# Understanding Public Views on Electric Vehicle Charging: a Thematic Analysis

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eCHARGE 4DRIVERS

# Understanding Public Views on Electric Vehicle Charging

- Introduction
- Method
- Result: Hierarchy of themes
- Examples of events and emotive subjects
- Findings

# Introduction

**Aim: to surface peoples' views on all aspects of EV charging**

**How:**

- Extract EV-charging related posts from X (2018 – 2022)
- Group similar posts
- Assign a descriptive label to each group
- Organize group labels into themes and sub-themes
- Analyse the volume and sentiment of posts within these themes
- "topic modelling" plus "thematic analysis"

**Output: thematic hierarchy**

# Result: Thematic Hierarchy

- Charging Tech
- Infrastructure
- Problems
- Government
- Home Charging
- Digitalisation
- Charging Experience
- Costs
- Green Issues

**Charging Tech** (23,436)
- Tech Discussion
- Fast Charging
- Wireless Charging
- Solar
- Hydrogen
- Automated Charging
- Lampost Charging
- Blockchain
- Battery Swapping
- Battery Tech
- Self-Charging
- Electric Scooters
- Smart Charging
- Off-Grid
- Payment Systems

**Infrastructure** (22,784)
- New Installations at Geographic Locations
- New Installations at Commercial Locations
- Strategic Discussion
- Current State Comment
- Expansion Investment
- Power Grid Capacity
- Tesla Charging Network

**Problems** (15,120)
- Blocked Chargers
- Range
- Broken Chargers
- Impact of Extreme Temperatures
- Penalties for Charger Misuse
- Obstruction to Pedestrians

**Government** (9,346)
- Regulation
- Tax
- Incentives
- Standardisation
- Investment
- Social Control

**Home Charging** (6,388)
- Access to Home Charging
- Benefits of Home Charging

**Digitalisation** (6,305)
- Navigation App Features
- Cybersecurity
- Charging App Problems

**Charging Experience** (5,166)
- Learning
- Charging Point Enquiries
- Electric Buses

**Costs** (4,425)
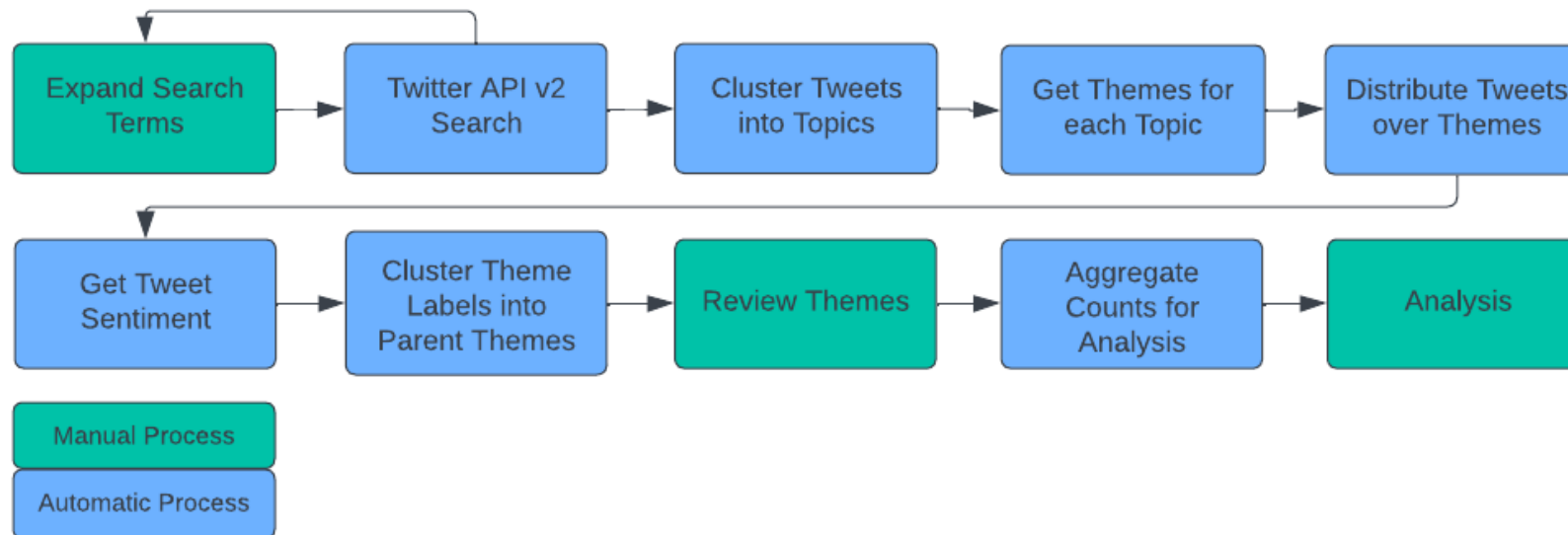- Ownership Costs
- Charging Costs
- EV Purchase Costs

**Green Issues** (4,198)
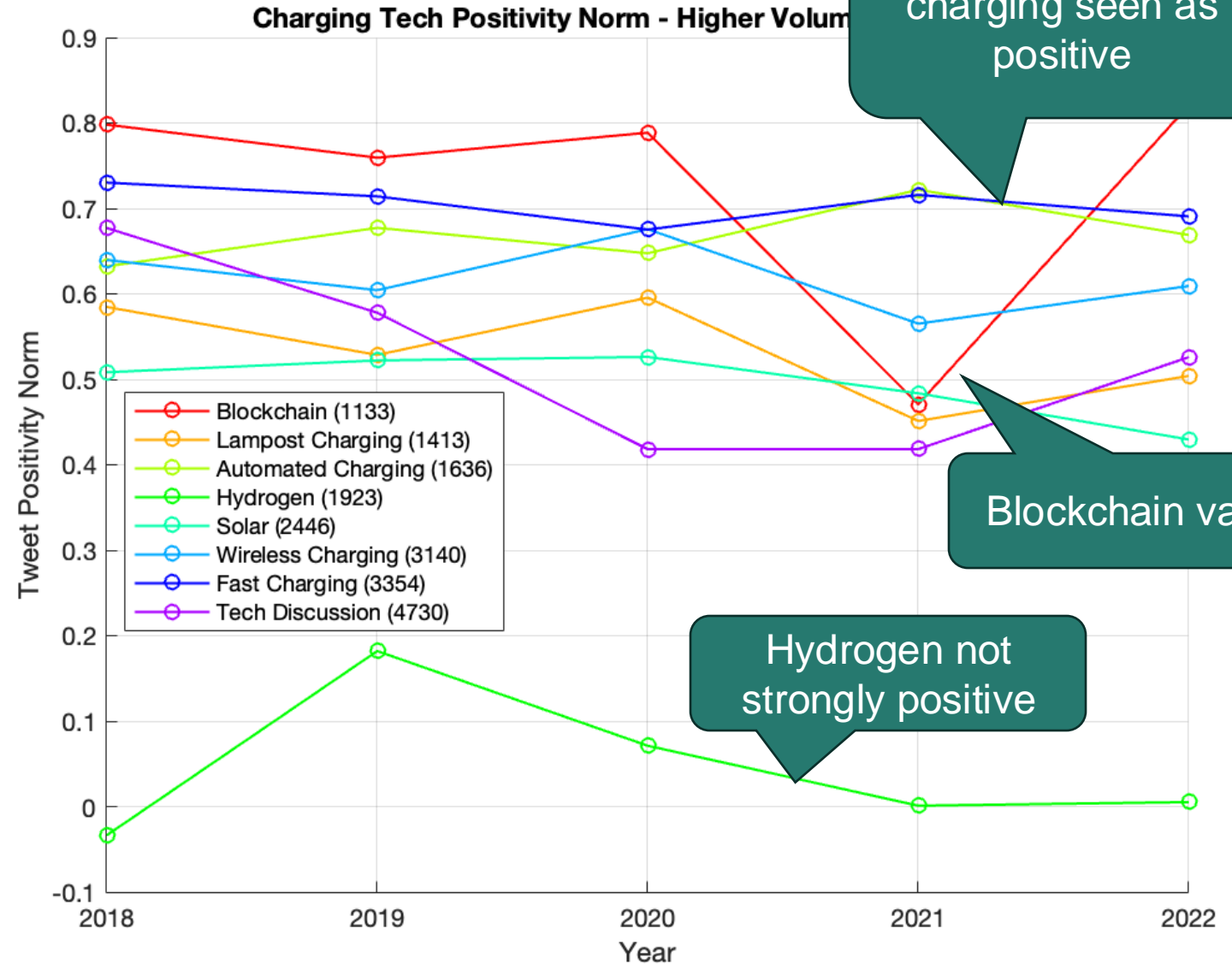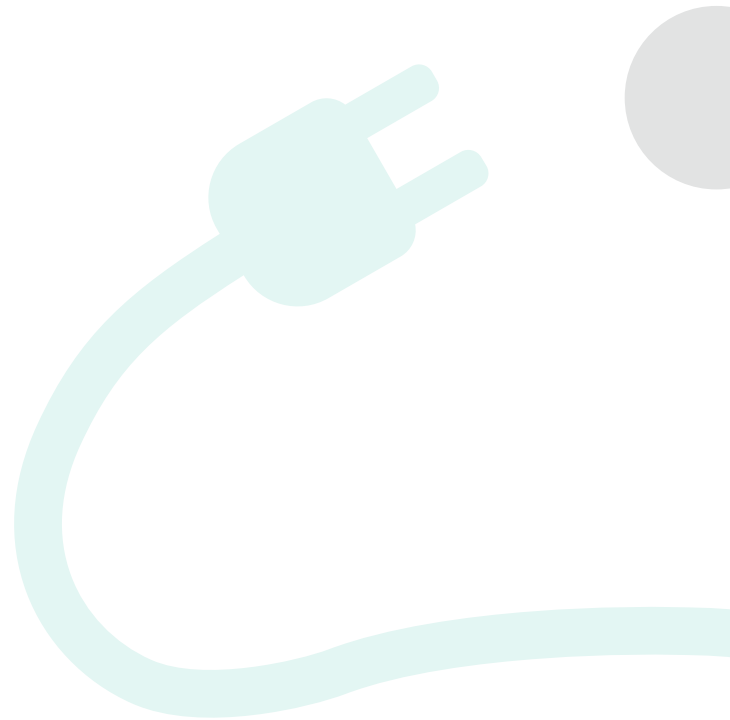- EV Charging Electricity Origin
- Environmental Impact of EVs

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# Method detail

- LLM = Large Language Model
- An AI model trained to "understand" text
- Used in automatic steps below



| Expand Search Terms | Twitter API v2 Search | Cluster Tweets into Topics | Get Themes for each Topic | Distribute Tweets over Themes |

| Get Tweet Sentiment | Cluster Theme Labels into Parent Themes | Review Themes | Aggregate Counts for Analysis | Analysis |

Manual Process
Automatic Process

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# Analysis: Charging Technology Sentiment

- Positive sentiment example

# Analysis: Problems Sentiment

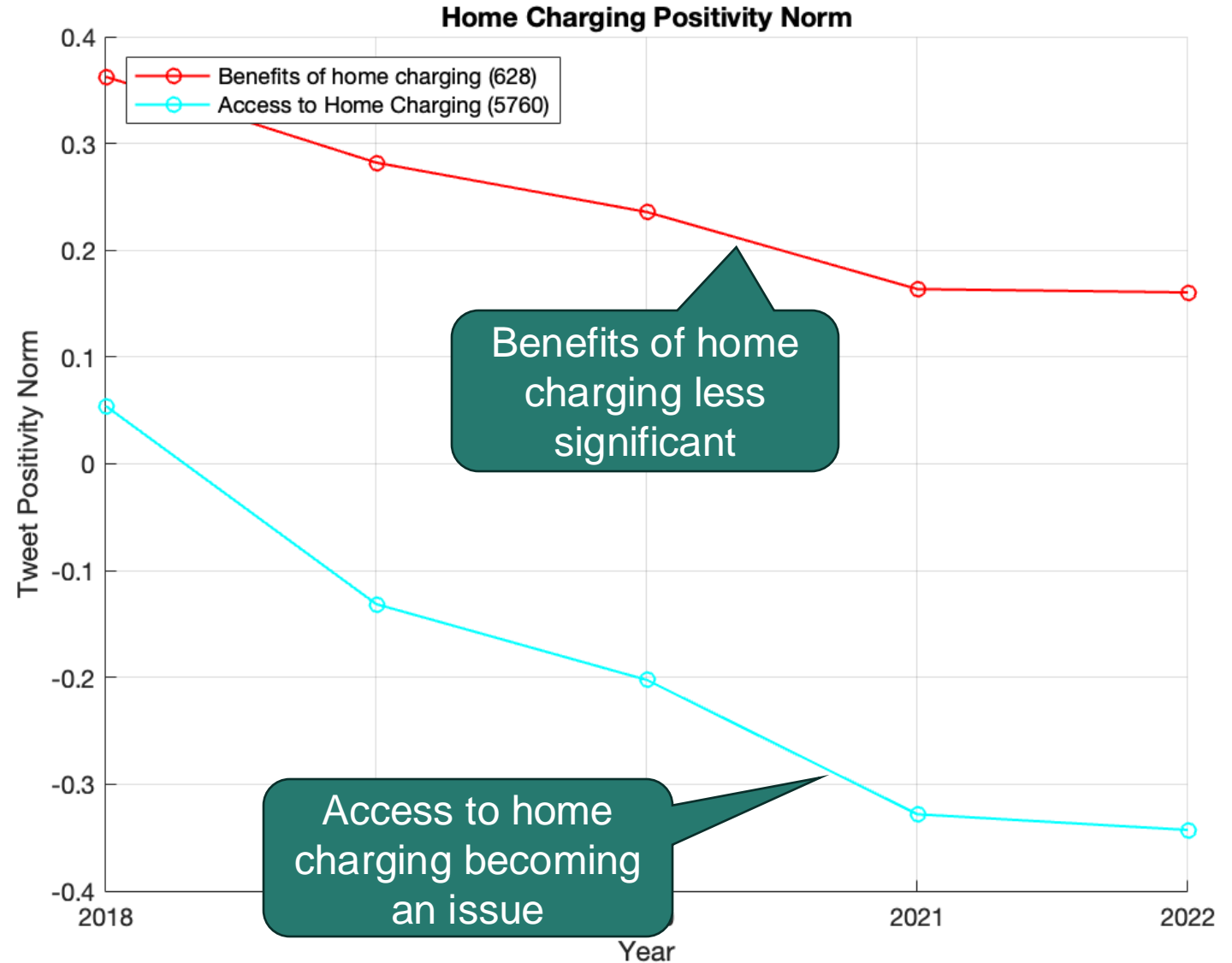- Negative sentiment example
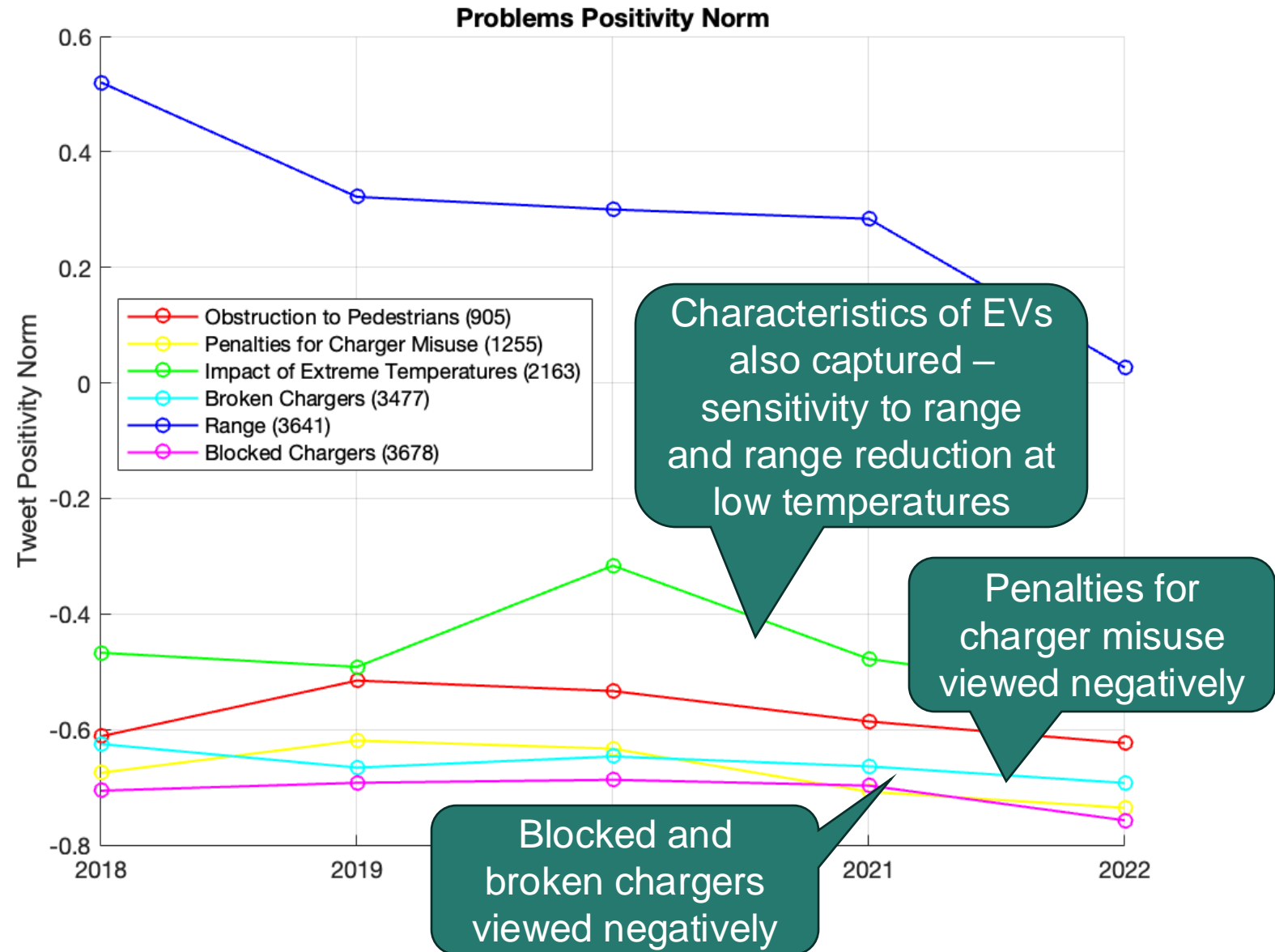
# Analysis: Home Charging Sentiment

- Negative sentiment example



**Home Charging Positivity Norm**

Legend:
- Benefits of home charging (628)
- Access to Home Charging (5760)

Callout: Benefits of home charging less significant

Callout: Access to home charging becoming an issue

Y-axis: Tweet Positivity Norm
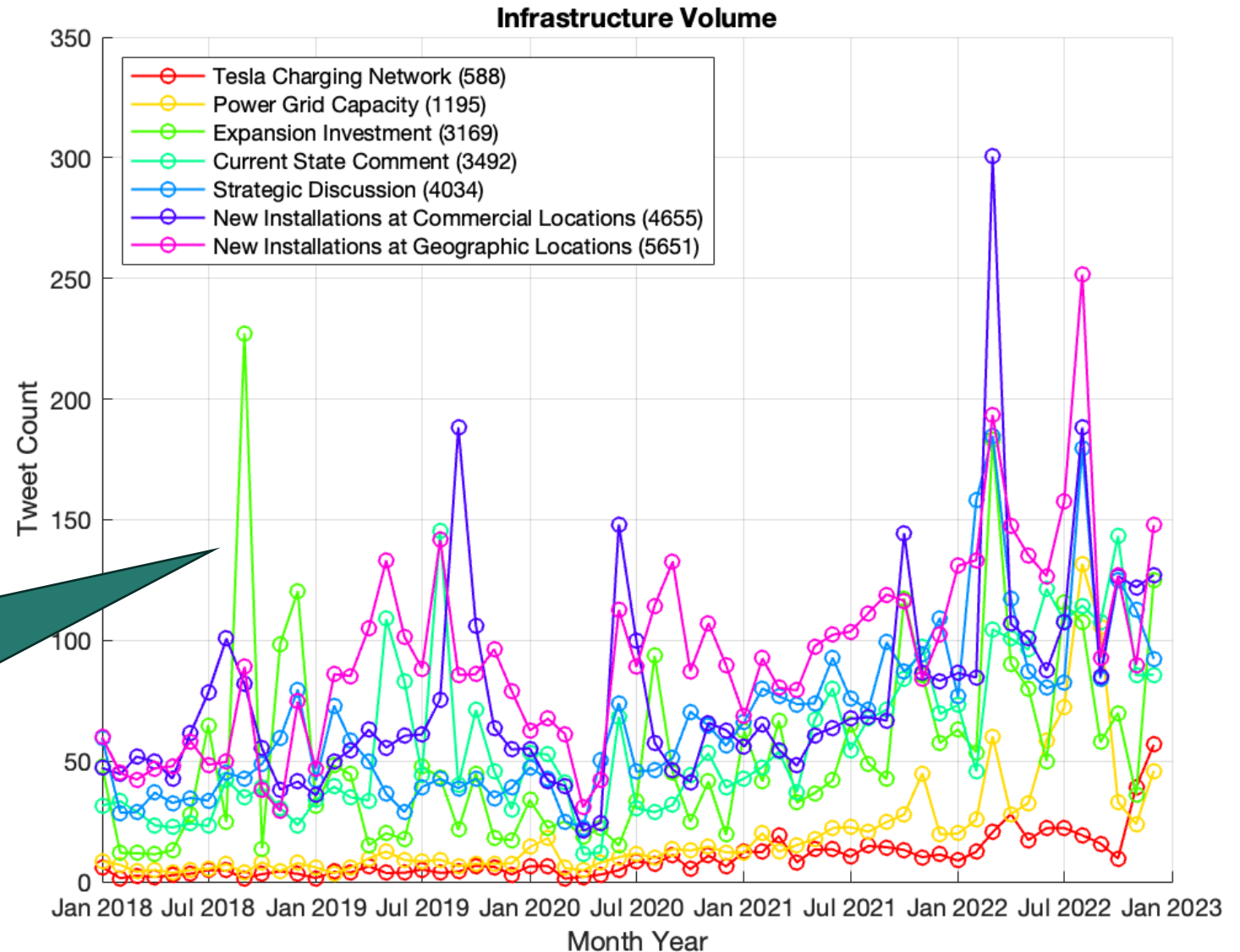X-axis: Year

# Analysis: Digitalisation events

- Volume of tweets
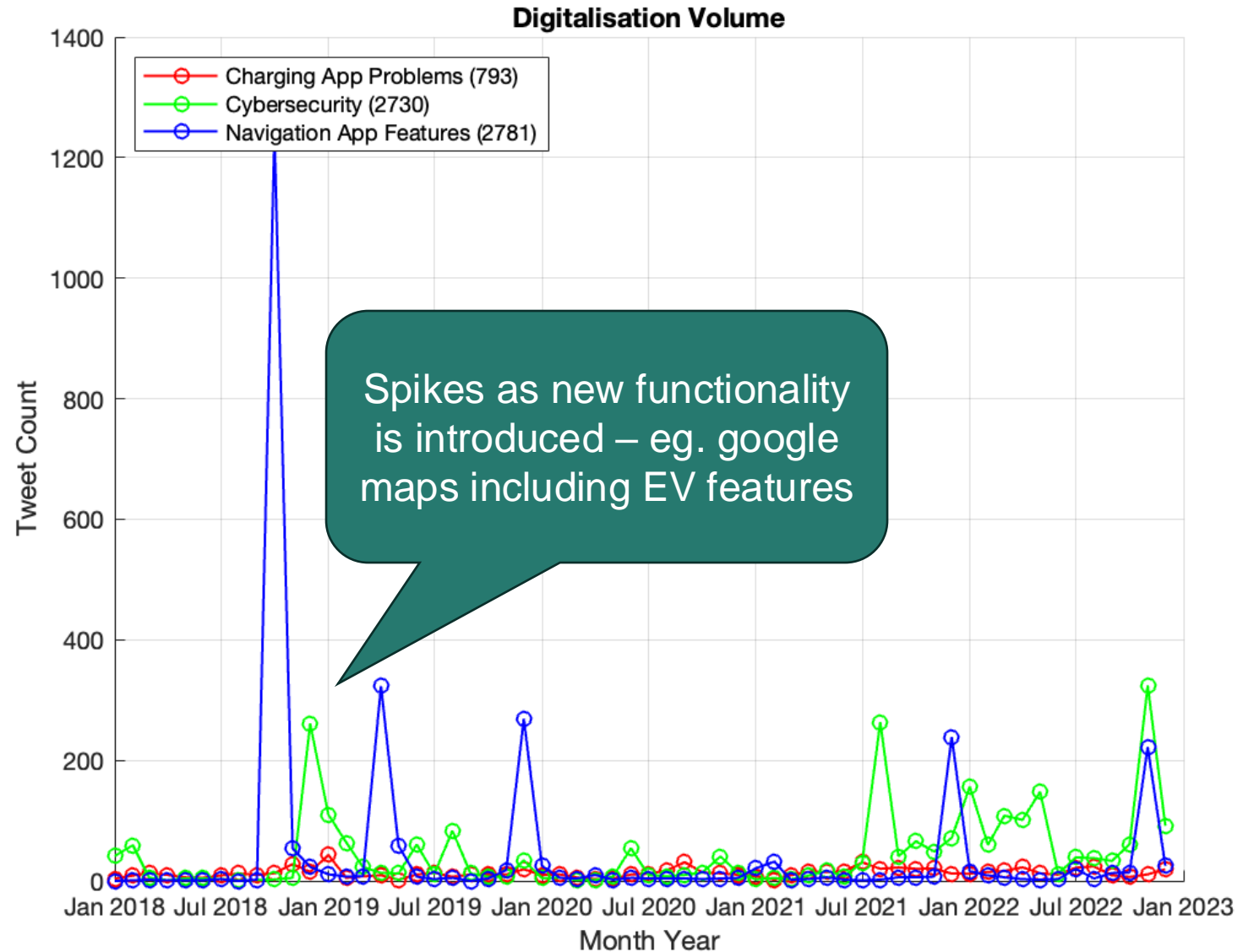
# Analysis: Infrastructure events

- Volume of tweets

**Spikes as new installations are announced and discovered – healthy discussion**



**Infrastructure Volume**

Legend:
- Tesla Charging Network (588)
- Power Grid Capacity (1195)
- Expansion Investment (3169)
- Current State Comment (3492)
- Strategic Discussion (4034)
- New Installations at Commercial Locations (4655)
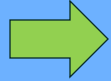- New Installations at Geographic Locations (5651)

# Thematic Hierarchy: Charging Technology

**Charging Tech** (23,436)
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- Off-Grid
- Payment Systems

- Overall sentiment remains positive
- Findings:
  - Strong interest and an overwhelmingly positive sentiment toward technologies that might improve the charging experience.
  - Exceptions are neutral overall sentiment toward hydrogen (opinion polarized) and slightly negative sentiment toward self-charging ("electrified roads").
  - Fast charging technology is welcomed, however there are concerns about impact on battery life.
  - The market for electric scooter chargers and accessories is significant and increasing rapidly, especially with battery swapping.

# Thematic Hierarchy: Problems

**Problems** (15,120)
- Blocked Chargers
- Range
- Broken Chargers
- Impact of Extreme Temperatures
- Penalties for Charger Misuse
- Obstruction to Pedestrians
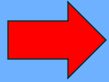
- Overall sentiment remains negative

- Findings:
  - The volume of interest in blocked and broken chargers show these issues to be more of a problem than the cost of public charging.
  - Range (and range anxiety) are not perceived negatively overall with many positive EV road trips reported.
  - The impact of cold climate on charging is viewed increasingly negatively.

# Thematic Hierarchy: Digitalisation

**Digitalisation** (6,305)
- Navigation App Features
- Cybersecurity
- Charging App Problems
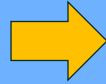
- Overall sentiment remains mixed

- Findings:
  - Navigation app features are viewed enthusiastically.
  - Cybersecurity concerns are on the rise and appear disproportionate to the relatively low number of vulnerability reports and the almost zero incidents of users being exploited.
  - Manufacturer charging app problem are negative but fairly low volume.

# Thematic Hierarchy: Green Issues

**Green Issues** (4,198)
- EV Charging Electricity Origin
- Environmental Impact of EVs

- Overall sentiment was initially positive but becoming increasingly negative

- Findings:
  - Interest in green issues has increased greatly since 2020, with sentiment becoming increasingly negative, especially regarding the origin of EV charging electricity.
  - However, relative to other themes, green issues are shown the least interest

# Conclusions

- Automated methodology to extract user feedback from Social Media feeds

- Key findings
  - Technology is making positive impact
  - Negative issues tend to be related to reliability of charge stations and blocked chargers
  - Work is needed to ensure the digital implementation does not impact the charging experience
  - Work needs to continue to counter concerns over green issues

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