

FOURSQUARE

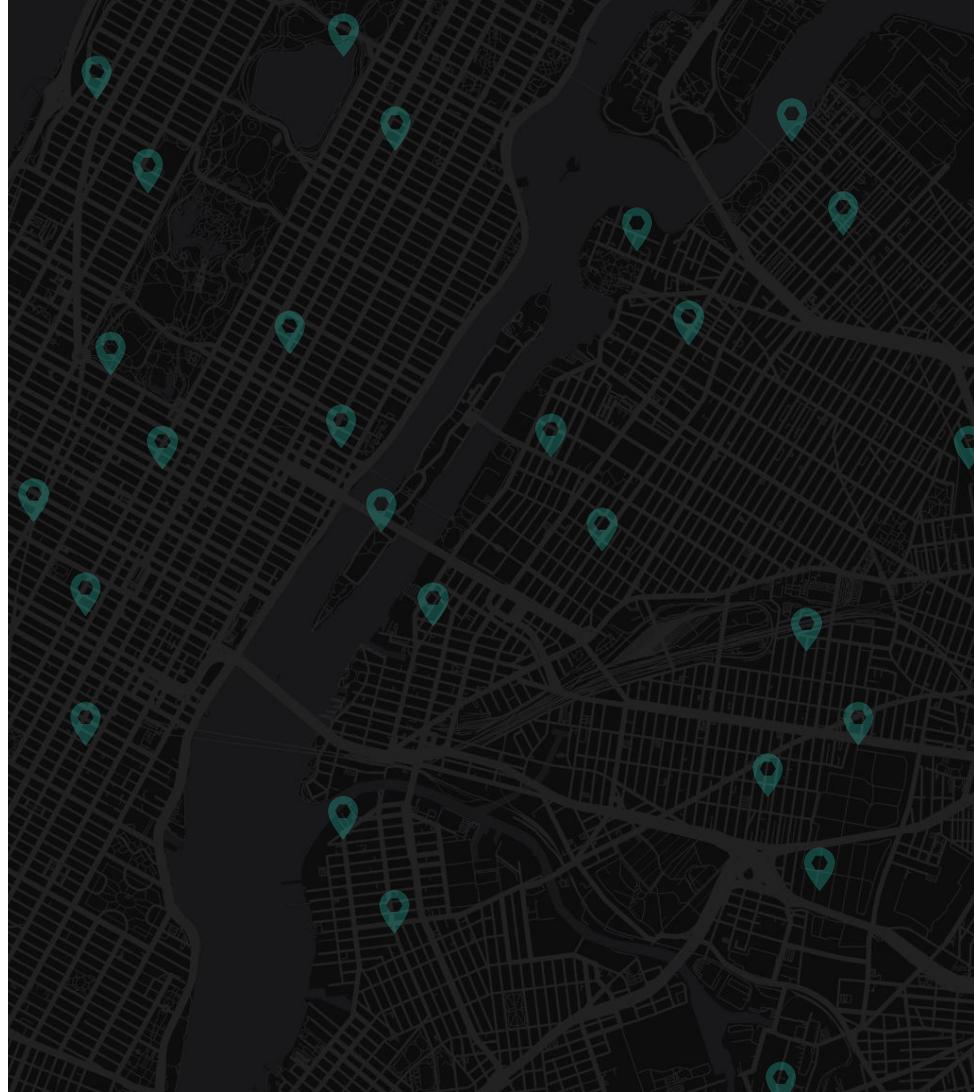
Spatial Analysis Guide

Tools and techniques to harness the
power of place using next-gen geospatial
technology



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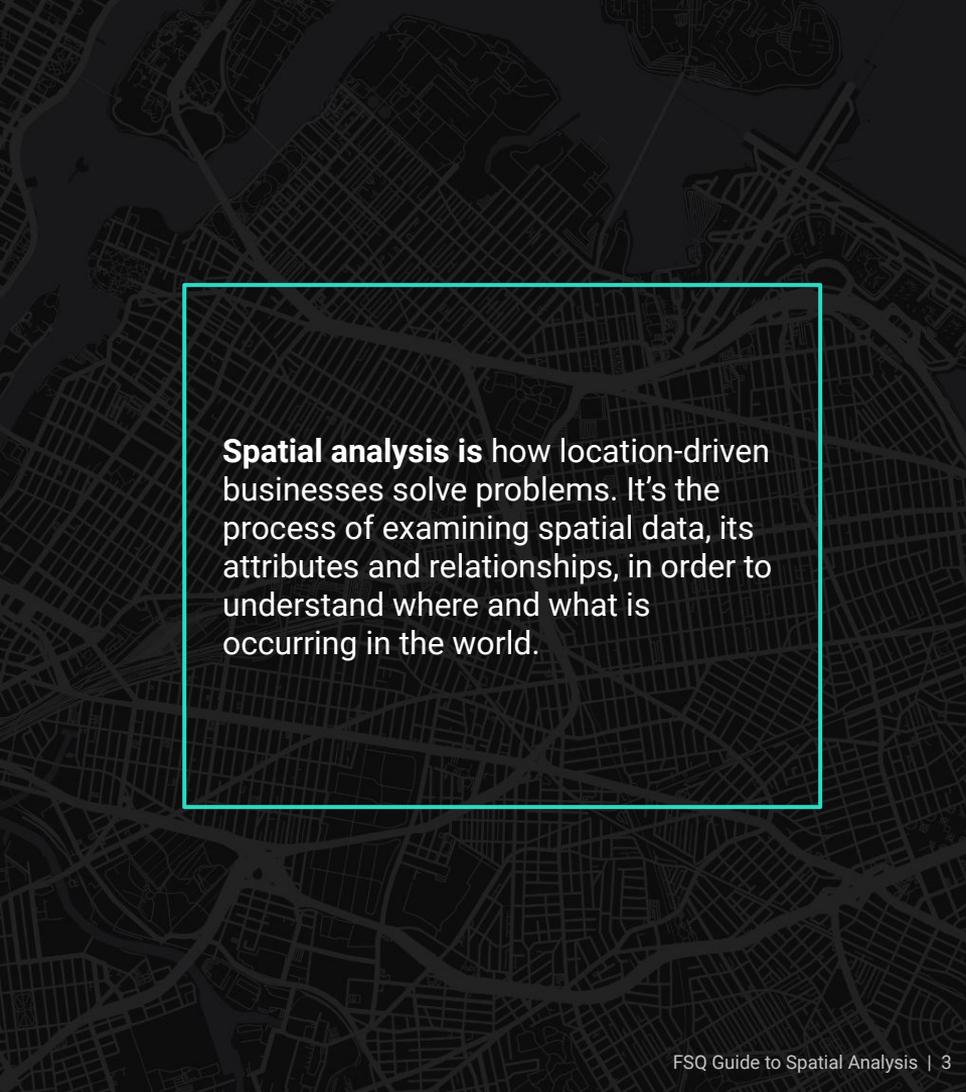
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Introduction

Today, we have more spatial data than ever before, pouring from satellites, mobile phones, drones and Internet of Things (IoT) devices. Foot traffic, weather events, crime statistics – the list goes on and on.

All of these are examples of geospatial data points. Individually, these data points are interesting, but in combination they can reveal surprising trends, hidden problems, and new paths forward for your business. This and more is made possible through **spatial analysis**.



Spatial analysis is how location-driven businesses solve problems. It's the process of examining spatial data, its attributes and relationships, in order to understand where and what is occurring in the world.

Spatial analysis is connected to many of the customer experiences we have every day, whether we're aware of it or not.

- When your Uber driver is directed to take another route around construction, **spatial analysis is getting you to your destination faster.**
- When your bank can quickly identify credit risk by looking at transaction histories of all other customers in demographically similar zip codes, **spatial analysis is getting you the credit you need.**
- When your insurance company can determine that your house is a low-risk flood zone because of the surrounding topography and a recently planted forest, **spatial analysis is saving you money.**

“Geospatial technology and analysis have a profound impact on businesses and our daily lives. They support a wide range of applications, such as mapping, navigation, transportation, forestry, urban planning, environmental monitoring, real estate, homeland security, disaster management, data visualization, among others. Geospatial technologies can facilitate geospatial data collection, visualization, and modeling to gain insights and make informed decisions.”

**Qiusheng Wu, PhD | Assistant Professor of Geography
University of Tennessee, Knoxville**

Spatial analysis drives better decision making.

Companies can use spatial analysis to make better strategic, operational, and experiential decisions across both the business and customer journey by providing insight into:



Where is a viable location for retail expansion?



How can we get products to our customers faster?



How can we better manage our assets on the ground?



Where should we place advertising to reach our ideal customers?

Luckily for us, geospatial technology is more accessible and powerful than ever, enabling anyone to answer these questions and harness “the power of place.”

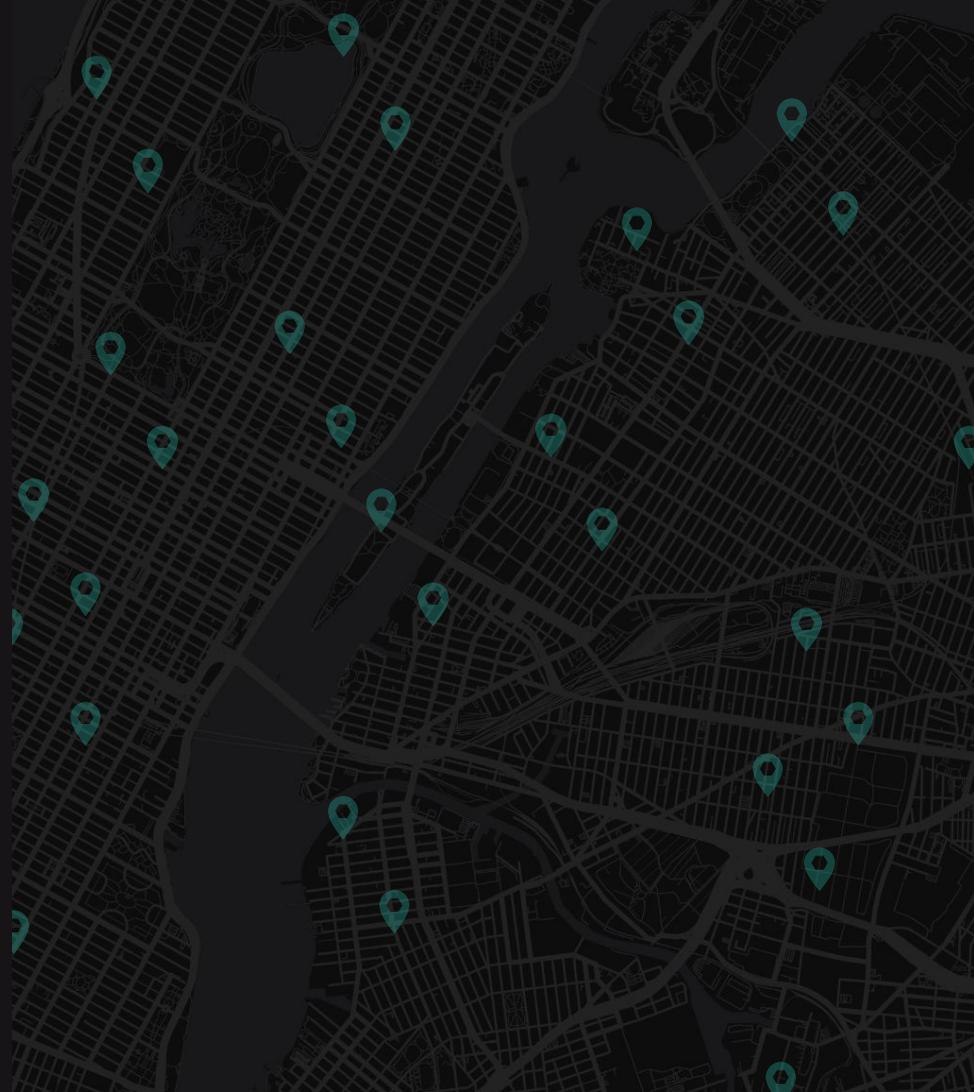
In this guide, we’ll break down a 5-step approach to performing spatial analysis in [Foursquare Studio](#), a next-generation geospatial platform that makes it easier and faster than ever before.

Our 5 step approach

- 1 Define the question
- 2 Find and prepare your data
- 3 Leverage the right tools & techniques
- 4 Add visual flare
- 5 Share and iterate

STEP
01

Define the question



Define the question

Determining the right question is the first and utmost important step for getting accurate and actionable insights from your data. After all, analytics, in its simplest form, is all about asking and answering questions.

What questions you ask and prioritize will vary based on your business goals, KPIs, and industry, among other things.

Having a clear picture of your desired outcome or insight will determine the tools, techniques, and data you use in your analysis.

For example, you may be curious to know...

?

Where are our customers interacting with us?

?

Where are our assets deployed?

?

Where do we have inefficiencies in our supply chain?

Beyond telling us where things [are](#), spatial analysis can help answer where they [should](#) be.

?

Where should we build new store or office locations?

?

Where should we direct more marketing spend?

?

Where should we build a new bike path?

?

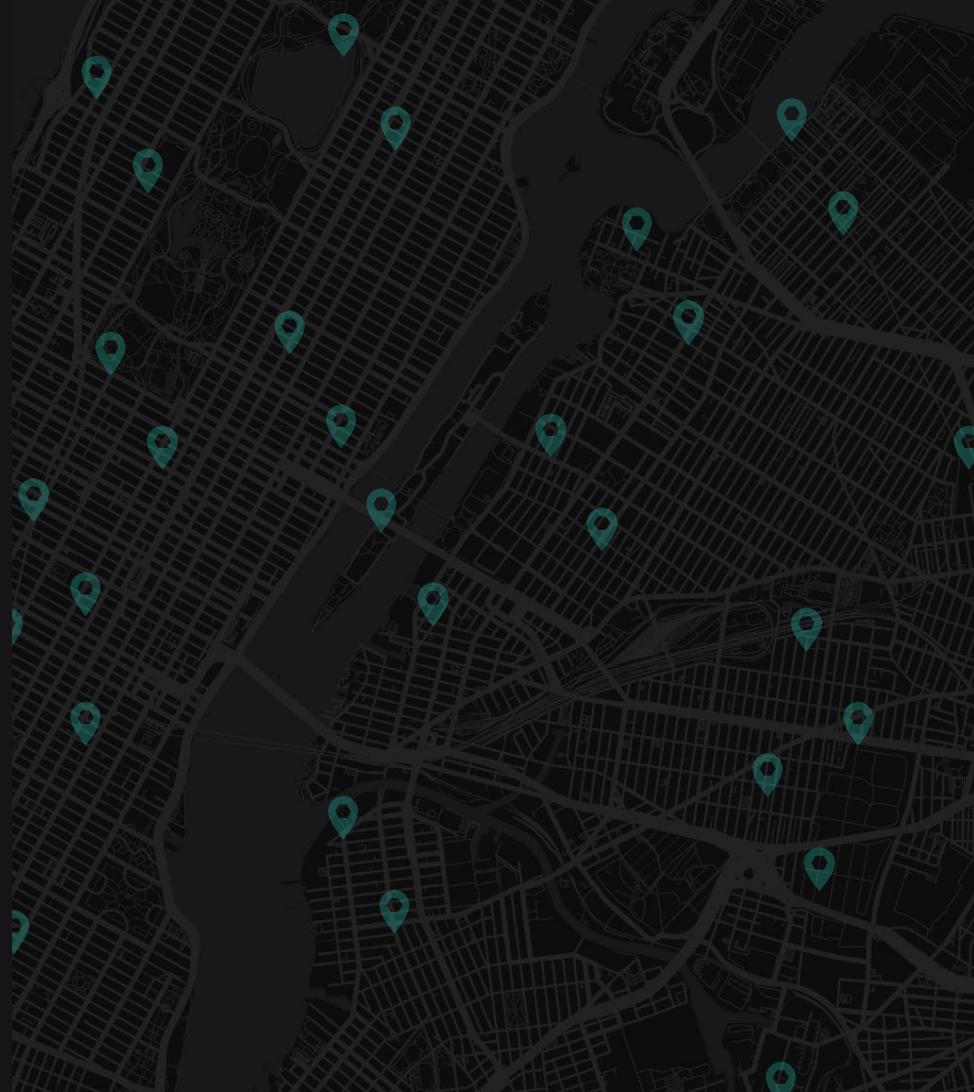
Where should we deploy resources to mitigate climate risk?

?

Where is COVID-19 exposure more likely for staff or customers?

STEP
02

Find and prepare your data



Find your data

The good news is that most useful data is free and available without restriction. The bad news is that there isn't a single authoritative source. So, we've gathered some sources, both free and paid, to enrich your analyses.

Demographics

- [US Census Bureau](#)
- [Esri Demographics Data](#)

Address

- [US Department of Transportation](#)
- [OpenAddresses](#)

Boundary

- [U.S. Census TIGER/Line Boundary Files](#)
- [Global Administrative Areas \(GADM\)](#)

Environmental

- [National Weather Service](#)
- [Esri Open Data Hub](#)

Point of interest

- [Foursquare Places](#)
- [Data.World](#)

Mobility

- [Foursquare Visits](#)
- [Replica Places](#)

Tool Tip:

[Foursquare Studio's Data Catalog](#) is a good resource to find a variety of public, ready-to-use datasets to enrich your analyses. The catalog is regularly updated with new Hex Tile datasets — just look for the purple "Hex Tile" badge on the top right of their tile.

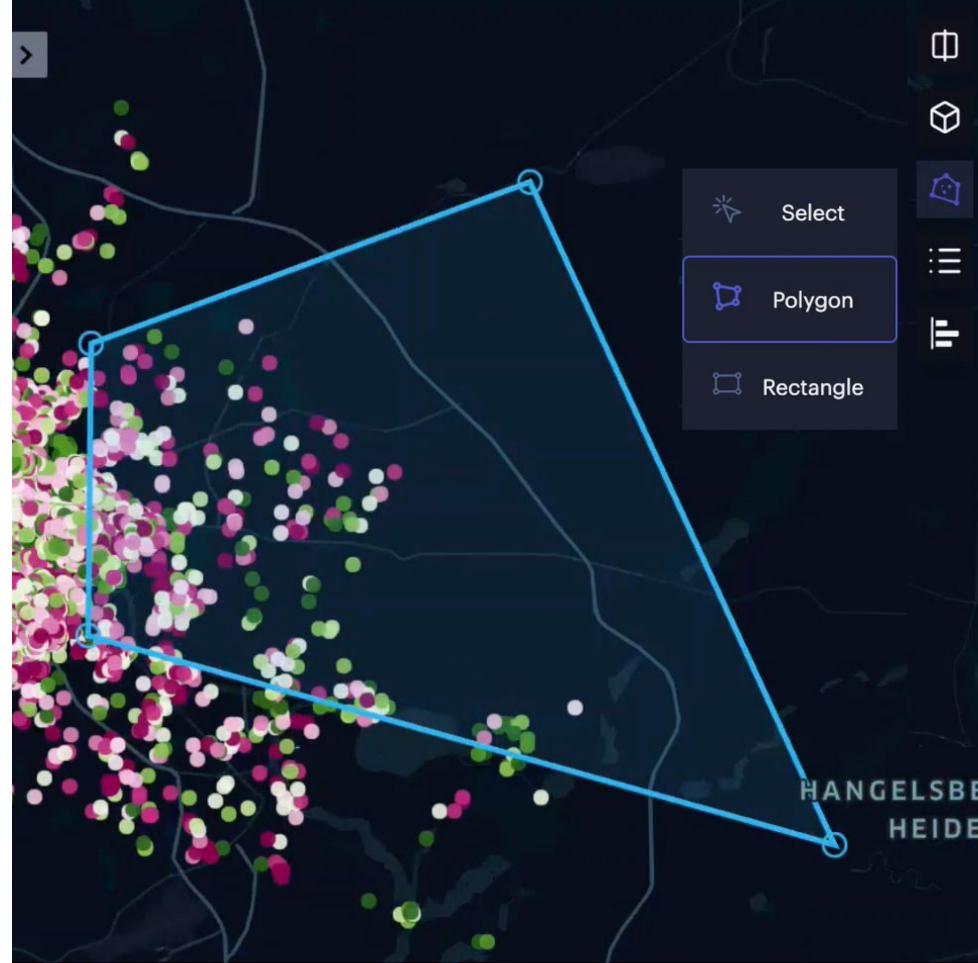


Prepare your data

The other caveat is that geospatial data can come in many different sizes, formats, and degrees of quality. You know what they say, “Garbage in, garbage out.” Preparation goes a long way towards making sure your analysis generates reliable results that you can confidently share with others. Plus, it will simply make your life easier.

For each dataset, we recommend exploring the geography, attributes, and metadata to determine whether the data will be useful for your analysis and what kind of preparation, if any, may be required.

Some, if not all, of this work can even be done directly in Foursquare Studio, depending on how much preparation is needed.



Here are a few tools and techniques that you can use to quickly explore and prepare your data.



Extracts

After importing your data, you may find that certain datasets are more extensive than you need. Data extracts help speed up processing time, focus your analysis, and enhance data visualization.



Enrichment

You may find yourself working with incomplete, inconsistent, or even incorrect data from which few, if any, actionable insights can be discovered. This is where enrichment comes into play to enhance, refine, or otherwise augment your existing data. This is typically achieved with imported datasets and a join operation. For example, you may upload internal business data which can be joined with external data streams, like POI, demographics or even route data like OpenStreetMap, to enrich your visualizations.



Expressions

Expressions are a powerful tool for processing different types of data, creating and converting columns, running mathematical functions, and even leveraging [H3](#) analytics. See Foursquare Studio's [expression syntax](#) to learn more.



Shapify

Shapify automatically recognizes datasets that contain identifiers for well-known administrative boundaries (such as ZIP codes or census tracts) so you can immediately visualize and explore boundaries on your map.



Filtering

To create focus in your analysis, consider limiting the data displayed on the map with [Data Filters](#). If you're dealing with time-based data, [Time Filters](#) can focus your analysis to a certain range of time. Need to filter an area of interest on-the-fly? Use the Draw tool to outline boundaries on the map and apply them as Filters.

Tool Tip:

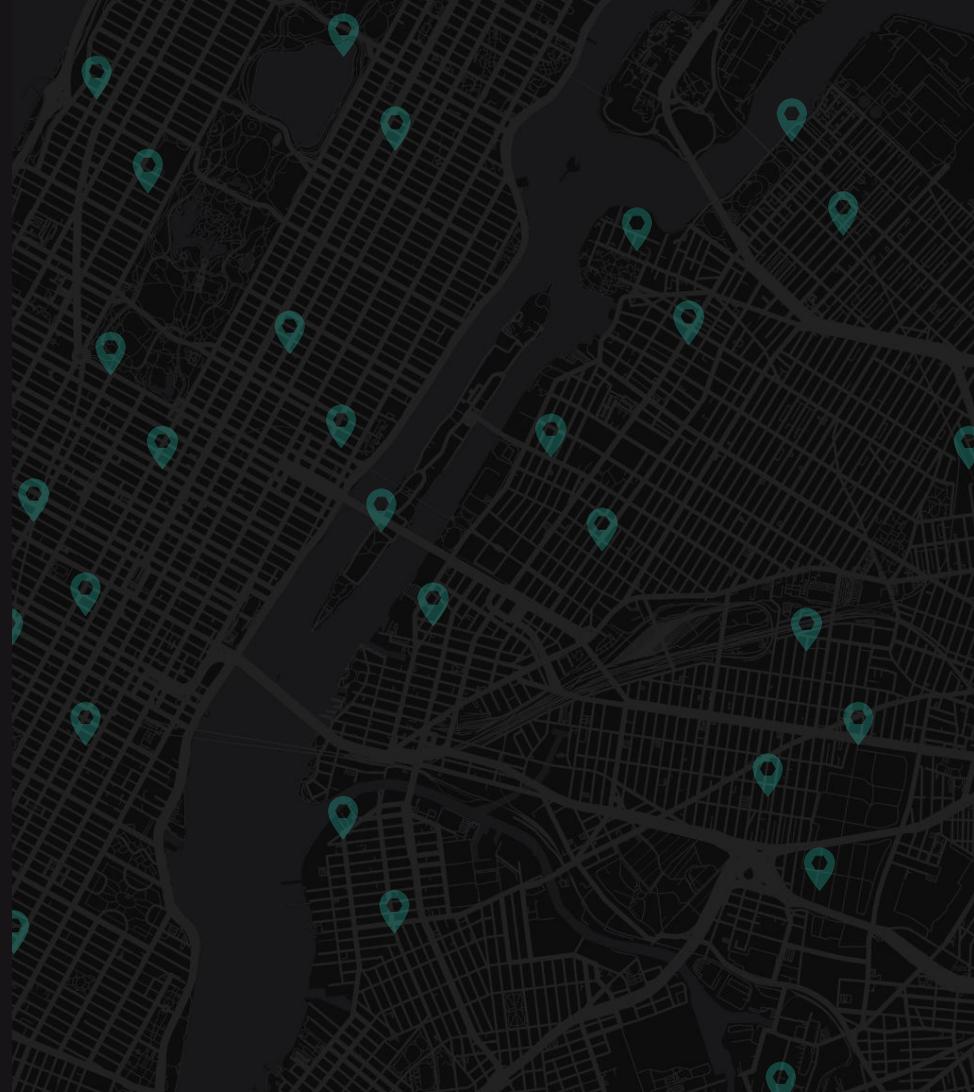
Prepping and juggling all of these large, disparate datasets can be tricky and time-consuming. With Foursquare Studio's proprietary tiling system, Hex Tiles, you can quickly and easily ingest spatial datasets and [transform them into your own Hex Tiles.](#)

This way, you can seamlessly unify, enrich, and explore your data in minutes instead of days.



STEP
03

Leverage the right tools
and techniques



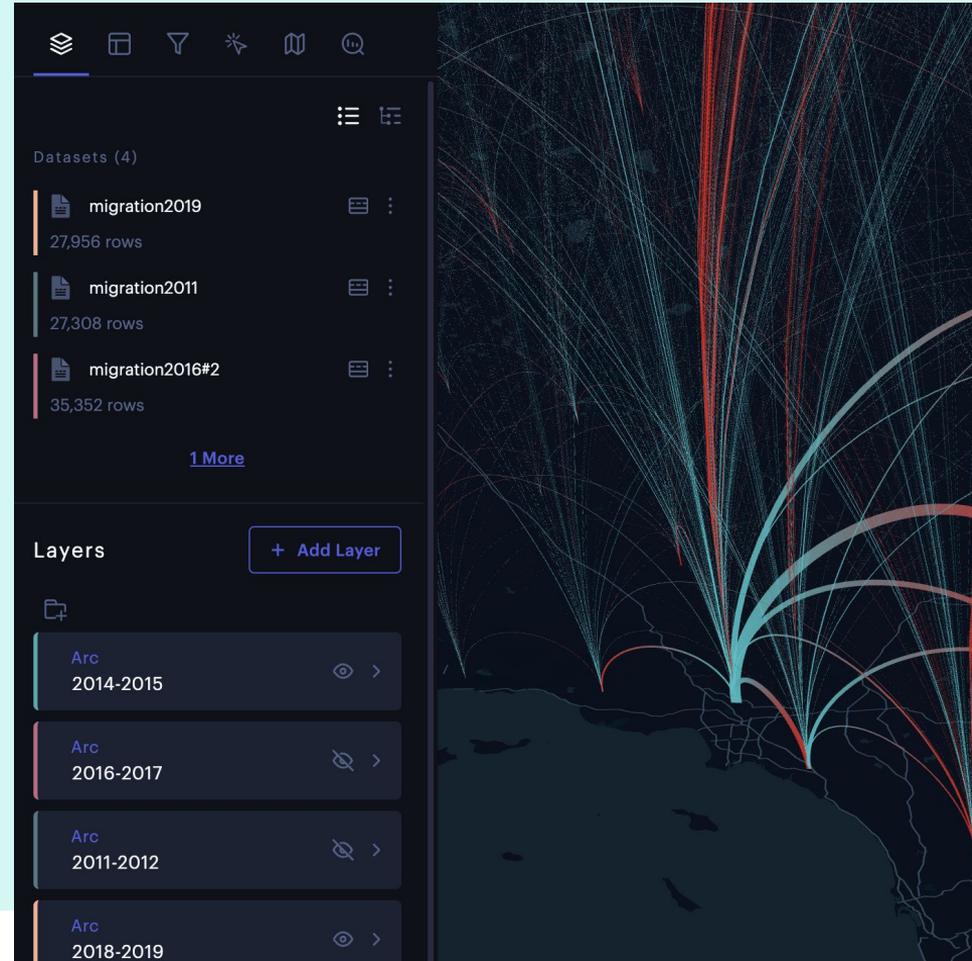
Leverage the right tools & techniques

Congrats! You made it through arguably the most painstaking, time-consuming part of the process.

At this point, multiple layers have been added to your map, visualizing different datasets or different aspects of the same dataset.

You'll find that Foursquare Studio has [a rich suite of layers](#) to work with, from basic points on a map to more advanced visualization. How you manipulate layers is up to you and the analysis technique you choose.

Let's take a look at a few of these analyses techniques:





Exploratory Analysis

For those seeking more information about patterns and data distribution. This technique can be implemented either independently or serve as a jumping-off point for more advanced analyses.



Cluster-Outlier Analysis

For those curious to discover hot spots, cold spots, and spatial outliers in their data. This technique applies Anselin's Local Indicators of Spatial Association (LISA), [specifically the local Moran statistic](#), to identify clusters of values or find geographical outliers. For example, you can explore the distribution of taxi fees, finding which pick-up and drop-off locations often have the highest-paying passengers.

**Analysis module available in Foursquare Studio.*



Origin-Destination Analysis

For those looking to understand travel patterns for vehicles, trucks, bikes, or pedestrians, and identify the most prevalent trip routes. This technique generates connecting lines between two geographic points, enabling users to reveal traffic bottlenecks, faster delivery routes, popular routes to and from specific points of interest, and more.



Suitability Analysis

For those looking to evaluate the suitability of a location or area for a certain use. This analysis computes a suitability score based on a set of user-defined criteria and weights. It's most commonly used for site selection, enabling smarter investment and planning decisions.

**Analysis module available in Foursquare Studio.*



Spatio-temporal Analysis

For those interested in exploring movement or changes over time and space. Analyzing these two components can be challenging because while space has unlimited directions — up, down, sideways, North, South, East, West — time can only go forward. However, this analysis can unlock invaluable insight into ride-sharing journeys, climate change, and migration patterns.



Spatial Joins

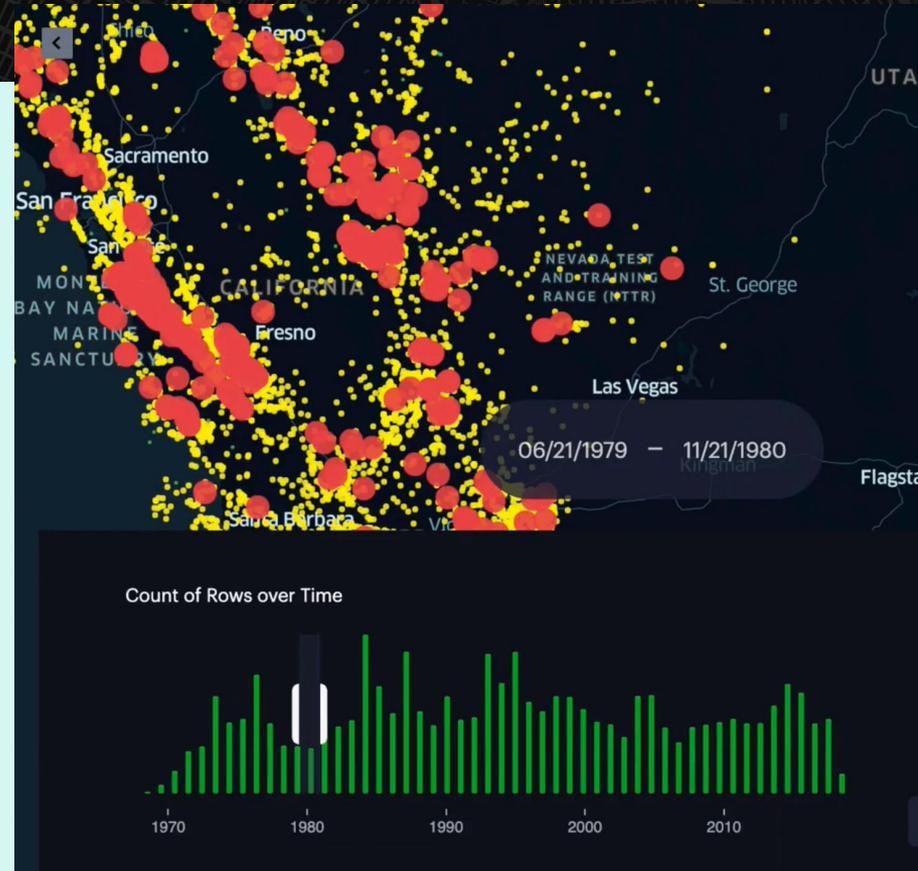
Spatial joins are the bread-and-butter of spatial analysis. This is a simple technique that combines attributes from one dataset to another based on their spatial relationship.

For example, let's say you wanted to know which Portland neighborhood has the most coffee shops. You could take two datasets: 1) POI data filtered by category: coffee shops (points) and 2) Portland neighborhood boundaries (polygons) and perform an Inner spatial join. Color the points by the neighborhood they reside in and you'll know where to go for your next cup of joe.

Tool Tip:

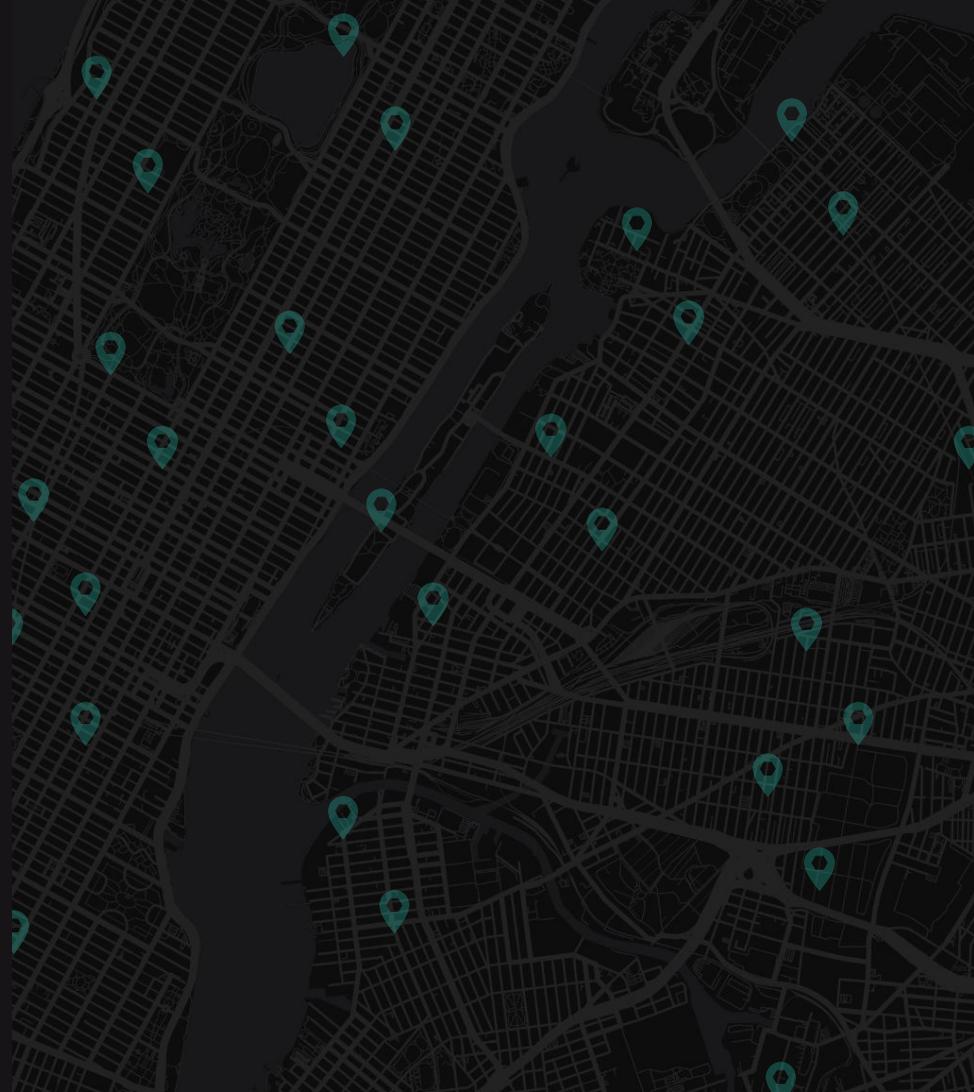
[Hex Tiles](#) are built to support and encode not only spatial data but also temporal data, enabling users to easily perform spatiotemporal analysis.

The system recognizes the time dimension so that users can smoothly animate and visualize their spatial data in Foursquare Studio over time.



STEP
04

Add visual flare



Add visual flare

Data visualization is the art of presenting data in a way that captures the viewer's attention and tells them what they need to know. It helps our audience see what would have otherwise been lost in other forms of raw data like tables or excel files – and it isn't achieved without adding some visual flare.



Color

Color is central to effective visualizations and map making. Which colors will distinguish between categories in your data? Which colors will highlight what's most important to the viewer? Which colors will make it easy to see differences between values?



Charts

While maps allow you to position your data in geographic context, sometimes you will need another medium to tell your data story. Consider charts as another element in your toolkit that can be used to supplement and strengthen visualization. [Line charts](#) can be added to showcase trends over time, while [bar charts](#) can be used to show categorical data.



3D Models

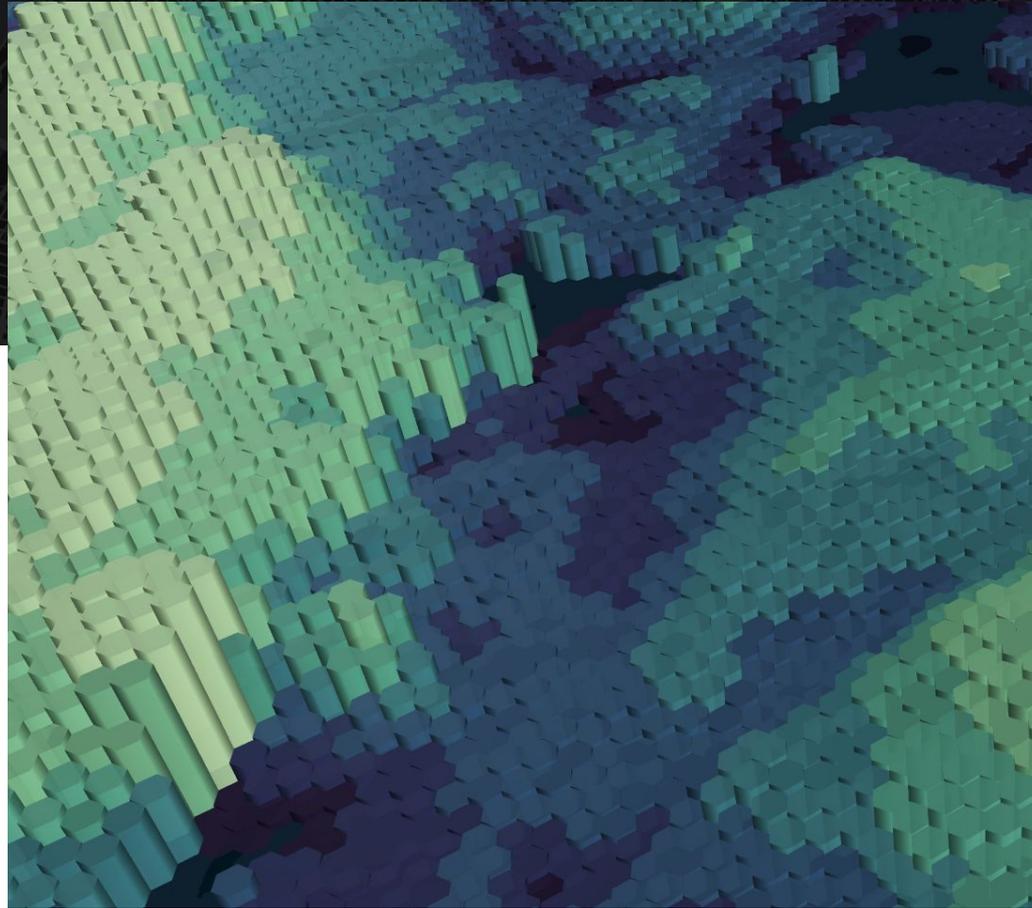
Take your visualization up another level with built-in 3D models. From airplanes, to trucks, to electric scooters, you're bound to find a model to fit your use case. They're especially suitable for businesses involved in mobility, transportation, and logistics.

Tool Tip:

Foursquare Studio provides 3 predefined color scale methods for creating thematic maps, i.e. a type of map that portrays the geographic pattern of a particular subject matter (theme) in a geographic area.

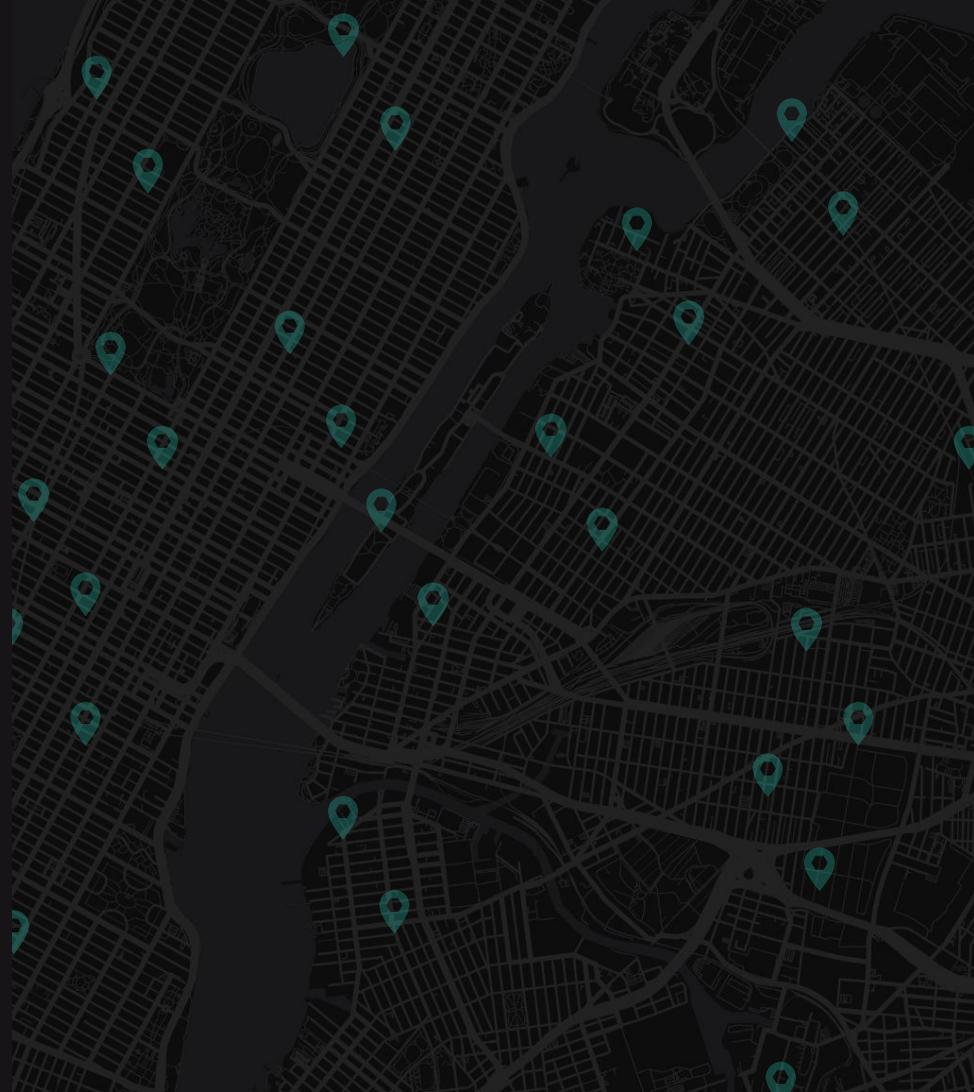
1. [Quantize](#)
2. [Quantile](#)
3. [Jenks Natural Breaks](#)

You might also create a custom color palette. In that case, [ColorBrewer](#) is a good resource to bookmark.



STEP
05

Share and iterate

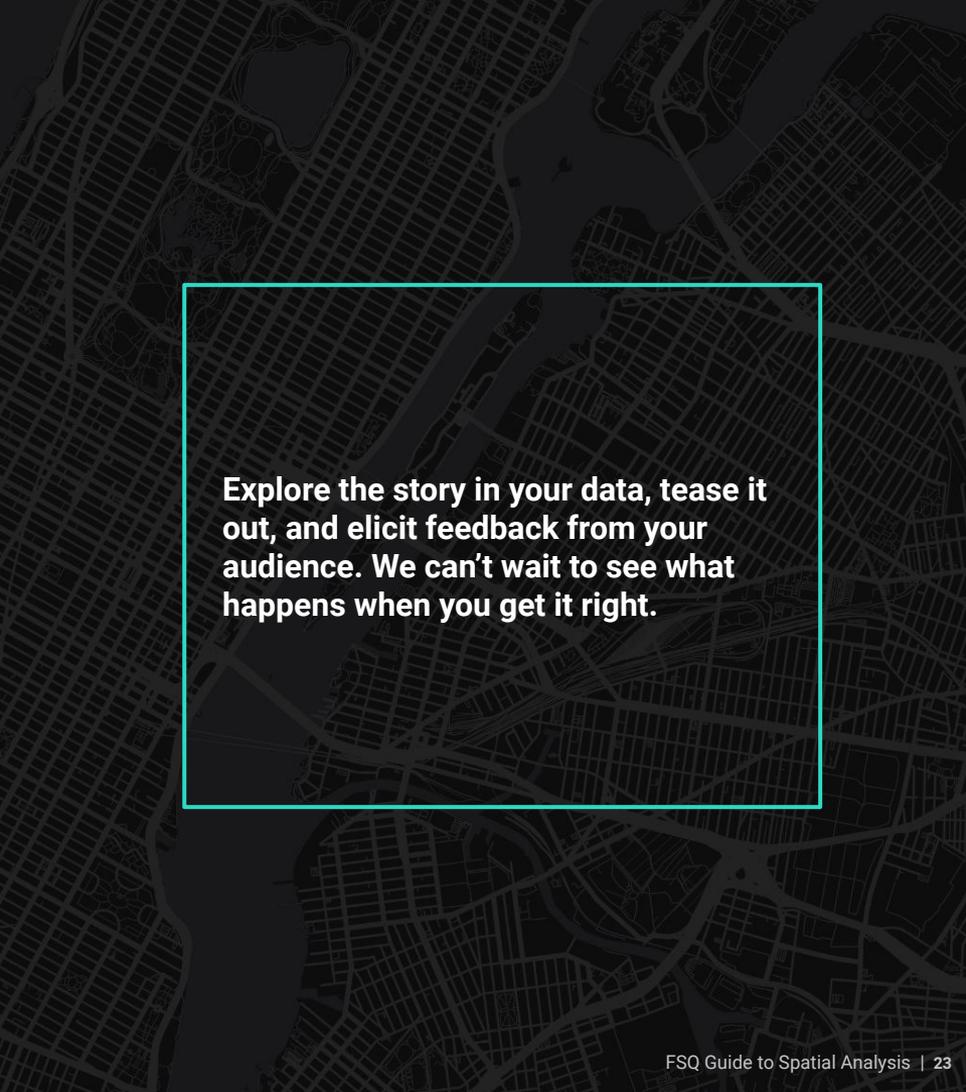


Share and iterate

Spatial analysis is rarely a linear process. Instead, it follows a more iterative, creative process: We ask a question, discover our first effort to answer it is incomplete, rework our approach, bring in new data, consult a domain expert, adjust our question, and so on. We might even get diverted to a more interesting tangent as the data reveals itself.

Iteration is the best way to find insight in your data, and the best way to share it with the people across your organization.

Having a time dimension in your data doesn't necessarily mean you should make a line chart. What if instead you built an animated playback of all the events over time? What will have the most impact?



Explore the story in your data, tease it out, and elicit feedback from your audience. We can't wait to see what happens when you get it right.



Learn more about Foursquare Studio on our website:

location.foursquare.com/products/studio/

Get started with your free account today!

studio.foursquare.com

