

Chart Generation for Contextualized Responses to NL COVID-19 Queries

Hannah DeBalsi, Bianca Yu

CS 294W Final Presentation

Outline

Motivation

User Research

Chart Generation

Future Work



Quick Recap



Quick Recap



Final Results



Final Results



Lessons Learned



Lessons Learned



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Motivation



Alexa, how many COVID-19 cases are there currently worldwide?

There are 6.8 million confirmed cases of COVID-19 worldwide, as of June 7.

Ok.



Motivation

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There are 6.8 million confirmed cases of COVID-19 worldwide, as of June 7.

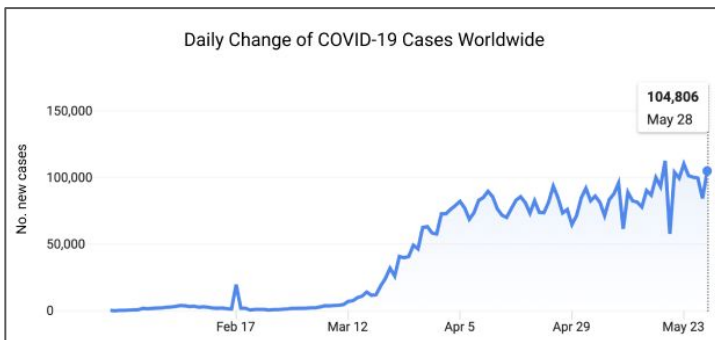
✓ **Answered Question**



Motivation

Alexa, how many COVID-19 cases are there currently worldwide?

There are 6.8 million confirmed cases of COVID-19 worldwide, as of June 7.



Interesting ... looks like cases are increasing.



Motivation

Alexa, how many COVID-19 cases are there currently worldwide?

There are 6.8 million confirmed cases of COVID-19 worldwide, as of June 7.



Daily Ch

Answered Question



+ Enhanced Understanding with Context

No. new cases

150,000

100,000

50,000

0

Feb

Apr

104,806

May 28

Interesting ... looks like cases are increasing.



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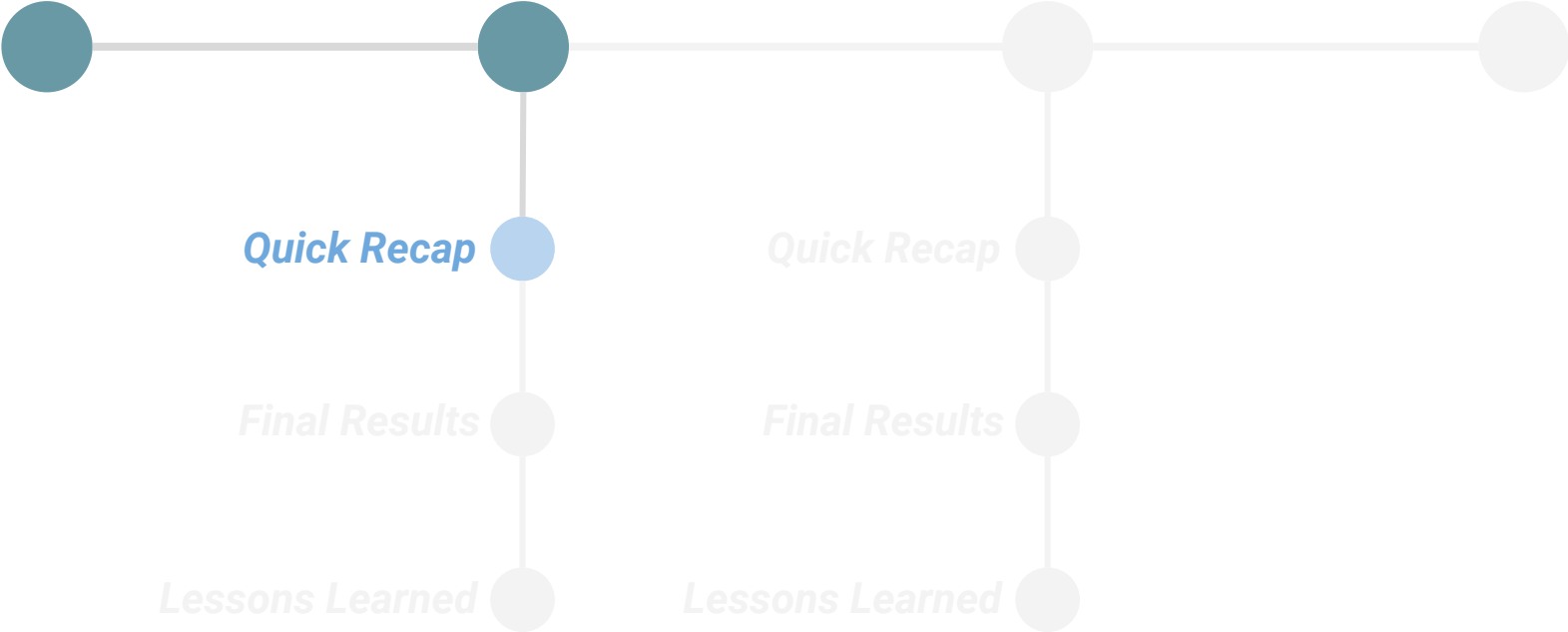
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User Research / Quick Recap



Survey #1

What do users want to know about COVID-19?
+ What are the most common quantitative questions?

User Research / Quick Recap



Survey #1

What do users want to know about COVID-19?
+ What are the most common quantitative questions?



Survey #2

What kinds of COVID-19 questions are best answered visually?
+ What is the most effective graph for these questions?

User Research / Quick Recap



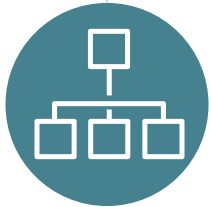
Survey #1

What do users want to know about COVID-19?
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Preliminary Semantic Parser

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User Research / Final Results



Survey #1



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Survey #1



Q Category	Count	# Quantitative	%
COVID Factsheet	14	3	21%
Death Count	10	10	100%
Case Count	9	8	89%
Symptoms	6	2	33%
Treatment	6	1	17%
Vaccine	5	0	0%
Infection	4	3	75%
Lockdown	4	1	25%
Testing	4	1	25%
Other	4	0	0%
Personal Safety	3	0	0%
Recovery Count	1	1	100%
Unemployment Count	1	1	100%
Total	71	31	

User Research / Final Results



Survey #2

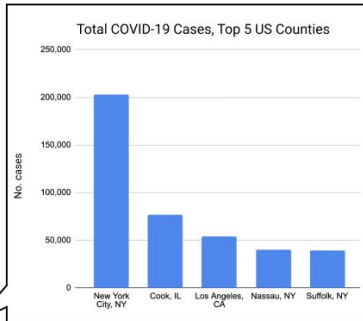


User Research / Final Results

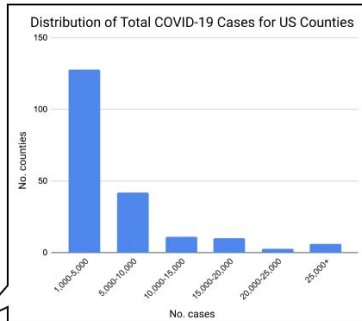
“What US city has the highest number of cases?”

New York City, New York has the highest number of confirmed COVID-19 cases.

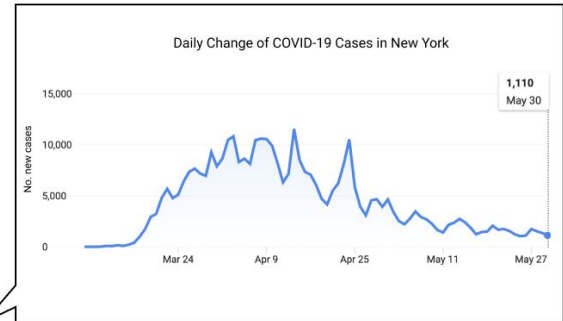
New York City, New York has the highest number of confirmed COVID-19 cases.



New York City, New York has the highest number of confirmed COVID-19 cases.



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User Research / Final Results



Survey #2



Significant agreement:

the percentage of participants who assigned the response a particular rank is $\geq 50\%$

User Research / Final Results



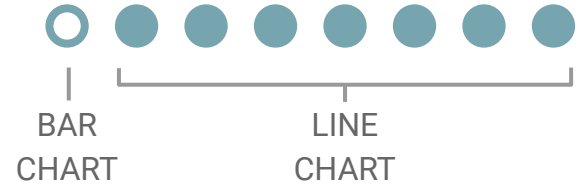
Survey #2



Significant agreement:

the percentage of participants who assigned the response a particular rank is $\geq 50\%$

Qs w/ significant agreement on first choice



User Research / Final Results



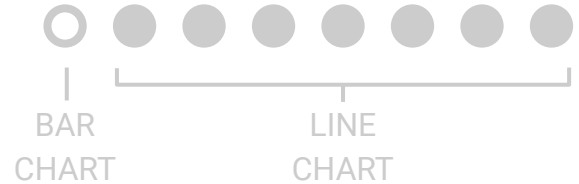
Survey #2



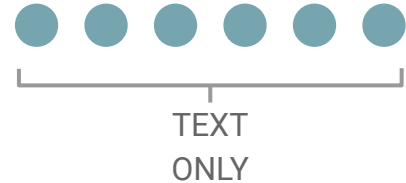
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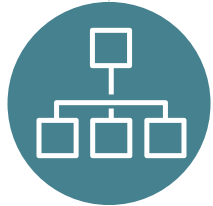
Qs w/ significant agreement on first choice



Qs w/ significant agreement on last choice



User Research / Final Results



*Preliminary
Semantic Parser*

User Research / Final Results

LABELS

Interrogative phrase

Answer type (quantity)

Answer type (noun)

Location

Filter (quantitative)

Filter (date/time)

Q3

***How many new cases
have there been reported
in Georgia today?***

User Research / Final Results

LABELS

Interrogative phrase

Answer type (quantity)

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How many new cases
*have there been reported
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Q3

***How many new cases**
have there been reported
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User Research / Final Results

LABELS

Interrogative phrase	“How many”
Answer type (quantity)	“cases”
Answer type (noun)	
Location	“Georgia”
Filter (quantitative)	“new”
Filter (date/time)	“today”

User Research / Final Results

LABELS

Interrogative phrase

“How many”

→

Chart Type: Line Graph

Answer type (quantity)

“cases”

→

Column Name: “Positive”

Answer type (noun)

Location

“Georgia”

→

Row: State == “Georgia”

Filter (quantitative)

“new”

→

Report single cell value

Filter (date/time)

“today”

→

Date: 06/08/2020

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User Research / Lessons Learned



A text + graph
response is
more helpful
than just text.

User Research / Lessons Learned

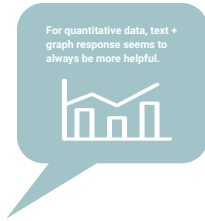


A text + graph response is more helpful than just text.



Users are mostly interested in change over time.

User Research / Lessons Learned



A text + graph response is more helpful than just text.



Users are mostly interested in change over time.



The graph content itself is critical.

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Chart Generation / Quick Recap

- Goal: Generate graphical representations to questions about COVID-19
- Started with:
 - Generating plots for questions already supported by ThingTalk (ie weather)
 - Generating plots in Python and then displaying an image of the plot to the user
- Moved to:
 - Generating plots for questions about coronavirus
 - Generating plots in Javascript using Chart.js

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Chart Generation / Final Results

```
\t now => @com.covidtracking.state(state='ca') => notify;
```



Thursday, March 19, 2020: 139 new confirmed cases, 2 new death in ca. In total, 1,063 confirmed cases, 20 death, 0 recovered.



Wednesday, March 18, 2020: 313 new confirmed cases, 5 new death in ca. In total, 924 confirmed cases, 18 death, 0 recovered.



Tuesday, March 17, 2020: 128 new confirmed cases, 2 new death in ca. In total, 611 confirmed cases, 13 death, 0 recovered.



Monday, March 16, 2020: 148 new confirmed cases, 5 new death in ca. In total, 483 confirmed cases, 11 death, 0 recovered.



Sunday, March 15, 2020: 42 new confirmed cases, 1 new death in ca. In total, 335 confirmed cases, 6 death, 0 recovered.



Saturday, March 14, 2020: 41 new confirmed cases, 0 new death in ca. In total, 293 confirmed cases, 5 death, 0 recovered.



Friday, March 13, 2020: 50 new confirmed cases, 1 new death in ca. In total, 252 confirmed cases, 5 death, 0 recovered.



Thursday, March 12, 2020: 0 new confirmed cases, 0 new death in ca. In total, 202 confirmed cases, 4 death, 0 recovered.

Chart Generation / Final Results



Tuesday, March 3, 2020: 0 new confirmed cases, 0 new death in ca. In total, 53 confirmed cases, 0 death, 0 recovered.

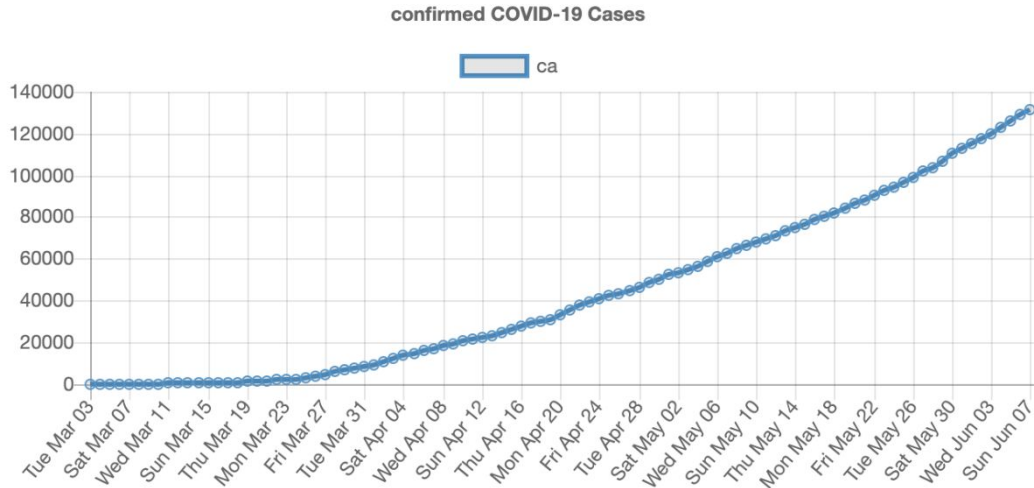


Chart Generation / Final Results



Friday, March 6, 2020: 0 new confirmed cases, 0 new death in ct. In total, 0 confirmed cases, 0 death, 0 recovered.



confirmed COVID-19 Cases

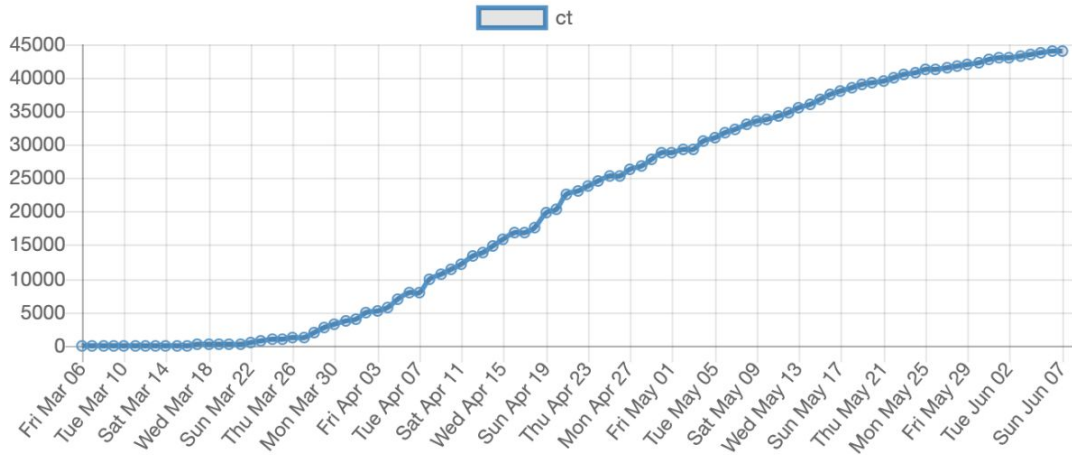


Chart Generation / Final Results

```
\t now => @com.covidtracking.us() => notify;
```



Tuesday, January 21, 2020: 0 new confirmed cases, 0 new death in US. In total, 1 confirmed cases, 0 death, 0 recovered.

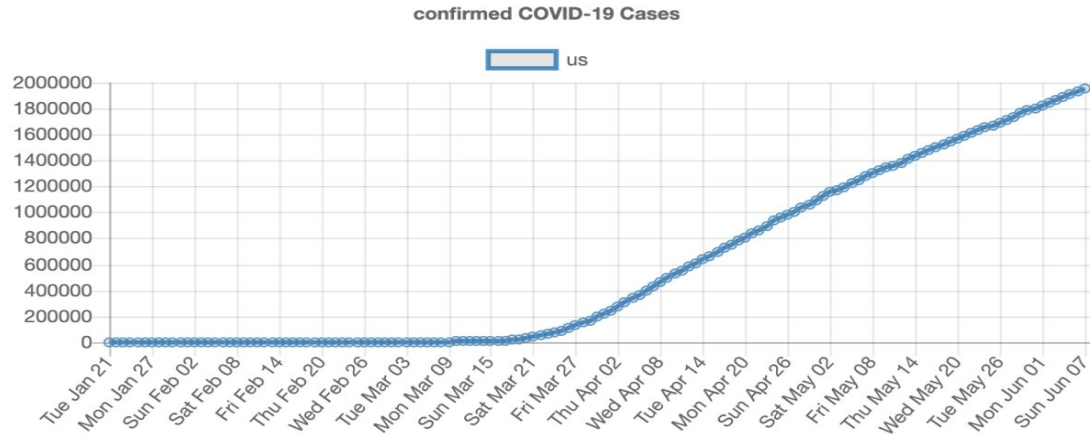
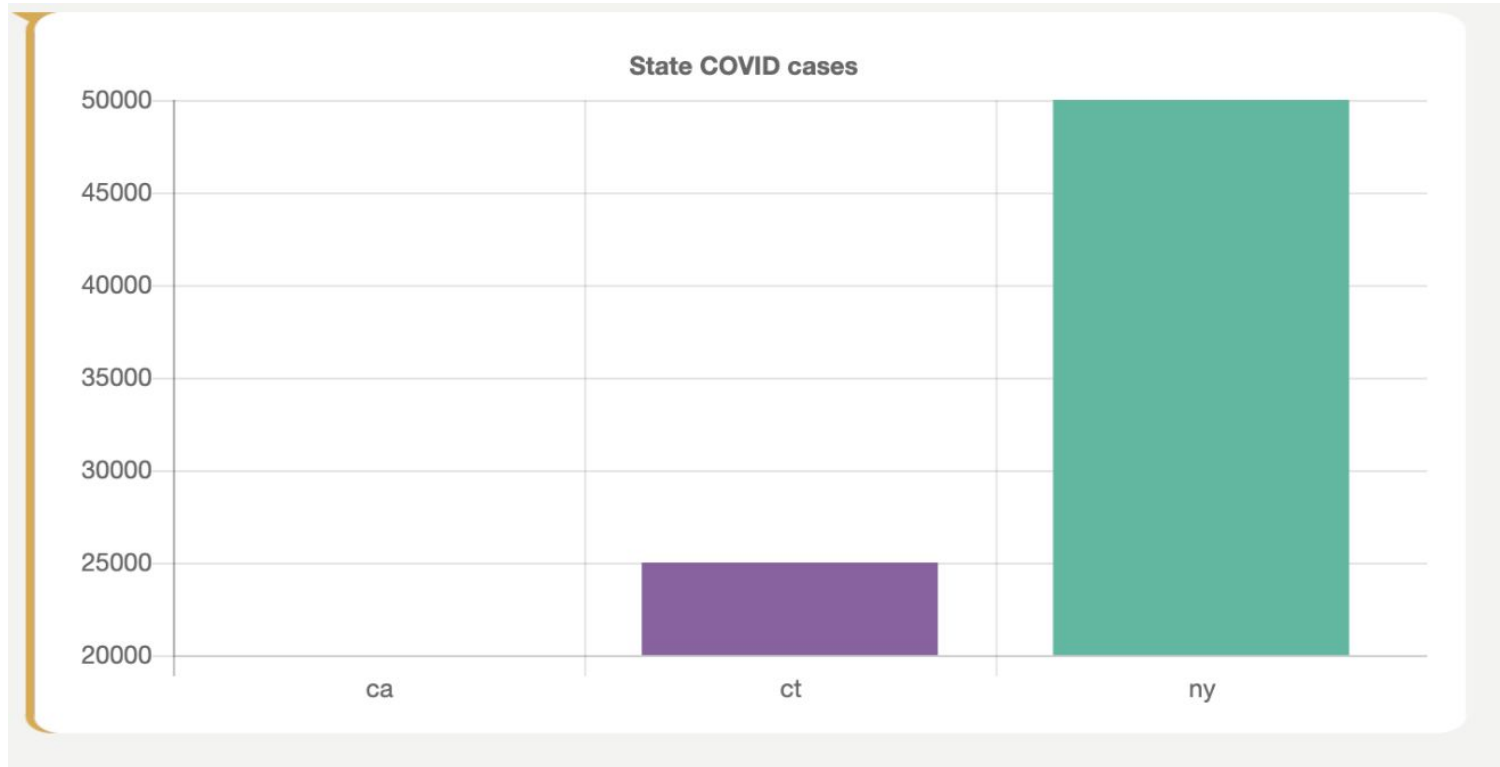


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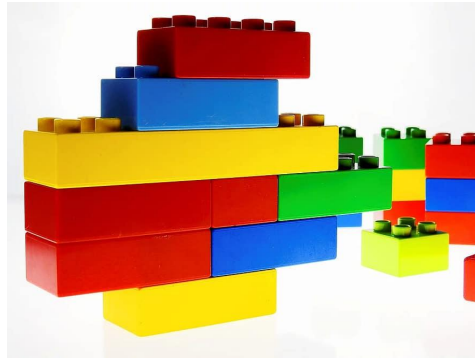


Chart Generation / Lessons Learned

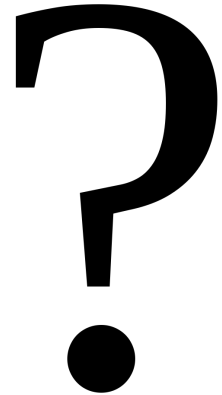
JavaScript



JavaScript



High level ideas → actual
implementation



People

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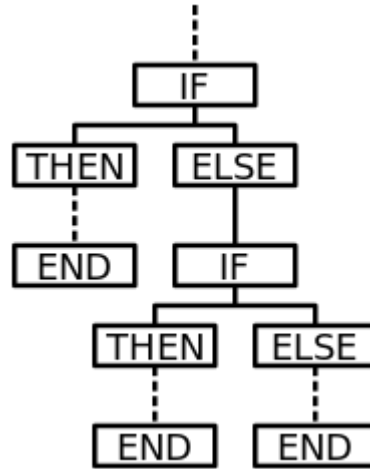
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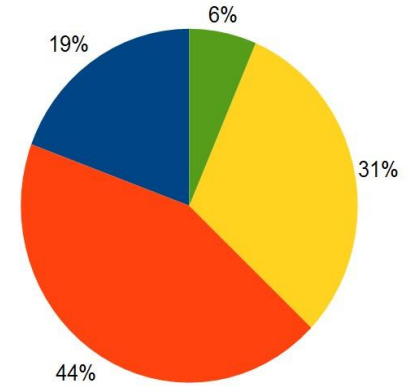
Future Work



Connect the pipeline



More robust mappings



More types of charts