Our Project Scope

1 Interactive Vis to allow user compare traffic volume in user's choice of time, and directions

3 Overlay pedestrian crossing data with the vehicle travelling data on the same map

2 Lay our visualization onto the intersection map to show an animation of road usage w.r.t. time

4 Integrate with future features (vehicle speed detection and tracking) if available

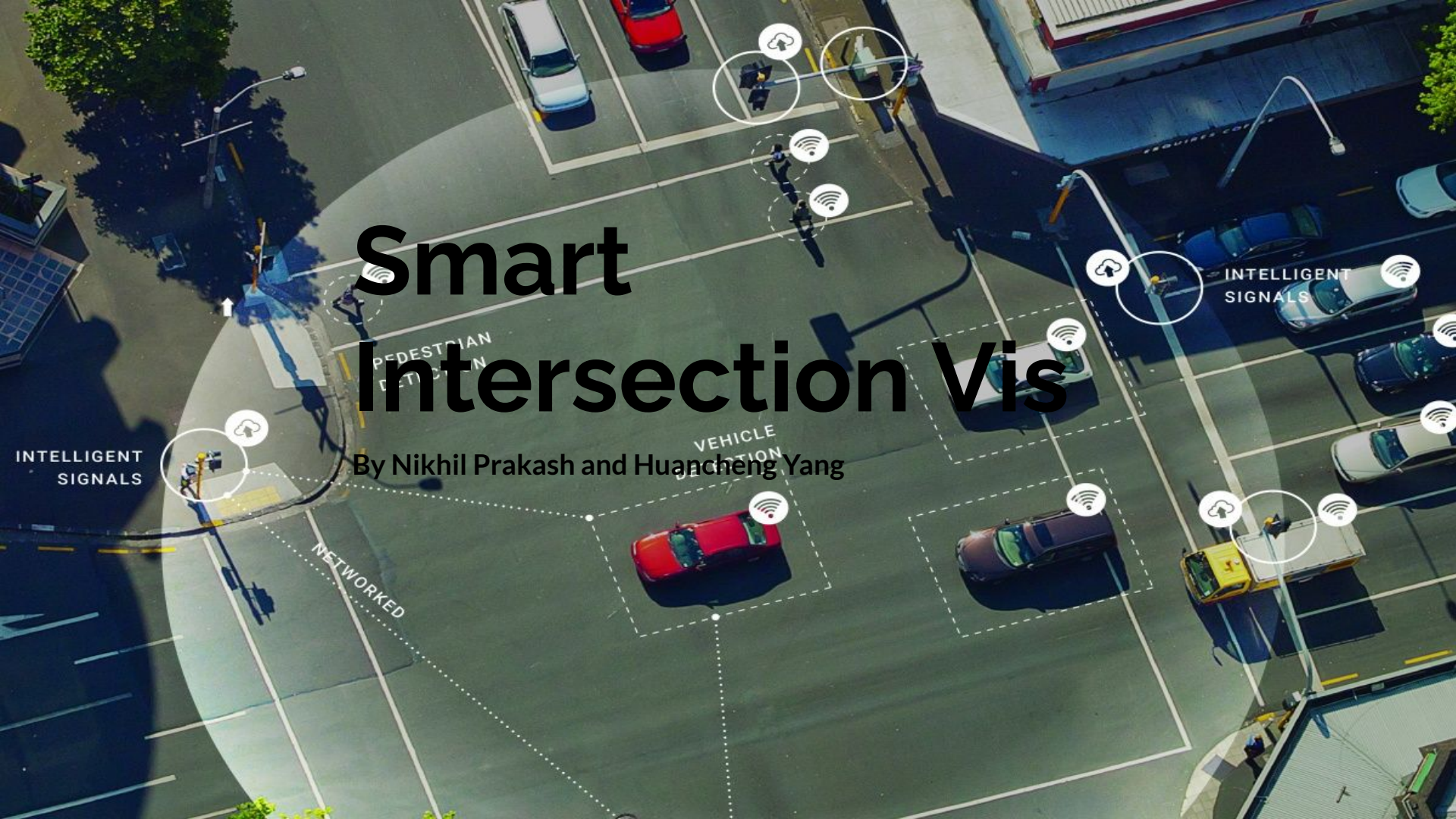# Smart Intersection Vis

By Nikhil Prakash and Huancheng Yang

High-Level Project Goal (Smart Intersections in Kelowna)

Smart Intersections 4.0: Using 5G-enabled Stationary LiDAR to Monitor Traffic in Downtown Kelowna
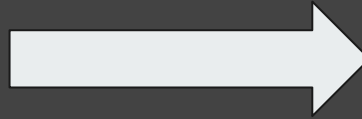

- Overall Project Goal: Help City of Kelowna understand the movements of pedestrians, cyclists, and vehicles (to plan and improve infrastructure)
- Why? Improve road safety; enable near-miss and conflict analysis

# Visualization Component Goal (a.k.a This Project!)

- An interactive visualization of the archived and (eventually real-time) data that supports:
  (i) Effectively visualize the quantity and direction of vehicle and pedestrian flow.
  (ii) Interactivity over multiple time intervals and location (for generating insights)
  (iii) Extensible to observe multiple intersections simultaneously (for RT observation)

High level overview
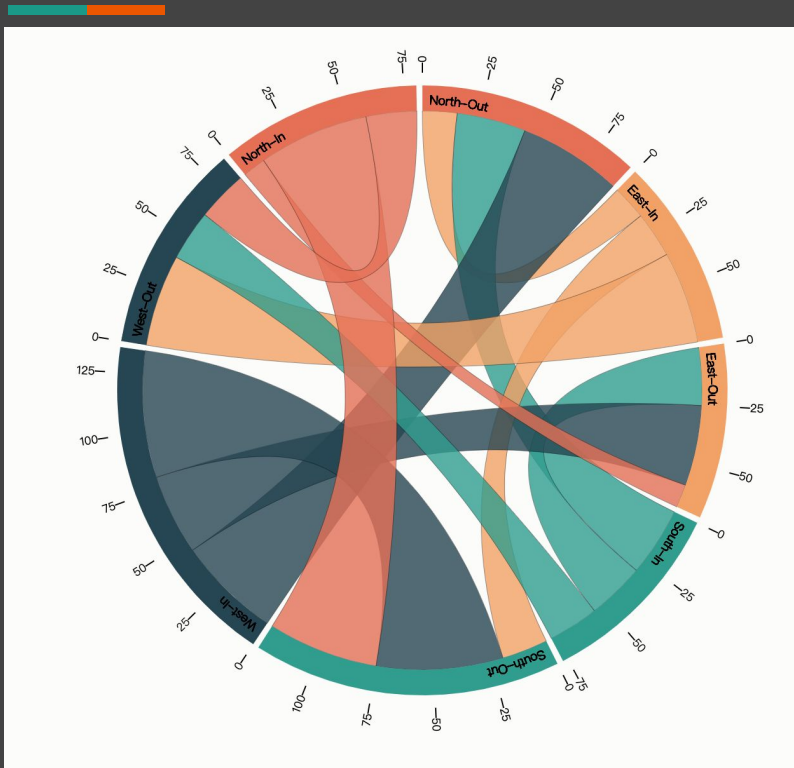
- An interactive chord diagram that can show how traffic crosses the intersections .

- Each direction is represented by a color that is easy to distinguish and can be 'highlighted' w/ labelled magnitude for observation when selected.

- Each direction we have inbound and outbound traffic counted separately for clarity.

Initial solutions: with Sankey and Others...
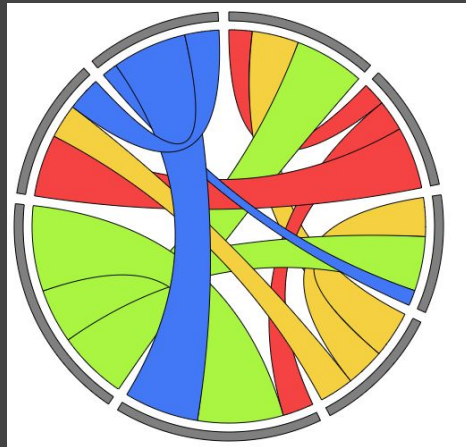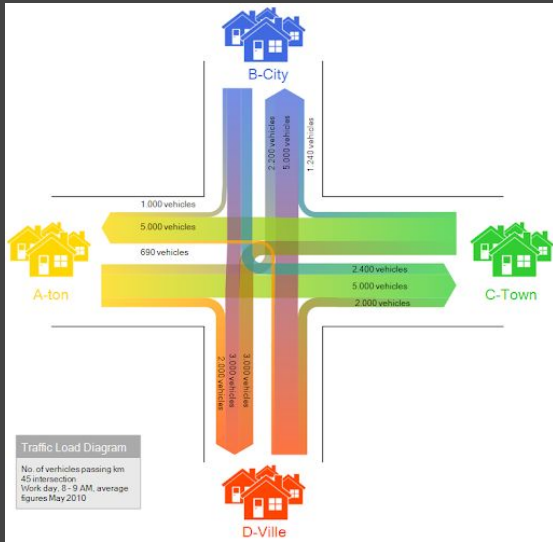
- We arrived at the chord by first selecting Sankey - major limitations...
- Chord has it's limitations too:
  - Circle to more rectangular intersection mapping
  - It did not clearly represent flow or magnitudes:
   until we split up out chord into in and out for each intercetion - as well as few other modifications.

Design Choices:

- In and outbound split allows to arrive arrive at a proper visualization shape.
- The colour pallete is chosen within the same colour family or group.
- In order to have visibility where all the chords overlapped, non-fully saturated colours were implemented.
- Hovering or closer observation on a chord segment or intersection side - displays the magnitude and fades all other chords to the back
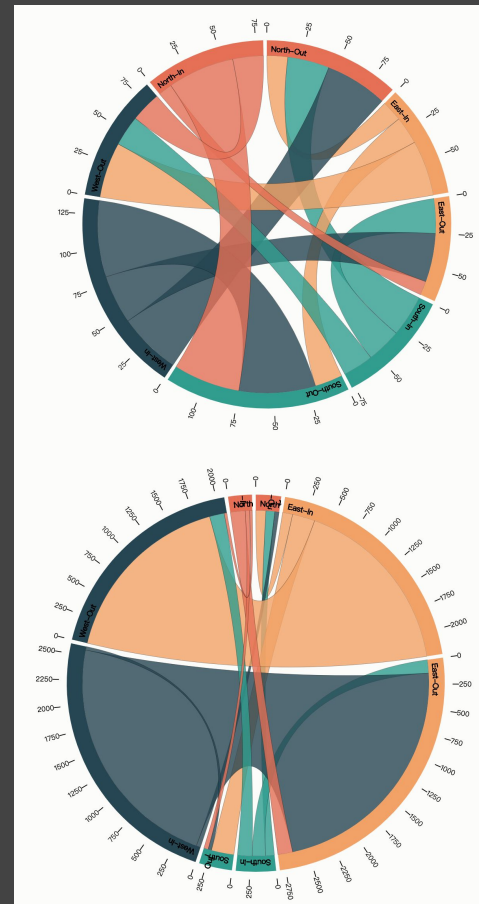
Interactivity for Exploration and Real-Time Observation Functionality: Validated by the Research Team

- Key Design feature: Can effectively show the flow of an intersection at "one glance", with further observability features i.e. magnitude.

- Key Design Feature: Select time periods or segments for a specific intersection or to compare across multiple intersections.
  - Enables: Exploration and ability to derive insights - not as easy w/ just the .csv data.

- Key Design Feature: Can support multiple intersections (in small multiples or overlayed directly on a map) and different intersection geometries. Suitable for RT observation.
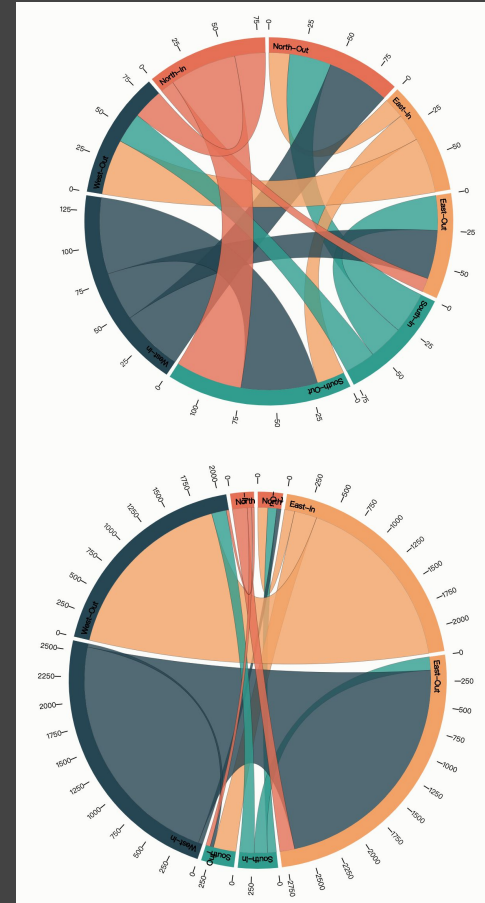
Our Design
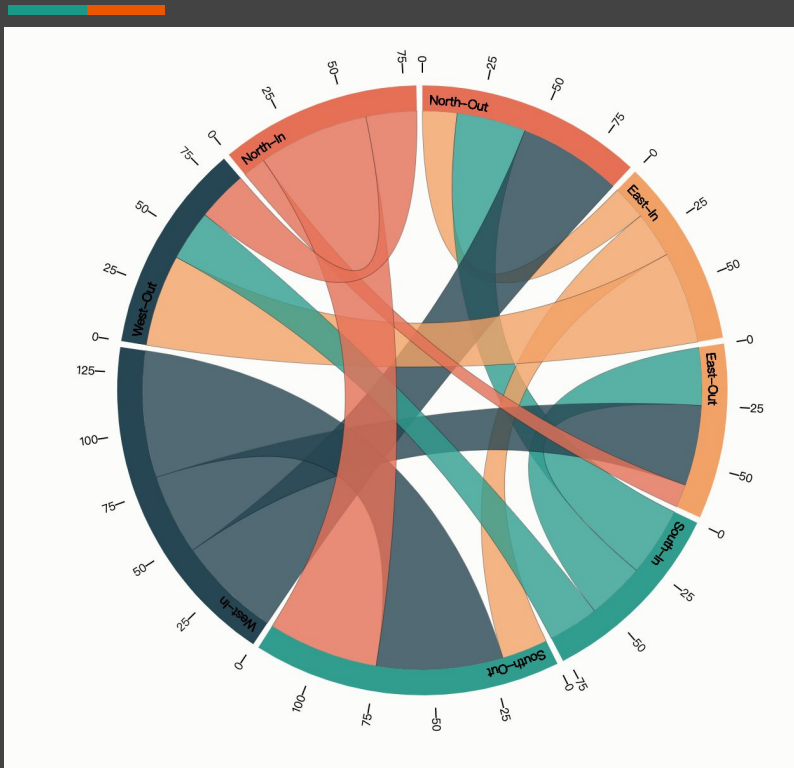
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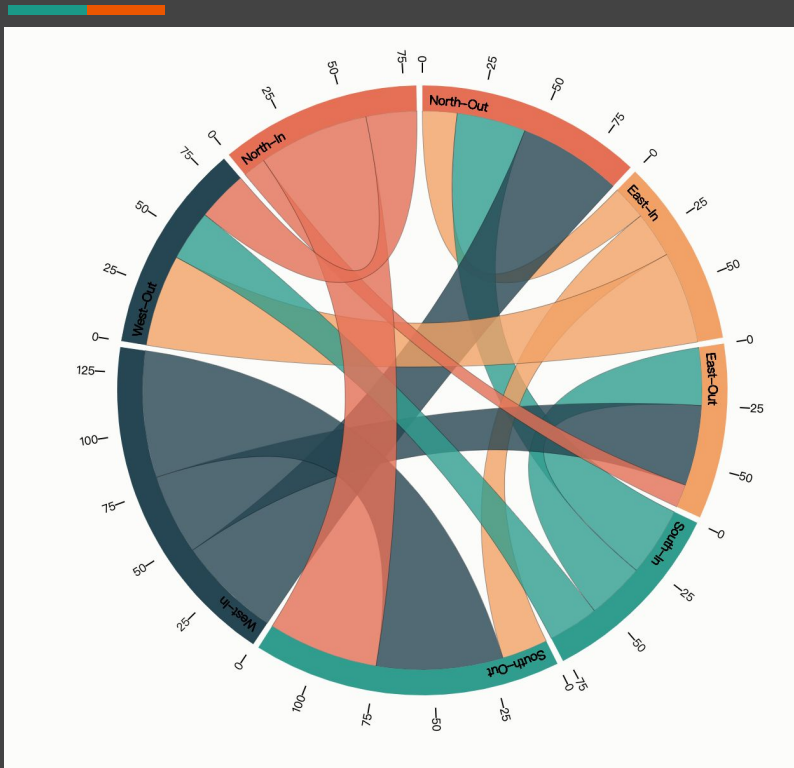- Each direction we have inbound and outbound traffic counted separately

Our Design

- An interactive chord diagram that can show how traffic crosses the intersections

- Each direction is represented by a color that is easy to distinct

- Each direction we have inbound and outbound traffic counted separately

Limitations

- Traffic Scenario: Road Construction

- Significant traffic flow reduction in NS directions

- Chord Diagram is not robust to extreme values
  - Hard to see small values and their relationships in the graph
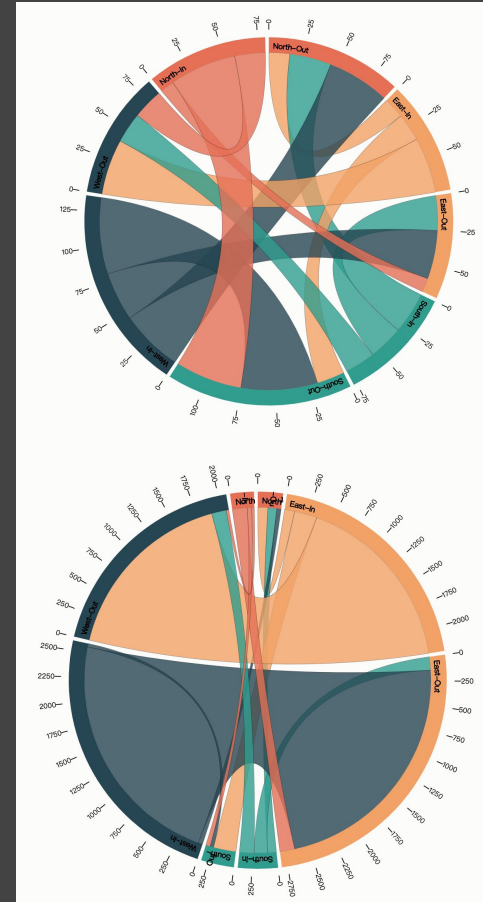
Limitations

- Traffic Scenario: Comparison Between Vehicle Flow During Midnight Hours & Peak Hours

- Significant traffic flow difference

- Chord Diagram looks similar - Only the ticks are showing the difference

- Solution: Using a stacked-bar chart to complement the comparison
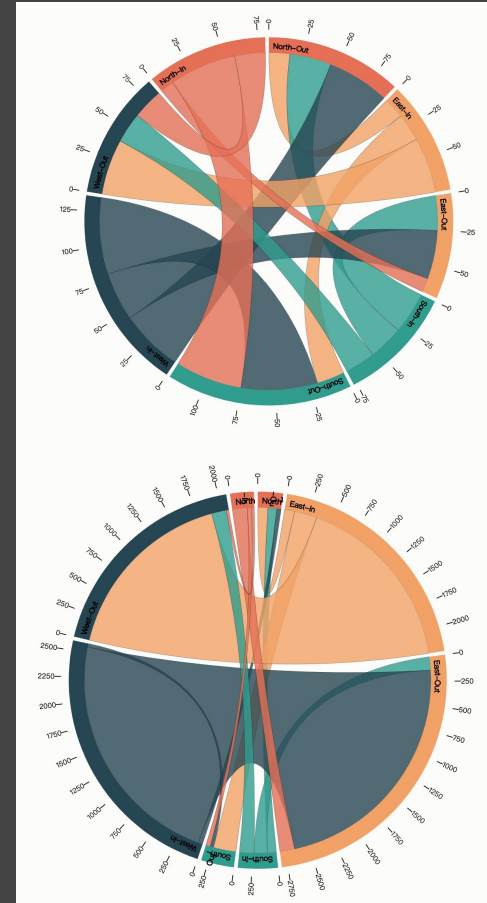
Lesson We Learned

1. The most powerful tool is not always the most appropriate tool
   a. D3 is a powerful tool

   b. Learning D3 takes much time

   c. Debugging things we are unfamiliar is challenging

2. Limitations of Javascript complicates the algorithm
   a. Unable to write to local file

   b. A lot of data pre-processing need to be done at the back

Thank you.