



Make your own GIS service

Summer School on Digital Humanities

Web site: <https://bit.ly/dt4h-gis>

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13 giugno 2025

How to proceed

- The tutorial consists in the step-by-step creation of a simple app that:
 - Displays a map
 - Allow the user to add markers to the map
 - Exports the markers as a GeoJSON string
- The tool we are going to use to practice the *leaflet* library is Stackblitz (<https://stackblitz.com/>), an online IDE for JavaScript
- The code we are going to use is the one we saw in the previous slide and modified as a Stackblitz project
- The link to each project is in the title of each slide and in the course website page dedicated to this topic.



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Using the Stackblitz IDE

- Follow the [project link](#) for the first step
- In the right frame you see the preview of your service, showing a map
 - the URL of the preview is functional: try it!
- In the left frame there is the project content
- The selected file shows in the center frame



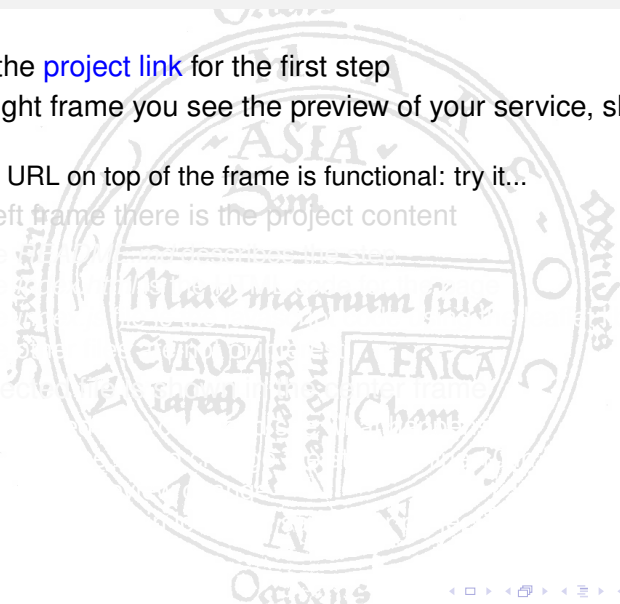
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 - The `README.md` describes the step
 - The `index.html` is the HTML code for the page
 - The `index.js` file is the javascript code using the leaflet library
 - The other files are the CSS and the images
- The selected file is shown in the center frame

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 - The other files are not of interest
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- The selected file is shown in the center frame
 - You can edit the code and see the changes in real time
 - For instance, try to change the map center in *index.html* and notice the preview

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 - The other files are not of interest
- The selected file is shown in the center frame
 - You can edit the code and see what happens
 - For instance, try to change the string in line 10 in *index.html* and notice the preview change
 - Your edits remain local. To save your project you should register on Stackblitz

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Step 1: the background (project)

- The first step in our tutorial consists of using the *Leaflet* library to display an OpenStreetMap raster
- How to:
 - The reference to the library in the package lock file
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- The first step in our tutorial consists of using the *Leaflet* library to display an OpenStreetMap raster
- How to:
 - The reference to the library is in the *package-lock* file
 - In the HTML file:
 - The *index.js* file contains the JavaScript code for our map
 - The *index.html* file contains the HTML code for our map
 - So we can use the *Leaflet* library
 - Next we add a background raster, which is *OpenStreetMap*

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 - In the HTML file:

- The index.js file contains the JavaScript code for our application
- The HTML file contains the structure of the application
- So we can use the Leaflet library to display the map
- Next we add a background raster, which is OpenStreetMap

Step 1: the background (project)

- The first step in our tutorial consists of using the *Leaflet* library to display an OpenStreetMap raster
- How to:
 - The reference to the library is in the *package-lock* file
 - In the HTML file:
 - a head element with the CSS for the *Leaflet* library
 - a div element for the map
 - The *index.js* file contains the JavaScript code of our app
 - The initial version of the app is very simple
 - So we will add a few more parameters
- Next we add a background raster, which is *OpenStreetMap*

Step 1: the background (project)

- The first step in our tutorial consists of using the *Leaflet* library to display an OpenStreetMap raster
- How to:
 - The reference to the library is in the *package-lock* file
 - In the HTML file:
 - a head element with the CSS for the *Leaflet* library
 - a div element for the map, its id is *mapid*
 - The *index.js* file contains the JavaScript code of our App
 - The capital *Letter* is of class *Leaflet*
 - So we create a *Leaflet* map with 3 parameters
- Next we add a background raster, which is *OpenStreetMap*

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- How to:
 - The reference to the library is in the *package-lock* file
 - In the HTML file:
 - a head element with the CSS for the *Leaflet* library
 - a div element for the map (its id is mapid)
 - The index.js file contains the JavaScript code of our App
 - The capital is stored in the Leaflet class
 - So we create a map with two parameters
 - Next we add a background raster, which is *OpenStreetMap*

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 - The reference to the library is in the *package-lock* file
 - In the HTML file:
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 - a div element for the map (its id is mapid)
 - The index.js file contains the JavaScript code of our App
 - The capital L stands for the Leaflet class
 - So we create a map with two parameters
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 - a div element for the map (its id is mapid)
 - The index.js file contains the JavaScript code of our App
 - The capital L stands for the *Leaflet* class
 - So we create a map with two parameters
 - the id of the div element (our mapid)
 - A JavaScript object with the map's center and zoom level
 - Next we add a background raster, which is *OpenStreetMap*

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 - The index.js file contains the JavaScript code of our App
 - The capital L stands for the *Leaflet* class
 - So we create a map with two parameters
 - the id of the DOM element hosting the raster (our mapid)
 - A JavaScript object that describes position of map center and zoom level
 - Next we add a background raster, which is *OpenStreetMap*

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 - In the HTML file:
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 - The `index.js` file contains the JavaScript code of our App
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Step 1: Lab activity

- Browse the web to find the coordinates of a place at your choice as the center of the raster
- Modify/remove the zoom factor

IMPORTANT:

- relax: you **cannot** damage my repo (you'd need my credentials)
- you may *Fork* (button on top-left corner) a branch in a repo of your own (recommended not strictly needed)
- you can undo unsaved updates with Ctrl-z
- after forking and signing up you can save your work

Step 2: show the coordinates (project)

- When the user clicks on the map an alert appears with the coordinates of the click
- How to:

- The first file is identical, we added management of click event in the code
- We added a new file to manage the click event



Step 2: show the coordinates (project)

- When the user clicks on the map an alert appears with the coordinates of the click
- How to:
 - The HTML file is identical, we added management of a click event in the JavaScript
 - We apply the `click` method to the map to catch click events



Step 2: show the coordinates (project)

- When the user clicks on the map an alert appears with the coordinates of the click
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 - The HTML file is identical, we added management of a click event in the JavaScript
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Step 2: show the coordinates (project)

- When the user clicks on the map an alert appears with the coordinates of the click
- How to:
 - The HTML file is identical, we added management of a click event in the JavaScript
 - We apply the *on* method to the map to catch *click* events
 - the first parameter is the name of the event we want to capture
 - the second parameter is a callback that takes the event description as a parameter
 - the callback is a function containing data extracted from the event descriptor *e*
 - the event descriptor is an object
 - we extract the lat and lng coordinates from the latlng field.

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 - the callback function handles containing data extracted from the event descriptor `e`
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 - we extract the `lat` and `lng` properties of the `latlng` field.

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Step 2: Lab activity

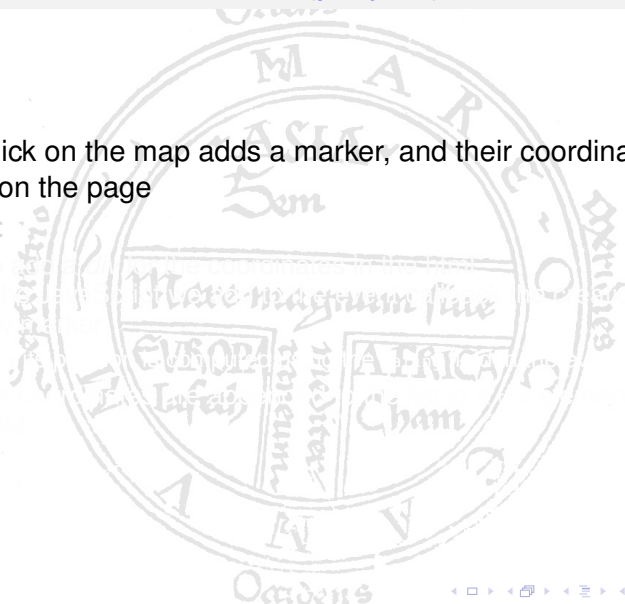
- create a named `<div>` and write within the coordinates. Use

```
document.getElementById("myDiv").textContent = ...
```

Step 3: collect coordinates (project)

- Each click on the map adds a marker, and their coordinates are shown on the page
- How to:

- We will use the coordinates in the
- In the 15th century, the discovery of the



Step 3: collect coordinates (project)

- Each click on the map adds a marker, and their coordinates are shown on the page
- How to:
 - We add a *div* for the coordinates in the html
 - In the JavaScript we catch the event callback the creation of the new marker
 - The coordinates are appended to the list in a *div* element of the DOM

Step 3: collect coordinates (project)

- Each click on the map adds a marker, and their coordinates are shown on the page
- How to:
 - We add a *div* for the coordinates in the html
 - In the JavaScript we add to the event callback the creation of the new marker
 - A position is obtained from the click event through the event descriptor
 - The coordinates are appended to the list in a *div* element of the DOM

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 - We add a *div* for the coordinates in the html
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Step 3: Lab activity

- Reverse the order of coordinates: longitude is shown first in the bottom list



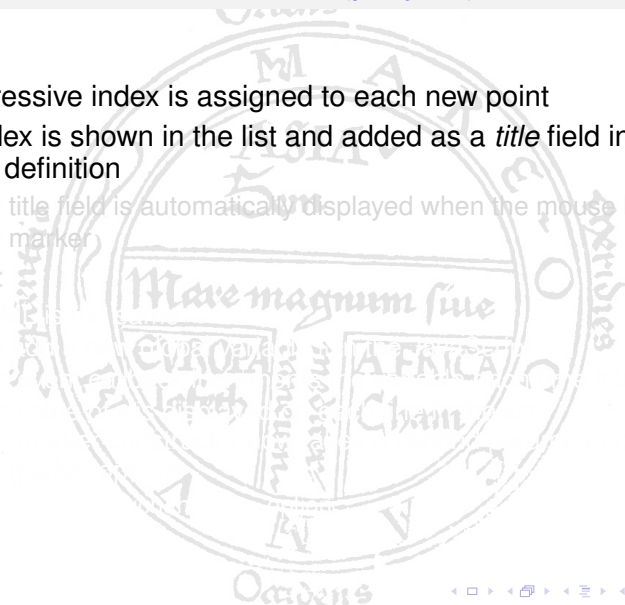
Step 4: enumerated markers (project)

- A progressive index is assigned to each new point
- The index is shown in the list and added as a *title* field in the marker definition
 - the title field is automatically displayed when the mouse hovers on the marker
- How to:



Step 4: enumerated markers (project)

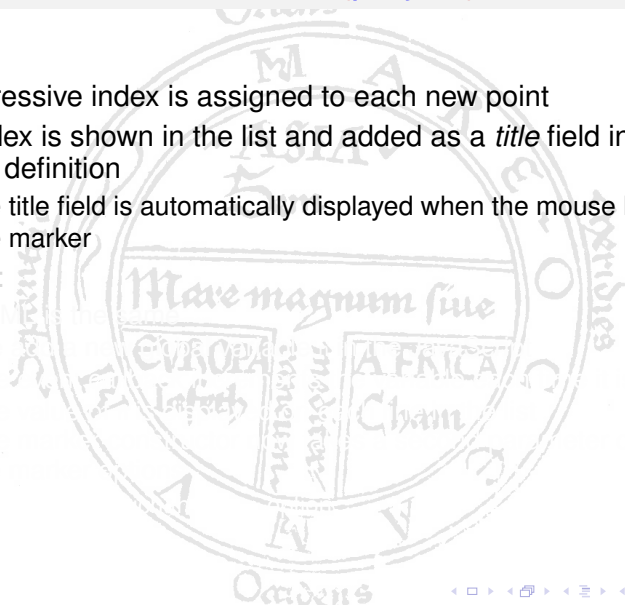
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- How to:

- HTML is the standard
- Web browser is the viewer



Step 4: enumerated markers (project)

- A progressive index is assigned to each new point
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- How to:
 - HTML is the same
 - We add a new global variable in the JavaScript
 - The event listener increments the variable each time it is run
 - The value of *n* is displayed next to the label in the list
 - The marker constructor now takes a second parameter containing the marker options

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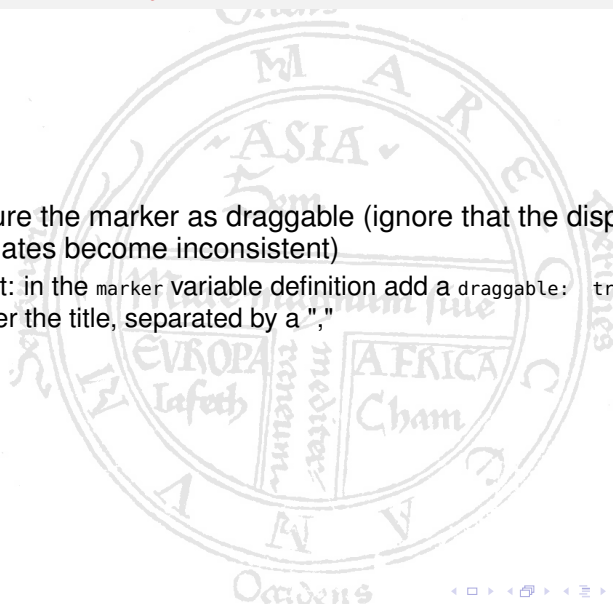
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 - We add a new global variable n in the JavaScript
 - The event callback increments the variable each time it is run
 - The value of n is displayed on each line in the list
 - The marker constructor now takes a second parameter containing the marker options
 - among which the `title` option

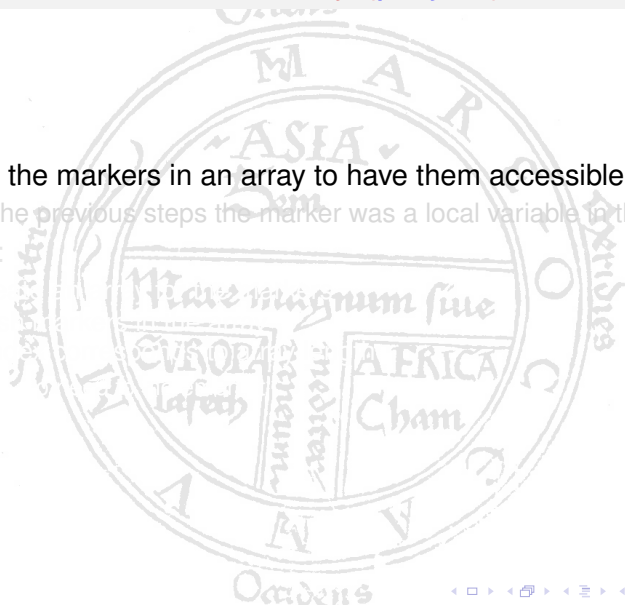
Step 4: Lab activity

- Configure the marker as draggable (ignore that the displayed coordinates become inconsistent)
 - hint: in the marker variable definition add a draggable: true property after the title, separated by a ","



Step 5: all markers in an array (project)

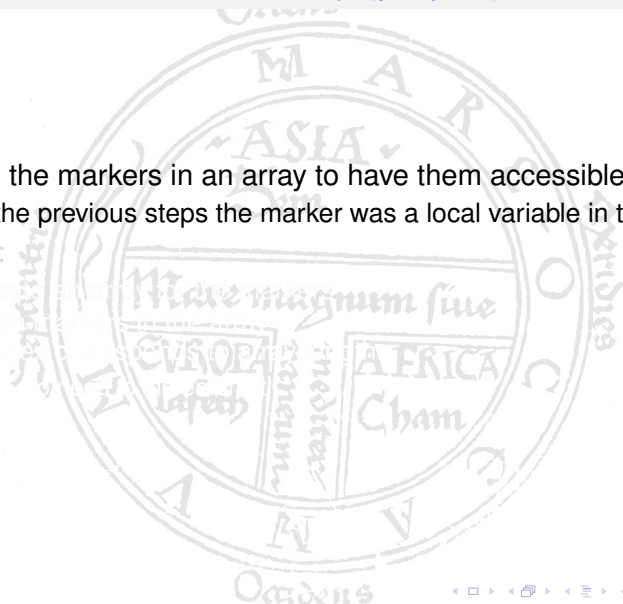
- Record the markers in an array to have them accessible
 - in the previous steps the marker was a local variable in the callback
- How to:



Step 5: all markers in an array (project)

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- How to:

- Create an array
- Push the marker



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 - n index corresponds to the length

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Step 5: Lab activity

- Create a button that fades-out the markers
- Hint
 - loop through all items in the array with a for loop

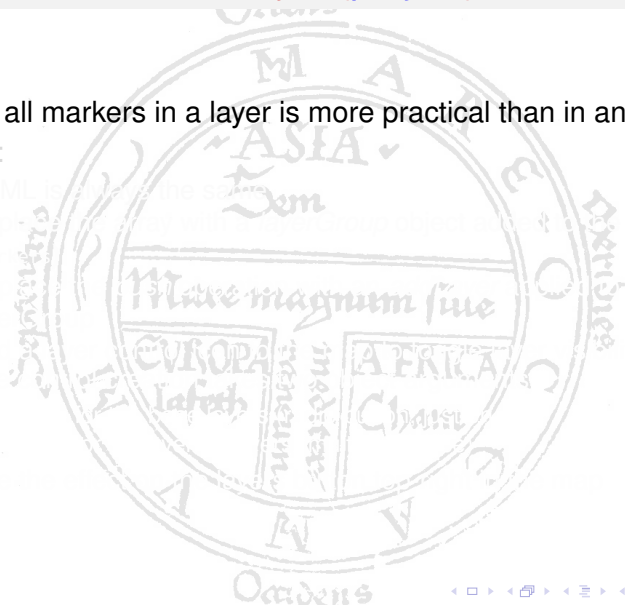
```
for (let m in markers) {...}
```

- use the `setOpacity(0.5)` on each marker

Step 6: all markers in a layer (project)

- Having all markers in a layer is more practical than in an array
- How to:

- HTML is always the same
- Replicate the array with a LayerGroup object add to the map (see the example)



Step 6: all markers in a layer (project)

- Having all markers in a layer is more practical than in an array
- How to:
 - HTML is always the same
 - Replace the array with a *layerGroup* object added to the map (markers)
 - Replace the *push* operation with an *addLayer* applied to the layerGroup
 - Add a layer control to the map to toggle the layer visibility
 - The *onCreate* method is not needed
- See the effect on the layers button top right in the map

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 - Replace the *push* operation with an *addLayer* applied to the layerGroup
 - Add a layer control icon to the map to toggle layer visibility
 - The control creation takes two object arguments
 - One for the title to be displayed (if any)
 - One for the layer to be added to the map
 - See the effect on the layers button top right in the map

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 - Replace the array with a *layerGroup* object added to the map (markers)
 - Replace the *push* operation with an *addLayer* applied to the layerGroup
 - Add a layer control icon to the map to toggle layer visibility
 - The control creation takes two object arguments
 - One for the base layers (radio button, just one)
 - One for the overlay layers (multiple choice)
 - See the effect on the layers button top right in the map

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Step 6: all markers in a layer (project)

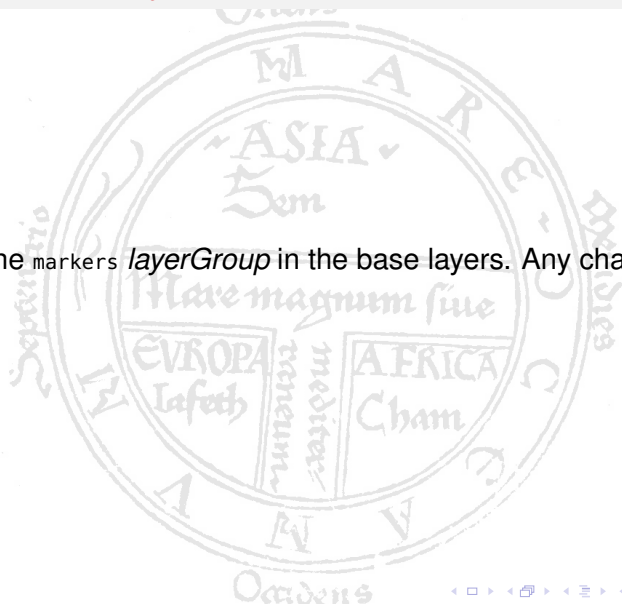
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Step 6: Lab activity

- move the markers `layerGroup` in the base layers. Any change?



Step 7: GeoJSON serialization (project)

- It is handy to have a standard string representation of a piece of data (serialization)
 - e.g. to store the data in a file
- The GeoJSON representation can be easily transformed into a JSON string, and viceversa
- We want to print in the console the JSON string for our markers
- The toJSON method of the GeoJSON object transforms the GeoJSON object into a JavaScript object with the GeoJSON properties
- The stringify method serializes the object into a String object
- The string is finally displayed on the display

Step 7: GeoJSON serialization (project)

- It is handy to have a standard string representation of a piece of data (serialization)
 - e.g. to store the data in a file
- The GeoJSON representation can be easily transformed into a JSON string, and viceversa
- We wanted to print in HTML the JSON string for our markers
- The `toGeoJSON` method converts the markers layer into a JavaScript object with the GeoJSON standard
- The `stringify` method serializes the object into a String object
- The string is finally displayed on the display

Step 7: GeoJSON serialization (project)

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- We want to print in the console the JSON string for our markers
- The `toGeoJSON` method converts the markers layer into a JavaScript object with the GeoJSON format
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Step 7: GeoJSON serialization (project)

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- We want to print in the console the JSON string for our markers
- The `toGeoJSON` method converts the markers layer into a JavaScript object with the GeoJSON format
 - alas, in the console it looks like this
- The `stringify` method serializes the object as a String object
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- The `toGeoJSON` method converts the markers layer into a JavaScript object with the GeoJSON format
 - alas, in this way we lose the `tile` field
- The `stringify` method serializes the object as a String object
- The string is finally recorded on the display

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- We want to print in the console the JSON string for our markers
- The `toGeoJSON` method converts the markers layer into a JavaScript object with the GeoJSON format
 - alas, in this way we lose the *title* field
- The `stringify` method serializes the object as a String object
- The string is finally recorded out on the display

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- The `stringify` method serializes the object as a String object
- The string is finally recorded put on the display

Step 7: Lab activity

- Copy the generated GeoJSON and feed it to an online viewer, like <https://www.geometrymapper.com/>
- Is there any way to record the *title* field in the JSON string?
- Study the GeoJSON format in the console and find a solution