

## Project Group 63: Day Zero Predictor

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### Project Description

'Day Zero' is a term that is used to refer to a situation of extreme water shortage - a situation that Cape Town came very close to facing last year. They have managed to avoid complete water shortage as of now, but it is a huge warning for the rest of the world. Many cities all around the world experience water shortages throughout the year, causing massive disruptions in day-to-day life of locals, businesses, and the economy. The ability to keep an eye on cities coming close to a 'Day Zero' event could be incredibly useful in not only effectively deploying aid, but also to take preventative actions early on so that local authorities are not forced to impose extreme water usage laws on short notice.

### Dataset Details

#### *Attributes*

1. Cultivated area in the country → numeric
2. Precipitation level in the country (mm) → numeric
3. Rain water harvesting awareness → boolean
4. Per capita consumption → numeric
5. Total available water resources per capita → numeric
6. Desalination capacity → numeric
7. Agricultural water withdrawal as % of total water withdrawal → numeric
8. Industrial water withdrawal as a % of total water withdrawal → numeric
9. Municipal water withdrawal as a % of total water withdrawal → numeric
10. Seasonal variability of water (on a scale of 0-5) → numeric
11. Dependency on external sources of water (from other countries) → numeric

#### *Target attribute and method used to obtain it*

The target attribute that is used to train the machine learning model is water stress for a particular country, and for a particular year.

We started off with a stress percentage, which was obtained from AQUASTAT. It takes into consideration the demand for water, availability of water, and environmental flow. 0% represents no water stress, and 100% represents maximum stress.

We have categorized stress into the following categories, and this is the final target attribute.

Stress percentage	Category
0-20%	No stress

21-40%	Low stress
41-60%	Medium stress
61-80%	Alert
81-100%	High stress
>100%	Critical stress

#### *Input given by user*

The user will select a country, to find out when it could possibly face Day Zero.

#### *Output*

The year will be given as output to the user. This output is obtained after two stages of machine learning:

1. Decision Tree modelling of the training set with 10 fold cross-validation, with Weka.
2. LSTM to generate a forecast of stress levels for each country. This data can be used to plot a graph, from which the year that corresponds to 100% stress can be found for each country. This was done using Keras.