

Data Visualization Challenge

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Goals

01

Informative

Code is flexible and well structured

02

Informative

Correct data is conveyed by each graphic

03

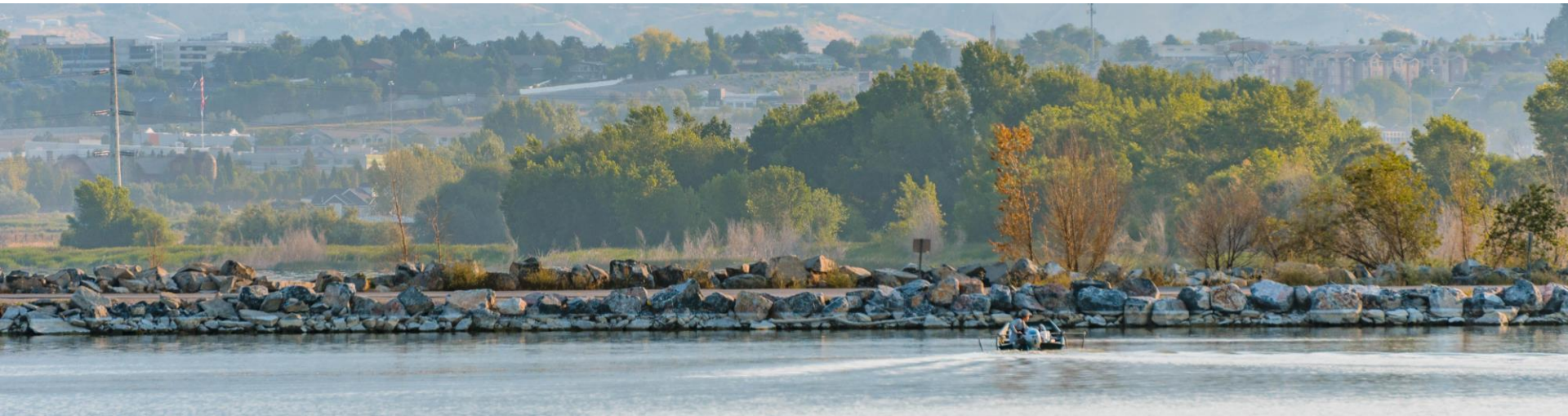
Understandable

Graphics are easily understood

04

Appealing

Visualizations have a similar design



About the Project

1. The project was built using:

- ▶ Python 3
- ▶ Jupyter Notebook
- ▶ Pandas
- ▶ Matplotlib
- ▶ Seaborn
- ▶ Plotly
- ▶ Pillow

2. The visualizations are designed for:

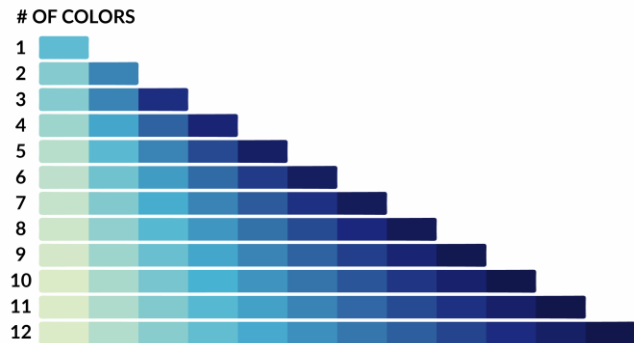
- ▶ Printed reports
- ▶ Webpages
- ▶ Email templates
- ▶ Etc.

3. The main fonts in the project are:

- ▶ Lato (headings/titles)
- ▶ Merriweather (body)

4. A color palette was selected to maximize visibility:

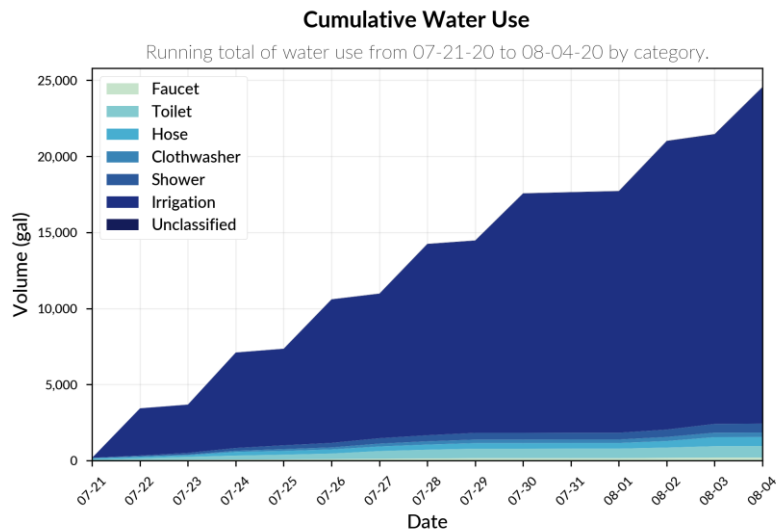
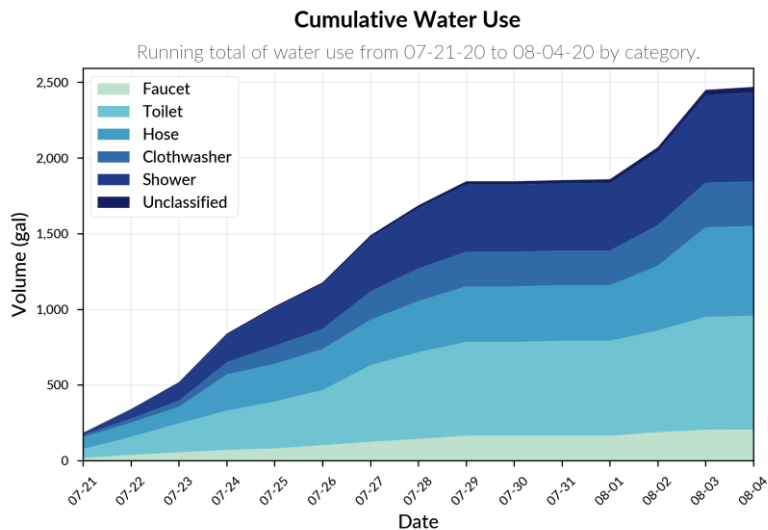
- ▶ Range of hue and brightness



- ▶ Report palette

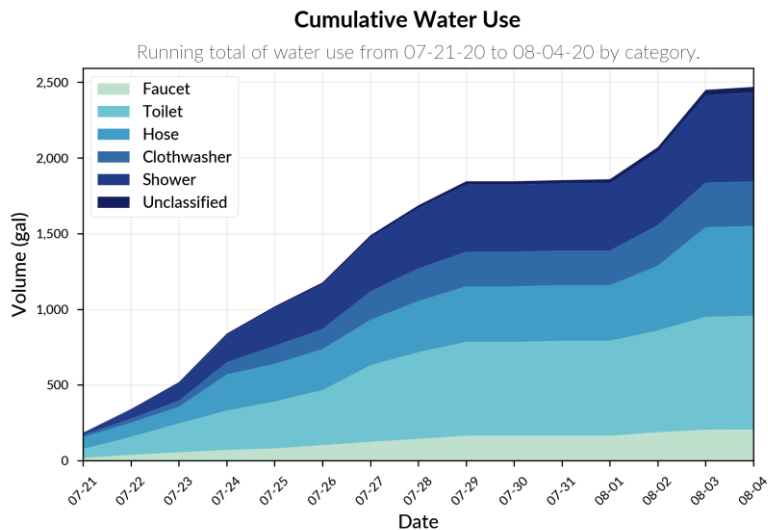


Stacked Area Plot



Compares the relative breakdown of water usage between categories over time.

Dynamic Filenames



Example from code:

```
# Creates a file name and saves the chart
period = period[:1]
period_show = period_show[:1]
figname = 'Stack'+ '_' + period + period_show + '_' + category_key + '_' + \
    min(x).strftime('%m-%d') + '_' + 'to' + '_' + max(x).strftime('%m-%d') + '_' + figtype
figpath = os.path.join(Results, figname)
fig.savefig(figpath, dpi=300, bbox_inches=0, transparent=False)
```

Filename:

Stack_YC_No_Irrigation_07-21_to_08-04.png

Chart Type

Period

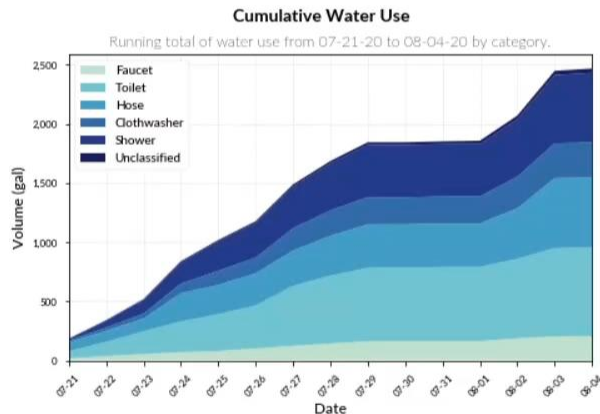
Labels

Date Range

File Type


```
# Sets axis and chart titles
ax.set_xlabel("Date", fontsize=fontsize_axis, fontname=font_axis, fontweight=fontweight_axis)
ax.set_ylabel("Volume (gal)", fontsize=fontsize_axis, fontname=font_axis, fontweight=fontweight_axis)
fig.suptitle('Cumulative Water Use', fontsize=fontsize_fig, fontname=font_fig, fontweight=fontweight_fig)
ax.set_title(sub_title, fontsize=fontsize_title, fontname=font_title, fontweight=fontweight_title)

# Creates a file name and saves the chart
period = period[:1]
period_show = period_show[:1]
figname = 'Stack'+period+period_show+'_'+category_key+'_'+min(x).strftime('%m-%d')+'_'+max(x).strftime('%m-%d')
figpath = os.path.join(Results, figname)
fig.savefig(figpath, dpi=300, bbox_inches=0, transparent=False)
```

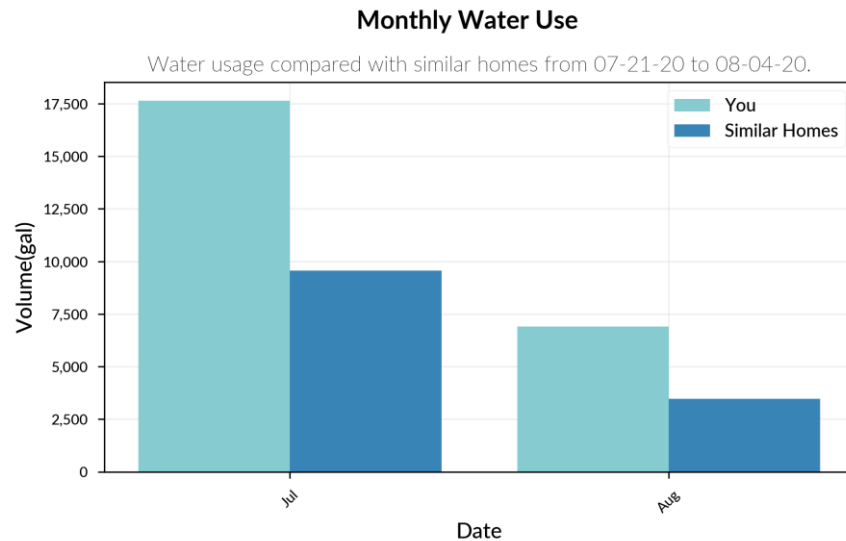
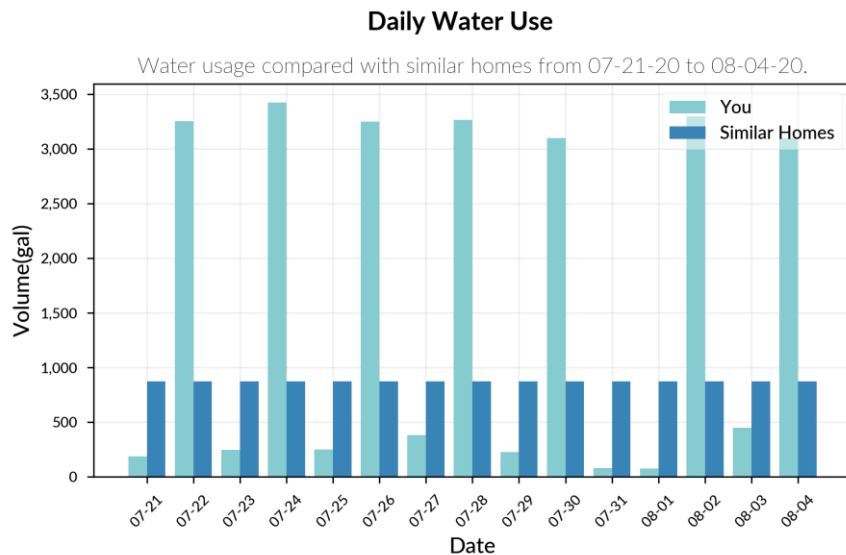


Bar Plot Averages

Select by date range.

```
In [18]: # Main plot options
style = 'seaborn-paper'
figtype = 'png'
size = (7.5, 4)
```

Bar Plot Comparison

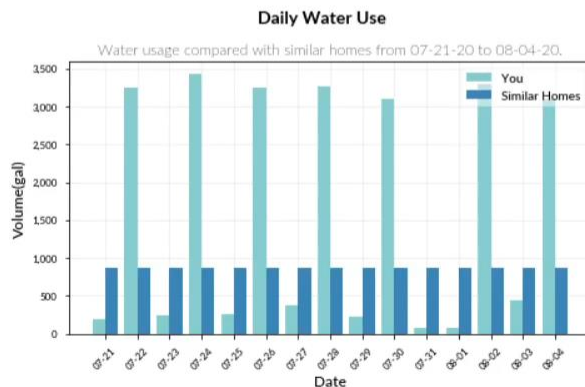


Compares the homeowner's water usage to the average in the area. Averages are based on data from the Utah Division of Water Resources [1].

```
# Creates grid markers
ax.set_axisbelow(True)
ax.grid(which='both', alpha=0.2)

# Formats legend
font_leg = fm.FontProperties(family=font_legend, weight=fontweight_legend, size=fontsize_legend)
ax.legend(prop=font_leg, framealpha=0.5, fancybox=True)

# Creates a file name and saves the chart
if period == 'Day':
    period = period[:1]
    figname = 'Averages_' + period + '_' + min(x_title).strftime('%m-%d') + '_' + 'to' + '_' + \
        max(x_title).strftime('%m-%d') + '.' + figtype
else:
    period = period[:1]
    figname = 'Averages_' + period + '_' + min(x_title_min).strftime('%m-%d') + '_' + 'to' + '_' + max(
        x_title_max).strftime('%m-%d') + '.' + figtype
figpath = os.path.join(Results, figname)
fig.savefig(figpath, dpi=300, bbox_inches='tight', transparent=False)
```



Pulses Plot

Add labels to new data if existing in classified data

Infographic

How much water is that?

Your water usage from **07-21** to **08-04** is equivalent to about:



1,965

SHOWERS

According to EPA estimates for a 5 minute shower using a standard 2.5 gallons per minute shower head.



4,912

TOILET FLUSHES

According to EPA estimates for an older toilet using 5 gallons of water per flush.



186,035

WATER BOTTLES

According to a typical size for a single use water bottle in the U.S. of 16.9 ounces.

This infographic helps to visualize water usage compared to household items that a typical homeowner uses on a regular basis. Water use for each household item is estimated according to the U.S. Environmental Protection Agency [1,2].

```
# Creates a file name and saves the image
start_file = dt.strptime(start, '%Y-%m-%d')
start_file = start_file.strftime('%m-%d')
end_file = dt.strptime(end, '%Y-%m-%d')
end_file = end_file.strftime('%m-%d')
figname = 'Infographic_Complete_'+start_file+'_to_'+end_file+'_'+figtype
figpath = os.path.join(Results, figname)
infographic_empty.save(figpath)
```

How much water is that?

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Usage and Time of Day

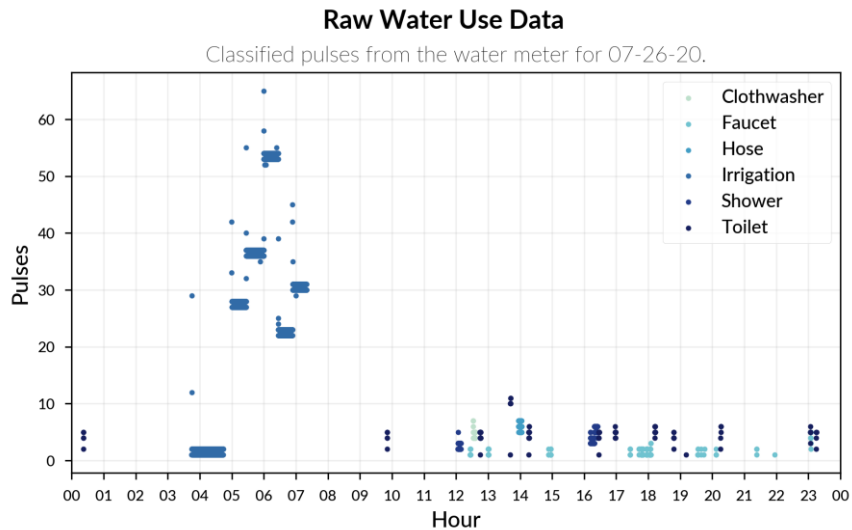
Creates a lineplot for the average water use for each hour of the day.

In [27]:

```
# Creates copy of dataframe
time_use = class_orig.copy()
```

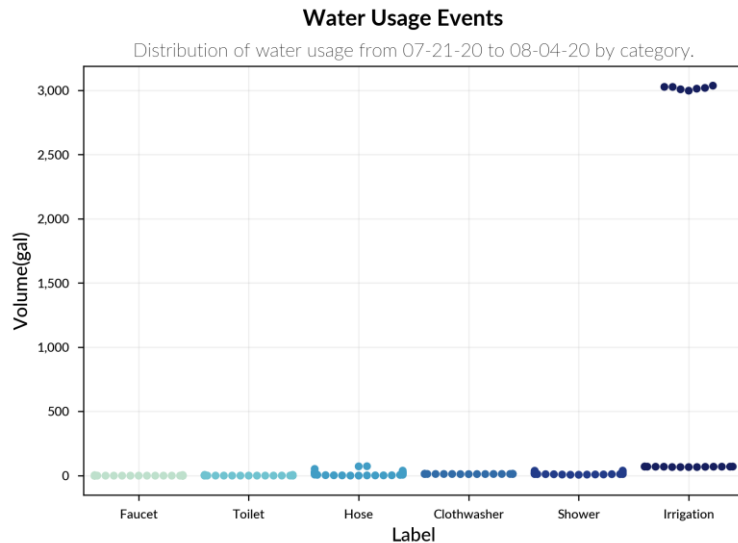
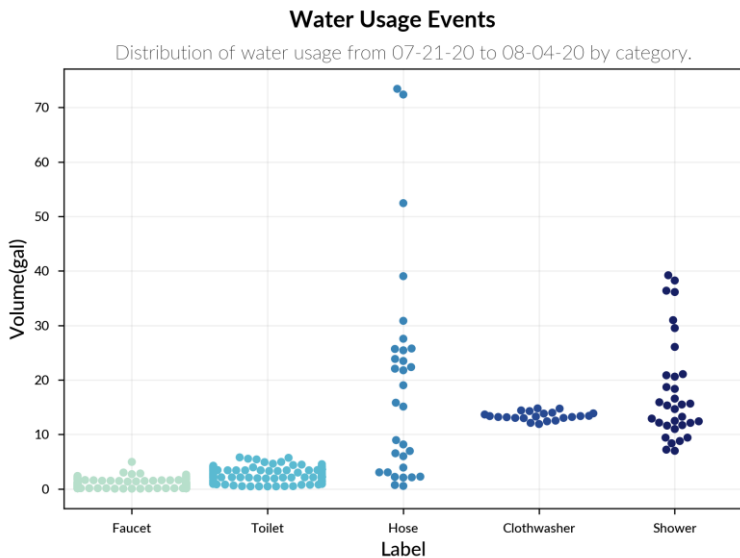
```
# Main plot options
style = 'seaborn-paper'
```

Raw Pulses Classification



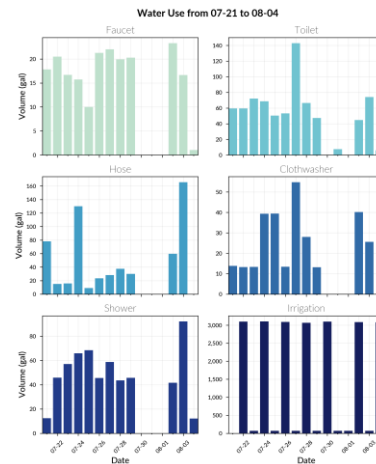
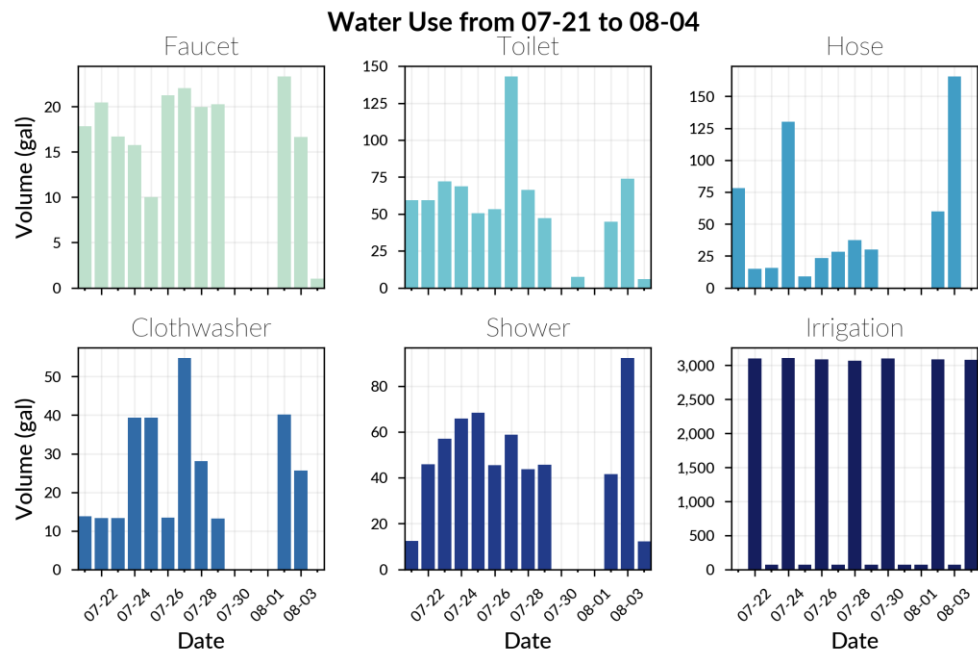
This plot is used to demonstrate the classification of the raw data over the course of a day.

Swarm Plot Distribution



Used to visualize the distribution in size of usage events over a specified time period.

Side by Side Bar Plots



Used to visualize the distribution of usage by category side by side.

Can display horizontally or vertically.

Total Use Table

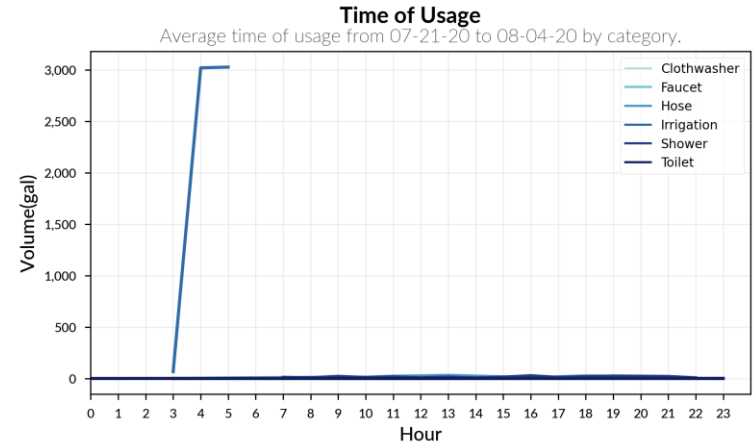
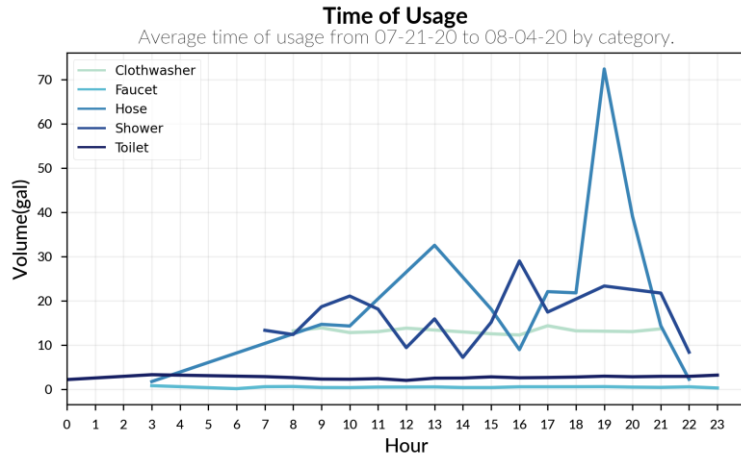
Total Water Use

Gallons of water used from 07-21 to 08-04.

Clothwasher	Faucet	Hose	Irrigation	Shower	Toilet	Unclassified
294	205	592	22,093	589	751	35

Shows quantitative usage by category for a specified period.

Hourly Average



Visualizes the average use of the time period for each hour of the day.

References

[1] <https://water.utah.gov/wp-content/uploads/2020/07/2015WaterDataV3.pdf>

[2] <https://www.epa.gov/sites/production/files/2017-03/documents/ws-facthseet-indoor-water-use-in-the-us.pdf>

[3] <https://www.epa.gov/watersense/showerheads>



Thank You



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<https://github.com/nguymon/CIWS-VisChallenge>

