


City of Boulder EV Charging Station Assessment

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

A large, dark blue diagonal shape that starts from the bottom left and extends towards the top right, covering the lower half of the slide.

Impact Hypothesis

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

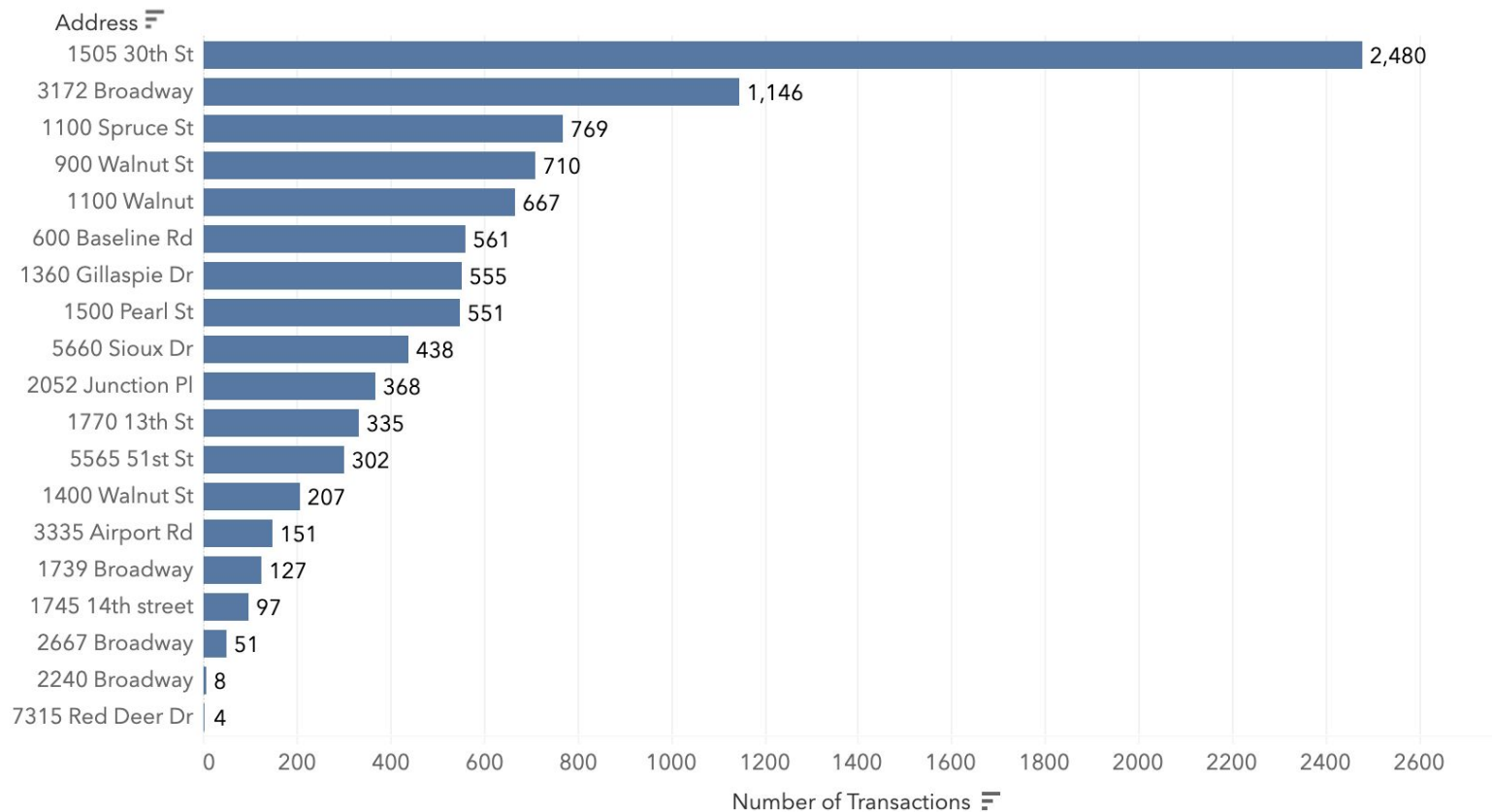


Preliminary Analysis

- 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

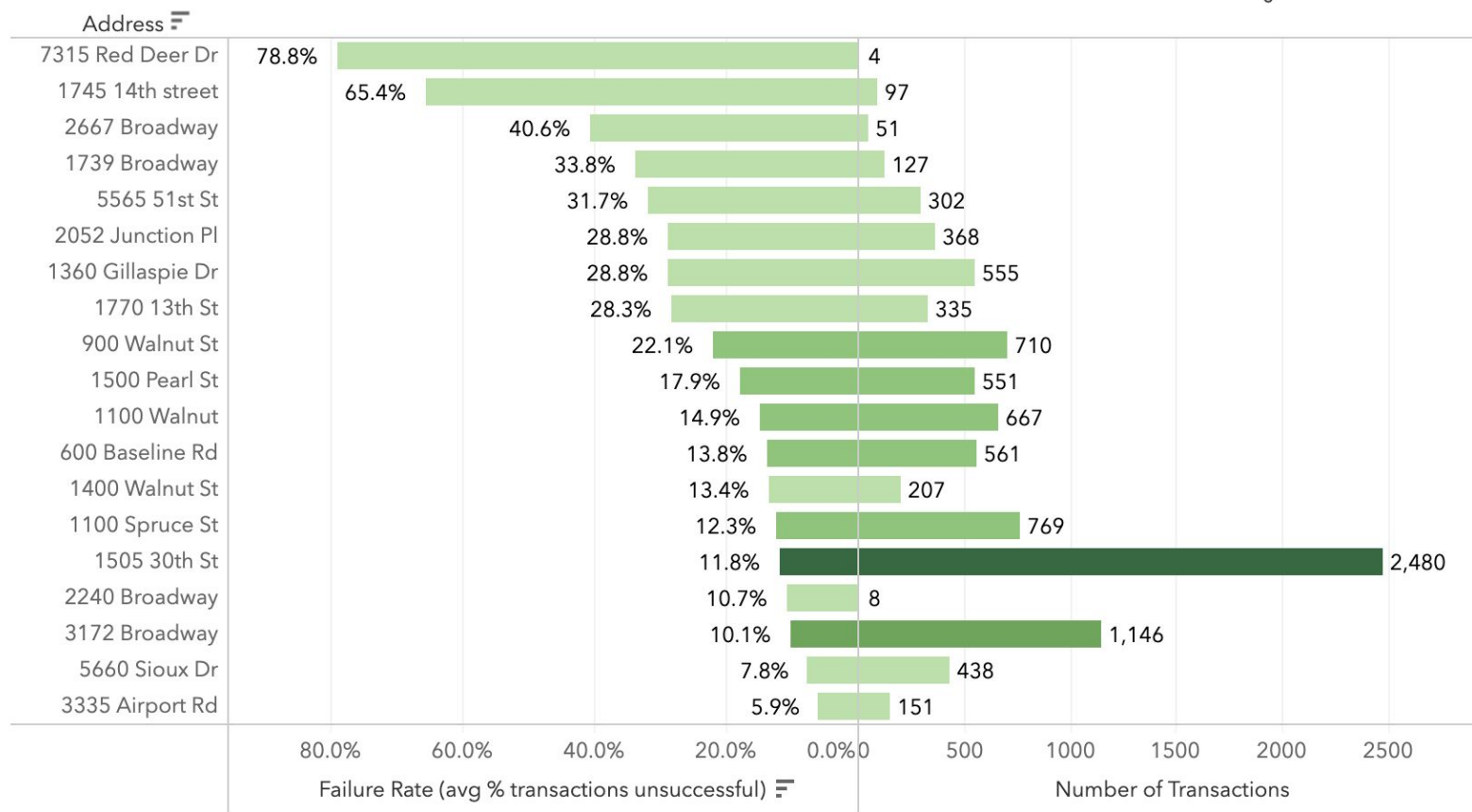
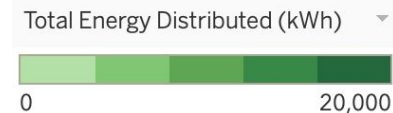


Number of Transactions in 2021



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

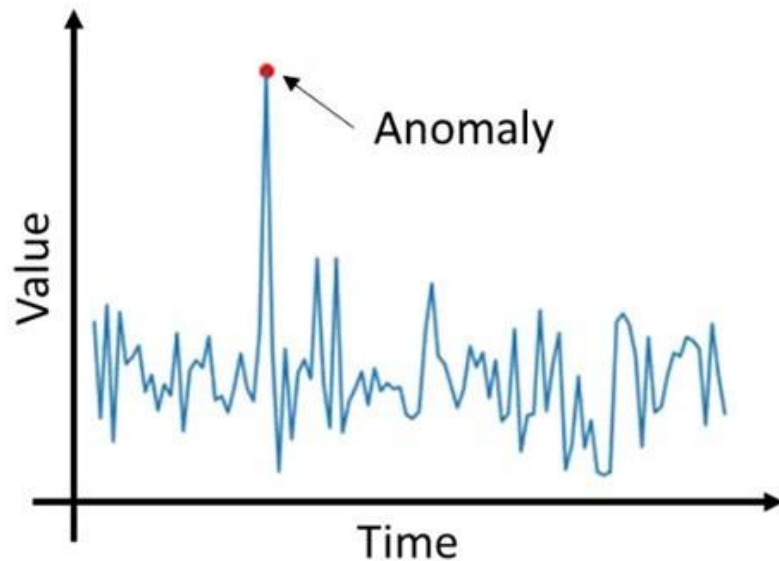
Failure Rates and Number of Transactions in 2021



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
- Technical measures
 - Recall: What proportion of true anomalies was identified?
 - Precision: What proportion of identified anomalies are true anomalies?



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



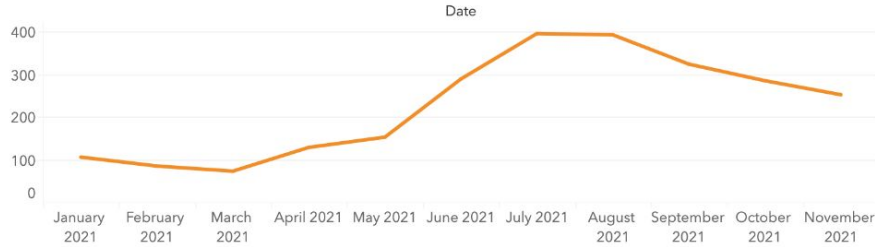
City of Boulder EV Station Assessment

Choose Station Address

1505 30th St

Free
TRUE
FALSE

Transactions per Month



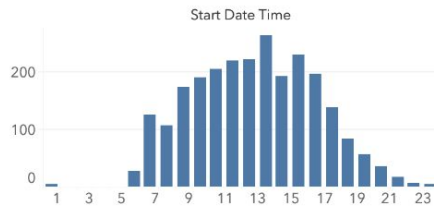
Percent
Unsuccessful

11.8%

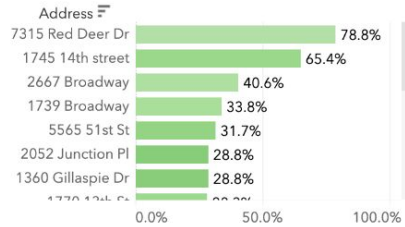
Percent Occupied
Monthly

16.8%

Total transactions by hour of the day



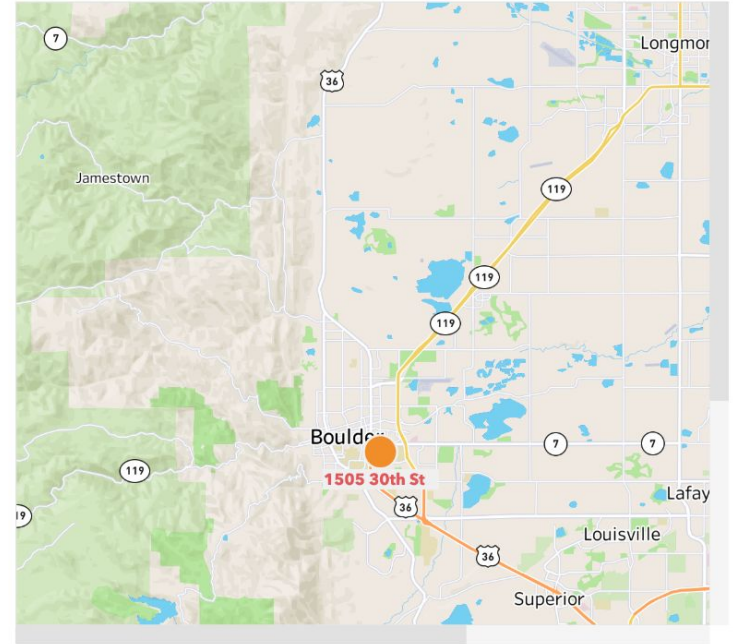
Average Percent Unsuccessful



GHG Savings
(kg CO₂)

12,937

Total Charge Distributed in 2021 (kWh)



Data Fields (fields used in final visualizations in bold)

Location	Charging Time (days)
Lat	Charging Time (mins)
Long	Energy (kWh)
Station Name	GHG Saving (kg)
Address	Gasoline Savings (gallons)
City	Port Type
State	Number of Ports
Zip Code	Free
Start Date Time	Unsuccessful Charge Time (mins)
Plug-in Hour	Percent Unsuccessful by Transaction
Start Time Zone	Month
End Date Time	Year
End Time Zone	Day of Week (1 = Sunday)
Total Duration (Days)	Date
Total Duration Mins	Monthly Station Total (mins)
	Percent Monthly Use
	Num Daily Transactions

Total Visits to City Operated EV Charging Stations

