TRANSPORTATION DATA SCIENCE

Our Expertise

Foursquare ITP is at the forefront of using **data and visualization** to advance **transportation planning**. As the volume and complexity of data grows at even the smallest of **public agencies**, transportation planning firms need the skills and tools to **leverage this data** for **insights** and **action**. Our **Transportation Data Science Team** brings all aspects of **data science** to the **transportation planning** world, from **complex data analysis** to **web applications** to **interactive visualizations**. We develop **tools** to improve the quality and depth of work on every Foursquare ITP project, while also using our **advanced skills** to tackle our clients' **data challenges** and build **customized web applications** and **dashboards** to monitor **service performance**, **assess transit** and **market trends**, and check the **quality of service planning** and operations outputs.

Our Specialties

- Interactive web apps and tools for transit planning and operations.
- Use of code to automate and improve data processing, data cleaning, and analysis.
- Development of customizable templates for data processing, visualization, and web apps.
- Development of dashboards to view historic and real-time datasets.
- Statistical analysis to evaluate system performance.

Our Tools

REFLECT™
Schedule & GTFS QA/QC

REFLECT™
GTFS Validator

GTFS to Existing Conditions

Transit Propensity

Data science combines multiple fields, including statistics, scientific methods, and data analysis, to extract value from data. Data science encompasses preparing data for analysis, including cleaning, aggregating, and manipulating the data to perform advanced data analysis—allowing data scientists to uncover patterns and draw unique insights.
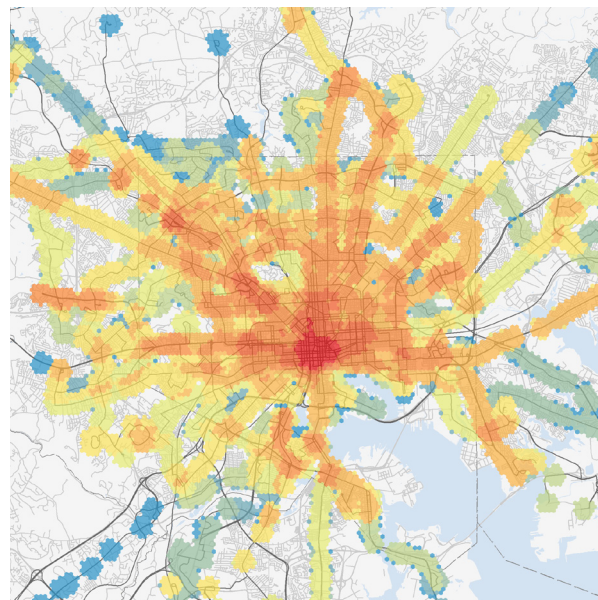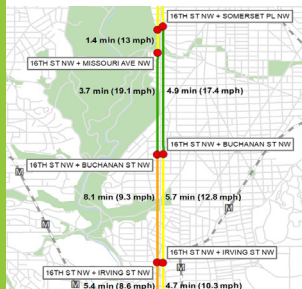
WMATA Transit Signal Priority Evaluation

Foursquare ITP assisted in the evaluation of the effectiveness of transit signal priority (TSP) on several corridors in Washington, DC and an analysis to reallocate TSP equipment from ineffective locations to new corridors. We contributed to the development of the bus metrics for the project and then led their evaluation, including runtimes, runtime reliability, and schedule deviation. We also analyzed intersection spacing, runtime reliability, and bus person throughput to prioritize the reallocation of TSP equipment. This analysis included processing of WMATA's detailed Trace Model in R; extensive calculations for the various measures in the effectiveness evaluation and the reallocation analysis; and the production of graphics to visualize results.

Tools and Software Used: RStudio
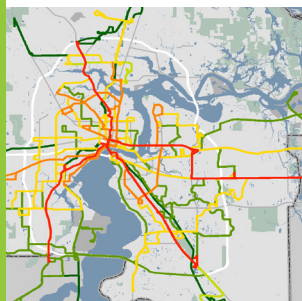
Jacksonville Transportation Authority Transit Development Plan

Foursquare ITP led a transportation development plan (TDP) effort for the Jacksonville Transportation Authority (JTA), providing a comprehensive system analysis and service area assessment which resulted in a full set of bus transit recommendations and a phasing and implementation plan. Throughout the project, our data scientists used R to clean and process JTA's GTFS and raw AVL data as well as regional travel demand model origin and destination travel flows. GTFS data was processed to calculate service levels at the route and stop levels while raw AVL data was cleaned to calculate runtimes and on-time performance. Both of these datasets were combined into informative route profiles and interactive dashboards through automated processes.
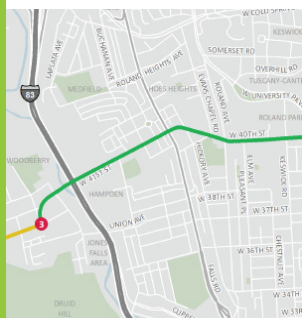
Tools and Software Used: RStudio — Route Profiler — Transit Propensity — Transit Resource Calculator

Maryland Transit Administration Premium Bus Pilot Study

As part of our ongoing work with the Maryland Transit Administration (MTA), Foursquare ITP created a premium bus service plan, which reconfigured existing BaltimoreLink bus service across several corridors around a frequent, limited-stop, premium bus service with bus rapid transit (BRT) characteristics and improvements to travel times, performance, and customer experience. Throughout the planning process, our data scientists used R to perform various tasks including headway and stop spacing calculations, origin-destination analysis that supported investigation into travel patterns with long trips or many transfers, and the creation of various inputs for route description sheets, including boardings by distance charts, street geometry data, dwell time, and ridership activity.

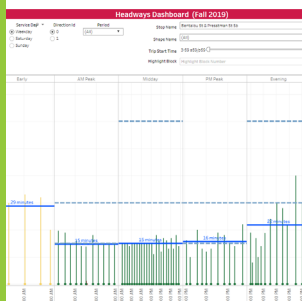**Tools and Software Used:** RStudio, ArcGIS Network Analyst — Route Profiler — GTFS to Existing Conditions — Transit Resource Calculator

BaltimoreLink Tools for Schedule & GTFS QAQC

As a part of ongoing support for MDOT MTA's Office of Service Development (OSD), Foursquare ITP has created schedule & GTFS QA/QC tools using the Shiny application development framework and the R programming language. Using the application, agency staff can upload any static GTFS feed or feeds which are then automatically processed using Foursquare ITP's custom GTFS tools. From this processed data, visualizations are automatically created in Tableau. Using the resulting dashboards, OSD staff can conduct a number of analyses, including: determining if a route's schedule meets OSD's internal guidelines for span, headway, and layover length; locating stops that are not inadvertently excluded from a route in GTFS; reviewing planned vehicle requirements and block assignments; validating feeds against the GTFS specification; and comparing service levels in a feed to previous GTFS feeds.

Tools and Software Used: R Studio, Tableau — REFLECT™ Schedule & GTFS QA/QC

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