
# User Guide

## Group 2: Street Surfers

Ride-hailing Demand in Jakarta, Indonesia

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# 1 Introduction

Street Surfers is a Shiny Web Application which leverages a variety of geospatial analysis methods to study mobility patterns and traffic congestion in Jakarta. As a user of this application, it will take you through a variety of methods such as Kernel Density Estimate (KDE), Network Kernel Density Estimate (NKDE), Local Indicators of Spatial Autocorrelation (LISA), and Origin-Destination (OD) analysis to analyze ride-hailing demand and distribution across the city of Jakarta, the second-most congested city in Southeast Asia (INRIX 2023 Global Traffic Scorecard).

This app focuses on identifying in-demand ride-hailing zones, traffic bottlenecks and potential mobility trends around key Point-of-Interest (POI) categories. Regardless of their level of expertise, users can intuitively personalize analysis parameters. The application is widely flexible in terms of customizing trip data parameters, including: analysing at a city or district level, trip type, day of week, time cluster and custom parameters set in the different layers of analysis. Such an experience is facilitated with a click of a few buttons.

# 2 R Packages

The following list outlines the packages used in our application. When setting up your own application environment, you may encounter errors if any packages are deprecated or updated. If this happens, please report the issue to us by reaching out on the provided email addresses. Your feedback is valuable in helping us maintain and improve the application.

| Package | Version | Link |
|---|---|---|
| **shiny** | 1.9.1 | https://cran.r-project.org/package=shiny |
| **Bs4Dash** | 2.3.4 | https://cran.r-project.org/package=Bs4Dash |
| **Thematic** | 0.1.6 | https://cran.r-project.org/package=thematic |
| **ggplot2** | 3.5.1 | https://cran.r-project.org/package=ggplot2 |
| **dplyr** | 1.1.4 | https://cran.r-project.org/package=dplyr |
| **tidyr** | 1.3.1 | https://cran.r-project.org/package=tidyr |

| | | |
|---|---|---|
| **DT** | 0.33 | https://cran.r-project.org/package=DT |
| **plotly** | 4.10.4 | https://cran.r-project.org/package=plotly |
| **tmap** | 3.3-4 | https://cran.r-project.org/package=tmap |
| **shinyBS** | 0.61.1 | https://cran.r-project.org/package=shinyBS |
| **shinyWidgets** | 0.8.7 | https://cran.r-project.org/package=shinyWidgets |
| **sf** | 1.0-16 | https://cran.r-project.org/package=sf |
| **treemap** | 2.4-4 | https://cran.r-project.org/package=treemap |
| **tibble** | 3.2.1 | https://cran.r-project.org/package=tibble |
| **circlize** | 0.4.16 | https://cran.r-project.org/package=circlize |
| **spatstat** | 3.1.1 | https://cran.r-project.org/package=spatstat |
| **raster** | 3.6-26 | https://cran.r-project.org/package=raster |
| **spNetwork** | 0.4.4.3 | https://cran.r-project.org/package=spNetwork |
| **spdep** | 1.3-5 | https://cran.r-project.org/package=spdep |
| **sfdep** | 0.2.5 | https://cran.r-project.org/package=sfdep |
| **knitr** | 1.48 | https://cran.r-project.org/package=knitr |
| **kableExtra** | 1.4.0 | https://cran.r-project.org/package=kableExtra |
| **stplanr** | 1.2.2 | https://cran.r-project.org/package=stplanr |
| **sp** | 2.1-4 | https://cran.r-project.org/package=sp |
| **reshape2** | 1.4.4 | https://cran.r-project.org/package=reshape2 |
| **tidyverse** | 2.0.0 | https://cran.r-project.org/package=tidyverse |
| **plotly** | 4.10.4 | https://cran.r-project.org/web/packages/plotly/index.html |

# 3 Datasets

The following datasets were used for the application. We chose to keep the intermediate datasets used to a minimum to enable a dynamic user experience across all 3 main pages of analysis.

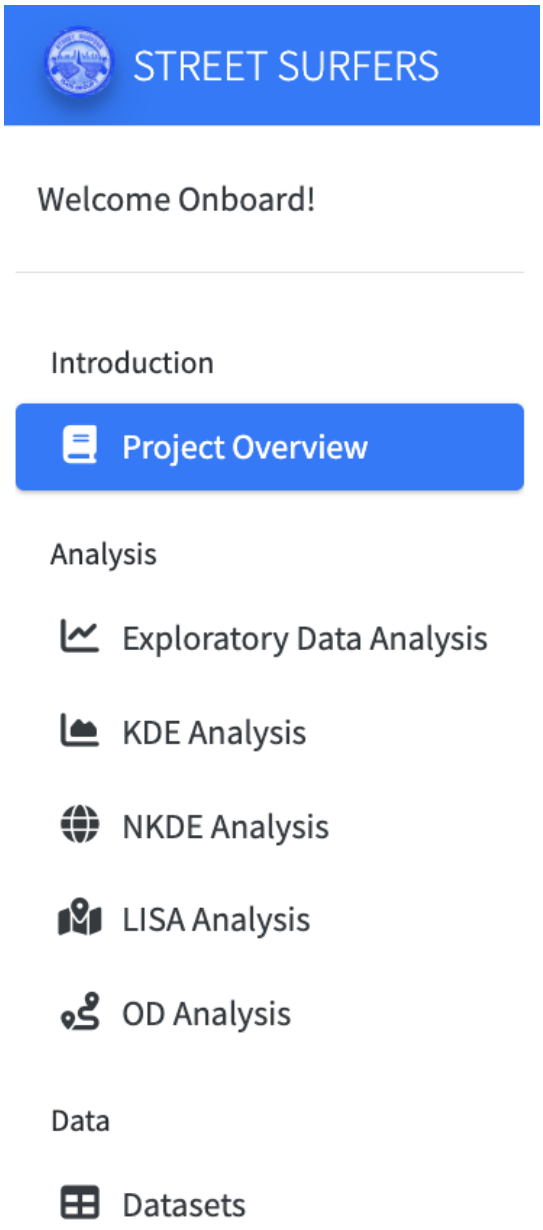
| Dataset | Description |
|---|---|
| trip_data | Main Dataset providing trip trajectory data, with details on:<br><br>• **trajectory_id**: A unique identifier for each trip trajectory.<br>• **driving_mode**: The mode of transportation used during the trip.<br>• **origin_time**: The starting time of the trip.<br>• **destination_time**: The ending time of the trip.<br>• **total_duration**: The trip duration, measured in minutes.<br>• **total_distance**: The total distance covered during the trip, measured in kilometers.<br>• **average_speed**: The average speed during the trip, measured in kilometers per hour (km/h).<br>• **origin_latitude** and **origin_longitude**: The geographical coordinates of the trip's starting point.<br>• **destination_latitude** and **destination_longitude**: The geographical coordinates of the trip's ending point.<br>• **origin_village** and **destination_village**: The specific villages where the trip starts and ends.<br>• **origin_district** and **destination_district**: The districts where the trip starts and ends.<br>• **origin_day** and **destination_day**: The day of the week when the trip starts and ends.<br>• **origin_hour** and **destination_hour**: The hour of the day when the trip starts and ends.<br>• **origin_time_cluster** and **destination_time_cluster**: Clustered time periods representing the trip's start and end times. |
| jakarta_poi_final | Aggregated Points-of-Interest (POI) Dataset for the whole of Indonesia with the following fields:<br><br>• **poi_name:** Name of Point of Interest<br>• **province** [Filtered to Jakarta Only]<br>• **village:** Village where POI is located<br>• **district:** District where POI is located<br>• **category:** Either one of the 9:<br>  ○ "Facilities_Services"<br>  ○ "Essentials"<br>  ○ "Offices_Business" |

| | |
|---|---|
| | ○ "Cultural_Attractions"<br>○ "Restaurants_Food"<br>○ "Recreation_Entertainment"<br>○ "Others"<br>○ "Shops"<br>○ "Tourism_Spots"<br>• **poi_type:** sub-categories of POIs<br>• **geometry:** POINT Geometry of POIs |
| jakarta_district | The dataset contains polygon features representing the boundaries of all 44 districts within Jakarta, with the following fields<br><br>• **district**: Name of district in Jakarta<br>• **province:** Jakarta<br>• **geometry:** POLYGON Geometry of District |
| jakarta_village | The dataset contains polygon features representing the boundaries of all 263 districts within Jakarta, with the following fields:<br><br>• **district**: Name of district in Jakarta<br>• **village:** Name of village within the district<br>• **province:** Jakarta<br>• **geometry:** POLYGON Geometry of Village |
| jakarta_district_population | This dataset provides population data and demographics at the district level in Jakarta, including total population, age distribution, and geographic boundaries.<br><br>**Fields:**<br><br>• **district**: Name of district in Jakarta<br>• **province**: Jakarta<br>• **total_population**: Total Number of people living in the district<br>• **student**: The number of students in the village.<br>• **working_adult**: Number of Working Adults based on Age Group<br>• **age_0**, **age_5**, **age_10**, ..., **age_75**: Age distribution of the population in 5-year intervals.<br>• **geometry**: POLYGON Geometry |
| jakarta_village_population | This dataset provides detailed population statistics for each village in Jakarta, including age distribution, student and working adult counts, and geographic boundaries. |

| | |
|---|---|
| | **Fields:**<br><br>• **district**: Name of district in Jakarta<br>• **province**: Name of village within Jakarta district<br>• **province**: Jakarta<br>• **total_population**: Total number of people living in the village<br>• **student**: The number of students in the village.<br>• **working_adult**: Number of Working Adults based on Age Group<br>• **age_0**, **age_5**, **age_10**, ..., **age_75**: Age distribution of the population in 5-year intervals.<br>• **geometry**: POLYGON Geometry |
| jakarta_roads | This dataset is used for NKDE, providing detailed information about Jakarta's road networks, reference identifier and important features.<br><br>**Fields:**<br><br>• **osm_id**: A unique identifier for each road segment from OpenStreetMap.<br>• **code**: The classification code for the road.<br>• **fclass**: The functional class of the road (e.g., primary, secondary).<br>• **name**: The name of the road.<br>• **ref**: Reference code or identifier for the road.<br>• **oneway**: Indicates whether the road is one-way (TRUE or FALSE).<br>• **maxspeed**: The maximum speed limit allowed on the road.<br>• **layer**: The vertical layer of the road (e.g., elevated, underground).<br>• **bridge**: Indicates if the road segment is a bridge (TRUE or FALSE).<br>• **tunnel**: Indicates if the road segment is a tunnel (TRUE or FALSE).<br>• **district**: The district where the road is located.<br>• **province**: The province where the road is located.<br>• **village**: The village where the road is located.<br>• **geometry**: LINESTRING Geometry |

# 4 UI and Tabs

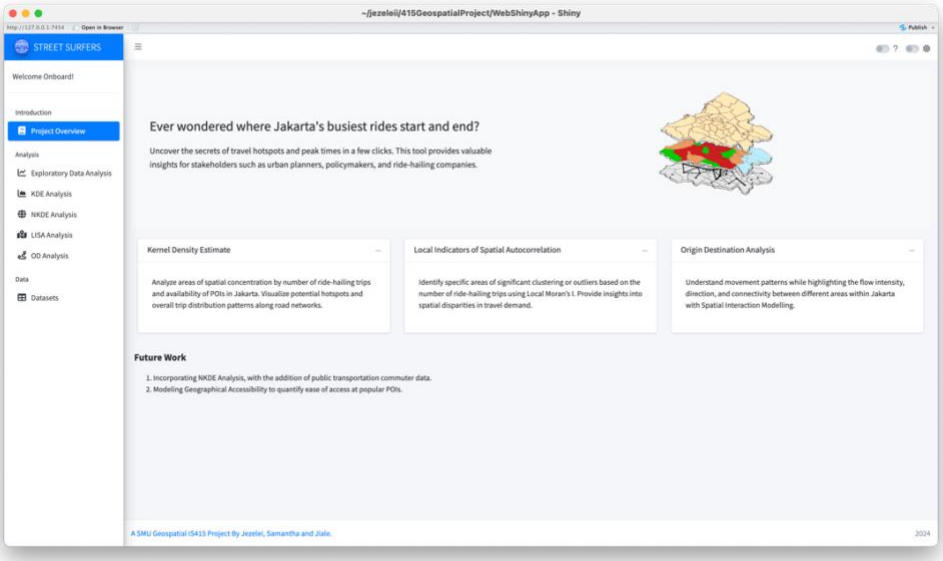
Upon start-up, you will be brought to a homepage, with 7 tabs on the sidebar:




Each page and subpages consist of different level of analysis:

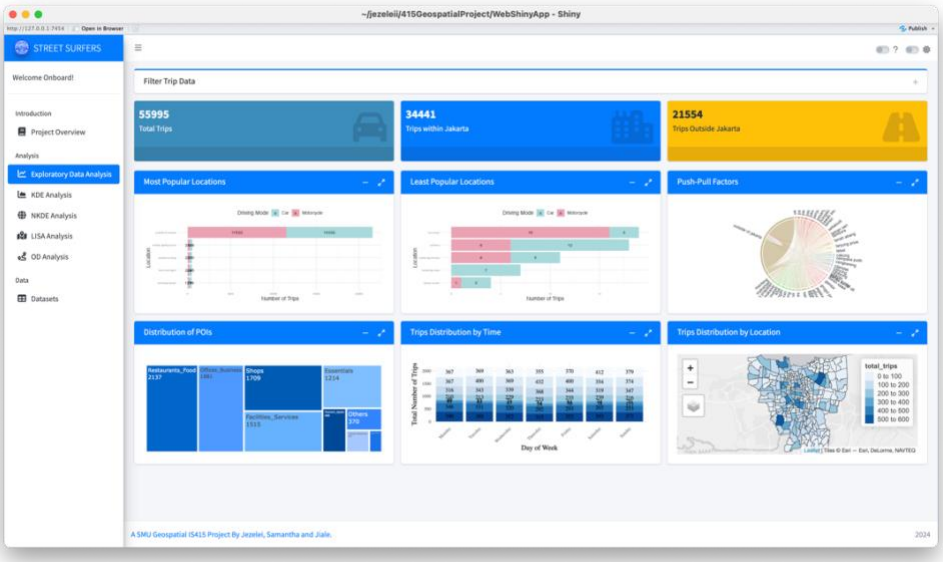
## Project Overview

The default loading page of the app, the Project Overview briefly introduces the different layers of analysis the user can explore within our ShinyApp and their purposes.



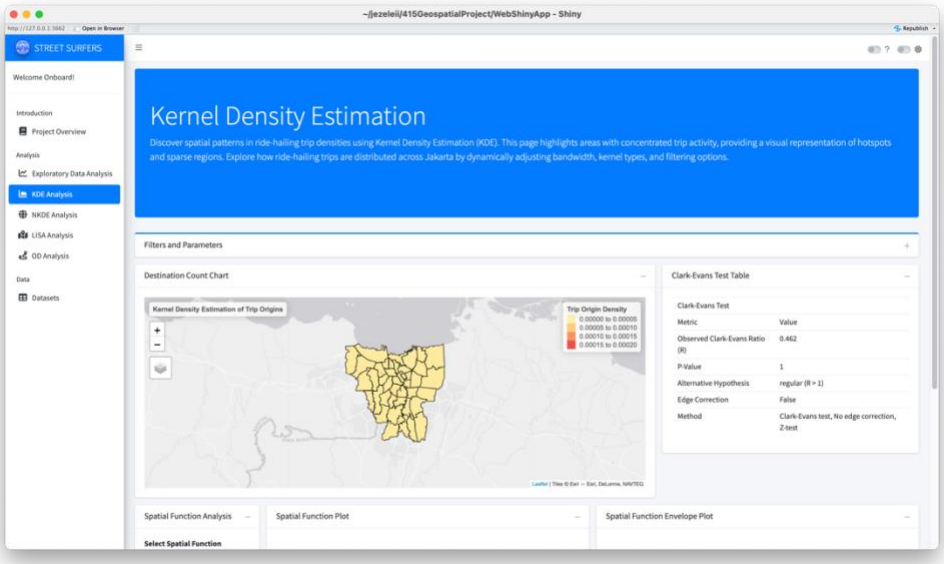

## Exploratory Data Analysis (EDA)

This page enables the user to gain quick insights into the distribution of trips, driving mode, propulsive and attractive factors of trips within the districts



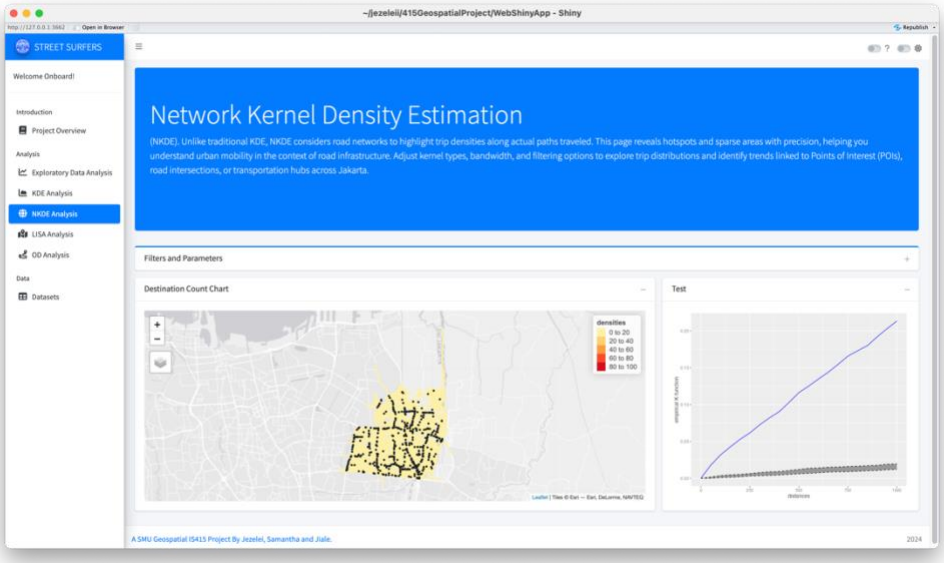
## Kernel Density Estimate (KDE)

This page explores spatial concentrations of ride-hailing trips in relation to the distribution of POIs across Jakarta. It highlights potential hotspots and visualizes trip patterns, emphasizing density along key road networks.



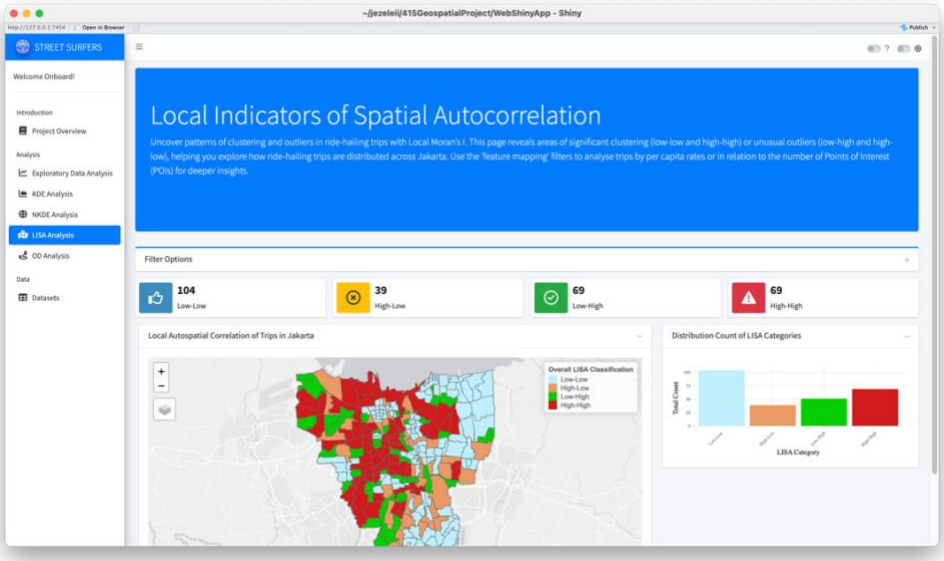

## Network Kernel Density Estimate (NKDE)

This page is used to map the density of ride-hailing trips along Jakarta's road networks, highlighting how trip activity can uncover network-specific hotspots.



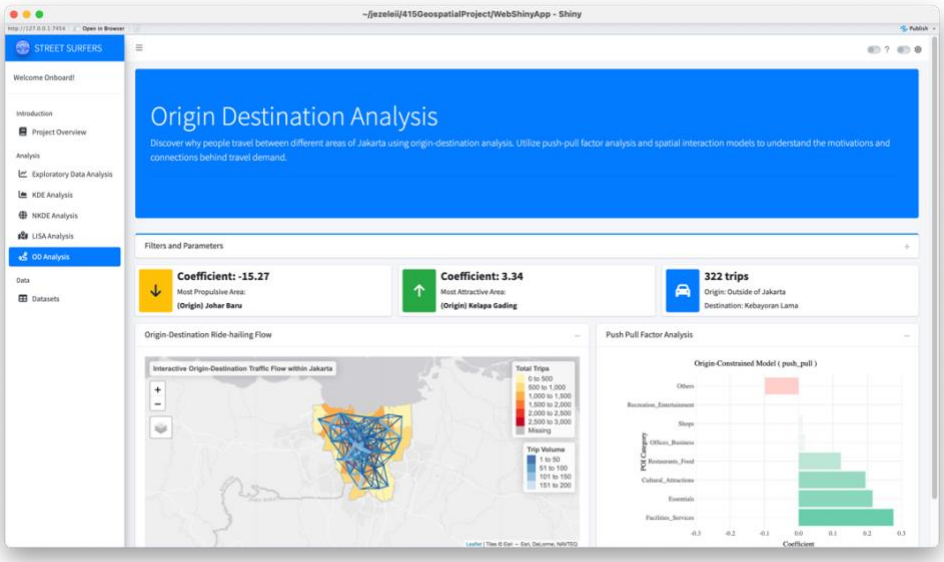
### Local Indicators of Spatial Autocorrelation (LISA)

This page utilizes Local Moran's I to identify areas of significant clustering or anomalies in ride-hailing trip activity. It provides insights into spatial variations in travel demand and highlights localized patterns or disparities.

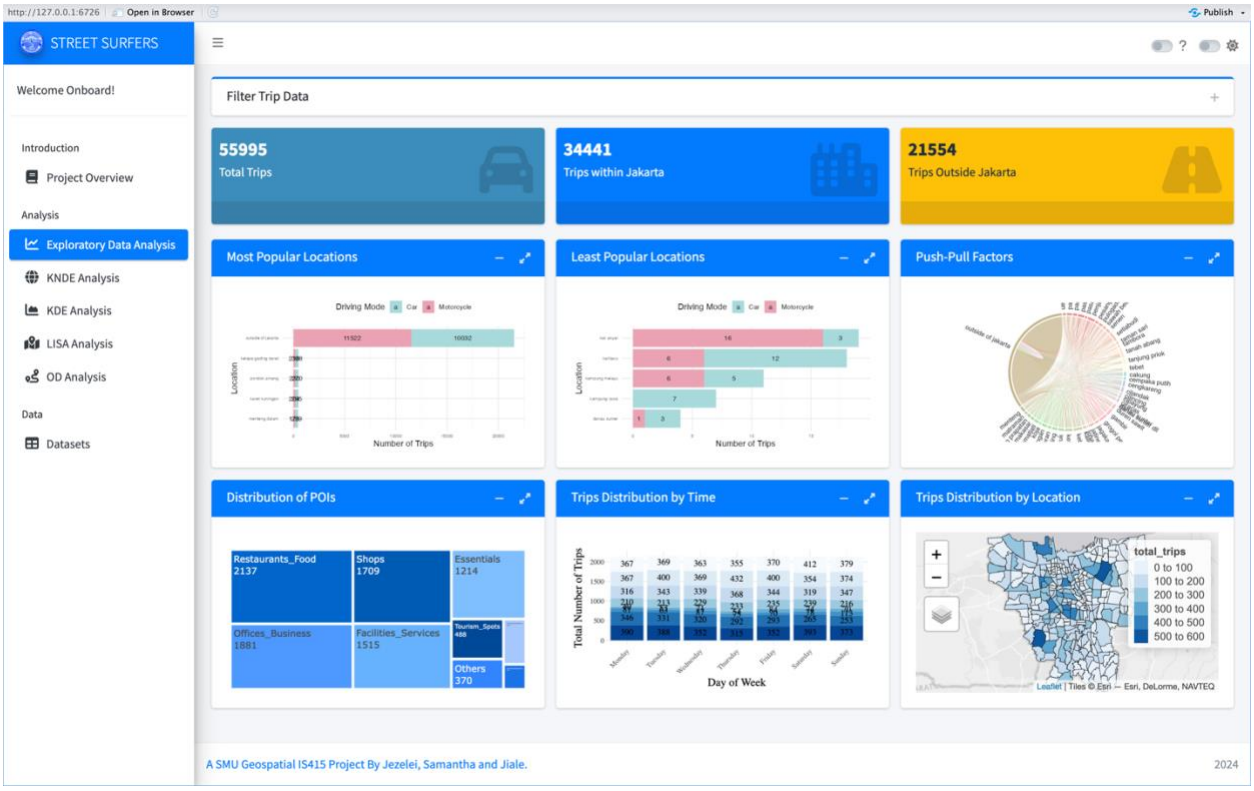



### Origin Destination (OD) Analysis

This page uses Spatial Interaction Modelling to analyse movement patterns in Jakarta, emphasizing flow intensity, and connectivity between different districts or villages.



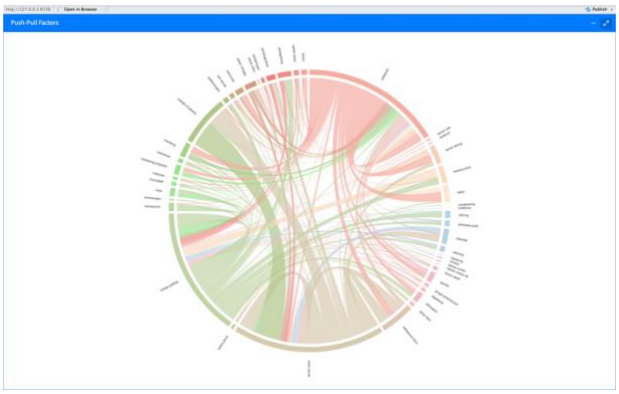
# 5 Exploratory Data Analysis (EDA)




This section provides users with an interactive and detailed exploration of the trips dataset, segmented into six key visualizations to enhance understanding.

**Key Features:**

1. Filters & Parameters
2. Most Popular Locations
3. Least Popular Locations
4. Push-Pull Factors
5. Distribution of POIs
6. Trips Distribution by Time
7. Trips Distribution by Location




Additionally, sub-components are collapsible or expandable, to enable the viewers to have smoother experience when toggling or viewing the resultant change to the graphs, or when trying to view the visualizations in greater detail. The following image on the left illustrates an expanded version of Visualization #3, Push-Pull Factor Chord Diagram.

## 5.1 EDA Charts

To create a new analysis, you can follow these steps after expanding the 'Filter Trip Data' Tab:

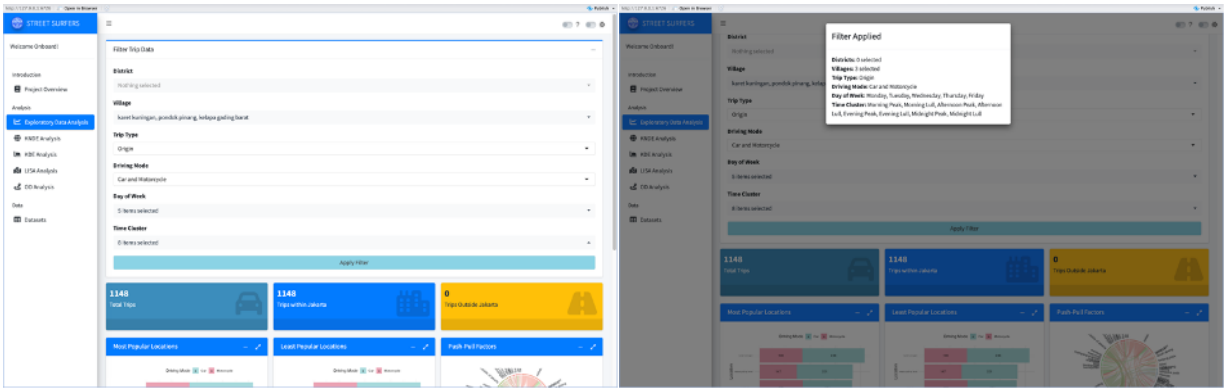
1. Select Districts / Villages
2. Select Trip Type:  Origin or Destination
3. Select Driving Mode: Car, Motorcycle or Car and Motorcycle
4. Select Day of Week
5. Select Time Cluster

**'Filter by Trips' Calibration Options**

| Parameter | Options | Input Type |
|---|---|---|
| District | All 44 Districts in Jakarta, "Outside of Jakarta" | Multi-select, Dropdown with search functionality |
| Village | All 263 Villages in Jakarta, "Outside of Jakarta" | Multi-select, Dropdown with search functionality |
| Trip Type | "Origin",<br>"Destination", | Single select, Dropdown |
| Driving Mode | "Car",<br>"Motorcycle",<br>"Car & Motorcycle", | Single select, Dropdown |
| Day of Week | "Monday", "Tuesday",<br>"Wednesday", "Thursday",<br>"Friday", "Saturday", "Sunday" | Multi-select, Dropdown |
| Time Cluster | "Morning Peak", "Morning Lull",<br>"Afternoon Peak", "Afternoon Lull",<br>"Evening Peak", "Evening Lull",<br>"Midnight Peak", "Midnight Lull" | Multi-select, Dropdown |

*Note: The 'Filter by Trips' feature is also present on other analysis pages (KDE, NKDE, LISA, and OD). However, changes made on one page are localized and do not affect the others.*

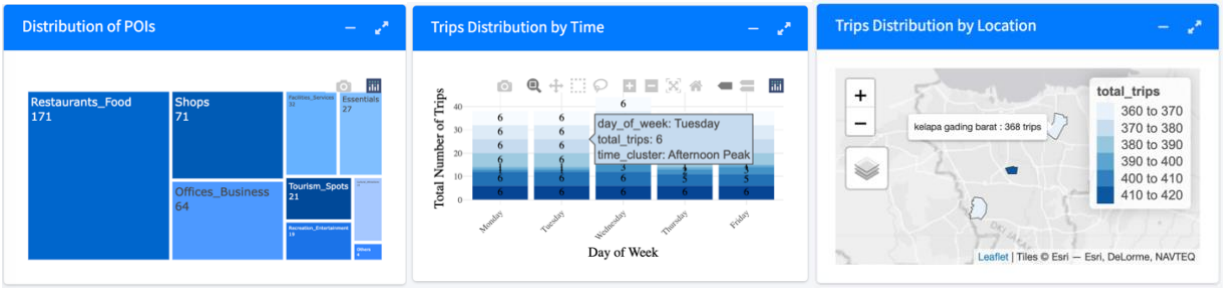
For this example, the following parameters were applied: *Karet Kuningan, Kelapa Gading Barat, Pondong Pinang* (3 most popular villages) shown in the default load, and narrowed it down to Weekdays (Monday to Friday). As shown below, there will be a confirmation modal to certify the filters applied to the updated view.



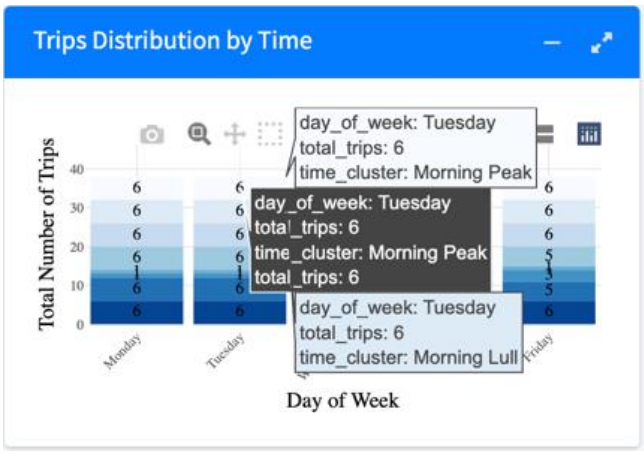
## 5.2 Interpretation of Results

1. KPI Cards will automatically update its numbers, along with the other charts.


2. For further information, the user can hover on the cards to view a detailed breakdown of counts and other associated details.

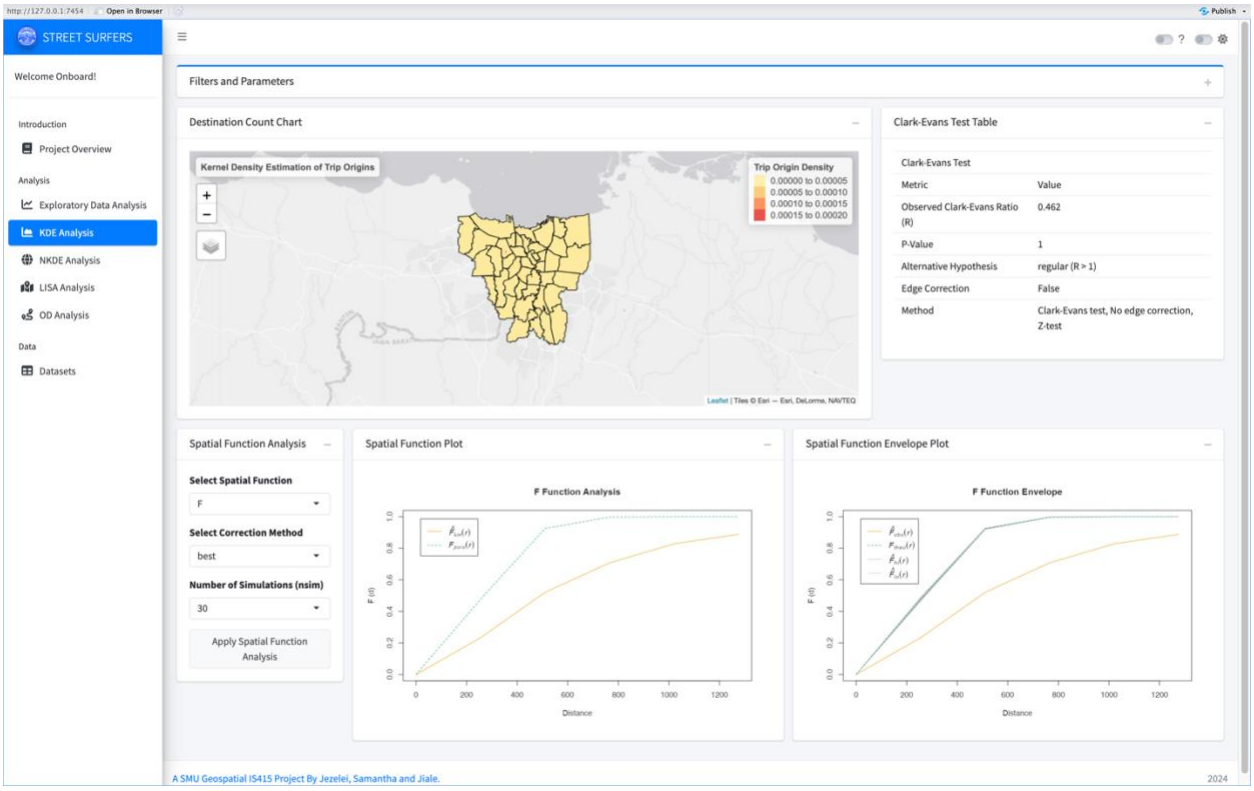



3. For "Distribution of POIs" and "Trips Distribution by Time", there are additional tools available to the user provided by Plotly, such as:




a. Download plot as PNG
b. Zoom
c. Pan
d. Box Select
e. Lasso Select
f. Auto scale
g. Compare data on hover

# 6 Kernel Density Estimate (KDE)

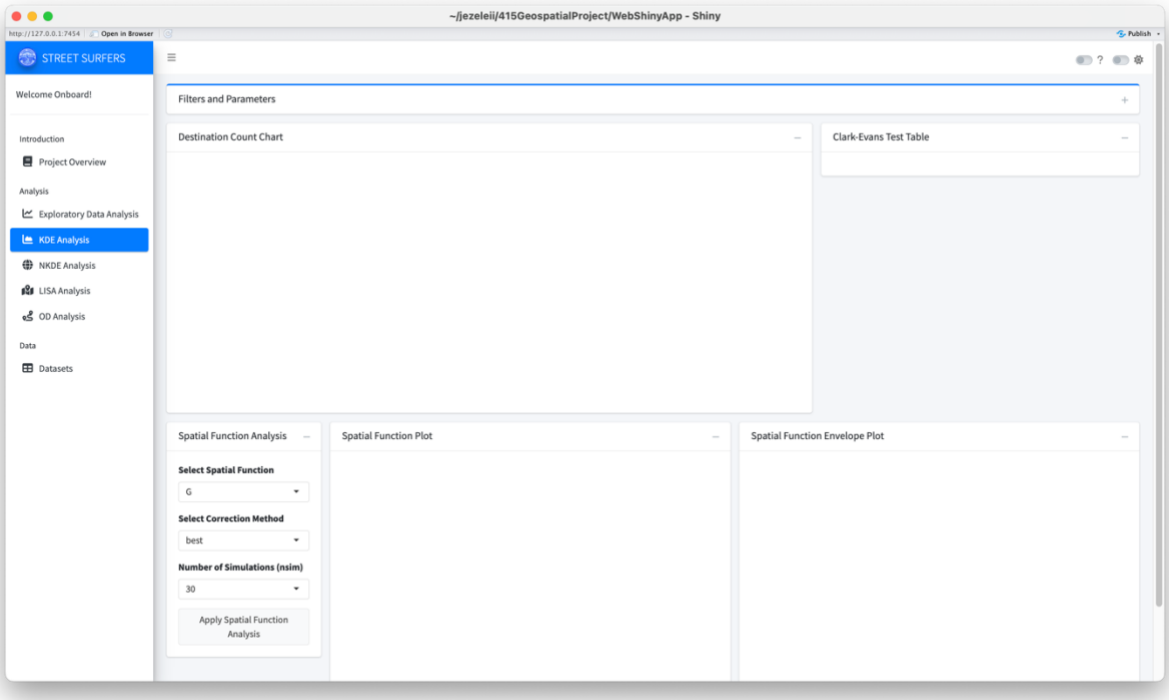



KDE allows users to explore spatial distribution of trip origins or destinations, and visualize density patterns across two different levels: the whole of Jakarta or on an individual district level. By doing so, users can identify hotspots or low-density areas which helps in establishing which areas they can focus on for further analysis.

**Key Features:**

1. Filters & Parameters
2. Density Count Chart
3. Clark-Evans Test Table
4. Spatial Function Analysis
5. Spatial Function Plot
6. Spatial Function Envelope Plot

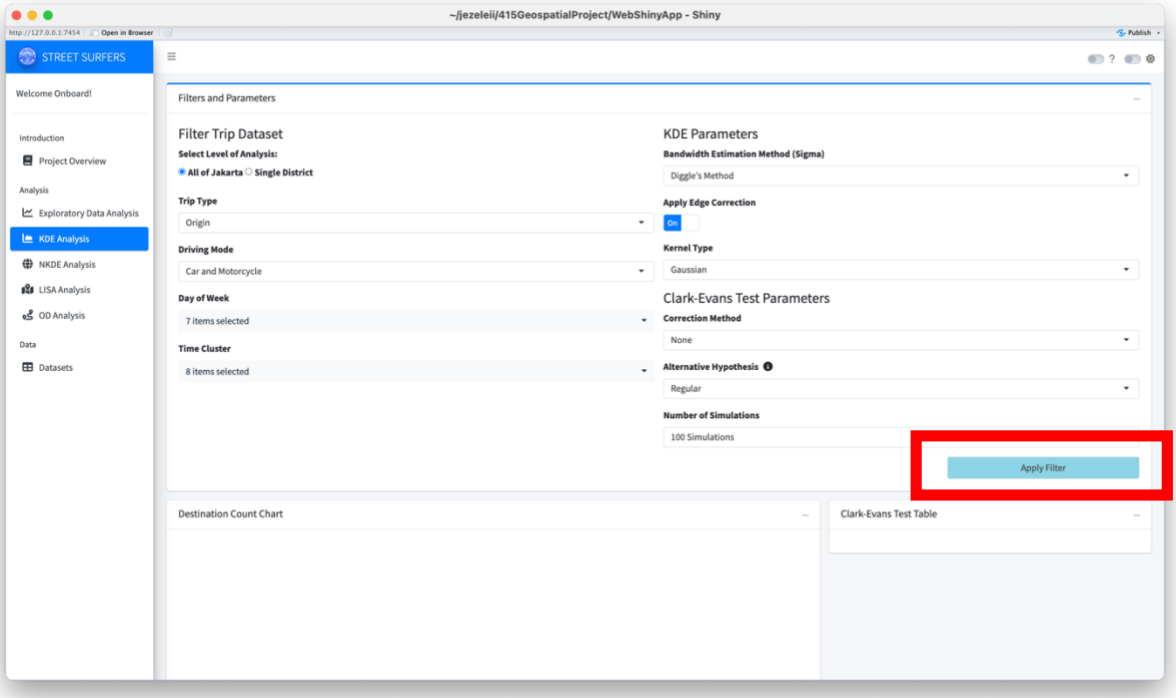
## 6.1 Destination Count Chart & Clark-Evans Test Table



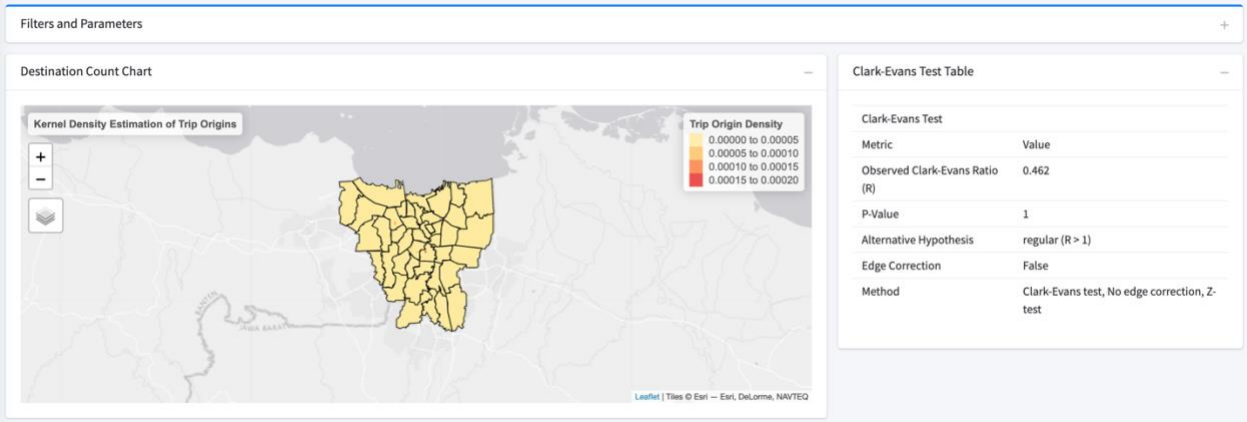

Upon application start-up, when you navigate to KDE, it should give you an empty page. To create a new analysis, you can follow these steps after expanding the Filter Tab:

| Filter Trip Dataset |
|---|
| 1. Select Level of Analysis<br>2. Select Trip Type<br>3. Select Driving Mode<br>4. Select Day of Week<br>5. Select Time Cluster |
| KDE Parameters |
| 6. Select Bandwidth Estimation Method<br>7. Apply Edge Correction (Optional)<br>8. Select Kernel Type |
| Clark-Evans Test Parameters |
| 9. Select Correction Method<br>10. Select Alternative Hypothesis<br>11. Select Number of Simulations<br>**12. Click 'Apply Filter"** |

If no configuration is changed, this will be the default pre-selected Filters:




The default output is as follows:



# 6.2 ‘Filters & Parameters’ Calibration Options

### Filter Trip Dataset

| Parameter | Options | Input Type |
|---|---|---|
| Select Level of Analysis | “All of Jakarta”,<br>“Single District” | Radio-select<br>*Additional Field of “Select District” is made available, which is a multi-select with search functionality. |
| Trip Type | "Origin",<br>"Destination", | Single select, Dropdown |
| Driving Mode | "Car",<br>"Motorcycle",<br>"Car & Motorcycle", | Single select, Dropdown |
| Day of Week | "Monday", "Tuesday",<br>"Wednesday", "Thursday",<br>"Friday", "Saturday", "Sunday" | Multi-select, Dropdown |
| Time Cluster | "Morning Peak", "Morning Lull",<br>"Afternoon Peak", "Afternoon Lull",<br>"Evening Peak", "Evening Lull",<br>"Midnight Peak", "Midnight Lull" | Multi-select, Dropdown |

### KDE Parameters

| Parameter | Options | Input Type |
|---|---|---|
| Bandwidth Estimation Method (Sigma) | “Diggle’s Method”,<br>“Pilot Density Method”,<br>“Scott’s Rule”,<br>“Cosslett and Van Loon’s Rule” | Single-select, Dropdown |
| Apply Edge Correction | “On”, “Off” | Toggle |
| Kernel Type | “Gaussian”, “Epanechnikov”,<br>“Disc”, “Quartic” | Single-select, Dropdown |

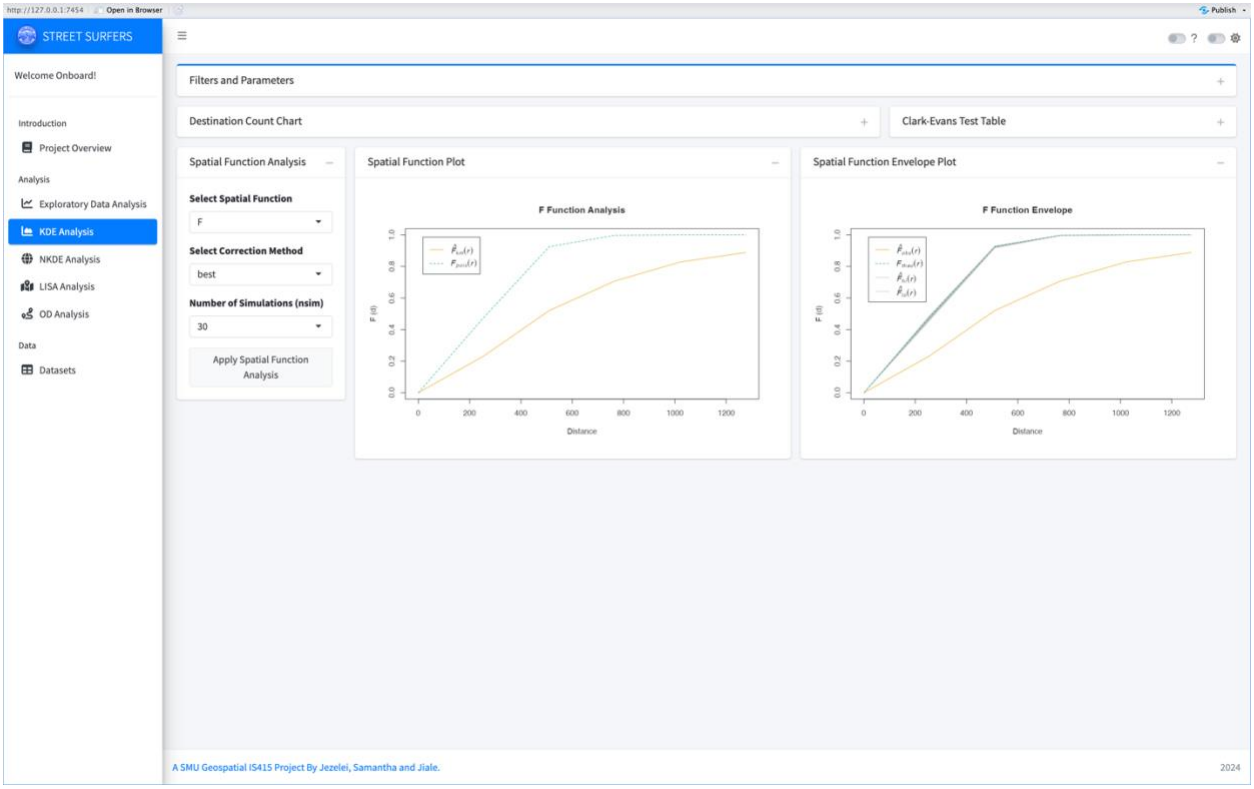
### Clark-Evans Test Parameters

| Parameter | Options | Input Type |
|---|---|---|
| Correction Method | “None”,<br>“Guard Region”,<br>“Cumulative Distribution Function” | Single select, Dropdown |
| Alternative Hypothesis | “Regular”, “Clustered”,<br>“Two-sided”, “Less”, “Greater” | Single select, Dropdown |
| Number of Simulations | “30 Simulations”,<br>“100 Simulations”,<br>“200 Simulations”,<br>“500 Simulations”, | Single select, Dropdown |

# 6.3 Spatial Function Analysis:

Further analysis can be generated with the following steps:

1. Select Spatial Function
2. Select Correction Method
3. Number of Simulations (nsim)
4. Click 'Apply Spatial Function Analysis'




### 'Spatial Function Analysis' Calibration Options

| Parameter | Options | Input Type |
|---|---|---|
| Select Spatial Function | "F",<br>"G" | Single select, Dropdown |
| Select Correction Method | "none",<br>"border",<br>"rs",<br>"km",<br>"han",<br>"best" | Single select, Dropdown |
| Number of Simulations (nsim) | "30","100",<br>"200","500" | Single select, Dropdown |

## 6.4 Interpreting Results

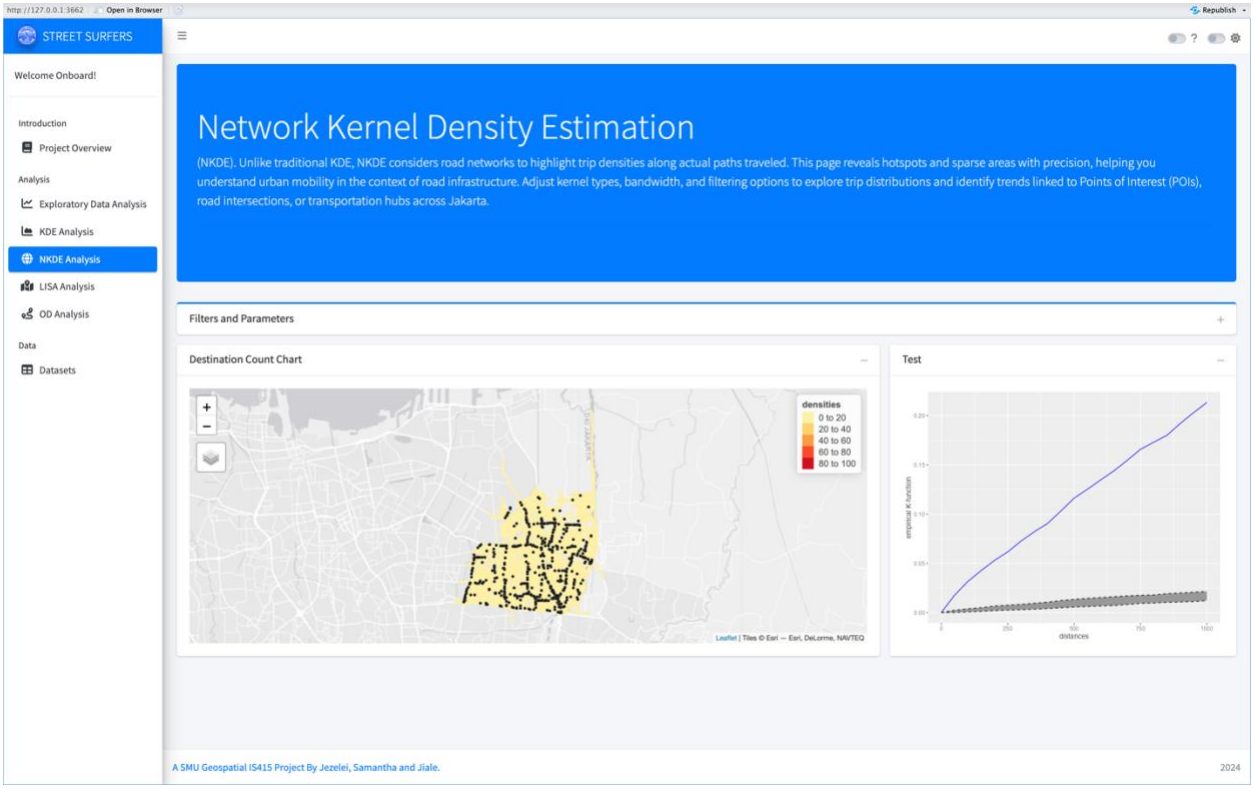
**How to interpret the KDE dashboard**

1. Clark-Evans Test (Observed Ratio):
    a. **R = 1**: The pattern is consistent with complete spatial randomness (CSR).
    b. **R < 1**: The points are **clustered** (points are closer together than expected).
    c. **R > 1**: The points are **regular** or evenly spaced (points are farther apart than expected).

2. The F-Function measures the distance between a randomly selected trip point (origin coordinates or destination coordinates depending on trip type).
    a. If the trips are regularly spaced, the F-function will have a gentler rise as randomly selected trips will generally be further from observed events
    b. If the trips are clustered, the F-function will have a steeper rise as tend to be closer to observed events.

3. The G-Function measures the distribution of distances between each observed trip and its nearest neighbour
    a. If the events are regularly spaced, the F-function will have a gentler rise as events tend to be spaced further apart
    b. If the events are clustered, the G-function will have a steeper rise

# 7 Network Kernel Density Estimate (NKDE)

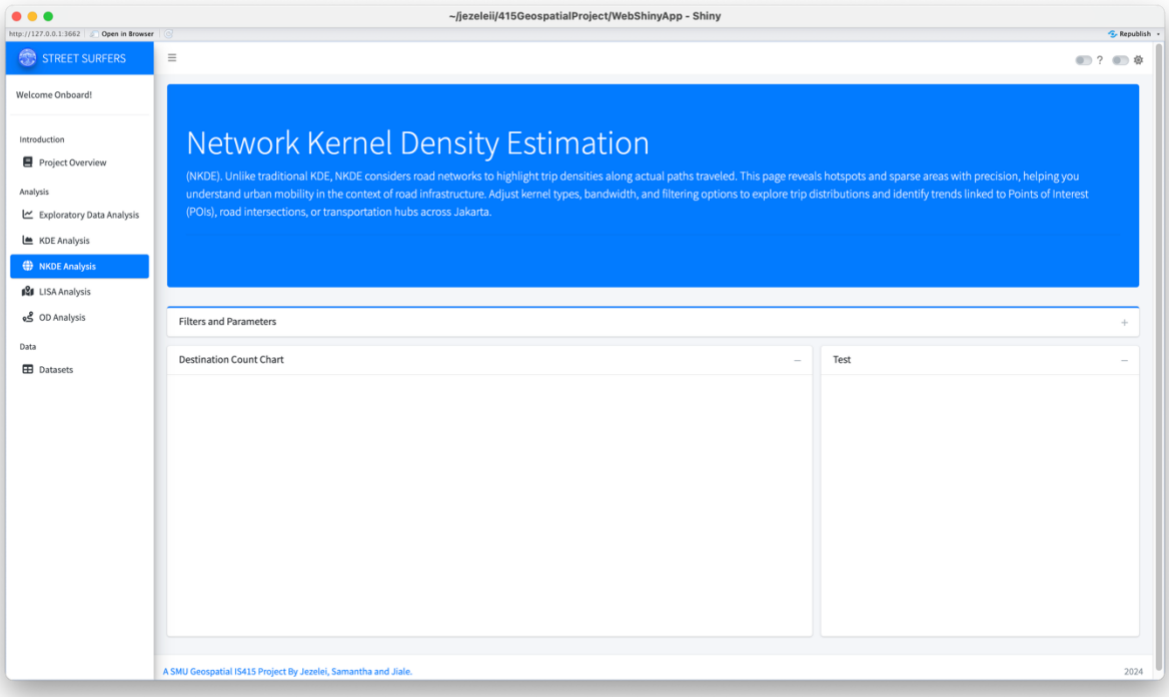



Network KDE allows users to analyse the spatial distribution of trip patterns constrained by road networks, useful for understanding trip volume intensity within formal and informal road networks in Jakarta.

**Key Features:**

1. Filters & Parameters
2. Density Count Chart
3. Test Table

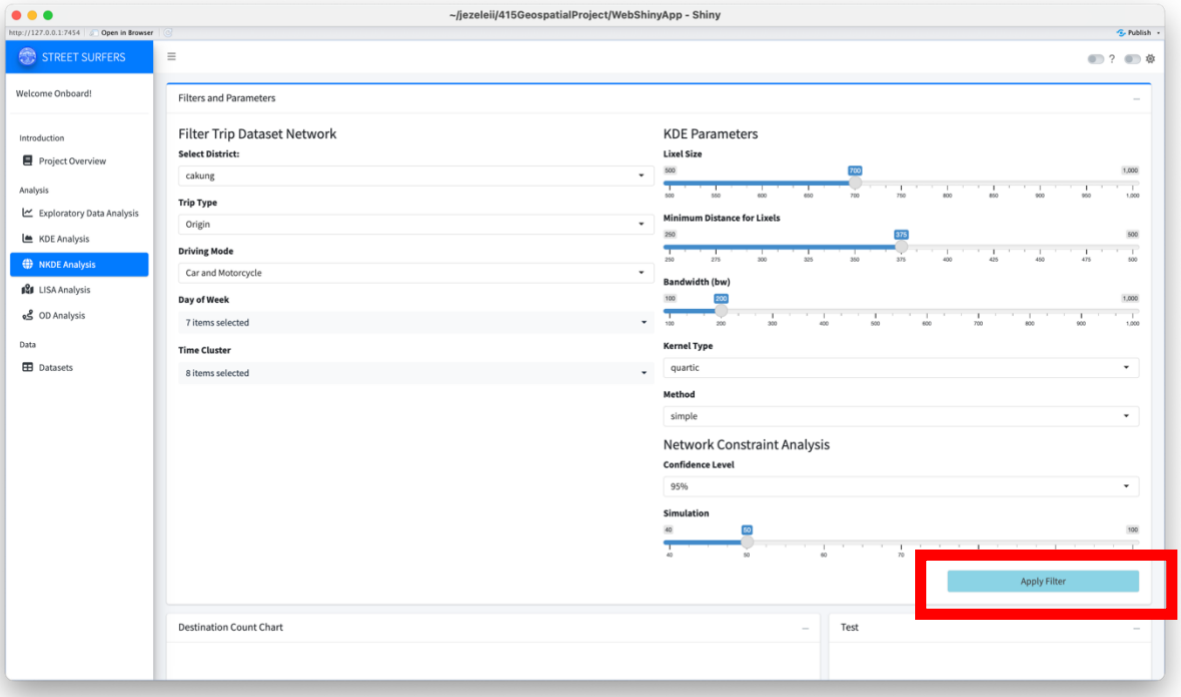
## 7.1 Destination Count Chart & Test Table



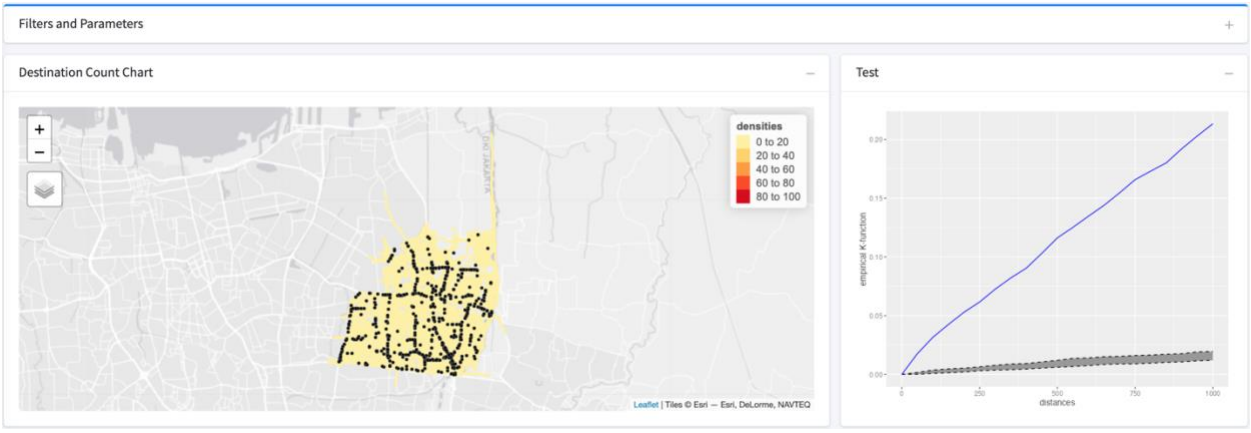

Upon application start-up, when you navigate to NKDE, it should give you an empty page as shown above. To create a new analysis, you can follow these steps after expanding the Filters & Parameters Tab:

| Filter Trip Dataset |
|---|
| 1. Select Level of Analysis<br>2. Select Trip Type<br>3. Select Driving Mode<br>4. Select Day of Week<br>5. Select Time Cluster |
| KDE Parameters |
| 6. Select Lixel Size<br>7. Select Minimum Distance for Lixels<br>8. Select Bandwidth (bw)<br>9. Select Kernel Type<br>10. Select method |
| Network Constraint Analysis |
| 11. Select Confidence Level<br>12. Select Number of Simulations (nsim)<br>**13. Click on 'Apply Filter'** |

If no configuration is changed, this will be the default pre-selected Filters:




The default output is as follows:



# 7.2 ‘Filters & Parameters’ Calibration Options

### Filter Trip Dataset Network

| Parameter | Options | Input Type |
|---|---|---|
| Select Level of Analysis | “All of Jakarta”,<br>“Single District” | Radio-select<br>*Additional Field of “Select District” is made available, which is a multi-select with search functionality |
| Trip Type | "Origin",<br>"Destination", | Single select, Dropdown |
| Driving Mode | "Car",<br>"Motorcycle",<br>"Car & Motorcycle", | Single select, Dropdown |
| Day of Week | ""Monday", "Tuesday",<br>"Wednesday", "Thursday",<br>"Friday", "Saturday", "Sunday" | Multi-select, Dropdown |
| Time Cluster | "Morning Peak", "Morning Lull",<br>"Afternoon Peak", "Afternoon Lull",<br>"Evening Peak", "Evening Lull",<br>"Midnight Peak", "Midnight Lull" | Multi-select, Dropdown |

### KDE Parameters

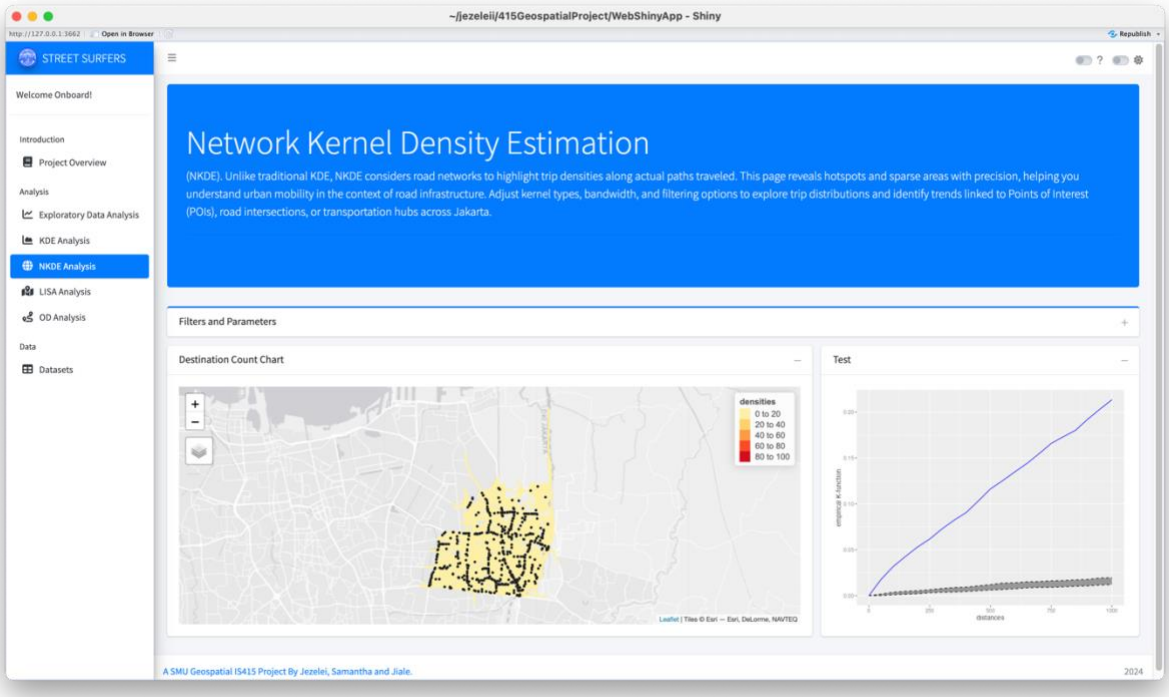
| Parameter | Options | Input Type |
|---|---|---|
| Lixel Size | Range: “500” – “1000”<br>Step: “100” | Slider Input with Steps |
| Minimum Distance for Lixels | Range: “250” – “500”<br>Step: “25” | Slider Input with Steps |
| Bandwidth (bw) | Range: “100” – “1000”<br>Step: “100” | Slider Input with Steps |
| Kernel Type | “Quartic” , “Triangle”,<br>“Epanechnikov”, “Gaussian”,<br>“Tricube”, “Uniform” | Single-select, Dropdown |
| Method | “Simple”,<br>“Discrete”,<br>“Continuous” | Single-select, Dropdown |

### Network Constraint Analysis

| Parameter | Options | Input Type |
|---|---|---|
| Confidence Level | “95%”, “90%”, “99%” | Single select, Dropdown |
| Number of Simulations | Range: “40” – “100”<br>Step: “10” | Slider Input with Steps |

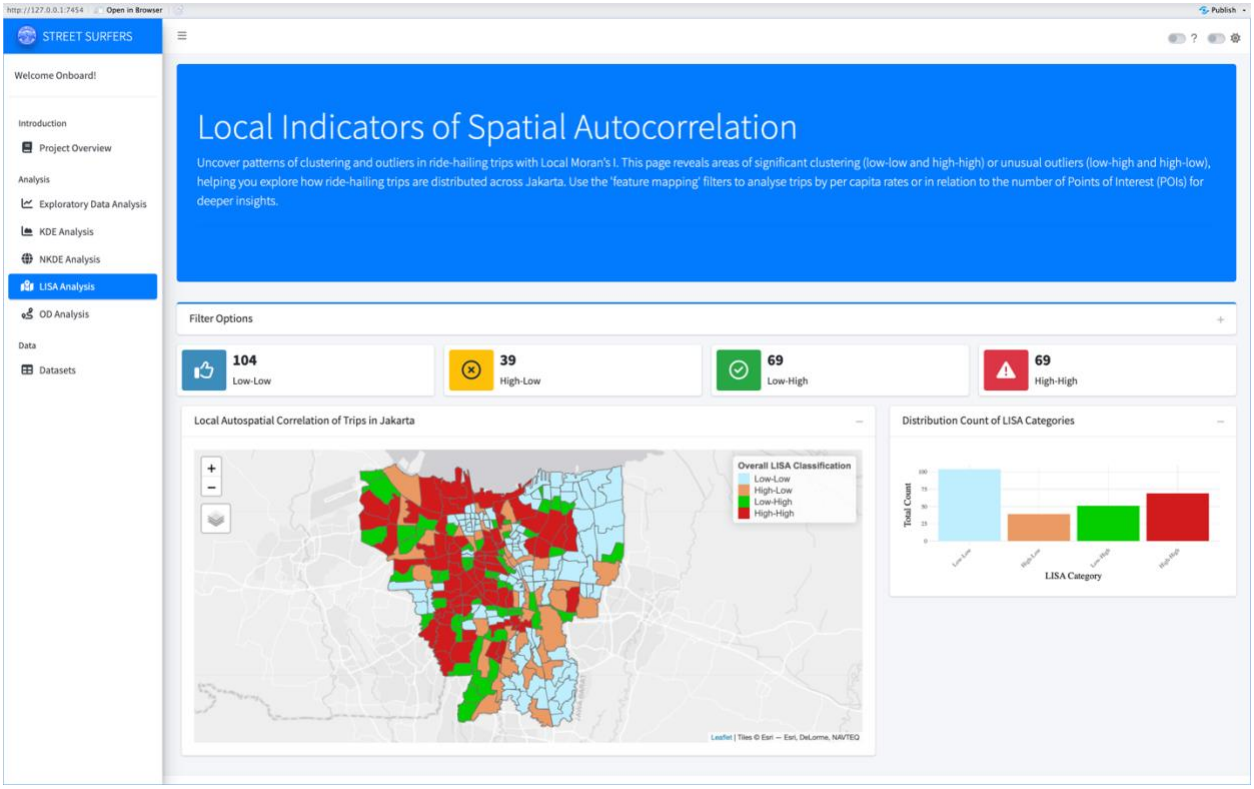
# 7.3 Interpreting Results

## How to interpret NKDE Dashboard




1. **Destination Count Chart :** Use this map to identify areas with concentrated trip destinations or sparse areas for potential intervention.
    - **Heatmap:**
        - Colors indicate density levels:
            - **Yellow (0–20):** Low-density trips.
            - **Red (80–100):** High-density trips (hotspots).
            - **Black Points:** Exact locations or nodes representing road intersections or key destinations.
2. **Test Chart (Right)**
    - **Empirical K-function (Blue Line):**
        - Measures spatial clustering of trip destinations.
        - Steeper slopes = stronger clustering within shorter distances.
    - **Dashed Confidence Band:**
        - Represents the expected spatial distribution under randomness.
        - If the blue line is above the band, destinations are clustered more than random chance.

# 8 Local Indicators of Spatial Autocorrelation (LISA)




LISA enables users to identify spatial clusters and outliers within Jakarta, highlighting areas of high and low activity. This analysis is crucial for detecting localized patterns, understanding neighbourhood-level dynamics, and assessing the spatial dependencies within key areas of interest.

**Key Features:**

1. Filter Options
2. KPI Cards depicting LISA Categories
3. Local Autospatial Correlation of Trips in Jakarta
4. Distribution Count of LISA Categories

## 8.1 LISA Trips in Jakarta & Distribution Count of LISA Categories

Upon application start-up, when you navigate to LISA, it will give you a default analysis of the entire city of Jakarta.

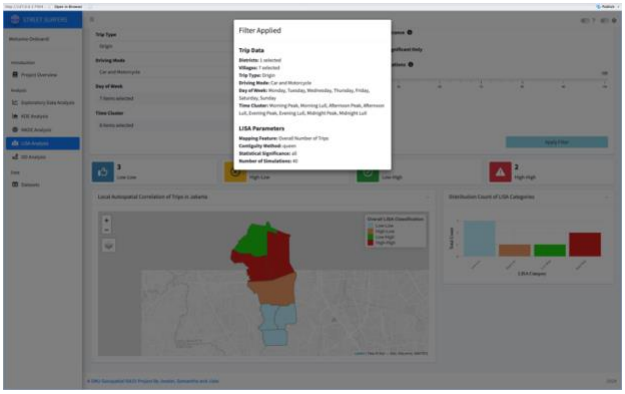
You will see the following:

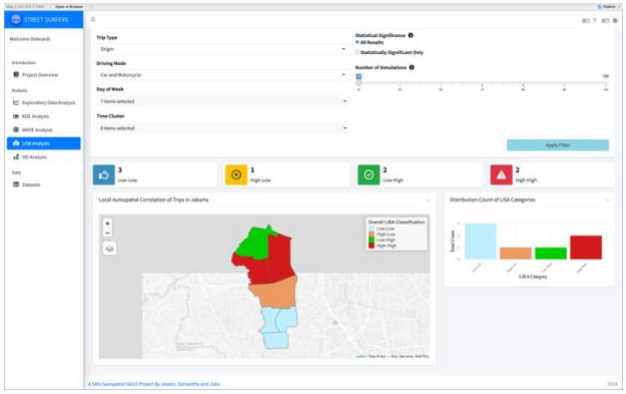
1. Brief Explanation of LISA in the Jumbotron
2. KPI cards containing the counts of the LISA Classifications
3. Corresponding LISA Map and Bar Chart

To create a new analysis, you can follow these steps:

| Filter Trip Dataset<br>*Note: The Trips Dataset defaults to selecting all districts and villages.* |
|---|
| 1. Select Districts<br>2. Select Villages<br>3. Select Trip Type<br>4. Select Driving Mode<br>5. Select Day of Week<br>6. Select Time Cluster |
| LISA Parameters |
| 7. Select Mapping Feature<br>8. Select Contiguity Method<br>9. Select Statistical Significance<br>10. Select Number of Simulations<br>**11. Click "Apply Filter"** |

In our example, we filter the dataset by 1 district (Kebon Jeruk) to view a village-level analysis. Upon clicking 'Apply Filter', a confirmation modal shows up.





# 8.2 ‘Filters & Parameters’ Calibration Options

### Filter Trip Data

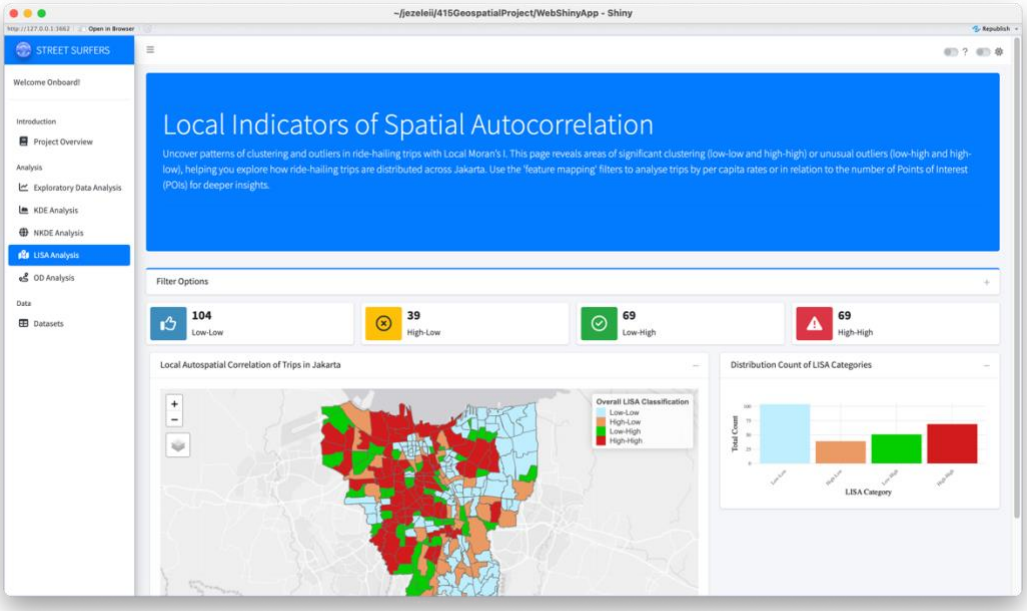
| Parameter | Options | Input Type |
|---|---|---|
| District | All 44 Districts in Jakarta, “Outside of Jakarta” | Multi-select, Dropdown with search functionality |
| Village | All 263 Villages in Jakarta, “Outside of Jakarta” | Multi-select, Dropdown with search functionality |
| Trip Type | "Origin",<br>"Destination", | Single select, Dropdown |
| Driving Mode | "Car",<br>"Motorcycle",<br>"Car & Motorcycle", | Single select, Dropdown |
| Day of Week | ""Monday", "Tuesday",<br>"Wednesday", "Thursday",<br>"Friday", "Saturday", "Sunday" | Multi-select, Dropdown |
| Time Cluster | "Morning Peak", "Morning Lull",<br>"Afternoon Peak", "Afternoon Lull",<br>"Evening Peak", "Evening Lull",<br>"Midnight Peak", "Midnight Lull" | Multi-select, Dropdown |

### LISA Parameters

| Parameter | Options | Input Type |
|---|---|---|
| Mapping Feature | “Overall Number of Trips”,<br>“Number of Trips per Capita”,<br>“Number of Trips per POI” | Single-select, Dropdown |
| Contiguity Method | “Queen”, “Rook” | Single-select, Dropdown |
| Statistical Significance | “All Results”,<br>“Statistically Significant Only” | Radio-Select |
| Number of Simulations | Range: “40” – “100”<br>Step: “10” | Slider Input with Steps |

# 8.3 Interpreting Results

**How to interpret the LISA dashboard**




1. Local Autocorrelation Trips in Jakarta: The map visualizes and highlights clusters (high-high, low-low) and outliers (high-low, low-high)
    - Clusters represent areas where a variable is similar to its neighbours
    - Outliers indicate areas where a variable differs from its neighbours.
2. Distribution Count of LISA Categories Bar Plot: Summary of the count for each LISA category.
    - Higher counts for specific categories indicate dominant spatial patterns within the region.

**Additional Tips**

Click the "Mapping Feature" dropdown to view a different angle of the LISA analysis.

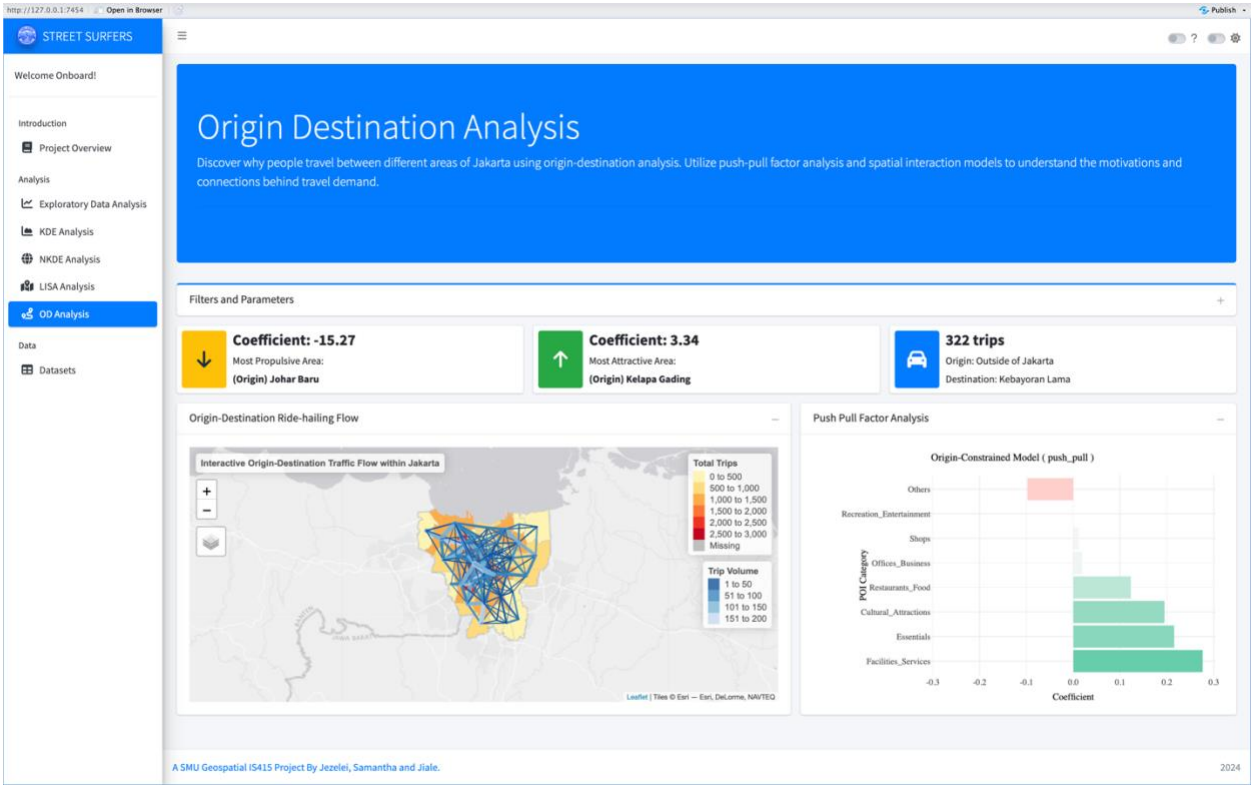
**Overall number of trips:** provides a general overview of regions where number of trips display clustering and outliers

- **High-High (HH)**: Areas with high no. of trips surrounded by other high values (hotspots).
- **Low-Low (LL):** Areas with low no. of trips surrounded by other low values (cold spots).
- **High-Low (HL)**: Areas with high no. of trips surrounded by low values (outliers).
- **Low-High (LH):** Areas with low no. of trips surrounded by high values (outliers).

- **Number of trips per capita:** accounts for the population size and provides a clearer picture of travel demand relative to the resident base.
    - **High-High and Low-Low Clusters:** Districts with high trips per capita (High-High clusters) could indicate areas where residents are especially reliant on ride-hailing services, potentially due to factors like limited local amenities, employment patterns, or population density. Low-Low clusters, on the other hand, might represent districts with lower overall travel needs or alternative forms of local transportation and amenities.
    - **High-Low and Low-High Outliers:** Outliers can reveal unique spatial patterns; for example, a Low-High outlier (low trips per capita in a high-demand neighboring area) might suggest that residents are less dependent on transportation services, potentially due to robust local infrastructure. Conversely, a High-Low outlier may indicate a district with high per capita trip demand in an otherwise low-demand region, possibly due to the district being a main city with more amenities.

- **Number of trips per POI:** Plotting the LISA categories of the number of trips per point of interest (POI) for each district can help us understand spatial patterns in travel demand intensity relative to the availability of POIs. This approach reveals insights into:
    - **High-High and Low-Low Clusters:** Districts with either high or low numbers of trips per POI may indicate varying levels of demand per resource, which can be associated with underlying factors such as accessibility, infrastructure, or population density. High-High clusters, for example, could highlight high-demand areas with limited POIs, indicating potential needs for additional amenities or services.
    - **High-Low and Low-High Outliers:** These outliers can identify unique districts where the number of trips per POI differs significantly from surrounding areas. For instance, a Low-High outlier would signal a district where the trip count per POI is lower than in neighboring districts, possibly pointing to underutilized facilities or areas that don't attract much traffic despite available resources.

# 9 Origin-Destination (OD) Analysis

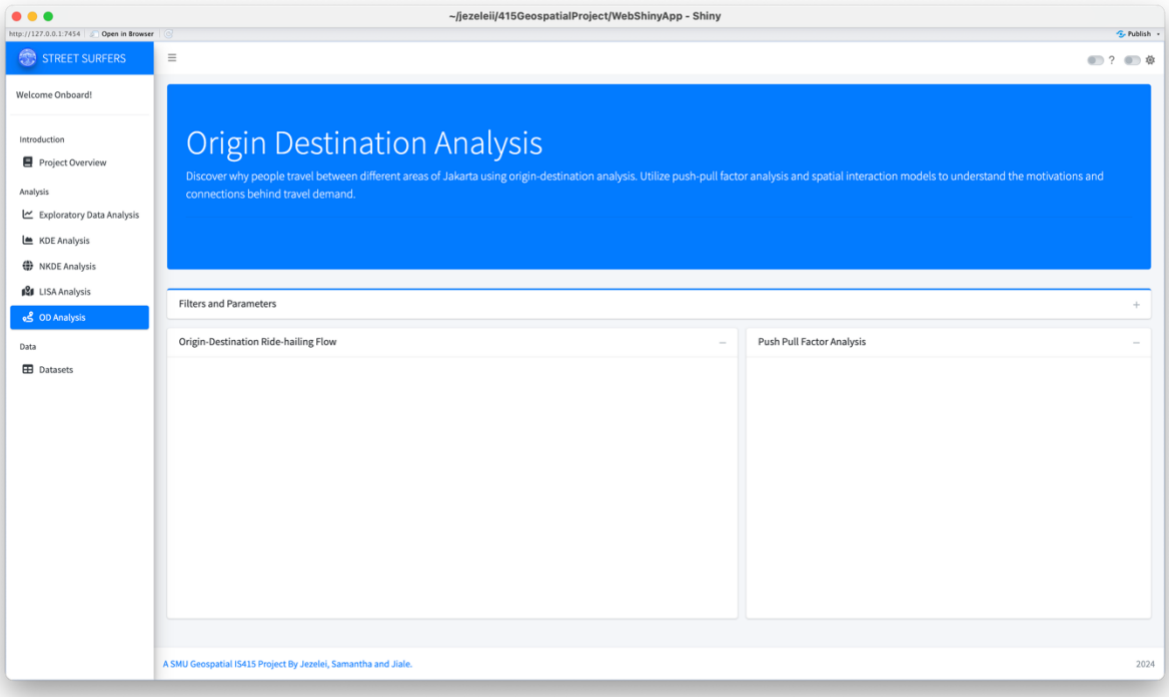



Origin-Destination analysis allows users to examine travel patterns between different areas within Jakarta, focusing on the intensity and direction of trips. This is instrumental in understanding spatial connectivity, identifying popular routes, and uncovering relationships between origins and destinations based on travel demand.

**Key Features:**

1. Filters and Parameters
2. KPI Cards Depicting Highest and Lowest Coefficients, District with Highest Trips
3. Origin-Destination Ride-hailing Flow
4. Push-Pull Factor Analysis

## 9.1 OD Ride-Hailing Flow & Push-Pull Factor Analysis

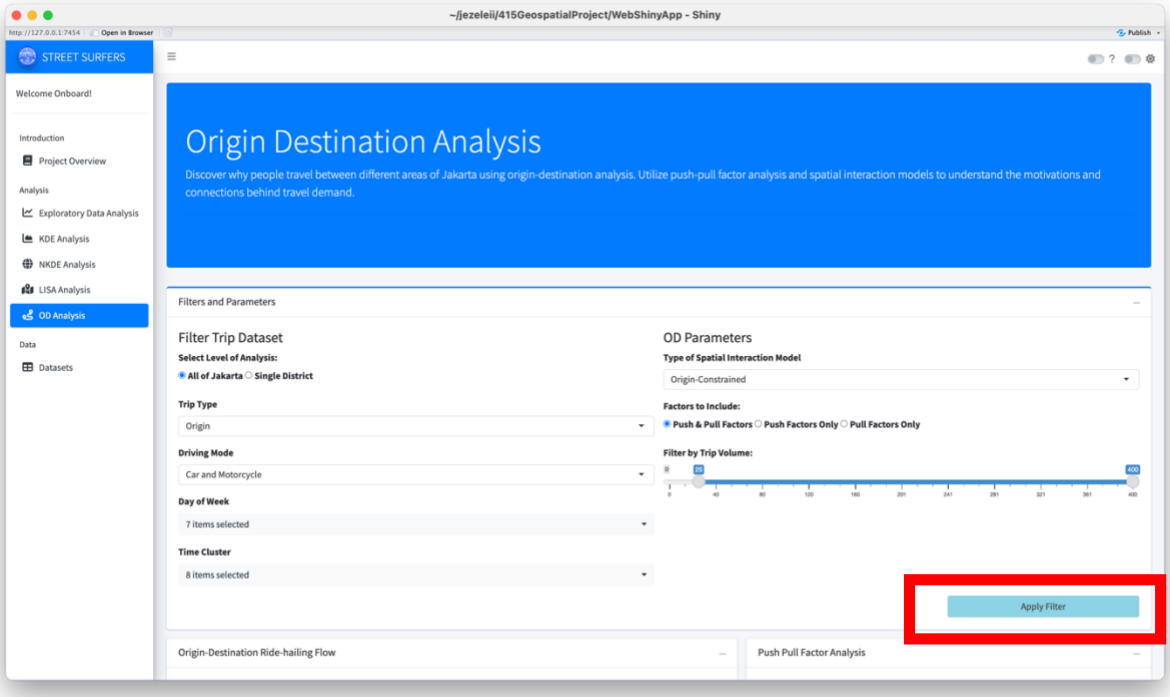



Upon application start-up, when you navigate to OD Analysis, it should give you an empty page.

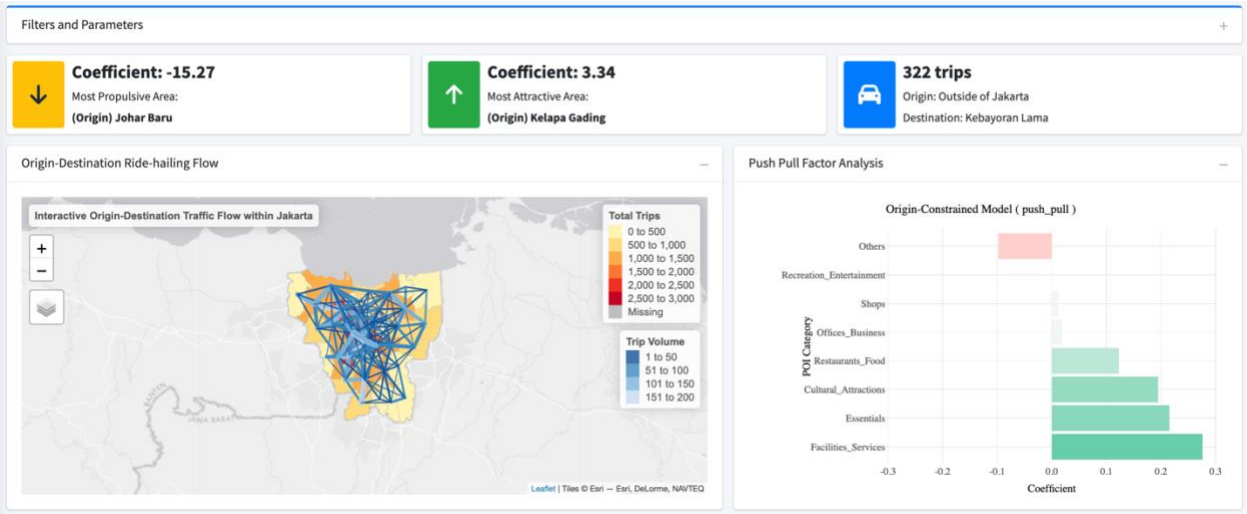
To create a new analysis, you can follow these steps after expanding the Filters & Parameters Tab:

| Filter Trip Dataset |
| --- |
| 1. Select Level of Analysis<br>2. Select Trip Type<br>3. Select Driving Mode<br>4. Select Day of Week<br>5. Select Time Cluster |
| KDE Parameters |
| 6. Select Type of Spatial Interaction Model<br>7. Select Factors to Include<br>8. Select Trip Volume<br>9. Click “Apply Filter” |

If no configuration is changed, this will be the default pre-selected Filters:




The default output is as follows:



# 9.2 ‘Filters and Parameters’ Calibration Options

### Filter Trip Dataset

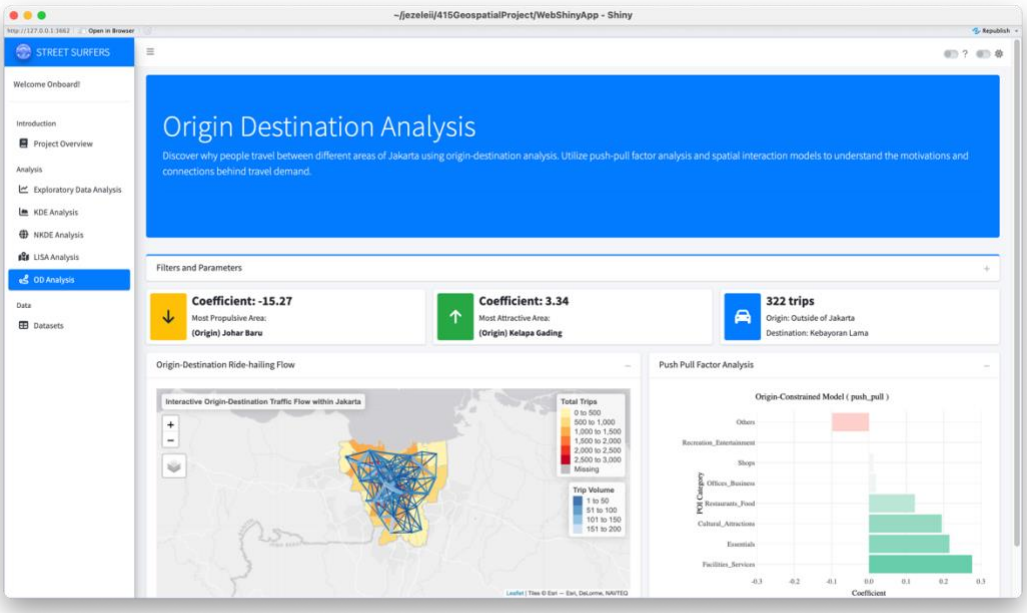
| Parameter | Options | Input Type |
|---|---|---|
| Select Level of Analysis | “All of Jakarta”,<br>“Single District” | Radio-select<br>*Additional Field of “Select District” is made available, which is a multi-select with search functionality |
| Trip Type | "Origin",<br>"Destination", | Single select, Dropdown |
| Driving Mode | "Car",<br>"Motorcycle",<br>"Car & Motorcycle", | Single select, Dropdown |
| Day of Week | "Monday", "Tuesday",<br>"Wednesday", "Thursday",<br>"Friday", "Saturday", "Sunday" | Multi-select, Dropdown |

### OD Parameters

| Parameter | Options | Input Type |
|---|---|---|
| Type of Spatial Interaction Model | “Origin-Constrained”,<br>“Destination-Constrained”,<br>“Doubly-Constrained” | Single-select, Dropdown |
| Factors to Include | “Push & Pull Factors”,<br>“Push Factors Only”,<br>“Pull Factors Only” | Radio-Select |
| Filter by Trip Volume | Range: “0” – “400”<br>Steps: “40”<br>Default: “25” – “400” | Slider Input with Steps |

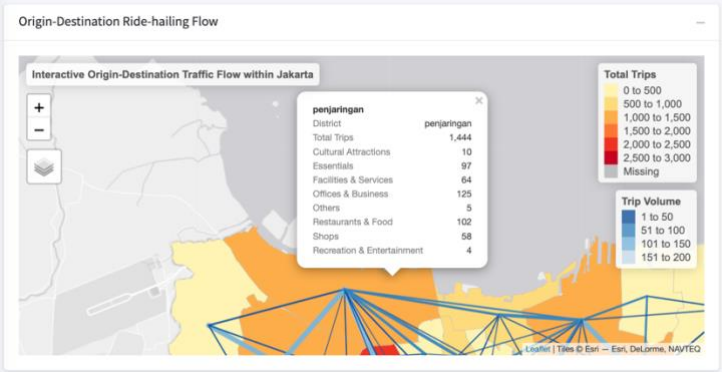
# 9.3 Interpretation of Results

## How to interpret the OD Dashboard




1. Origin-Destination Ride-Hailing Flow
    - Total Trips Heatmap (YlOrRd): Highlights high-demand zones, with central districts showing the highest trip volumes located in the central region of Jakarta (red zones)
    - Trip Volume Flow Lines (-Blues): Higher values of trip volume corresponds to the thicker and lighter lines.
2. Push-Pull Factor Analysis: Coefficient Value & Meaning
    - Positive coefficients indicate pull factors for ride demand.
    - Negative coefficients indicate push factors for ride demand.
    - If the coefficient value is closer to 1 or -1, the strength of it being a push or pull factor is stronger.

## Additional Tip:




To view additional information on the District/Village, click on the district to view the individual counts of the POI categories for the selected area, along with the total Trips.

# 10 Conclusion

This user guide provides a comprehensive framework to understand and analyse spatial and temporal data using the tools and visualizations included in the platform. By exploring key concepts in layers, we hope our users can derive meaningful insights regardless of their field of expertise and background.