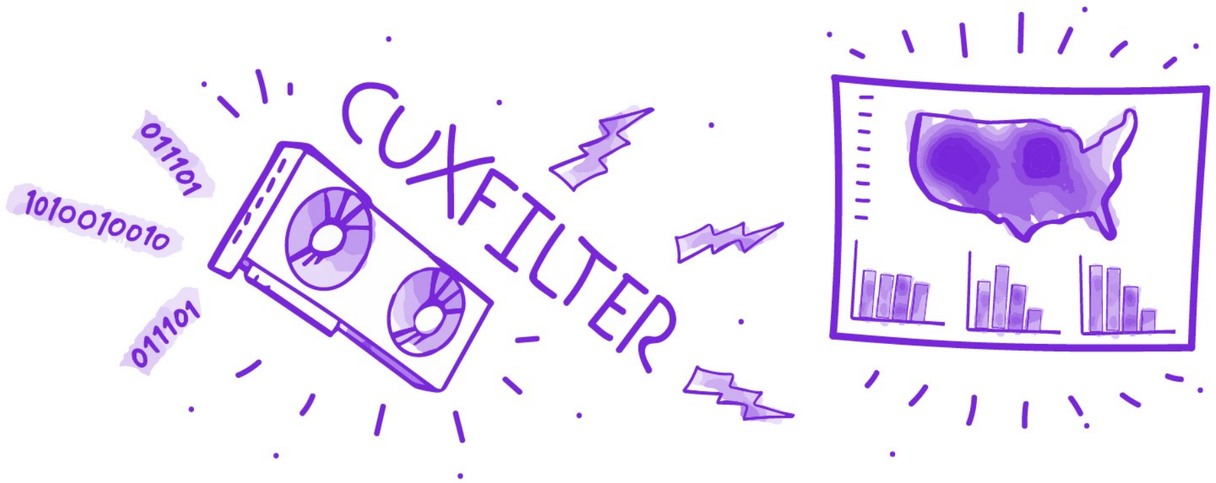

DLI Accelerated Data Science Teaching Kit

# Lecture 7.6 - cuXFilter

# How to implement visualization?




**cuXFilter**

**(ku-cross-filter)**

Retrieved from https://github.com/rapidsai/cuxfilter

# What is cuXFilter?

- RAPIDS framework connecting web visualization to GPU accelerated cross-filtering (filtering data and having visualization tool reflect the changes)
- Inspired from Crossfilter library
- What is Crossfilter?
  - Javascript library
  - Explore multivariate datasets in browser with filtering mechanism
- Limitations of Crossfilter?
  - Data stored in client-side browser memory
  - Inefficient on large datasets

# How to overcome limitations associated with large datasets?

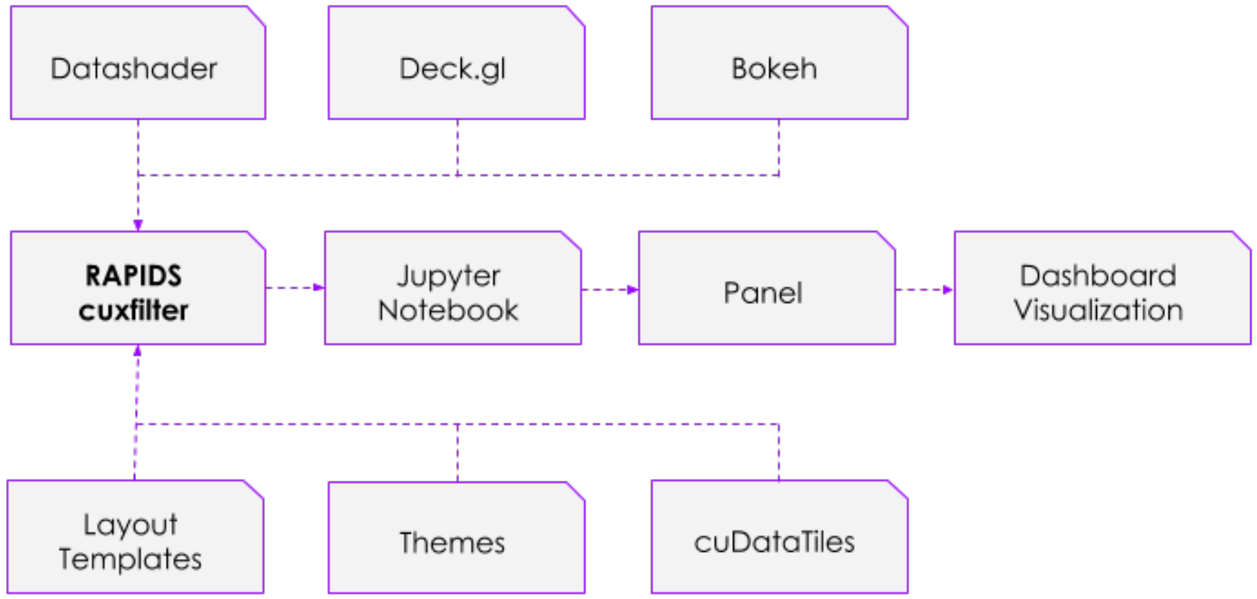
Maintain data in GPU via RAPIDS' GPU Dataframe (cuDF)

No longer dependent on browser memory

RAPIDS GPU acceleration now available

# What Does cuXFilter Do?

- Connects different visualization libraries to GPU backend
- Provides user with UI components connecting libraries
- Precomputes aggregations for quick visualization interactions via cuDataTiles

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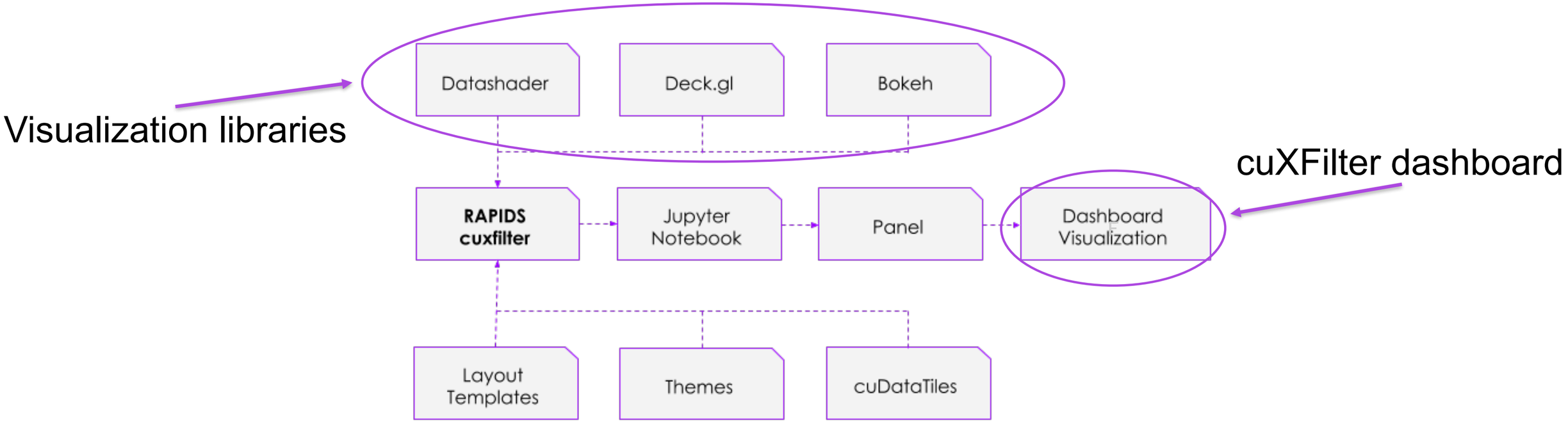


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# How fast is cuXFilter?

cuDataTiles take around 250 milliseconds per chart given a 100 million row dataset.

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cuDataTiles take around 250 milliseconds per chart given a 100 million row dataset.

Quite fast!

# cuXFilter Demonstration

# Importing Data and Setting Up cuDF

```
import cuxfilter

cux_df = cuxfilter.DataFrame.from_dataframe("./path_to_dataframe")

#would display something like image from below
cux_df.data.head()
```

| __index_level_0__ | STATE | ST_CASE | VEH_NO | PER_NO | COUNTY | CITY | DAY | MONTH | YEAR | DAY_WEEK | ... | ROUTE | RELJCT2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 10001.0 | 1 | 1 | 831 | 968 | 19 | 2 | 2017 | 1 | ... | 1 | 1 |
| 1 | 1 | 10002.0 | 1 | 1 | 1009 | 5923 | 14 | 2 | 2017 | 3 | ... | 1 | 1 |
| 2 | 1 | 10003.0 | 1 | 1 | 1120 | 8314 | 31 | 1 | 2017 | 3 | ... | 1 | 1 |
| 3 | 1 | 10003.0 | 2 | 1 | 1120 | 8314 | 31 | 1 | 2017 | 3 | ... | 1 | 1 |
| 4 | 1 | 10003.0 | 3 | 1 | 1120 | 8314 | 31 | 1 | 2017 | 3 | ... | 1 | 1 |

Retrieved from https://docs.rapids.ai/api/cuxfilter/stable/10%20minutes%20to%20cuxfilter.html

# Creating Charts Based Off Data

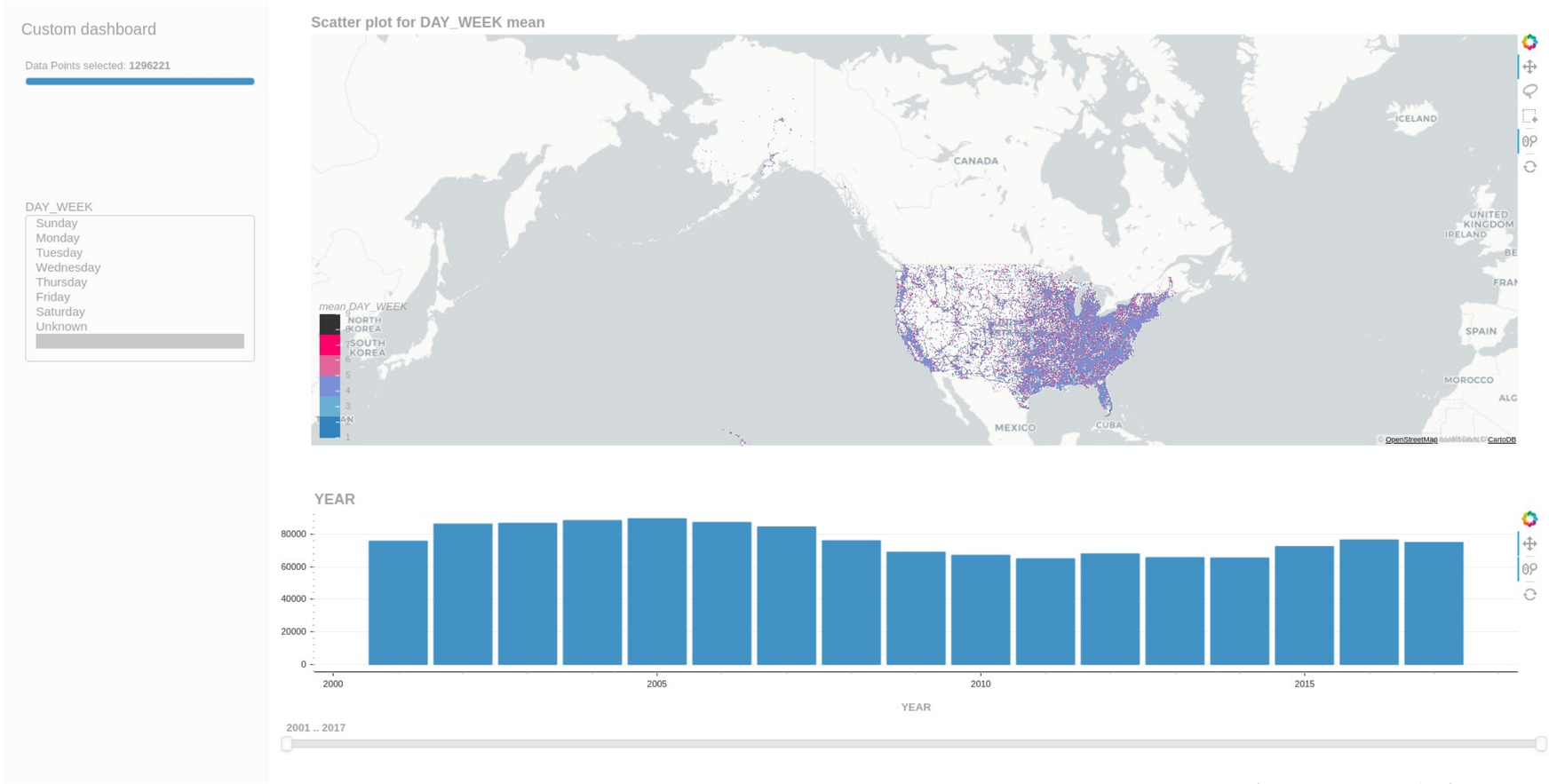
```
demo_palette = ["#3182bd", "#6baed6", "#7b8ed8", ... , "#323232" ]

chart1 = cuxfilter.charts.scatter(x='data_column_1',
    y='data_column_2', aggregate_col='data_column_3',
aggregate_fn='mean', color_palette=demo_palette,
tile_provider='CARTODBPOSITRON', pixel_shade_type='linear')

chart2 = cuxfilter.charts.bar('data_column_4')

...

charts_list = [chart1, chart2, ...]
```

Retrieved from https://docs.rapids.ai/api/cuxfilter/stable/10%20minutes%20to%20cuxfilter.html

# Viewing Dashboard with Charts

```
d = cux_df.dashboard(charts_list, title='Custom dashboard’,
layout=layouts.feature_and_base, theme=themes.light, data_size_widget=True)
```

```
wait d.preview()
```



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# Running Dashboard and Saving Snapshot

```
#opens in new tab
d.show('current_notebook_url:current_notebook_port')

#saves snapshot as dataframe
current_state_df = d.export()

#stops server
d.stop()
```

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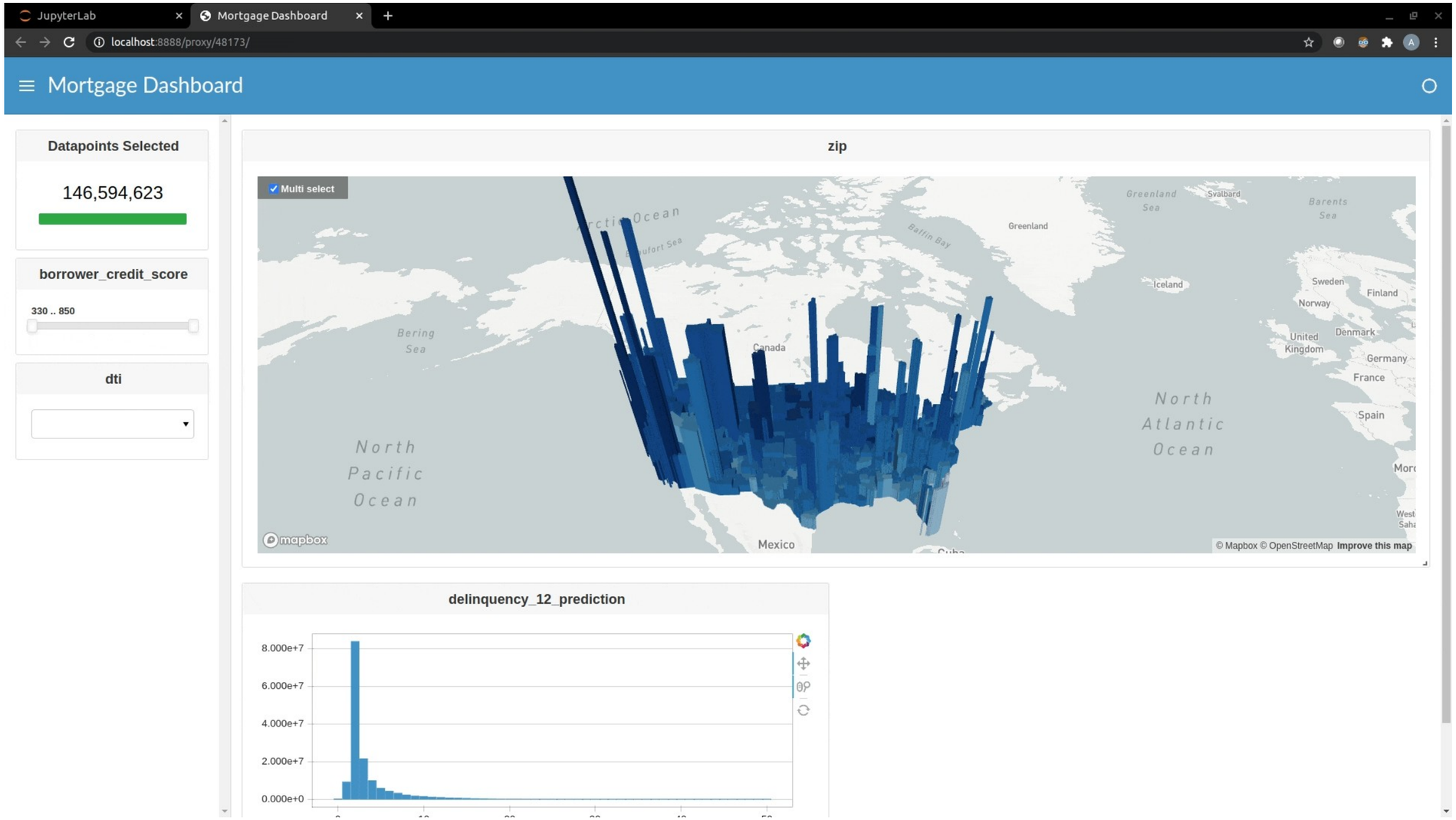
# Live Demo of cuXFilter Dashboard




Demo retrieved from https://github.com/rapidsai/cuxfilter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LEARNING
INSTITUTE


PRAIRIE VIEW
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# Thank You