

Micro-module E: Data-visualisation

E2- Spatial Data Mapping and Diagramming

This guide will introduce the method of visualizing spatial data through Mapbox, including the method of adding new data layers to generate a heat-map and using the intelligent component in Mapbox to generate 3D extrusion map.

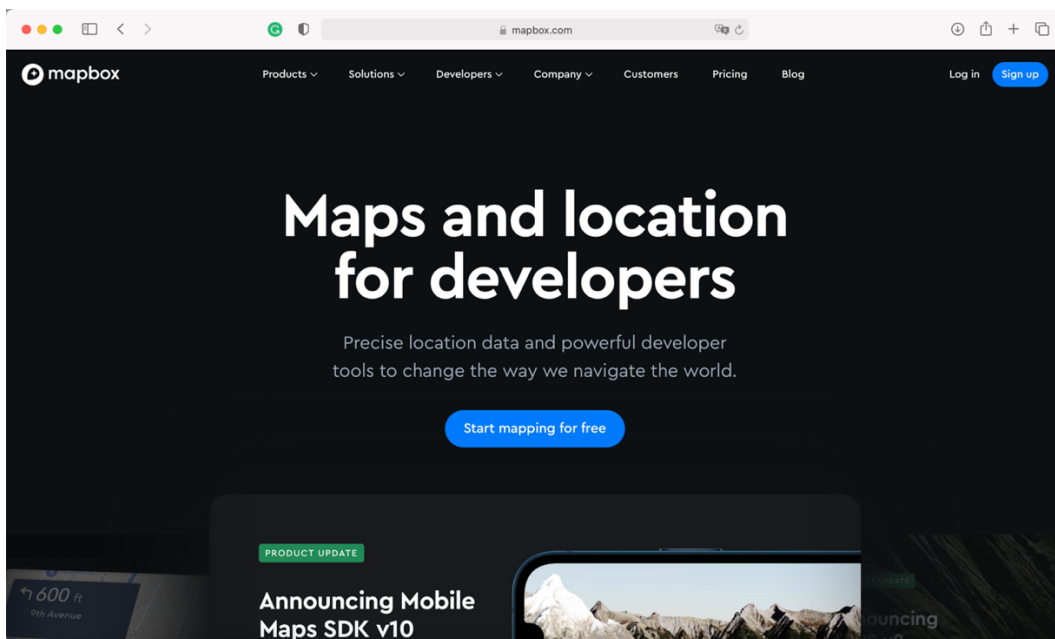
The first part is the preparation work before using Mapbox, including the basic introduction of Mapbox studio, as well as the method of registering account and uploading data, etc.

Second is the use of Mapbox basic function to visualize spatial data, in this guide we will use the dataset of the distribution of Hong Kong bus station to generate a heat-map as an example to introduce.

Finally, we will use the data visualization component of Mapbox to visualize spatial data. In this guide, we will use the total number of public rental housing units and the number of occupied units per capita in 18 districts in Hong Kong to generate a 3D extrusion map as an example to explain.

1. Getting started

Mapbox is an online custom map platform, and it is the significant contributor to, some open source mapping libraries and applications. It is easy to use Mapbox to create beautiful custom maps and quickly integrate them into websites and mobile apps. The service is very convenient to use, looks aesthetically attractive, and has a wide range of functions.



1.1 Register account

Before you can visualize, you need to register for a Mapbox account, which can be done at the following link.

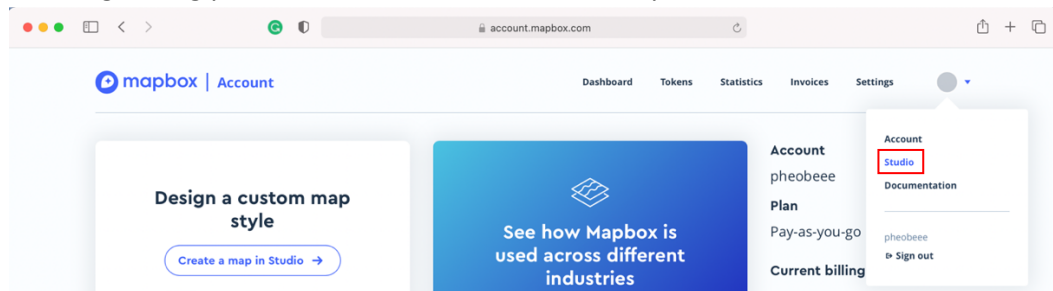
<https://account.mapbox.com/auth/signup/>



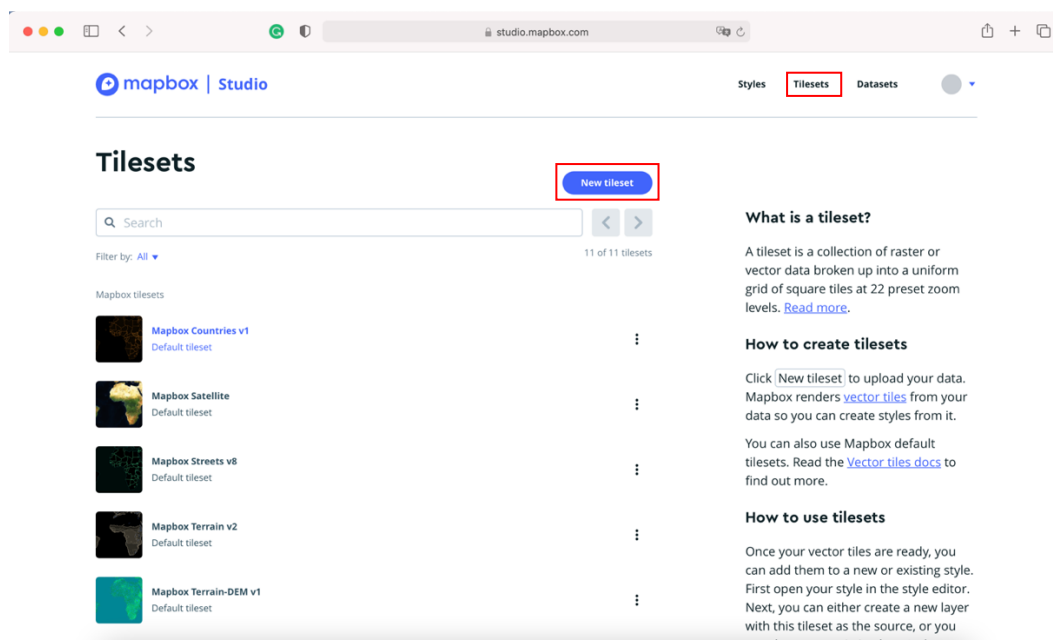
After entering the webpage, click 'Sign up' and enter the required information to register for free.

1.2 Upload data

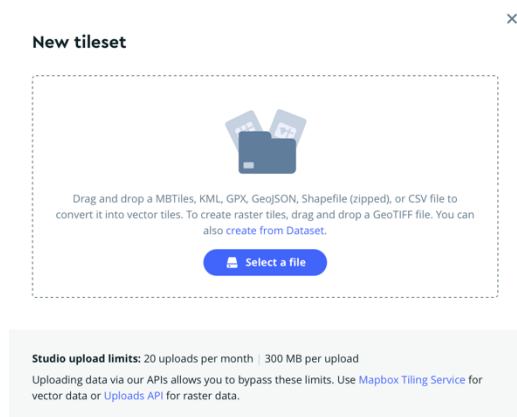
After registering your account, click on 'Studio' under your account.



- Click on 'Tilesets'.
- Select 'New Tileset'.



The types of data that can be uploaded, vector tiles including MBTiles, KML, GPX, GeoJSON, zipped shapefile, CSV, raster tiles including GeoTIFF, and it should be noted that you can only upload data through this way 20 times a month with a file size limit of 300M.

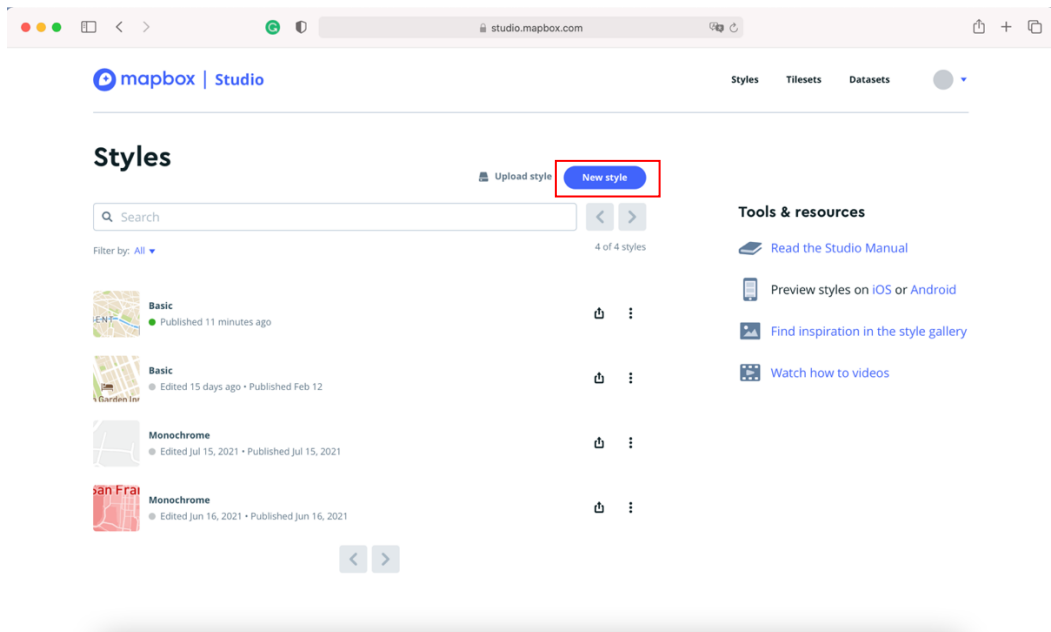


- Click 'Select a file' to select the data you want to upload and search for it when you

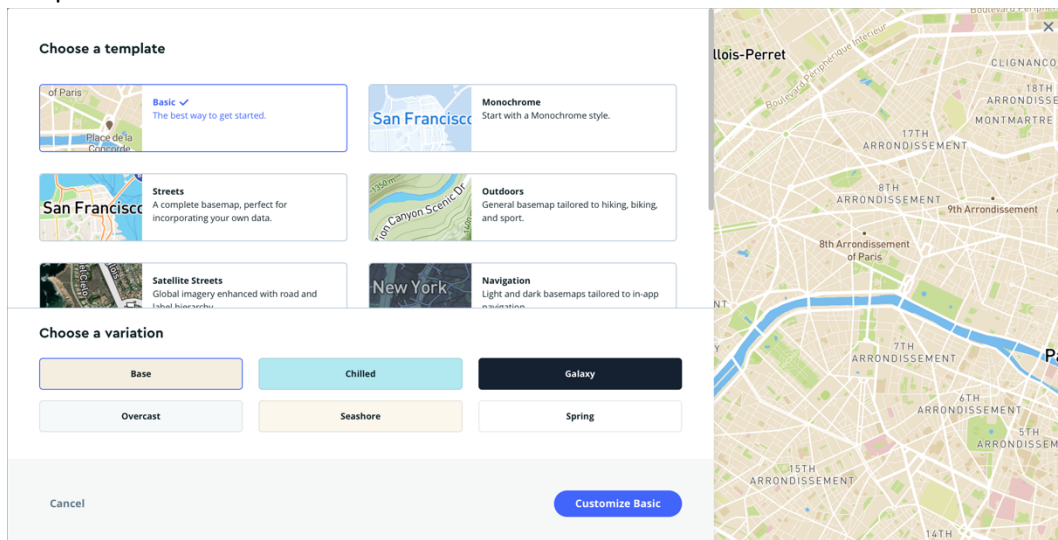
use it.

1.3 Create a new style

- Click 'New style' to create a new style.



Choose a template and variation according to your needs, or you can choose a blank template for customization.



- When finished, click 'Customize Basic' to access the map for editing.

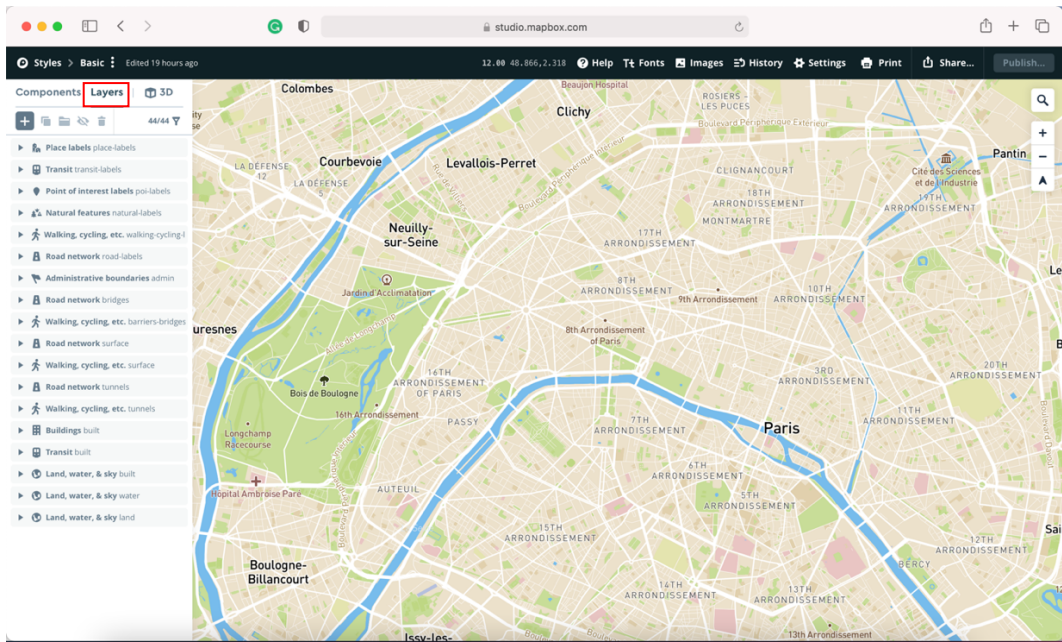
2 Create a heatmap

Heat-maps can visualize data based on the attributes of the dataset, showing the density between data points and the relative differences.

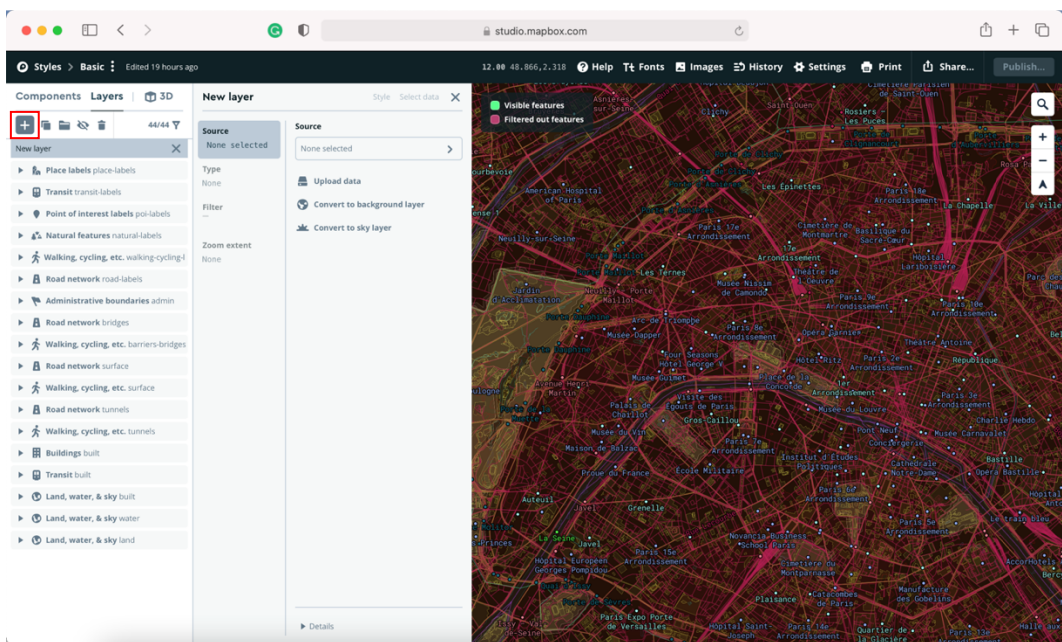
2.1 Upload data

In addition to uploading data according to the method in 1.2, you can also upload data according to the following methods.

- After creating a new style, click 'Layers' at the top of the page.



- Click on the button '+' in the line below 'Layer' to add a new layer.



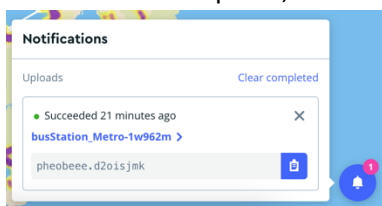
- Click 'Upload data'.

Drag or select the file you need here. In this guide, the distribution of bus stops in Hong Kong is shown as an example.

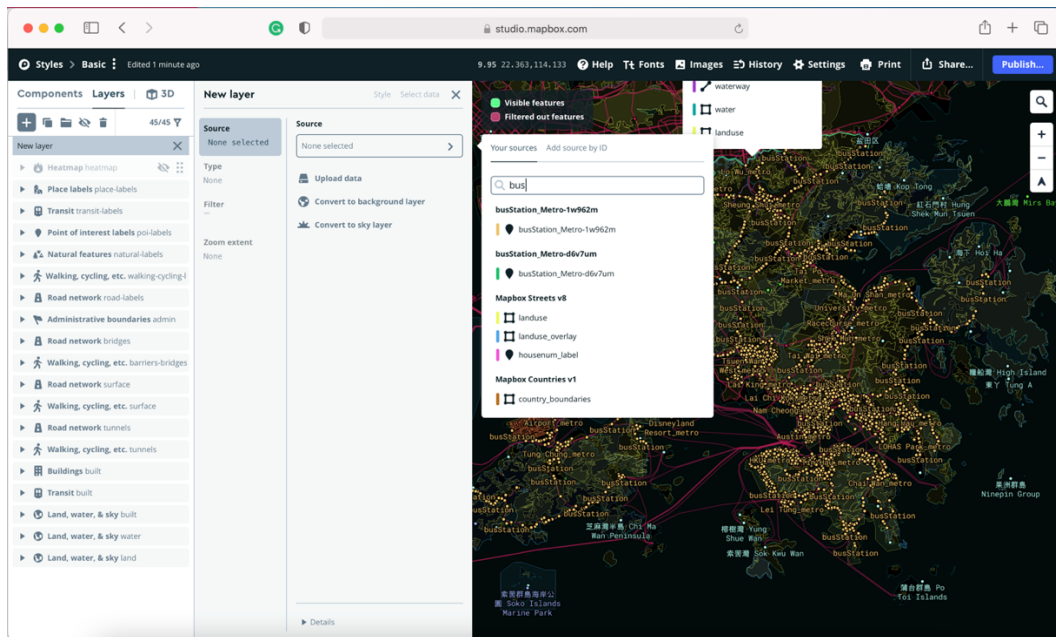
- Select the bus stop file to upload.

- Click 'Confirm'.

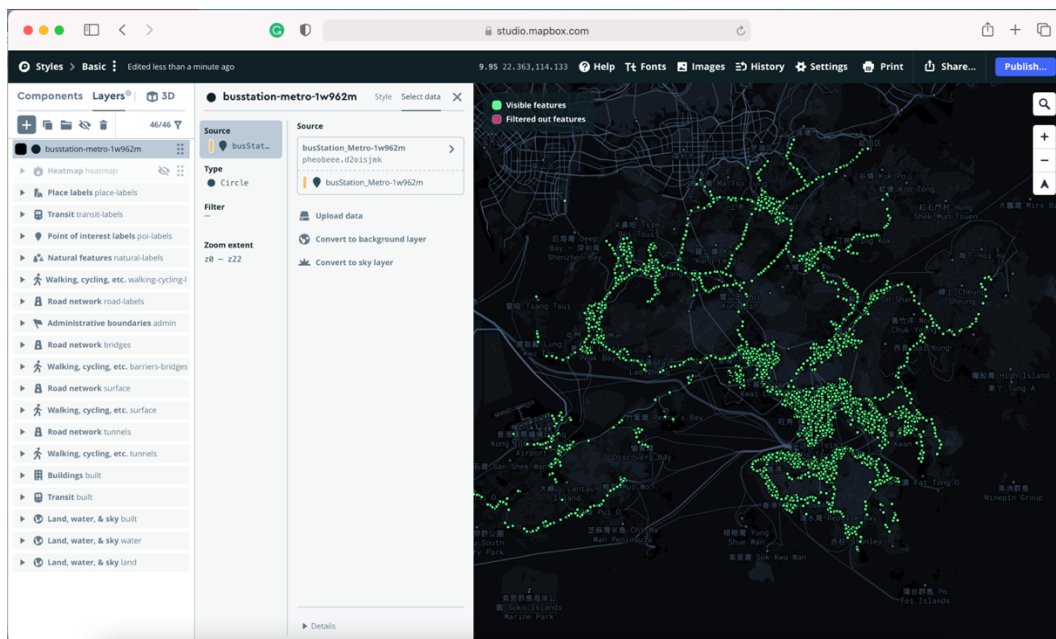
After successful upload, there will be a message in the bottom right corner of the page.



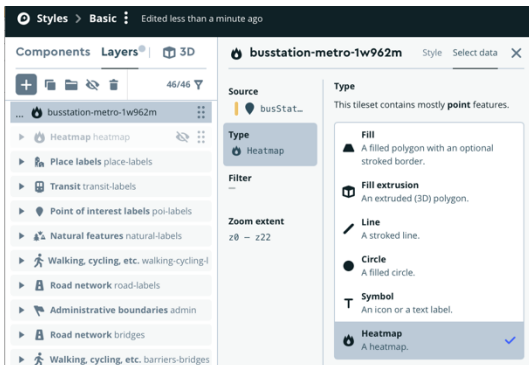
- After the upload is complete, click on the search box under 'Source' and search for the data you just uploaded.



- Click on the data you can see that the data with geotags has been imported into Mapbox.



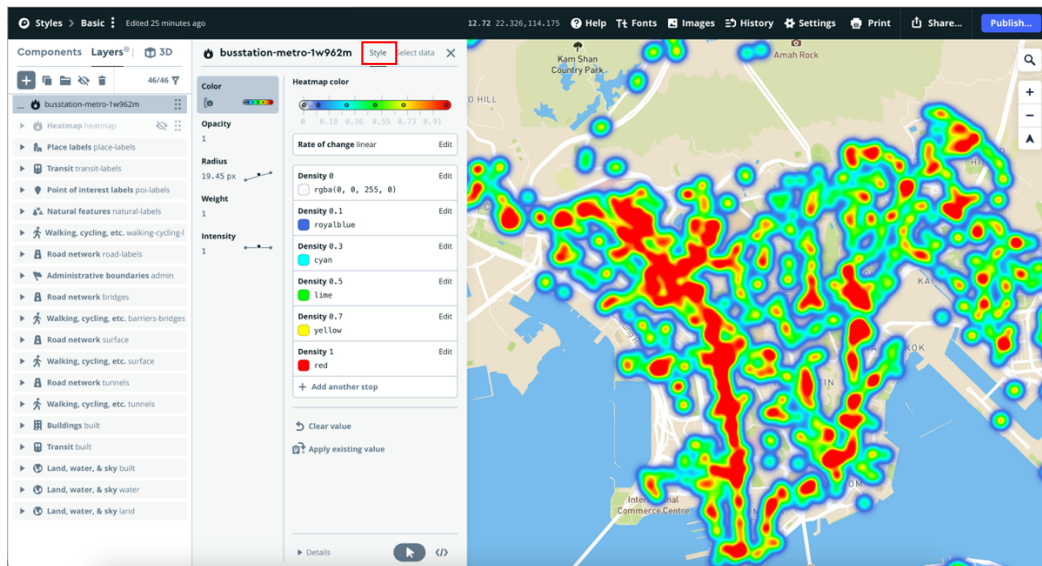
- Click on 'Type' on the left.
- Chose 'Heatmap'.



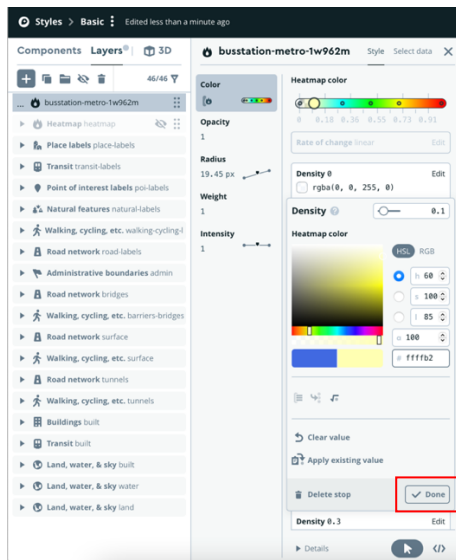
Then you can see the heatmap of the distribution of bus stops in Hong Kong.

2.2 Adjusting Heatmap layer properties

- Click on 'Style', you can see the properties of the Heatmap layer, the properties that can be modified are Color, Opacity, Radius, Weight and Intensity.
- Color

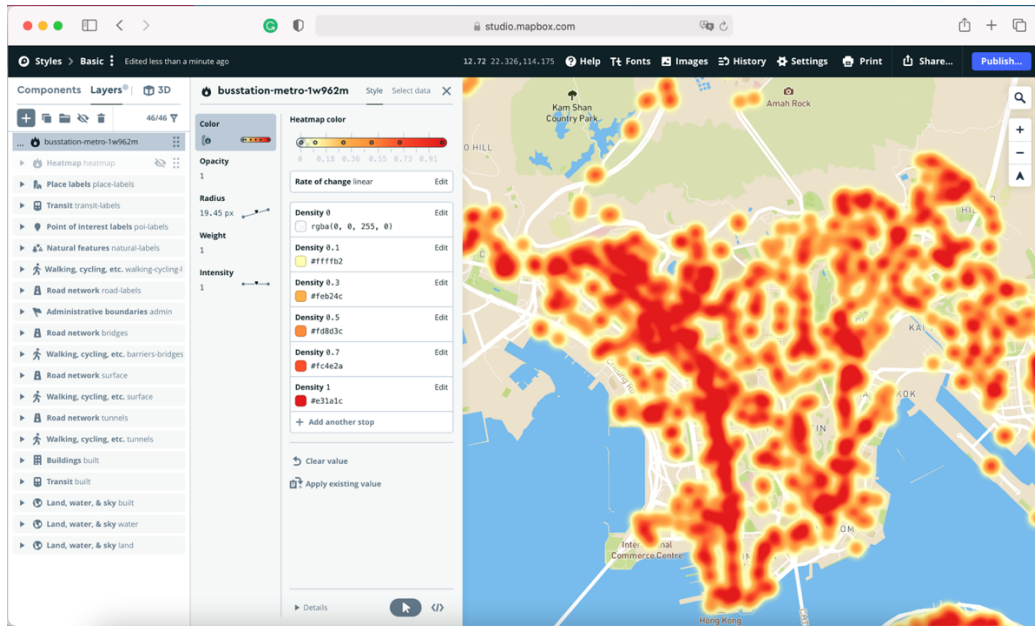


- Click on the color block under each Density to edit the color.

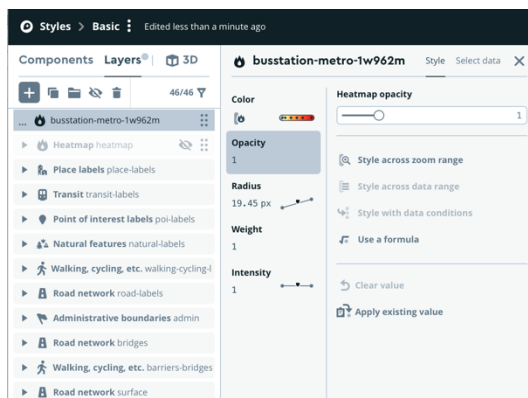


- Click 'Done' when finished.

You can be modified the colors to the same color gradient mode, as shown in the figure.

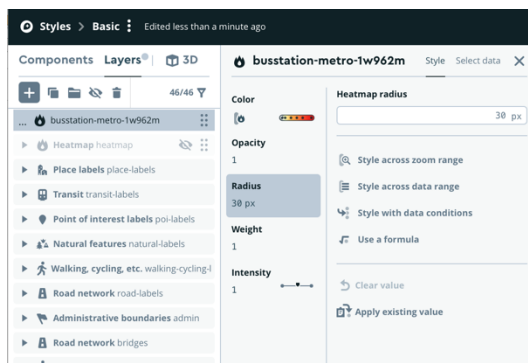


- Opacity

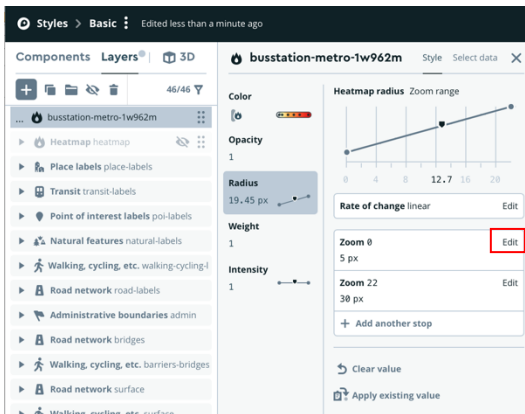


- Enter the number or drag the button to edit the opacity.

- Radius



- Chose 'Style across zoom range'.



- Click 'Edit' and you can edit the radius at each zoom level.

In this guide we sets the radius value of zoom0 to 5px and the value of zoom22 to 30px, then the radiation range of the Heatmap will change as the zoom scale changes.

The larger the radius, the smoother the edges of the whole Heatmap.

- Weight

Weight is a measure of the contribution of each point in the dataset to the overall heatmap, and you can also increase the weight of an attribute in the dataset according to your needs.

- Intensity

Intensity is a feature that can conveniently adjusts the appearance of the Heatmap when zoom.

The principle of adjusting weight and intensity is similar to adjusting radius, it can adjust the appearance of the Heatmap when zoom and can also apply on one property in the dataset.

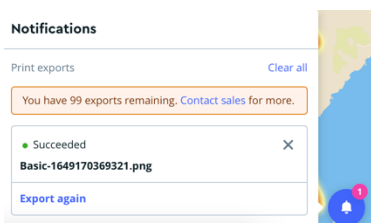
2.3 Publish and export map

After editing the style, you can click 'Publish' to share the heatmap on other platforms.



Or you can click 'Print' to export the map. You can manually enter the size of the exported image and select the range and scaling, click 'Export' after the settings are completed.

After export successfully, the following message will appear in the bottom right corner of the page.



At this point, you have been given the methods to generate a custom Heatmap via Mapbox, and you can apply the Heatmap to any aspect you need.

3 3D Extrusions map

3.1 Basic introduction

The 3d histogram is mainly implemented through the visualization component in the Mapbox studio style editor, which enables six different types of data visualization:

Choropleth, Data-driven circles, Data-driven lines, 3D extrusions, Heatmap, and Symbols visualizations. You can view the studio manual at the following link to get tips on using the components.

Mapbox studio: <https://docs.mapbox.com/studio-manual/guides/>

Components: <https://docs.mapbox.com/studio-manual/guides/components/#style-a-map-using-components>

You can choose visualization type according to the characteristics of the data you upload, and Mapbox will recommend you to use one or several visualization types according to the data type.

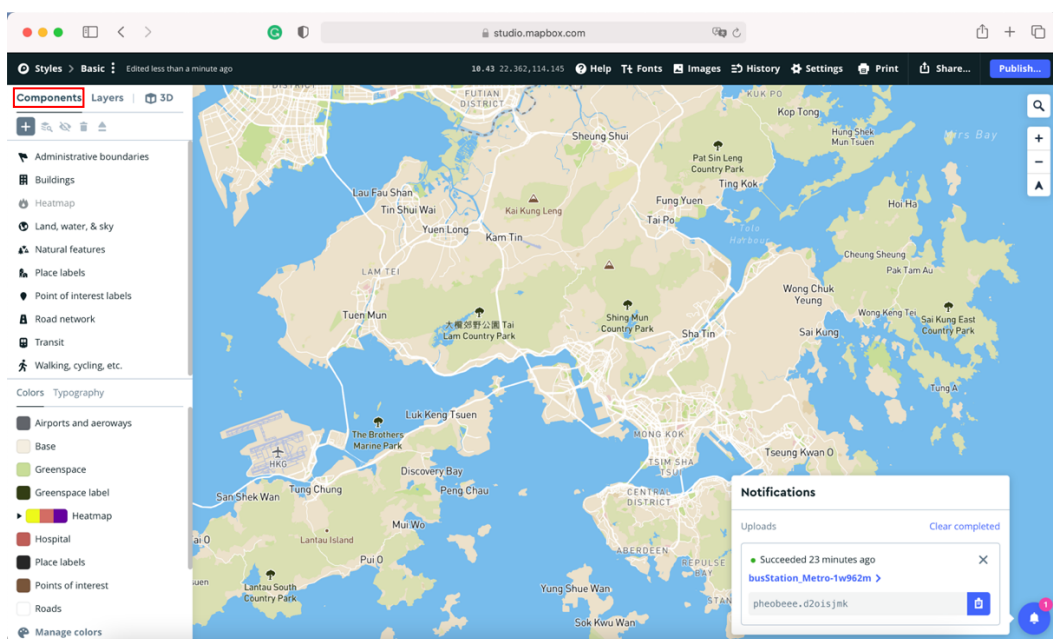
The following table lists the corresponding feature data for each visualization type.

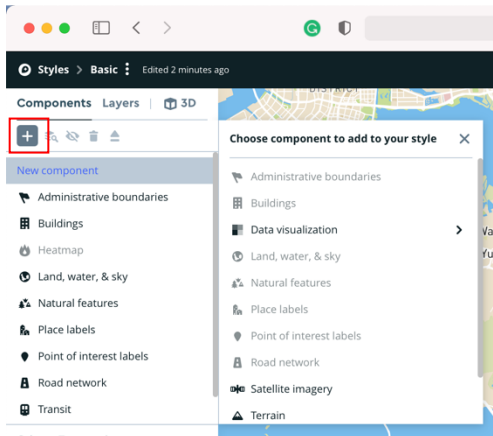
Choropleth	Use the color of polygons to show the characteristics of the data in the dataset.
Data-driven circles	Demonstrate the variable characteristics of the data in the dataset using the size or color of the points.
Data-driven lines	Use the width or color of the lines to show the variable characteristics of the data in the dataset.
3D extrusions	Use the height or color of a polygon to display one or more variables of data in a dataset.
Heatmap	A thematic map that smart-styles your data based on feature density.
Symbols	Use icons to represent one or more variables in a data set.

In this guide we will use the total number of public rental housing units in the 18 districts of Hong Kong and the number of units per capita in each district as an example.

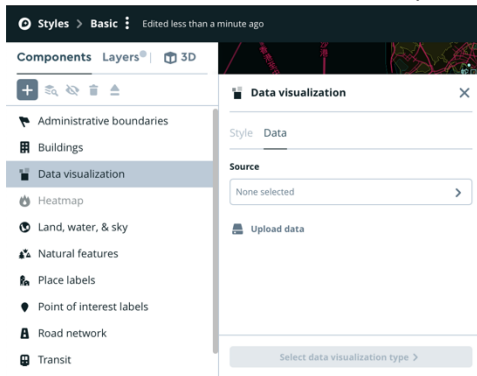
3.2 Data visualization

- Click 'Components' at the left corner of the page.
- Click '+' button at next line to add new components.



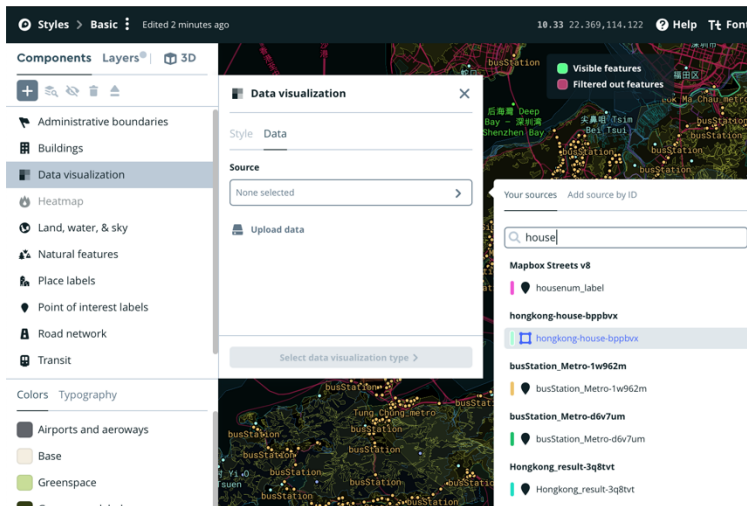


- Chose 'Data visualization' component.



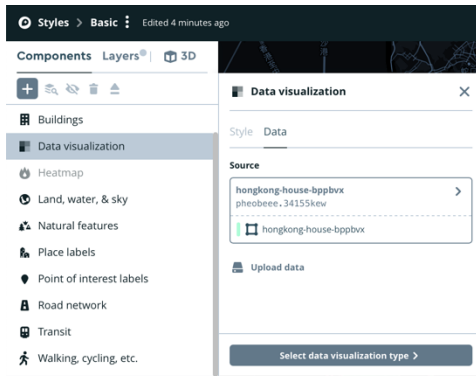
- Click 'Upload data' to chose the data you need.

After upload the data, click 'None selected' under 'Source', and search the keywords of the data that you have just uploaded.



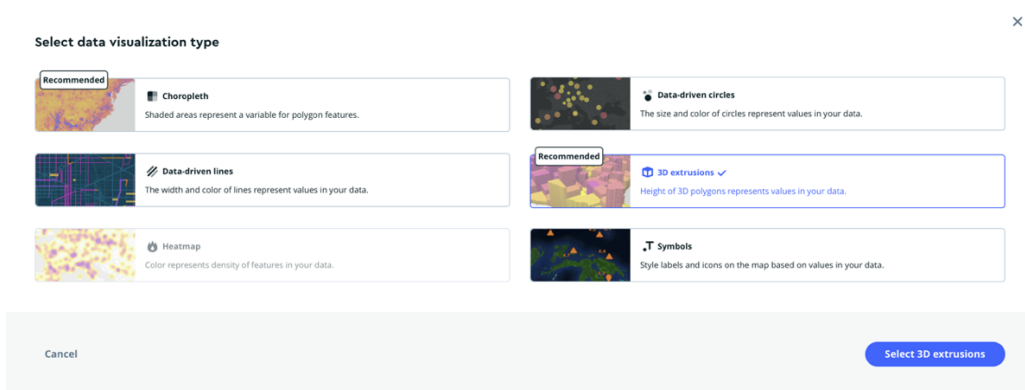
- Chose the data that you have uploaded.

- Click 'Selected data visualization type' at left.



The component will recommend the appropriate visualization type based on the data type, because sometimes choosing the inappropriate visualization type may cause display problems, you can choose according to your needs, in this guide we choose 3d extrusions.

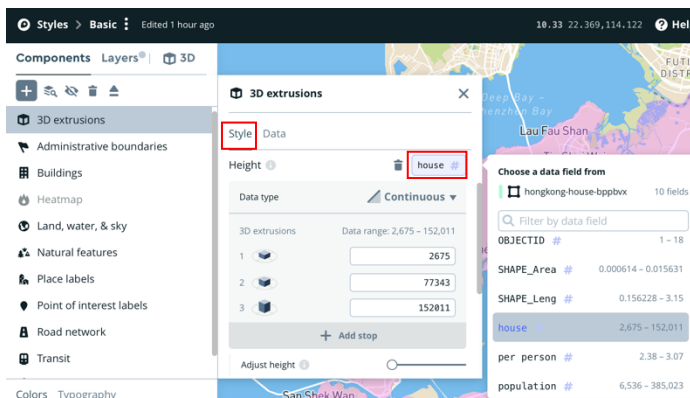
- Click 'Select 3D extrusions'.



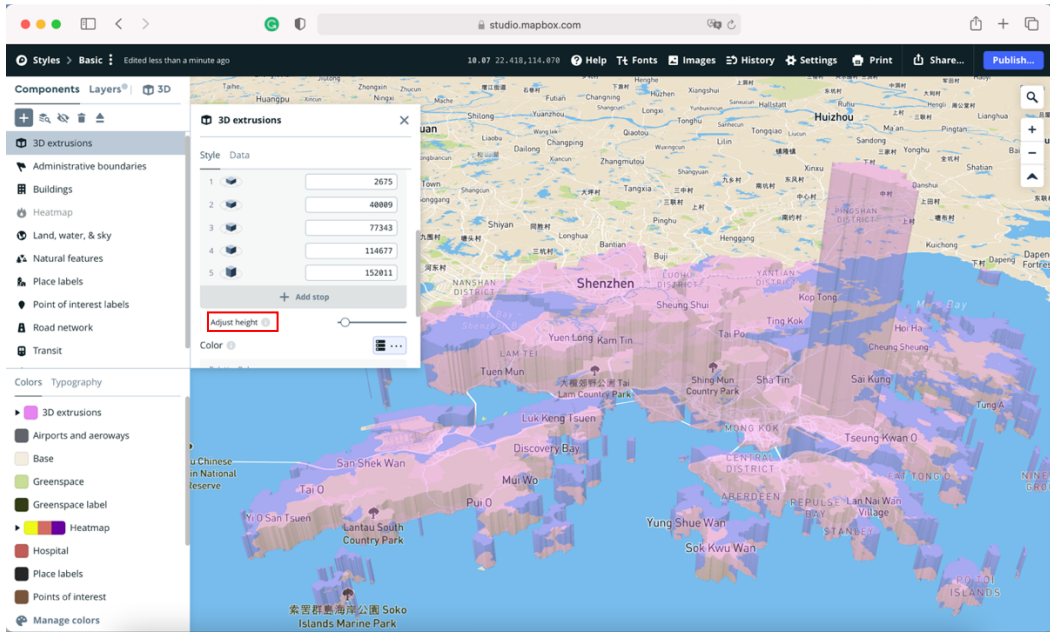
After finished the steps above, you can see the data in the Mapbox map.

3.3 Adjusting layer properties

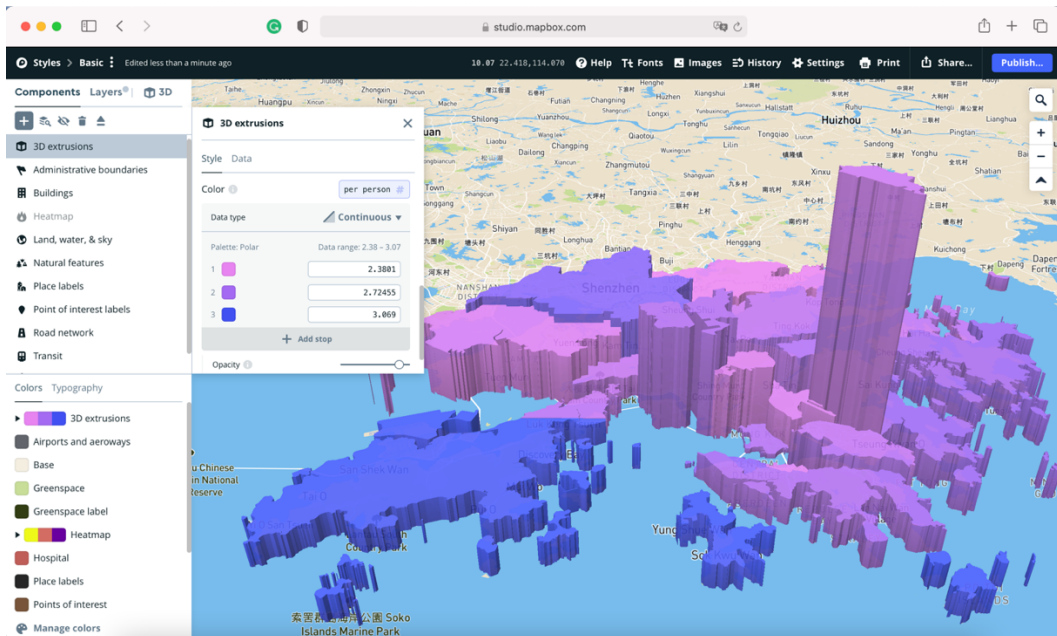
After adding a new components, you can change the appearance of the 3d extrusion map by setting features such as color and opacity.



- Click 'Style'.
 - Click on the word next to 'Height' to select the data attribute expressed in height.
- In this guide, the total number of public rental housing units in the 18 districts of Hong Kong is taken as an example.



- Click add stop to add the standard point of column height according to your needs.
 - Drag the button of 'Adjust height' to adjust the height of the 3D column.
- Use the methods above can set the attribute that define the column color, in this guide we take the number of public rental housing units per capita in Hong Kong's 18 districts as an example, the more blue the color, the higher the per capita occupancy. You can drag the opacity button to adjust the opacity, and change the color according to your needs.



At this point, you have gained the methods to visualize geographic data through Mapbox, including adding new data layers and using the visualization components in Mapbox. You can edit the data in Mapbox and export the maps for use in your own field of research, or you can directly connect Mapbox to your web pages to generate interactive maps.