



Community Experience Distilled

Leaflet.js Essentials

Create interactive, mobile-friendly mapping applications using the incredibly light yet powerful Leaflet.js platform

Paul Crickard III

[PACKT] open source*
PUBLISHING community experience distilled

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BIRMINGHAM - MUMBAI

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Currently, Paul works as a programmer analyst in Albuquerque, specializing in the design, maintenance, and the implementation of geospatial applications. He has written plugins and extensions for ArcMap and ArcGIS Explorer Desktop to utilize NoSQL databases and send data using the Advanced Message Queuing Protocol (AMQP). Paul has built applications using OpenLayers and Leaflet.js and is currently utilizing the ESRI JavaScript API in production.

Paul tries to incorporate Python in geospatial development wherever possible. From building plugins, toolboxes, and the Field Calculator functions in ArcMap to coding standalone desktop and web applications, pyshp is his favorite library for geospatial Python applications.

When he is not coding, Paul enjoys relaxing with his wife and son, cooking, and brewing beer.

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Alexander Parshin is a web developer in the area of web mapping. He was the author of the first Leaflet workshop in Russia, has been the author of several Leaflet plugins, and is a contributor to the Leaflet library. His current job is related to the library as well; he is the Lead of the UI team in his company, which builds commercial B2B Web-GIS systems based on the Leaflet mapping framework.

Antonio Santiago is a Computer Science professional with more than 10 years of experience in designing and implementing systems.

Since the beginning of his professional life, his work experience has always been related to the world of meteorology; he has worked for different companies as an employee or a freelancer. He is experienced in the development of systems to collect, store, transform, analyze, and visualize data; he is also actively interested in any GIS-related technology, with preference for data visualization.

With a restless mind, which is mainly experienced in the Java ecosystem, he has also worked actively with many related web technologies and is always looking for ways to improve the client side of web applications.

A firm believer in software engineering practices, he is an enthusiast of Agile methodologies, which involves customers as the main key for the project's success.

Antonio is also the author of *OpenLayers Cookbook*, Packt Publishing.

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I would like to dedicate this book to my wife, Yolanda. It would not have been possible without her love and support.

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Preface

Making maps used to require an extensive knowledge of cartography, expensive software, and technical know-how. Today, there are numerous tools available, many of which are free, that have simplified the map-making process. This book is about using one such library, Leaflet.js.

Leaflet.js is a JavaScript library that although small, is packed with almost every feature you could need. If a feature is not available in the core library, it may be available as one of the many plugins that have become available. The largest map-making software vendor, Environmental Systems Research Institute (ESRI), has even released a plugin for Leaflet.js. If you are interested in making maps or in data visualization, Leaflet.js is the library to learn.

Whether you are looking to build simple maps or advanced mapping applications, this book will build on your JavaScript knowledge to help you reach your goal. This book was designed to be accessible to individuals who are new to map making and also to those who may know maps but are just learning to code.

What this book covers

Chapter 1, Creating Maps with Leaflet, walks you through the basics of making maps in Leaflet.js. You start by creating an HTML file with the minimum JavaScript code required to display a map. You are going to learn how to select different basemaps and providers and different basemap formats. Then, you will learn how to display geographic features such as points, polylines, and polygons.

Chapter 2, Mapping GeoJSON Data, introduces you to a geographic version of the JSON data format. You will learn how to create your own GeoJSON data as well as consume data from other sources. In this chapter, you will learn how to style the data and iterate through features to add pop ups.

Chapter 3, Creating Heatmaps and Choropleth Maps, moves away from simply displaying points and towards displaying the significance or comparisons of the data. It builds on what you have learned so far and teaches you how to use different plugins to create heatmaps. You will also learn how to use your knowledge of styling GeoJSON to create choropleth maps.

Chapter 4, Creating Custom Markers, guides you through the customization of the markers you use in your maps. You will learn how to draw your own image or modify an existing image to use it as a marker in your map. You will be introduced to several plugins that offer premade markers that are customizable. Also, you will learn how to animate markers and combine plugins for added effects.

Chapter 5, ESRI in Leaflet, opens up the most commonly used data formats and server endpoints in mapping. This chapter will teach you how to load shapefiles in your maps. You will also learn how to connect to an ESRI server that has an exposed REST service. Using the ESRI-Leaflet plugin, you will learn how to geocode and reverse geocode addresses, filter data from a server, and query by location.

Chapter 6, Leaflet in Node.js, Python, and C#, expands on everything you have learned in order to teach you how to build applications in other frameworks and languages. This chapter teaches you how to build both the frontend and the backend. You will build servers in JavaScript and Python. You will be introduced to NoSQL databases and AJAX to display and update data without refreshing your web page. Lastly, you will learn how to create a Windows desktop application by embedding Leaflet in C#.

What you need for this book

You need, at a minimum, the following software for this book:

- A web browser, preferably Google Chrome, which is available at <https://www.google.com/chrome/browser/>

For the examples in *Chapter 5, ESRI in Leaflet* and *Chapter 6, Leaflet in Node.js, Python, and C#*, the following software is required:

- Node.js, which is available at <http://nodejs.org/>.
- Python 2.7, preferably 3.x. You can download either version from <https://www.python.org/>.
- Visual Studio Express 2010. You will find a free copy at <http://www.visualstudio.com/downloads/download-visual-studio-vs>.
- CherryPy is available at <http://www.cherrypy.org/>.
- MongoDB is available at <http://www.mongodb.org/>.

- Pymongo is the Python library to use MongoDB, and it is freely available at <https://pypi.python.org/pypi/pymongo/>.
- C# drivers for MongoDB are available in several formats at <https://github.com/mongodb/mongo-csharp-driver/releases>.
- WAMP can be downloaded from <http://www.wampserver.com/en/>.

Who this book is for

If you are a map maker with some JavaScript knowledge, this book is an ideal resource that teaches you how to bring your maps to the Web and make them interactive. If you are a JavaScript developer, this book will show you how to use those skills to build powerful mapping applications.

Conventions

In this book, you will find a number of styles of text that distinguish between different kinds of information. Here are some examples of these styles, and an explanation of their meaning.

Code words in text, database table names, folder names, filenames, file extensions, pathnames, dummy URLs, user input, and Twitter handles are shown as follows: "Create a text string of the query and initialize your `StringBuilder()` method to hold the JavaScript of the function and results."

A block of code is set as follows:

```
var layer = new L.TileLayer('http://{s}.tile.thunderforest.com/  
landscape/{z}/{x}/{y}.png');  
map.addLayer(layer);
```

When we wish to draw your attention to a particular part of a code block, the relevant lines or items are set in bold:

```
<style>  
  html, body, #map {  
    padding: 0;  
    margin: 0;  
    height: 100%;  
  }  
  #points.hidden {  
    display: none;  
  }  
</style>
```