

# Package ‘streetscape’

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**Type** Package

**Title** Collect And Investigate Street Views For Urban Science

**Version** 1.0.0

**Description** A collection of functions to search and download street view imagery ('Mapillary' <<https://www.mapillary.com/developer/api-documentation>>) and to extract, quantify, and visualize visual features. Moreover, there are functions provided to generate Qualtrics survey in TXT format using the collection of street views for various research purposes.

**License** GPL-3

**Depends** R (>= 4.1)

**RoxygenNote** 7.3.1

**Language** en\_GB

**Encoding** UTF-8

**LazyData** true

**Suggests** testthat (>= 3.0.0), knitr, rmarkdown

**VignetteBuilder** knitr

**Imports** rlang, methods, dplyr, sf, sp, httr, reticulate, osmdata, quickPwCR, mapview, SuperpixelImageSegmentation, OpenImageR, pbmcapply, parallelly

**Config/reticulate** list( packages = list( list(package = ``mapbox\_vector\_tile", pip = TRUE) ) )

**NeedsCompilation** no

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available-field-and-filter  
*available-field-and-filter*

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**Description**

available\_field provides a list of available fields.

available\_filter provides a list of available filters.

**Usage**

```
available_field()
```

```
available_filter()
```

**Details**

Field and Filter List

**Value**

dataframe, including field names and their descriptions.

dataframe, including filter names and their descriptions.

**Note**

More information about fields and filter at <https://www.mapillary.com/developer/api-documentation>

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decode_detections	<i>decode_detections</i>
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**Description**

convert Mapillary object detection into sf polygons

**Usage**

```
decode_detections(detections_string)
```

**Arguments**

detections\_string  
character, an encoded string of semantic segmentation, for example, "Gmt4AgoGbXB5L=="

**Value**

sf polygon

**Examples**

```
detection <- readLines(system.file('detection.txt', package = 'streetscape'))
streetscape::decode_detections(detection)
```

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install_mvt	<i>install_mvt</i>
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**Description**

install\_mvt is a wrapped function of py\_install in the reticulate package for installing the python package mapbox\_vector\_tile, which will be installed in a virtual environment - "r-mvt".

**Usage**

```
install_mvt(envname = "r-mvt", method = "auto")
```

**Arguments**

envname           The name, or full path, of the environment in which Python packages are to be installed.  
method            character, indicating installation method.

**Value**

None

---

sdataframe                    *streetscape dataframe*

---

**Description**

streetscape dataframe

**Usage**

```
data(sdataframe)
```

**Format**

An object of class "StreetscapeDataFrame"; see [see\\_streetscape\\_class\(\)](#).

**Examples**

```
data(sdataframe)
```

---

see\_streetscape\_class    *see\_streetscape\_class*

---

**Description**

A function to call out help page of StreetscapeDataFrame

**Usage**

```
see_streetscape_class()
```

**Details**

see\_streetscape\_class

**Value**

No return value, called for side effects

**Note**

User can also directly use ?StreetscapeDataFrame

**Examples**

```
see_streetscape_class()
```

---

Streetscape-class	<i>Streetscape-Class</i>
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## Description

The output of `strview_search` family functions is constructed in this data format - A specialized data frame for streetscape package for initializing the object with streetscape data and extracting and decoding segmentation information of streetscape dataframe.

## Fields

`data` A data frame containing metadata of Mapillary street view images  
`epsg` A numeric epsg code

## Methods

`decodeDetection()` Regenerate a dataframe with decoded segmentation. 'detections' column will be updated and a new column 'segmentation' will be added.  
`download_data(path, items)` Download street view images (and segmentations in sf format if applicable)  
`get_mask(index)` Convert the semantic segmentation of a street view image from the Streetscape-DataFrame into sf polygons  
`gvi()` Calculate green view index (GVI) for each collected image by segmenting green pixels and quantifying the percentage in street view images. This method adds a new column of greenness percentage to the dataframe  
`mapPreview(maptype = "meta", fields = c())` Plot data points in an interactive map view

## Class Methods

### Method list:

- [StreetscapeDataFrame\\$decodeDetection\(\)](#)
- [StreetscapeDataFrame\\$gvi\(\)](#)
- [StreetscapeDataFrame\\$get\\_mask\(\)](#)
- [StreetscapeDataFrame\\$mapPreview\(\)](#)
- [StreetscapeDataFrame\\$download\\_data\(\)](#)

### Method `decodeDetection()`:

*Usage:* `sdataframe$decodeDetection()`

### Method `gvi()`:

*Usage:* `sdataframe$gvi()`

### Method `get_mask()`:

*Usage:* `sdataframe$get_mask(index = 1)`

*Arguments:*

index numeric, the row index of the dataframe of StreetscapeDataFrame class

**Method** mapPreview():

*Usage:* scdataframe\$mapPreview(maptypes = 'meta')

*Arguments:*

maptypes character or character, specifying what type of information to be mapped: 'meta' - image meta, 'seg' - segmentation proportion, and 'gvi' - GVI".

fields vector (optional), a vector of fields indicates the information of images to be included for the 'meta' map. The fields of 'id', 'is\_pano', 'height', 'width', 'lon', and 'lat' are already included

**Method** download\_data():

*Usage:* scdataframe\$download\_data(path = 'path/to/download', items = c('image', 'mask'))

*Arguments:*

path character, directory for downloading street view images or segmentation masks or both

items character or vector, specifying what to download: 'image' - 'original street view image'; 'mask' - semantic segmentation (sf objects in .geojson format)"

StreetscapeDataFrame-class

*Class* "StreetscapeDataFrame"

**Description**

"The output of strview\_search family functions is constructed in this data format - A specialized data frame for streetscape package for initializing the object with streetscape data and extracting and decoding segmentation information of streetscape dataframe."

**Extends**

All reference classes extend and inherit methods from "[envRefClass](#)".

**Fields**

data: Object of class data.frame ~~

epsg: Object of class numeric ~~

**Methods**

download\_data(path, items): ~~

get\_mask(index): ~~

gvi(): ~~

decodeDetection(): ~~

mapPreview(maptypes, fields): ~~

initialize(data, epsg): ~~

**Author(s)**

"Xiaohao Yang"

**Examples**

```
showClass("StreetscapeDataFrame")
```

---

```
strview2qualtrics      strview2qualtrics
```

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**Description**

strview2rate: pack street views as a Qualtrics survey file that can be imported to Qualtrics platform  
 strview2pwc: pack street views as a Qualtrics survey file for pair-wised comparison

**Usage**

```
strview2rate(df, header, questions, choices, file)
```

```
strview2pwc(df, k, header, questions, file)
```

**Arguments**

df	StreetscapeDataFrame
header	character, indicating the task for a question. For example, "Please review the following picture:"
questions	vector, a list of questions (see details)
choices	list, a list of choices (see details) (this is only for strview2rate)
file	character, indicating the directory and file name (without extension) for saving the Qualtrics survey file
k	numeric, indicating how many street views each street view will be paired with for pair-wised comparison (this is only for strview2pwc)

**Details**

strview2qualtrics

For strview2rate(), the lengths of questions and choices must match. For example, when questions = c('1. To what existence you can feel pleasant if you were in this environment', '2. To what existence you can feel safe if you were in this environment'), choices could be list(c('Unpleasant', 'Less pleasant', 'More pleasant', 'Pleasant'), c('Unsafe', 'Less safe', 'Safer', 'Safe')) For strview2pwc, the choices are always c('left', 'right') for the coparison purposes.

**Value**

character if argument 'file' is not specified

character if argument 'file' is not specified

**Examples**

```

data('scdataframe')
header <- "Please review the following picture(s):"
questions <- c('1. To what extent you feel pleasant if you were in this environment',
              '2. To what extent you feel safe if you were in this environment')
choices <- list(c('Unpleasant', 'Less pleasant', 'Pleasant', 'More pleasant'),
              c('Unsafe', 'Less safe', 'Safe', 'Safer'))
txt <- streetscape::strview2rate(scdataframe, header, questions, choices)

data('scdataframe')
header <- "Please review the following picture(s):"
questions <- 'which one is more beautiful?'
txt <- streetscape::strview2pwc(scdataframe, k=1, header, questions)

```

---

strview\_search

*strview\_search*


---

**Description**

strview\_searchByGeo: Search for and download the meta information of street view images via Mapillary API (See details) based on coordinates of a spatial point with a given distance or a bounding box.

strview\_search\_nnb: Search for the nearest (within 10m buffer) available street view images and download meta information via Mapillary API (See details) given coordinates of a spatial point.

strview\_search\_osm: Search for street view images by sampling locations along the OSM road lines and download meta information via Mapillary API (See details) given a bounding box.

strview\_search\_multi: Search for and download the meta information of street view images via Mapillary API (See details) based on multiple coordinates

**Usage**

```

strview_searchByGeo(
  x,
  y,
  r,
  epsg,
  bbox,
  token = "",
  limit = 10,
  fields = c(),
  ...
)

strview_search_nnb(x, y, epsg, token = "", fields = c(), ...)

strview_search_osm(bbox, epsg, token, fields = c(), size, ...)

```



```
strview_search_multi(viewpoints, epsg, token, fields = c(), ...)
```

### Arguments

x	numeric, indicating Longitude degree of the center point.
y	numeric, indicating latitude degree of the center point.
r	numeric, indicating search distance (meter or feet) for LiDAR data.
epsg	numeric, the EPSG code specifying the coordinate reference system.
bbox	vector, a bounding box defining the geographical area for downloading data.
token	character, API token of Mapillary.
limit	numeric, indicating the number of returns. The maximum is 2000.
fields	vector, a vector of fields indicates the information of images to be retrieved (See details). 'is_pano', 'thumb_256_url', 'height', 'width', 'computed_geometry', 'computed_altitude', and 'detections' are retrieved as a default setting.
...	indicating filters (see details)
size	numeric, (approximate) number of locations sampled on OSM spatial lines (this is for strview_search_osm only).
viewpoints	sf or matrix, indicating multiple degress-based coordinates for searching available street views (this is for strview_search_multi only).

### Details

strview\_search

To request an API token of Mapillary, please create your access token at <https://mapillary.com/developer>. For 'fields', one can review all available fields in this package by calling `streetscape::field_list()`.

### Value

For `strview_searchByGeo()`, a `StreetscapeDataFrame` returned combining a dataframe of the image information.

For `strview_search_nnb()`, a `StreetscapeDataFrame` with one-row dataframe will be returned if there is any available images near to the given point

For `strview_search_osm()`, a `StreetscapeDataFrame` that combines the information of street views from all sampled points along the OSM lines within the specified bounding box.

For `strview_search_multi()`, a `StreetscapeDataFrame` that combines the information of street views based on the coordinates of multiple spatial points

### Note

If there is no street view images within the search area, the function only returns an integer 0.

### See Also

[available\\_field\(\)](#) [available\\_filter\(\)](#) [see\\_streetscape\\_class\(\)](#)

**Examples**

```
bbox <- c(-83.751812,42.272984,-83.741255,42.279716)
data <- streetscape::strview_searchByGeo(bbox = bbox,
                                         epsg = 2253,
                                         token = "token",
                                         is_pano = TRUE)
data <- streetscape::strview_searchByGeo(x = -83.741289,
                                         y = 42.270146,
                                         r = 100,
                                         epsg = 2253,
                                         token = "token",
                                         is_pano = TRUE)
```

```
data <- streetscape::strview_search_nnb(
  x = -83.743460634278,
  y = 42.277848830294,
  epsg = 2253,
  token = 'token')
```

```
bbox <- c(-83.752041,42.274896,-83.740711,42.281945)
data <- streetscape::strview_search_osm(
  bbox = bbox,
  epsg = 2253,
  token = 'token',
  size = 100)
```

```
x <- c(-83.752041, -83.740711)
y <- c(42.274896, 42.281945)
viewpoints <- cbind(x, y)
data <- streetscape::strview_search_multi(
  viewpoints = viewpoints,
  epsg = 2253,
  token = 'token')
```

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