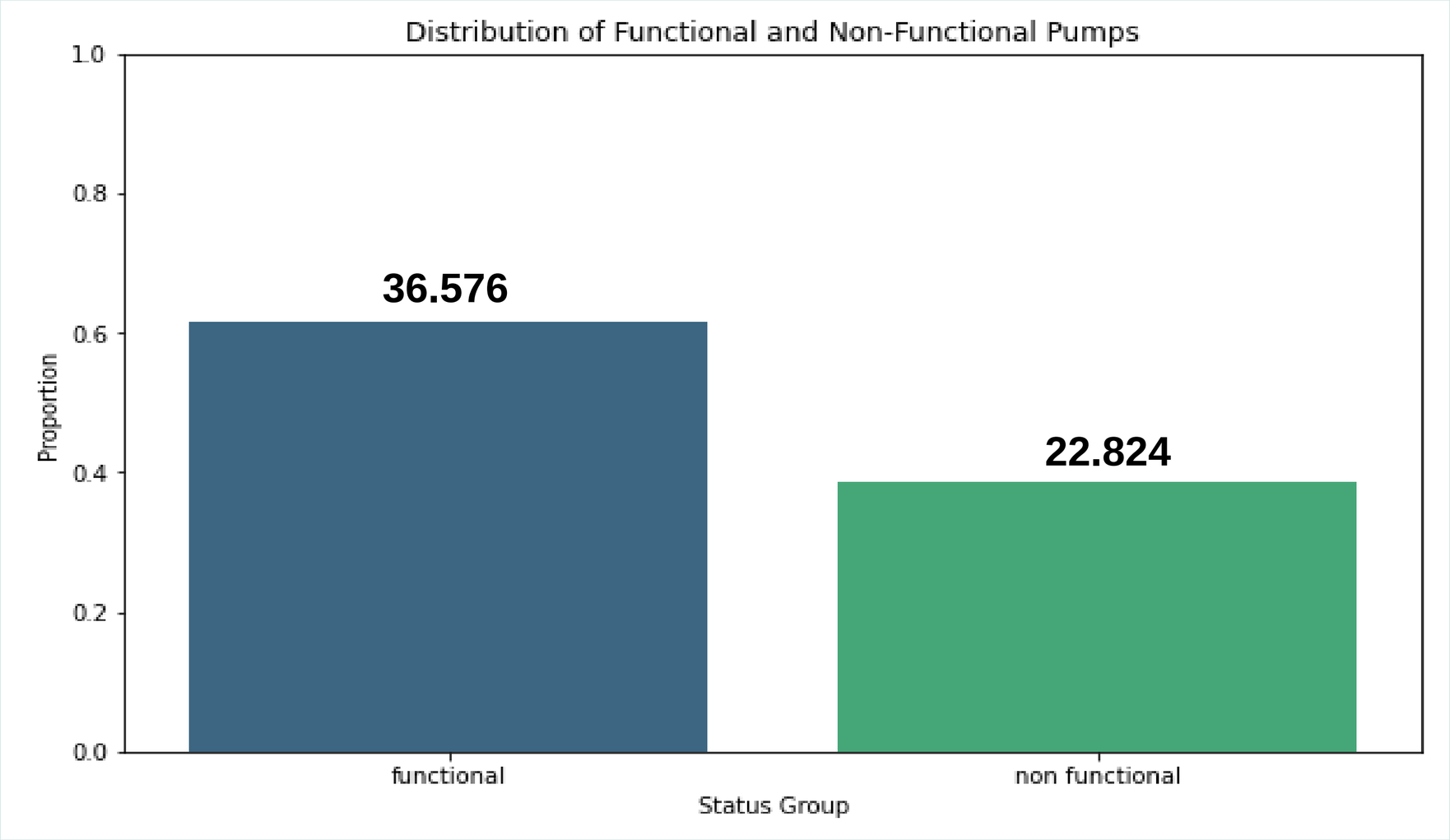
- Source: DrivenData
- Link to the source: https://www.drivendata.org/competitions/7/pump-it-up-data-mining-the-water-table/page/23/

- Training dataset: 60000 records
- Testing dataset: 15000 records

DATASET DESCRIPTION

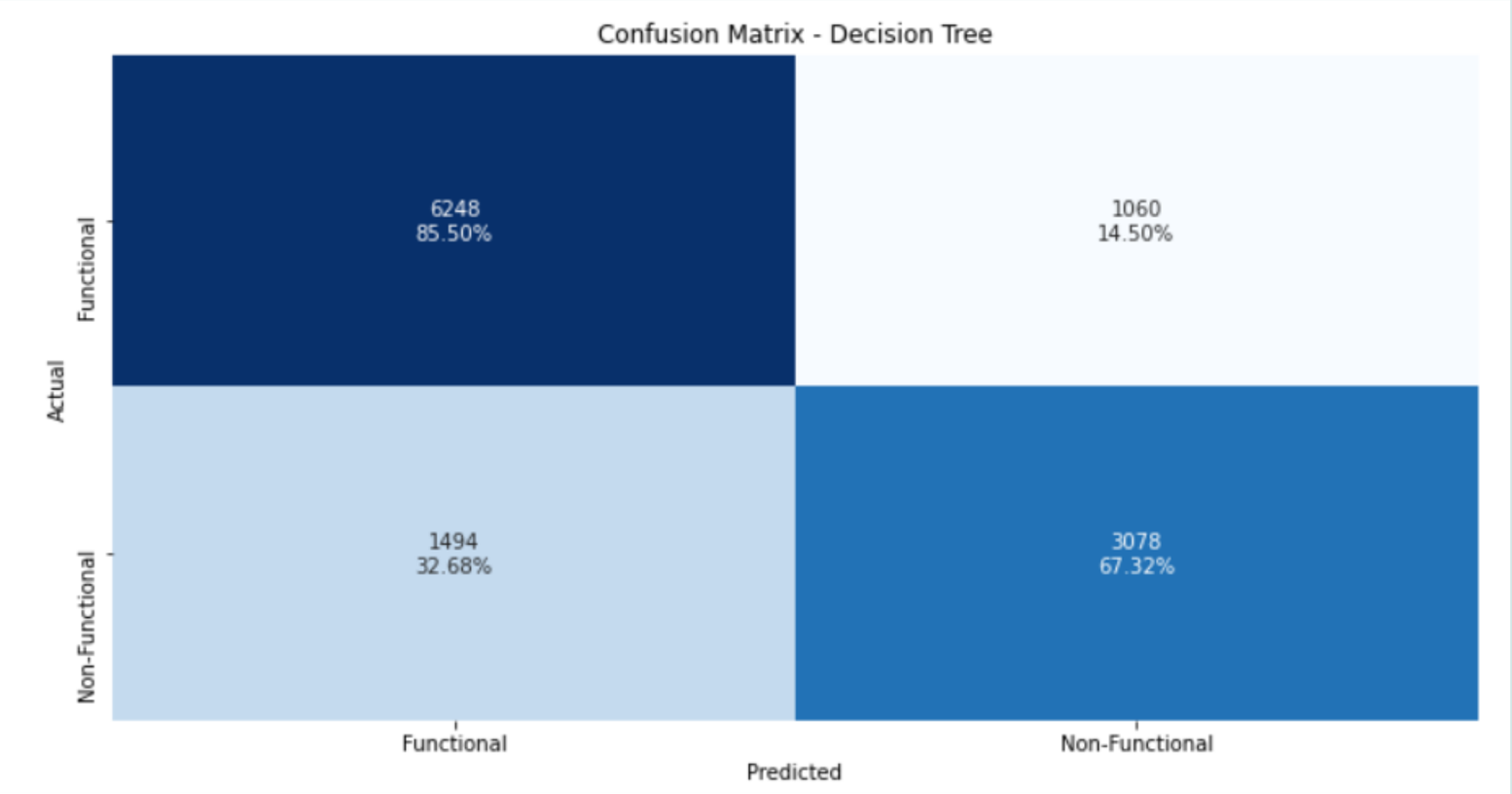
- Certain fields: Geographic location, water access point, quantity of water

PUMPS STATUS



MODELING APPROACH

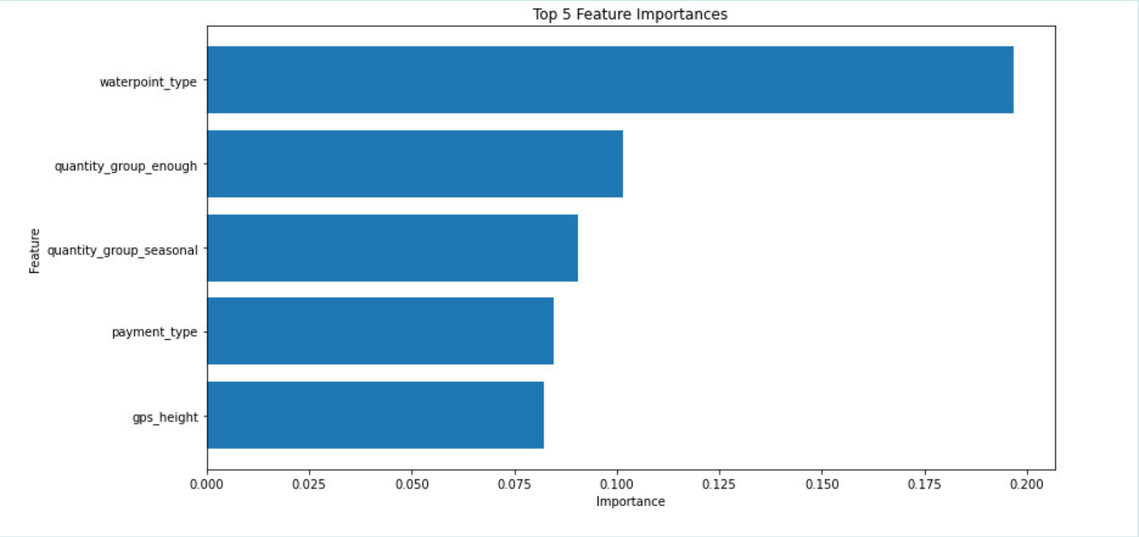
We prioritized the Recall score to determine the best model. Based on this metric, the best model we designed was the Decision Tree Classifier



FEATURE IMPORTANCE

Here are the most important variables that better discriminate between functional and non-functional:

1. Waterpoint_type (ie. Water Access point)
2. Quantity_group (ie. Quantity of wáter)
3. Payment_type (ie. Payment method)



RECOMMENDATIONS

1. Align Payment Plans:

Providing financial assistance more accessible (with monthly or per-bucket payments)

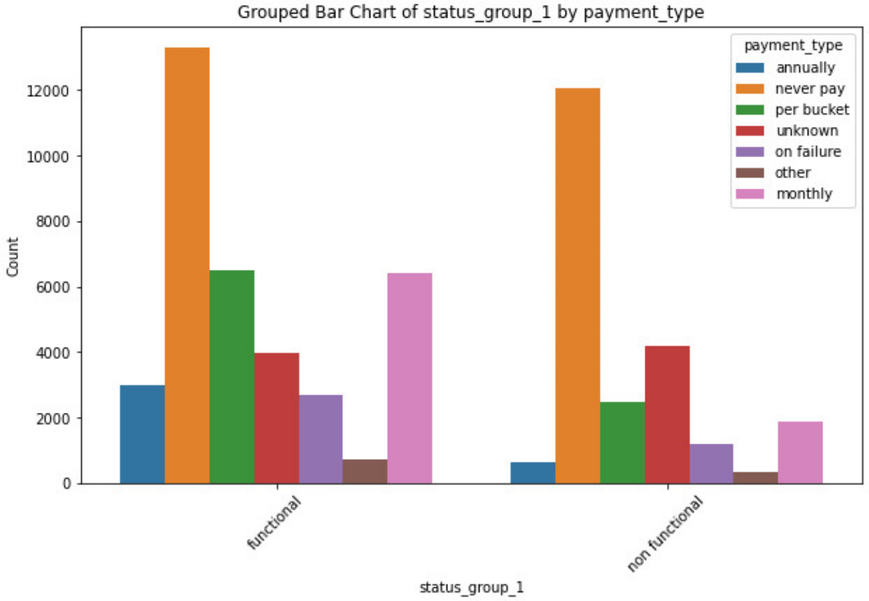


Table for payment_type:

payment_type	annually	monthly	never pay	on failure	other	per bucket	unknown
status_group_1							
functional	8.17%	17.52%	36.32%	7.40%	1.99%	17.77%	10.83%
non functional	2.87%	8.29%	52.85%	5.29%	1.42%	10.89%	18.39%

RECOMMENDATIONS

2. Use Dry Pumps as Indicators:

Using dry as an indicator helps identify non- functional pumps for targeted repairs

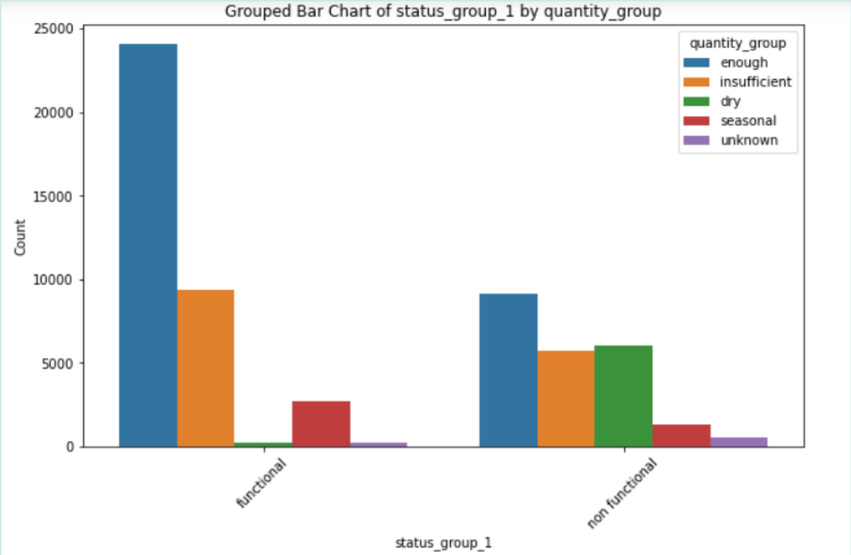


Table for quantity_group:

quantity_group	dry	enough	insufficient	seasonal	unknown
status_group_1					
functional	0.53%	65.75%	25.61%	7.49%	0.62%
non functional	26.52%	40.04%	25.25%	5.74%	2.46%

RECOMMENDATIONS

3. Identify Non-Common Types:

Invest in communal standpipe multiple as it best detects pump functionality

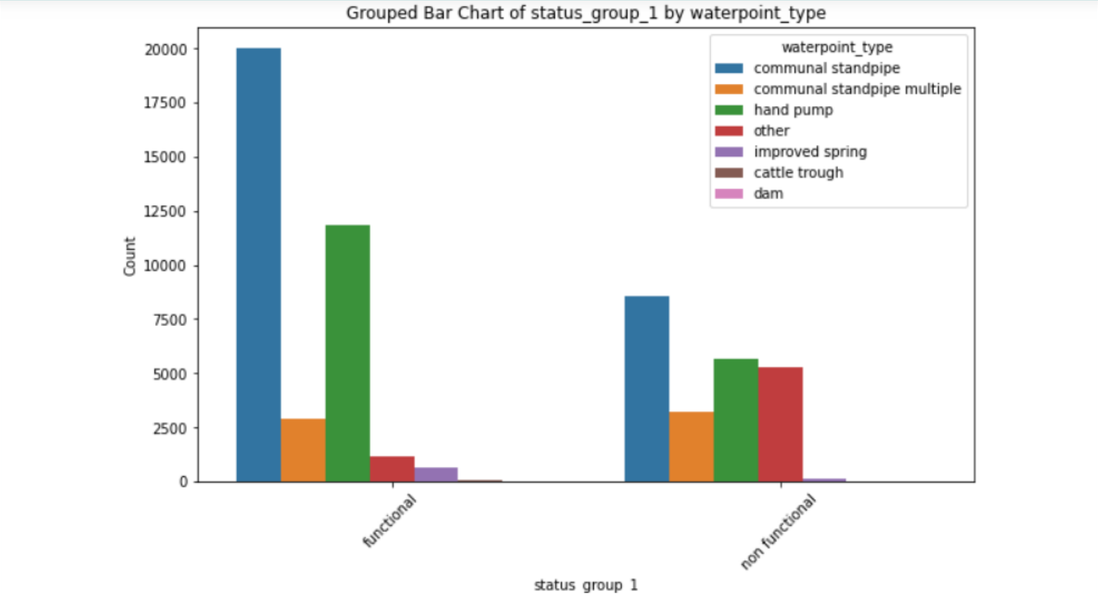


Table for waterpoint_type:

waterpoint_type	cattle trough	communal standpipe	communal standpipe multiple	dam	hand pump	improved spring	other
status_group_1							
functional	0.24%	54.64%	7.88%	0.02%	32.35%	1.77%	3.10%
non functional	0.13%	37.40%	14.11%	0.00%	24.77%	0.60%	22.99%

THANK YOU VERY MUCH

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