City of Boulder EV Charging Station Assessment

Using data science to evaluate and monitor the health of City operated charging stations

Impact Hypothesis

Automated detection of plug failures and reporting malfunctions can improve maintenance response time, shortening outages and increasing public use and satisfaction
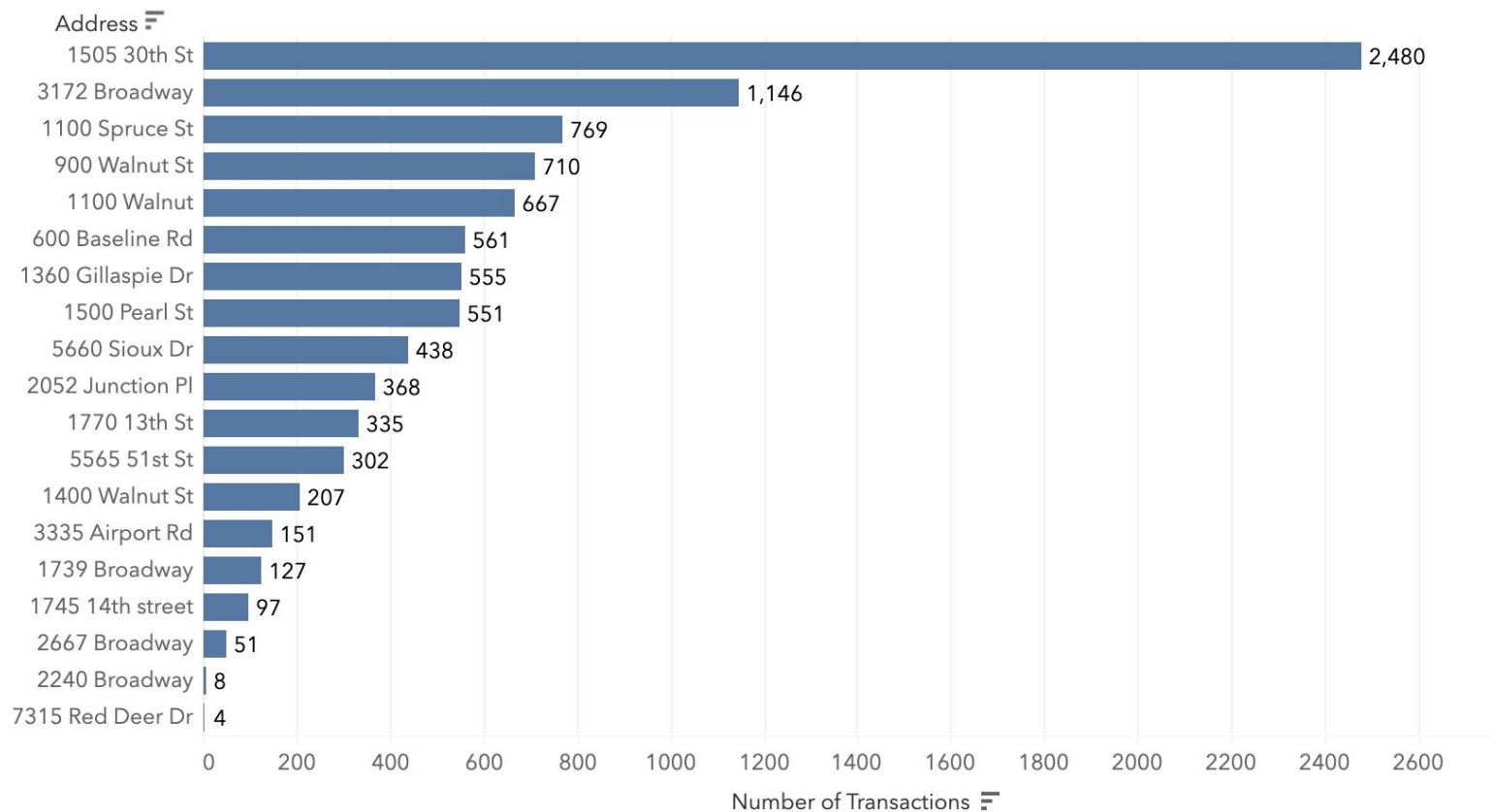
Preliminary Analysis

- Combined City of Boulder's data on electric vehicle charging station energy consumption with info about the number of plugs and cost at each station
- Focused on 2021 data for a more recent picture
- Key metrics:
  - % failure per transaction
  - Number of transactions per station
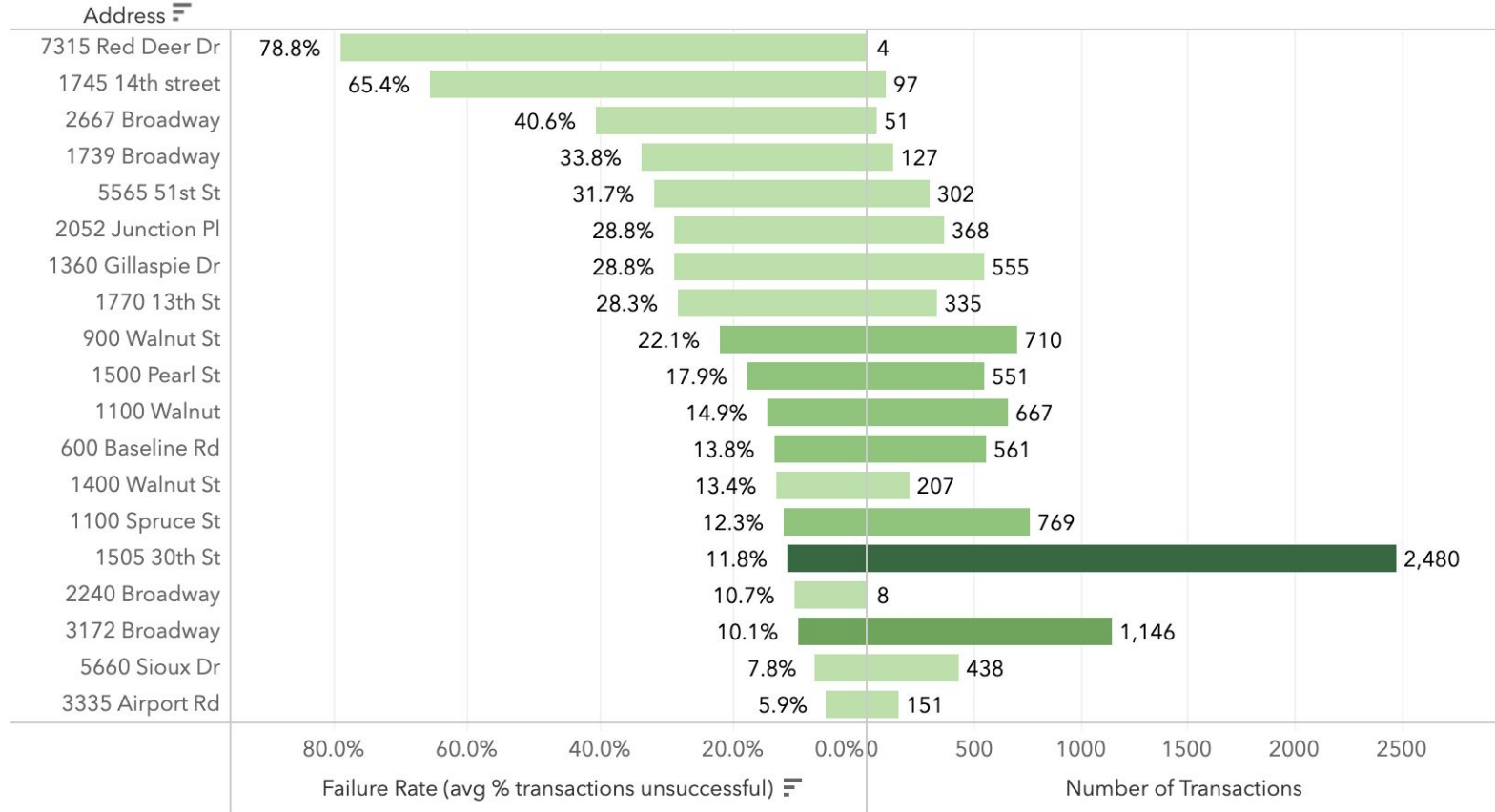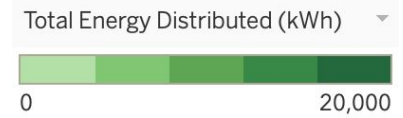 - Energy distributed per station

Number of Transactions in 2021

Address	Number of Transactions
1505 30th St	2,480
3172 Broadway	1,146
1100 Spruce St	769
900 Walnut St	710
1100 Walnut	667
600 Baseline Rd	561
1360 Gillaspie Dr	555
1500 Pearl St	551
5660 Sioux Dr	438
2052 Junction Pl	368
1770 13th St	335
5565 51st St	302
1400 Walnut St	207
3335 Airport Rd	151
1739 Broadway	127
1745 14th street	97
2667 Broadway	51
2240 Broadway	8
7315 Red Deer Dr	4

https://public.tableau.com/views/BoulderEVTransactionCount2021/NumberofTransactions?:language=en-US&publish=yes&:display_count=n&:origin=viz_share_link

Failure Rates and Number of Transactions in 2021

Total Energy Distributed (kWh)

0   20,000

Address	Failure Rate (avg % transactions unsuccessful)	Number of Transactions
7315 Red Deer Dr	78.8%	4
1745 14th street	65.4%	97
2667 Broadway	40.6%	51
1739 Broadway	33.8%	127
5565 51st St	31.7%	302
2052 Junction Pl	28.8%	368
1360 Gillaspie Dr	28.8%	555
1770 13th St	28.3%	335
900 Walnut St	22.1%	710
1500 Pearl St	17.9%	551
1100 Walnut	14.9%	667
600 Baseline Rd	13.8%	561
1400 Walnut St	13.4%	207
1100 Spruce St	12.3%	769
1505 30th St	11.8%	2,480
2240 Broadway	10.7%	8
3172 Broadway	10.1%	1,146
5660 Sioux Dr	7.8%	438
3335 Airport Rd	5.9%	151

Failure Rate (avg % transactions unsuccessful)   Number of Transactions

80.0% 60.0% 40.0% 20.0% 0.0%   500 1000 1500 2000 2500

Explore further in [Tableau dashboard](#)

Proposed Solution Path

- Establish real-time system of anomaly detection to identify malfunctioning chargers, as well as stations whose data reporting system may be failing

- Communicate functioning/malfunctioning stations to consumers via simple app or dashboard
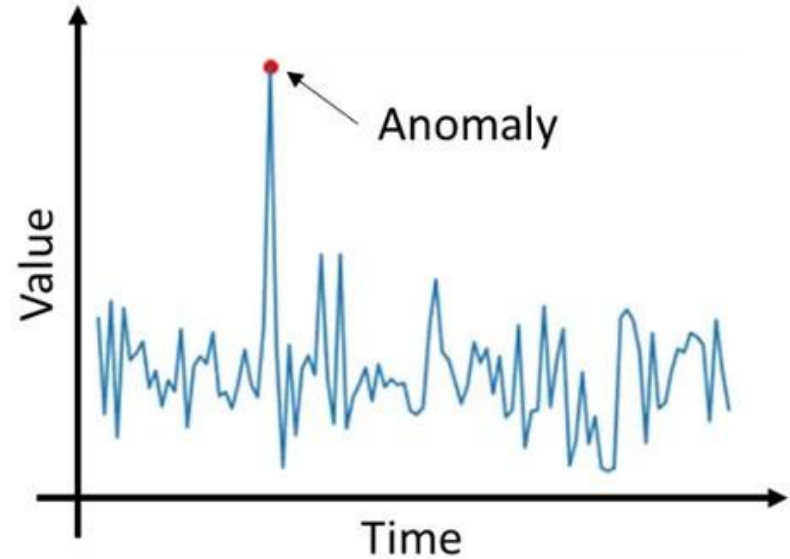
Measures of Success

- Early detection of deviations in failure rates or usage (target time goal may be limited by frequency of transactions at a given station)

- Decreased average failure rates per station

Risks & Assumptions

- Efficient data streaming coming from stations

- Identified malfunctions in stations can be corrected

- Having functioning stations

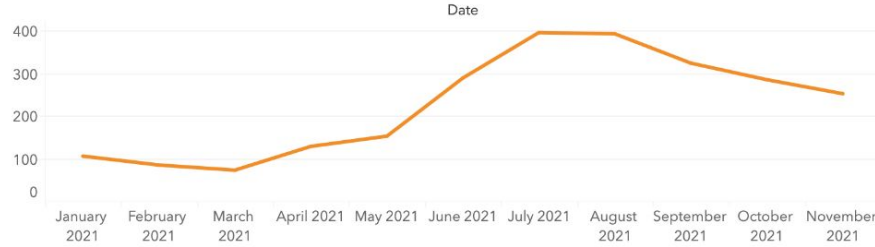- Consumers will use resulting info to inform decisions

Appendix

City of Boulder EV Station Assessment

Choose Station Address

1505 30th St

Transactions per Month

Free
TRUE
FALSE

Percent Unsuccessful
11.8%

Percent Occupied Monthly
16.8%

Total transactions by hour of the day

Average Percent Unsuccessful

Address	
7315 Red Deer Dr	78.8%
1745 14th street	65.4%
2667 Broadway	40.6%
1739 Broadway	33.8%
5565 51st St	31.7%
2052 Junction Pl	28.8%
1360 Gillaspie Dr	28.8%
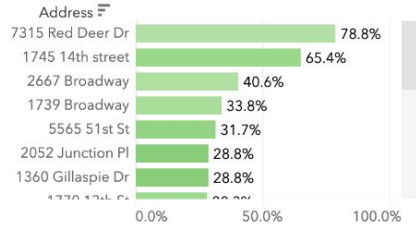
GHG Savings (kg CO2)
12,937

Total Charge Distributed in 2021 (kWh)

1505 30th St   3172 Broadway   900 Walnut St   1100 Walnut   1500 Pearl St

Data Fields (fields used in final visualizations in bold)

Location

Lat

Long

Station Name

Address

City

State

Zip Code

Start Date Time

Plug-in Hour

Start Time Zone

End Date Time

End Time Zone

Total Duration (Days)

Total Duration Mins

Charging Time (days)

Charging Time (mins)

Energy (kWh)

GHG Saving (kg)

Gasoline Savings (gallons)

Port Type

Number of Ports

Free

Unsuccessful Charge Time (mins)

Percent Unsuccessful by Transaction

Month

Year

Day of Week (1 = Sunday)

Date

Monthly Station Total (mins)

Percent Monthly Use

Num Daily Transactions

Total Visits to City Operated EV Charging Stations