AP090 TRB Annual Meeting: Workshop

Open-source tools for transit data: hands-on code for interactive visualizations

Description of Session

Transit agencies and regional transportation planners now have a wealth of data on operations and customers, with high temporal and spatial resolution: vehicle positions (AVL), passenger activity (APC and AFC), detailed customer surveys and travel behavior logs. The volume and dimensionality of these data are a challenge, specifically how they vary by geography, and change within hierarchical time periods. Planners can benefit from moving beyond monthly averages or similar summaries, to match the structure of the data and gain more intuitive understanding of both variation and trends. One powerful way to accomplish this is by *interacting* with data: seeing how changing filters or time periods causes the patterns and trends to change.

Interactive data tools, powerful as they can be, do require some overhead in terms of coding and data expertise. However, transit agencies have the advantage that **both the planning questions, and the data sources, are similar across transit providers.** Thus, solutions developed at one transit agency may be applicable at another, with less overall coding effort than would be required to build tools from scratch.

In this workshop, we use a mix of demonstration and hands-on interactive coding to show how open source, free software tools can be used to build and share understanding of transit data. We first describe the overall approach and demonstrate the tools using a simple coding exercise. Then, through a series of hands-on, "challenge & solution" vignettes, we demonstrate how researchers can make use of the tools that are available, modify them for their own use, and build upon them in order to advance their understanding of public transportation planning and use.

Requirements:

* [if in-person] reliable wireless internet connection; ideally a LAN (cord) internet connection
* [if in-person] projector and connection for presenter laptop
* [if in-person] room with tables, to allow participants to use laptops during workshop; ideally separate tables to allow small group discussion; ideally power strips at each table
* participants with laptop or remote computer installed with:
    - R
    - RStudio
    - Python

Installation Guide to be provided for workshop attendees beforehand

Timeline:

5 min	Introductions and workshop purpose; technical logistics
25 min	Introduction to Working with Transit Data: Why is code needed?

- Dimensionality & aggregation
- Interactivity
- Data visualization
- Reproducibility & Shareability

15 min Building capacity within transit agencies
- how data standards facilitate tool development (GTFS, TCRP G-18)
- adopting code and tools developed elsewhere
- building a pipeline from operational data to interactive website

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1h 30 min Hands-on Transit Tools Case Studies*
(breakout tables to be worked on in parallel? Or all in series?)

1. Schedule Data [GTFS]: understanding schedule changes, frequencies, access

   Solution: Code to parse and visualize GTFS schedules, and compare across schedule changes to understand agency offerings.

2. Rider Activity Data [APC]: understanding long-term ridership trends given seasonality

   Solution: “Route Trends” tool for uploading time series of ridership data, extracting statistical trend and seasonality components, and displaying the resulting components in interactive plots

3. Vehicle Movement Data [AVL]: understanding variation in bus speeds on road segments

   Solution: “Bus Speed” tool for selecting a road segment of interest, using sequential GPS observations such as those produced by AVL systems to generate estimates of speed, and summarizing resulting calculations in a variety of interactive displays.

4. Linking Trips by Individuals [AFC]: understanding transfers

   Solution: stop-trip matching and simple trip-chaining algorithms

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20 min Optimizing collaboration for tool development
- Discussion of code sharing methods
- Licensing, contributing open-source code as a public agency

- Communal “help-desk” models

5 min Wrap-up; code repository locations and future collaborations

* all tools available online and open source code published for adopting by anyone