

Capstone Project - The Battle of Neighborhoods (Week 2)

April 19, 2020

1 Exploring the business potential for opening a hotel in Madrid

1.1 1.Introduction

This report explores the opportunities for the opening of a new hotel in the city of Madrid.

Madrid is the European tourist capital with the most average expenditure per tourist with €355 per day.

During the last 6 years, the number of foreign tourists who have visited the Community of Madrid maintains a sustained growth, well above the rest of Spanish destinations.

The city of Madrid recorded in 2019 the arrival of 10.4 million visitors (+2.1% vs 2018), of which 55% were international and 45% national. 22.6 million overnight stays were generated (+5.7% vs 2018). The main international tourism source markets were the United States, Italy, France, the United Kingdom and Germany, and the fastest growing markets were the United States, China, Italy, Brazil and Mexico. A total expense of 10,451 million was reached (+12.6% vs 2018) and an average daily expense of 270 euros (+11% vs 2018).

The number of rooms in 5-star hotels in Madrid is growing, although it is still below that of other European capitals. This represents a business opportunity in a growth environment.

In the capital there are more than 5,100 rooms available in 5-star establishments compared to almost 22,000 in Paris or more than 18,000 in London. Most of the hotels in Madrid are 4-stars, therefore this is the segment with the highest competition.

1.2 2. The data

The following data sets will be used for this report:

- A dataset containing the districts and neighborhoods of Madrid will be used. This dataset will include the geographic coordinates of each district for subsequent location on maps and clusters. Madrid has 21 districts that, in addition, group a total of 131 administrative neighborhoods. This information will be obtained from Wikipedia (https://en.wikipedia.org/wiki/Districts_of_Madrid) and from official organizations such as (<http://gestiona.madrid.org/iestadis/>) and (<http://gestiona.madrid.org/nomecalles/DescargaBDTCorte.icm#delimitacionesterritoriales>)

- We will use Foursquare.com to obtain leisure venues that may be of interest to tourists, from each district and existing hotels. Crossing this information with the previous one of the districts we will be able to group the information obtained in clusters and we will be able to represent them on maps for a better understanding. In this way we will be able to determine the best location for the new hotel.

Scrapping Madrid Districts Table from Wikipedia

```
[1]: import numpy as np
import pandas as pd
import requests
from bs4 import BeautifulSoup

URL = 'https://en.wikipedia.org/wiki/Districts_of_Madrid'
res = requests.get(URL)
scraped_data = BeautifulSoup(res.text, 'html.parser')
```

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[2]: scraped_data
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Ciudad Universitaria (93)
Valdezarza (94)
ValdemarÃñn (95)
El PlantÃño (96)
Aravaca (97)</small>

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Lucero (103)
Aluche (104)
Campamento (105)
Cuatro Vientos (106)
Las ÃAguilas (107)</small>

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title="San Isidro (Madrid)">San Isidro</a> (113)<br/><a
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Quintana (153)
Concepción (154)
San Pascual (155)
San Juan Bautista (156)
Colina (157)
Atalaya (158)
Costillares (159)</small>
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Canillas (163)
Pinar del Rey (164)
Apóstol Santiago (165)
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<h2><span class="mw-headline" id="Popular\_neighbourhoods">Popular neighbourhoods</span><span class="mw-editsection"><span class="mw-editsection-bracket">[</span><a href="/w/index.php?title=Districts\_of\_Madrid&action=edit&section=2" title="Edit section: Popular neighbourhoods">edit</a><span class="mw-editsection-bracket">]</span></span></h2>  
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de Comunicaciones</a></div></div></div>

<p>Contemporary Madrid came into its own after the death of general <a href="/wiki/Francisco\_Franco" title="Francisco Franco">Francisco Franco</a>. Reaction against the dictatorial bureaucracy centered in Madrid, and a history of centralism that predated Franco by centuries has resulted in the successful modern movement towards increased <a class="mw-redirect" href="/wiki/Autonomous\_entity" title="Autonomous entity">autonomy</a> for the regions of Spain, considered autonomous regions under the umbrella of Spain. The modern metropolis is home to over three million people.

</p>
<h3><span id="Alonso\_Mart.C3.ADnez"></span><span class="mw-headline" id="Alonso\_MartÃÑez">Alonso MartÃÑez</span><span class="mw-editsection"><span class="mw-editsection-bracket">[</span><a href="/w/index.php?title=Districts\_of\_Madrid&amp;action=edit&amp;section=3" title="Edit section: Alonso MartÃÑez">edit</a><span class="mw-editsection-bracket">]</span></span></h3>
<p>This area contains the large <a href="/wiki/Plaza\_de\_Col%C3%B3n" title="Plaza de ColÃ³n">Plaza de ColÃ³n</a>. This plaza commemorates <a href="/wiki/Christopher\_Columbus" title="Christopher Columbus">Christopher Columbus</a>, who was responsible for ushering in the Spanish imperial golden age of the 16th and 17th centuries. It is within walking distance of the main cultural and commercial areas of the city, such as the <a class="mw-redirect" href="/wiki/Prado" title="Prado">Prado</a> museum, the expansive <a class="mw-redirect" href="/wiki/Parque\_del\_Buen\_Retiro" title="Parque del Buen Retiro">Parque del Buen Retiro</a> and the business center on the lower part of the <a href="/wiki/Paseo\_de\_la\_Castellana" title="Paseo de la Castellana">Paseo de la Castellana</a>.
</p>
<h3><span class="mw-headline" id="Atocha">Atocha</span><span class="mw-editsection"><span class="mw-editsection-bracket">[</span><a href="/w/index.php?title=Districts\_of\_Madrid&amp;action=edit&amp;section=4" title="Edit section: Atocha">edit</a><span class="mw-editsection-bracket">]</span></span></h3>
<p><a href="/wiki/Atocha\_(Madrid)" title="Atocha (Madrid)">Atocha</a> covers a large area and is bordered by the Huertas and LavapiÃ's neighbourhoods. It contains several notable cultural institutions, including the <a href="/wiki/Museo\_Nacional\_Centro\_de\_Arte\_Reina\_Sof%C3%ADa" title="Museo Nacional Centro de Arte Reina SofÃa">Reina SofÃa Museum</a>. Also located here is the central bus terminal and the <a href="/wiki/Madrid\_Atocha\_railway\_station" title="Madrid Atocha railway station">Atocha Railway Station</a>, one of two main train stations in Madrid, the other being located in <a href="/wiki/Chamart%C3%ADn\_(Madrid)" title="ChamartÃn (Madrid)">ChamartÃn</a>. This was the main site of the <a href="/wiki/2004\_Madrid\_train\_bombings" title="2004 Madrid train bombings">train bombings</a> carried out on March 11, 2004. Atocha was also the site of the <a class="mw-redirect" href="/wiki/1977\_Massacre\_of\_Atocha" title="1977 Massacre of Atocha">1977 Massacre of Atocha</a>.

### AZCA / Nuevos Ministerios<span class="mw-editsection-bracket">[edit](/w/index.php?title=Districts_of_Madrid&action=edit&section=5 "Edit section: AZCA / Nuevos Ministerios")



Torre Picasso, designed by [Minoru Yamasaki](/wiki/Minoru_Yamasaki "Minoru Yamasaki")

Located in the Cuatro Caminos ward, [AZCA](/wiki/AZCA "AZCA") is the financial center of Madrid. The area is populated by skyscrapers, among them [Torre Picasso](/wiki/Torre_Picasso "Torre Picasso") at 157 metres (515 ft), Edificio BBVA at 107 metres (351 ft) and [Torre Europa](/wiki/Puerta_de_Europa "Puerta de Europa") at 115 metres (377 ft). The skyscraper [Torre Windsor](/wiki/Torre_Windsor "Torre Windsor") once stood here as well, until it burned completely on the night of 12 February 2005. A large [El Corte Inglés](/wiki/El_Corte_Ingl%C3%A9s "El Corte Inglés") department store consisting of three interconnected buildings is also located here. The area is directly linked to [Barajas Airport](/wiki/Barajas_Airport "Barajas Airport") by [metro](/wiki/Madrid_Metro "Madrid Metro") line 8 at the *Nuevos Ministerios* station. It's the [Parkour](/wiki/Parkour "Parkour") centre of Madrid.

### Cuatro Torres Business Area<span class="mw-editsection-bracket">[edit](/w/index.php?title=Districts_of_Madrid&action=edit&section=6 "Edit section: Cuatro Torres Business Area")

The [Cuatro Torres Business Area](/wiki/Cuatro_Torres_Business_Area "Cuatro Torres Business Area") is composed of the four tallest skyscrapers in Madrid. The tallest is [Torre Bankia](/wiki/Torre_Bankia "Torre Bankia"), once known as the Torre [Repsol](/wiki/Repsol "Repsol"), at 250 metres (820 ft). It was designed by

[Sir Norman Foster](/wiki/Norman_Foster,_Baron_Foster_of_Thames_Bank "Norman Foster, Baron Foster of Thames Bank"), and is the third tallest skyscraper in Europe. [>Torre de Cristal](/wiki/Torre_de_Cristal_(Madrid) "Torre de Cristal (Madrid)"), or 'Crystal Tower', is only 0.6 metres (2 ft 0 in) lower than Torre Bankia, at 249.4 metres (818 ft), and was designed by [>Cesar Pelli](/wiki/Cesar_Pelli "Cesar Pelli"). [>Torre PwC](/wiki/Torre_PwC "Torre PwC") is the third tallest in Madrid, at 235 metres (771 ft), and was designed by Enrique Alvarez & Carlos Rubio. The fourth skyscraper is [>Torre Espacio](/wiki/Torre_Espacio "Torre Espacio"), or 'Space Tower'. It is 223 metres (732 ft) tall and it was designed by I.M. Pei.<sup>class="reference" id="cite\_ref-CTBA\_Madrid\_3-0"><a href="#cite\_note-CTBA\_Madrid-3">[2]</a></sup> The four skyscrapers were finished in 2008.</sup>

</p>

<h3><span class="mw-headline" id="Chueca">Chueca</span><span class="mw-editsection"><span class="mw-editsection-bracket"></span><a href="/w/index.php?title=Districts\_of\_Madrid&action=edit&section=7" title="Edit section: Chueca">edit</a><span class="mw-editsection-bracket"></span></span></h3>

<p><a href="/wiki/Chueca" title="Chueca">Chueca</a> is well known as a [>centre of gay culture</a> in Madrid.<sup>class="reference" id="cite\\_ref-Let's\\_Go:\\_Spain\\_&\\_Portugal\\_4-0"><a href="#cite\\_note-Let's\\_Go:\\_Spain\\_&\\_Portugal-4">\[3\]</a></sup></sup>](/wiki/Gay_village "Gay village")

</p>

<h3><span class="mw-headline" id="Las\_Cortes">Las Cortes</span><span class="mw-editsection"><span class="mw-editsection-bracket"></span><a href="/w/index.php?title=Districts\_of\_Madrid&action=edit&section=8" title="Edit section: Las Cortes">edit</a><span class="mw-editsection-bracket"></span></span></h3>

<p>This small area is notable for housing the [>Congress of Deputies](/wiki/Congress_of_Deputies_(Spain) "Congress of Deputies (Spain)"), known as the *Congreso de los diputados*, the lower house of the Spanish parliament. Other notable sites include the [>Thyssen-Bornemisza Museum](/wiki/Thyssen-Bornemisza_Museum "Thyssen-Bornemisza Museum"), the [>Banco de España](/wiki/Banco_de_Espa%C3%B1a "Banco de España"), the Caf  del C rculo de Bellas Artes, the Zarzuela Theater and the [>Plaza de Cibeles](/wiki/Plaza_de_Cibeles "Plaza de Cibeles").

</p>

<h3><span class="mw-headline" id="Huertas">Huertas</span><span class="mw-editsection"><span class="mw-editsection-bracket"></span><a href="/w/index.php?title=Districts\_of\_Madrid&action=edit&section=9" title="Edit section: Huertas">edit</a><span class="mw-editsection-bracket"></span></span></h3>

<p>This neighbourhood, also known as Barrio de las Letras, is west of the Paseo



del Prado and north of Calle Atocha. Once the home and popular hangout of writers such as [Miguel de Cervantes](/wiki/Miguel_de_Cervantes "Miguel de Cervantes") and [Calderon de la Barca](/wiki/Calderon_de_la_Barca "Calderon de la Barca"), Huertas is now considered Madrid's literary neighbourhood.<sup>class="reference" id="cite\_ref-Let's\_Go:\_Spain\_&\_Portugal\_4-1"><a href="#cite\_note-Let's\_Go:\_Spain\_&\_Portugal-4">[3]</a></sup> One prominent landmark is the house where Cervantes died in 1616.<sup>class="reference" id="cite\_ref-5"><a href="#cite\_note-5">[4]</a></sup> It is a popular nightlife spot and tourist destination.</sup></sup>

</p>

<h3><span id="Gran\_V.C3.ADa"></span><span class="mw-headline" id="Gran\_VÃąa">Gran VÃąa</span><span class="mw-editsection"><span class="mw-editsection-bracket">[</span><a href="/w/index.php?title=Districts\_of\_Madrid&action=edit&section=10" title="Edit section: Gran VÃąa">edit</a><span class="mw-editsection-bracket">]</span></span></h3>

<div class="thumb tright"><div class="thumbinner" style="width:222px;"><a class="image" href="/wiki/File:Croisement\_Gan\_Via-Alcala.jpg"></a> <div class="thumbcaption"><div class="magnify"><a class="internal" href="/wiki/File:Croisement\_Gan\_Via-Alcala.jpg" title="Enlarge"></a></div>Gran VÃąa</div></div></div>

<p>As the name implies, the Gran VÃąa area contains one of Madrid's most important avenues, the [Gran VÃąa](/wiki/Gran_V%C3%ADa_(Madrid) "Gran VÃąa (Madrid)") (literally, "Great Way"). First and foremost it is a shopping street; however, it also contains a number of tourist accommodations, plenty of nightlife (including Madrid's large [goth scene](/wiki/Goth_subculture "Goth subculture")), many of Madrid's largest movie theaters and live musical shows. It is also a hub for Madrid's [red-light district](/wiki/Red-light_district "Red-light district"), as it links many side streets. One of these streets, calle Fuencarral, has become a link between the old shopping area of the center of the city, the Bohemian MalasaÃąa, and the hip Chueca district, making of it one of the most cosmopolitan areas of the city.

</p>

<h3><span id="Lavapi.C3.A9s"></span><span class="mw-headline" id="LavapiÃąs">LavapiÃąs</span><span class="mw-editsection"><span class="mw-editsection-bracket">[</span><a href="/w/index.php?title=Districts\_of\_Madrid&action=edit&section=11"

title="Edit section: LavapiÃ's">edit</a><span class="mw-editsection-bracket">]</span></span></h3>

<p>One of the poorer neighbourhoods near the city center, <a href="/wiki/Lavapi%C3%A9s" title="LavapiÃ's">LavapiÃ's</a> has maintained much of true 'MadrileÃ'so' spirit of the past. LavapiÃ's has a high concentration of immigrants (mainly Chinese, Arabs, Hindi, Africans and Caribbeans), and also tends to attract artists and writers, adding to the cosmopolitan mix. The presence of immigrants has led to a variety of good, cheap shops and restaurants of both local and international food. It's one of the best places to find foreign herbs and spices. It is changing rapidly under the pressures of <a href="/wiki/Gentrification" title="Gentrification">gentrification</a>.

</p>

### <span class="mw-headline" id="La\_Latina">La Latina</span><span class="mw-editsection"><span class="mw-editsection-bracket">[</span><a href="/w/index.php?title=Districts\_of\_Madrid&amp;action=edit&amp;section=12" title="Edit section: La Latina">edit</a><span class="mw-editsection-bracket">]</span></span></h3>

<p>In and around <a href="/wiki/Barrio\_de\_La\_Latina\_(Madrid)" title="Barrio de La Latina (Madrid)">La Latina</a> are the origins of Madrid. Its difficult to put precise boundaries on La Latina, because, like its immediate neighbours, streets are narrow and winding. There are quite a few nightlife spots, though the neighbourhood is best known as having a concentration of <a href="/wiki/Tapas" title="Tapas">tapas</a> bars (particularly on the Cava Baja and Cava Alta). There are also a number of attractive churches, including the <a href="/wiki/Church\_of\_San\_Andr%C3%A9s\_(Madrid)" title="Church of San AndrÃ's (Madrid)">Church of San AndrÃ's</a> and the <a class="mw-redirect" href="/wiki/San\_Francisco\_el\_Grande\_Basilica" title="San Francisco el Grande Basilica">San Francisco el Grande Basilica</a>. On Sundays and major holidays, the famous <a class="mw-redirect" href="/wiki/Rastro" title="Rastro">Rastro</a> flea-market begins on the eastern edge, spilling out of the San Millan exit of the La Latina metro stop to the Plaza de Cascorro and all the way to the Ronda de Toledo to the south. Plaza de la Paja is another interesting location here. On its other side, La Latina borders Plaza Mayor and another ancient part of the town, <a href="/wiki/El\_Madrid\_de\_los\_Austrias" title="El Madrid de los Austrias">El Madrid de los Austrias</a>, where you can find the beautiful <a

26

class="mw-redirect" href="/wiki/Palacio\_Real" title="Palacio Real">Palacio Real</a> (Royal Palace).

</p>

<h3><span id="Malasa.C3.B1a"></span><span class="mw-headline" id="MalasaÃsa">MalasaÃsa</span><span class="mw-editsection"><span class="mw-editsection-bracket">[</span><a href="/w/index.php?title=Districts\_of\_Madrid&amp;action=edit&amp;section=13" title="Edit section: MalasaÃsa">edit</a><span class="mw-editsection-bracket">]</span></span></h3>

<p><a href="/wiki/Malasa%C3%B1a" title="MalasaÃsa">MalasaÃsa</a> is famous for →its

nightlife, and for having been the main hub of the <a href="/wiki/La\_Movida\_Madrile%C3%B1a" title="La Movida MadrileÃsa">movida</a> countercultural movement in the 1970s and 1980s. Considerated very popular and one of the bestÃts MadridÃts neighbourhoods with available pubs and bars during night.

</p>

<h3><span id=".C3.93pera"></span><span class="mw-headline" id="Ãspera">Ãspera</span><span class="mw-editsection"><span →class="mw-editsection-

bracket">[</span><a href="/w/index.php?title=Districts\_of\_Madrid&amp;action=edit&amp;section=14" title="Edit section: Ãspera">edit</a><span class="mw-editsection-bracket">]</span></span></h3>

<p>As the name implies, this area around the <a href="/wiki/%C3%93pera\_(Madrid\_Metro)" title="Ãspera (Madrid Metro)">Ãspera metro stop</a> is the location of Madrid's main Opera Theatre, the <a href="/wiki/Teatro\_Real" title="Teatro Real">Teatro Real</a> (Royal Theatre). In front of the theatre is the <a class="mw-redirect" href="/wiki/Palacio\_Real\_de\_Madrid" title="Palacio Real de Madrid">Palacio Real de Madrid</a>, or Royal Palace. The Royal Palace is no longer used as a residence, but it has been kept intact, serving as a cultural monument that is occasionally used for state functions. It's one of largest palaces in Europe, surpassing even the Versailles Palace.

</p>

<h3><span class="mw-headline" id="Retiro">Retiro</span><span class="mw-editsection"><span class="mw-editsection-bracket">[</span><a href="/w/index.php?title=Districts\_of\_Madrid&amp;action=edit&amp;section=15" title="Edit section: Retiro">edit</a><span class="mw-editsection-bracket">]</span></span></h3>

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<p>Barrio Retiro is a classic neighbourhood surrounding the famous <a class="mw-redirect" href="/wiki/Buen\_Retiro\_Park" title="Buen Retiro Park">Buen Retiro Park</a>, to the east of the center of the city. It is demographically the oldest neighbourhood in the city, but over the past five years the increasing number of flats for rent has been attracting young people and students to the area in growing numbers. The neighbourhood can be characterized by the style of its three most important areas. In the north, centering on Calle Ibiza, streets are in a grid pattern and buildings, normally 6-10 storeys, are packed closely together, creating a bustling atmosphere of small shops, bars, and restaurants. This area is very similar to the neighbouring Salamanca district. In the south, called NiÃŃso Jesus, the area is quieter, more spacious, and residential. In the west, the JerÃƒnimos area, with its beautiful 18th and 19th century buildings and many museums (including the <a href="/wiki/Museo\_del\_Prado" title="Museo del Prado">Museo del Prado</a>), has few private residences, its large flats that often surpass 200 mÃŠ (2,150 sq ft) being mainly used for offices.

</p>

### <span class="mw-headline" id="Hortaleza">Hortaleza</span><span class="mw-editsection"><span class="mw-editsection-bracket">[</span><a href="/w/index.php?title=Districts\_of\_Madrid&amp;action=edit&amp;section=16" title="Edit section: Hortaleza">edit</a><span class="mw-editsection-bracket">]</span></span></h3>

<p>A residential district in the north, Hortaleza includes the headquarters of the <a href="/wiki/Spanish\_Olympic\_Committee" title="Spanish Olympic Committee">Spanish Olympic Committee</a>, the <a href="/wiki/IFEMA" title="IFEMA">IFEMA</a> (Madrid's main trade fair centre) and <a href="/wiki/Juan\_Carlos\_I\_Park" title="Juan Carlos I Park">Juan Carlos I Park</a>, a park between Campo de las Naciones (commercial district) and Barajas. Mar de Cristal is a tube station in Hortaleza district with an airport connection.

</p>

### <span class="mw-headline" id="Vallecas">Vallecas</span><span class="mw-editsection"><span class="mw-editsection-bracket">[</span><a href="/w/index.php?title=Districts\_of\_Madrid&amp;action=edit&amp;section=17" title="Edit section: Vallecas">edit</a><span class="mw-editsection-bracket">]</span></span></h3>

<p><a href="/wiki/Vallecas" title="Vallecas">Vallecas</a> is a working-class residential neighbourhood in the south of Madrid. It is also home to the <a href="/wiki/Rayo\_Vallecano" title="Rayo Vallecano">Rayo Vallecano</a> football team.

</p>

### <span class="mw-headline" id="Aravaca">Aravaca</span><span class="mw-editsection"><span class="mw-editsection-bracket">[</span><a href="/w/index.php?title=Districts\_of\_Madrid&amp;action=edit&amp;section=18" title="Edit section: Aravaca">edit</a><span class="mw-editsection-

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 <p><a href="/wiki/Aravaca" title="Aravaca">Aravaca</a> is an upper-class residential suburb in the northwest of Madrid. During the <a href="/wiki/Spanish\_Civil\_War" title="Spanish Civil War">Spanish Civil War</a> the front was stabilized here for almost three years. Aravaca and its surroundings include parkland and wooded areas such as <a href="/wiki/Casa\_de\_Campo" title="Casa de Campo">Casa de Campo</a>.  
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<li><a href="/wiki/Sol\_(Madrid)" title="Sol (Madrid)">Sol</a></li></ul>

</div></td></tr><tr><th class="navbox-group" scope="row" style="width:1%;text-align: left;"><a href="/wiki/Chamart%C3%ADn\_(Madrid)" title="ChamartÃn (Madrid)">ChamartÃn</a></th><td class="navbox-list navbox-odd hlist" style="text-align:left;border-left-width:2px;border-left-style:solid;width:100%;padding:0px"><div style="padding:0em 0.25em">

<ul><li><a href="/wiki/Castilla\_(Madrid)" title="Castilla (Madrid)">Castilla</a></li>

<li><a href="/wiki/Ciudad\_Jard%C3%ADn\_(Madrid)" title="Ciudad JardÃn (Madrid)">Ciudad JardÃn</a></li>

<li><a href="/wiki/El\_Viso\_(Madrid)" title="El Viso (Madrid)">El Viso</a></li>

<li><a href="/wiki/Hispanoam%C3%A9rica" title="HispanoamÃrica">HispanoamÃrica</a></li>

<li><a href="/wiki/Nueva\_Espa%C3%B1a\_(Madrid)" title="Nueva EspaÃa (Madrid)">Nueva EspaÃa</a></li>

<li><a href="/wiki/Prosperidad\_(Madrid)" title="Prosperidad (Madrid)">Prosperidad</a></li></ul>

</div></td></tr><tr><th class="navbox-group" scope="row" style="width:1%;text-align: left;"><a href="/wiki/Chamber%C3%AD" title="ChamberÃ" >ChamberÃ</a></th><td class="navbox-list navbox-even hlist" style="text-align:left;border-left-width:2px;border-left-style:solid;width:100%;padding:0px"><div style="padding:0em 0.25em">

<ul><li><a href="/wiki/Almagro\_(Madrid)" title="Almagro (Madrid)">Almagro</a></li>

<li><a href="/wiki/Arapiles\_(Madrid)" title="Arapiles (Madrid)">Arapiles</a></li>

<li><a href="/wiki/Gaztambide\_(Madrid)" title="Gaztambide (Madrid)">Gaztambide</a></li>

<li><a href="/wiki/R%C3%ADos\_Rosas\_(Madrid)" title="RÃos Rosas (Madrid)">RÃos Rosas</a></li>

<li><a href="/wiki/Trafalgar\_(Madrid)" title="Trafalgar (Madrid)">Trafalgar</a></li>

<li><a href="/wiki/Vallehermoso\_(Madrid)" title="Vallehermoso (Madrid)">Vallehermoso</a></li></ul>

</div></td></tr><tr><th class="navbox-group" scope="row" style="width:1%;text-align: left;"><a href="/wiki/Ciudad\_Lineal" title="Ciudad Lineal">Ciudad Lineal</a></th><td class="navbox-list navbox-odd hlist" style="text-align:left;border-left-width:2px;border-left-style:solid;width:100%;padding:0px"><div style="padding:0em 0.25em">

<ul><li><a href="/wiki/Atalaya\_(Madrid)" title="Atalaya (Madrid)">Atalaya</a></li>

<li><a href="/wiki/Colina\_(Madrid)" title="Colina (Madrid)">Colina</a></li>

<li><a href="/wiki/Concepci%C3%B3n\_(Madrid)" title="ConcepciÃn

(Madrid)">ConcepciÃ³n</a></li>  
<li><a class="mw-redirect" href="/wiki/Pinar\_de\_Chamart%C3%ADn" title="Pinar de ChamartÃ³n">Pinar de ChamartÃ³n</a></li>  
<li><a href="/wiki/Pueblo\_Nuevo\_(Madrid)" title="Pueblo Nuevo (Madrid)">Pueblo Nuevo</a></li>  
<li><a href="/wiki/Quintana\_(Madrid)" title="Quintana (Madrid)">Quintana</a></li>  
<li><a href="/wiki/San\_Juan\_Bautista\_(Madrid)" title="San Juan Bautista (Madrid)">San Juan Bautista</a></li>  
<li><a href="/wiki/San\_Pascual\_(Madrid)" title="San Pascual (Madrid)">San Pascual</a></li>  
<li><a href="/wiki/Ventas\_(Madrid)" title="Ventas (Madrid)">Ventas</a></li></ul>  
</div></td></tr><tr><th class="navbox-group" scope="row" style="width:1%;text-align: left;"><a href="/wiki/Fuencarral-El\_Pardo" title="Fuencarral-El Pardo">Fuencarral-El Pardo</a></th><td class="navbox-list navbox-even hlist" style="text-align:left;border-left-width:2px;border-left-style:solid;width:100%;padding:0px"><div style="padding:0em 0.25em">  
<ul><li><a class="mw-redirect" href="/wiki/Barrio\_del\_Pilar" title="Barrio del Pilar">Barrio del Pilar</a></li>  
<li><a href="/wiki/El\_Goloso" title="El Goloso">El Goloso</a></li>  
<li><a href="/wiki/El\_Pardo" title="El Pardo">El Pardo</a></li>  
<li><a href="/wiki/Fuentealarreina" title="Fuentealarreina">Fuentealarreina</a></li>  
<li><a href="/wiki/La\_Paz\_(Madrid)" title="La Paz (Madrid)">La Paz</a></li>  
<li><a href="/wiki/Mirasierra" title="Mirasierra">Mirasierra</a></li>  
<li><a href="/wiki/Pe%C3%B1agrande" title="PeÃ±agrande">PeÃ±agrande</a></li>  
<li><a href="/wiki/Valverde\_(Madrid)" title="Valverde (Madrid)">Valverde</a></li></ul>  
</div></td></tr><tr><th class="navbox-group" scope="row" style="width:1%;text-align: left;"><a href="/wiki/Hortaleza" title="Hortaleza">Hortaleza</a></th><td class="navbox-list navbox-odd hlist" style="text-align:left;border-left-width:2px;border-left-style:solid;width:100%;padding:0px"><div style="padding:0em 0.25em">  
<ul><li><a class="mw-redirect" href="/wiki/Ap%C3%B3stol\_Santiago\_(Madrid)" title="ApÃ³stol Santiago (Madrid)">ApÃ³stol Santiago</a></li>  
<li><a href="/wiki/Canillas\_(Madrid)" title="Canillas (Madrid)">Canillas</a></li>  
<li><a href="/wiki/Palomas\_(Madrid)" title="Palomas (Madrid)">Palomas</a></li>  
<li><a href="/wiki/Pinar\_del\_Rey\_(Madrid)" title="Pinar del Rey (Madrid)">Pinar del Rey</a></li>  
<li><a href="/wiki/Piovera\_(Madrid)" title="Piovera (Madrid)">Piovera</a></li>  
<li><a href="/wiki/Valdefuentes\_(Madrid)" title="Valdefuentes (Madrid)">Valdefuentes</a></li></ul>  
</div></td></tr><tr><th class="navbox-group" scope="row" style="width:1%;text-align: left;"><a href="/wiki/Latina\_(Madrid)" title="Latina (Madrid)">Latina</a></th><td class="navbox-list navbox-even hlist" style="text-align:left;border-left-width:2px;border-left-

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style:solid;width:100%;padding:0px"><div style="padding:0em 0.25em">
Aluche
<a href="/wiki/Campamento_(Madrid)" title="Campamento
(Madrid)">Campamento
Cuatro
Vientos
Las ÃAguilas
Lucero
Los CÃArmenes</
→li>
Puerta del
ÃAngel
</div></td></tr><tr><th class="navbox-group" scope="row" style="width:1%;text-
align: left;">Moncloa-
Aravaca</th><td class="navbox-list navbox-odd hlist" style="text-
align:left;border-left-width:2px;border-left-
style:solid;width:100%;padding:0px"><div style="padding:0em 0.25em">
Aravaca
<a href="/wiki/Arg%C3%BCelles_(Madrid)" title="ArgÃijelles
(Madrid)">ArgÃijelles
Casa de Campo
<a href="/wiki/Ciudad_Universitaria_(Madrid)" title="Ciudad Universitaria
(Madrid)">Ciudad Universitaria
El PlantÃño
ValdemarÃñ
Valdezarza
</div></td></tr><tr><th class="navbox-group" scope="row" style="width:1%;text-
align: left;">Moratalaz</th><td
class="navbox-list navbox-even hlist" style="text-align:left;border-left-
width:2px;border-left-style:solid;width:100%;padding:0px"><div
style="padding:0em 0.25em">
FontarrÃñ
Horcajo
Marroquina
<a class="mw-redirect" href="/wiki/Media_Legua_(Madrid)" title="Media Legua
(Madrid)">Media Legua
Pavones
Vinateros
</div></td></tr><tr><th class="navbox-group" scope="row" style="width:1%;text-
align: left;"><a href="/wiki/Puente_de_Vallecas" title="Puente de
Vallecas">Puente de Vallecas</th><td class="navbox-list navbox-odd hlist"
style="text-align:left;border-left-width:2px;border-left-
style:solid;width:100%;padding:0px"><div style="padding:0em 0.25em">
EntrevÃñas
<a href="/wiki/Numancia_(Madrid)" title="Numancia
(Madrid)">Numancia
Palomeras

```

Bajas

- [Palomeras Sureste](/wiki/Palomeras_Sureste "Palomeras Sureste")
- [Portazgo \(Madrid\)](/wiki/Portazgo_(Madrid) "Portazgo (Madrid)")
- [San Diego \(Madrid\)](/wiki/San_Diego_(Madrid) "San Diego (Madrid)")

|                                                                          |                                                                            |
|--------------------------------------------------------------------------|----------------------------------------------------------------------------|
| <div> <div>Retiro (Madrid)</div> <div>Retiro</div> </div>                | <div> <div>Adelfas</div> <div>Adelfas</div> </div>                         |
| <div> <div>Estrella (Madrid)</div> <div>Estrella (Madrid)</div> </div>   | <div> <div>Ibiza (Madrid)</div> <div>Ibiza (Madrid)</div> </div>           |
| <div> <div>Jerónimos (Madrid)</div> <div>Jerónimos (Madrid)</div> </div> | <div> <div>Niño Jesús (Madrid)</div> <div>Niño Jesús (Madrid)</div> </div> |
| <div> <div>Pacífico (Madrid)</div> <div>Pacífico (Madrid)</div> </div>   |                                                                            |

|                                                                          |                                                                            |
|--------------------------------------------------------------------------|----------------------------------------------------------------------------|
| <div> <div>Salamanca (Madrid)</div> <div>Salamanca (Madrid)</div> </div> | <div> <div>Castellana (Madrid)</div> <div>Castellana (Madrid)</div> </div> |
| <div> <div>Fuente del Berro</div> <div>Fuente del Berro</div> </div>     | <div> <div>Goya (Madrid)</div> <div>Goya (Madrid)</div> </div>             |
| <div> <div>Guindalera</div> <div>Guindalera</div> </div>                 | <div> <div>Lista (Madrid)</div> <div>Lista (Madrid)</div> </div>           |
| <div> <div>Recoletos (Madrid)</div> <div>Recoletos (Madrid)</div> </div> |                                                                            |

|                                                                            |                                                                      |
|----------------------------------------------------------------------------|----------------------------------------------------------------------|
| <div> <div>San Blas-Canillejas</div> <div>San Blas-Canillejas</div> </div> | <div> <div>Amposta (Madrid)</div> <div>Amposta (Madrid)</div> </div> |
| <div> <div>Arcos (Madrid)</div> <div>Arcos (Madrid)</div> </div>           | <div> <div>Canillejas</div> <div>Canillejas</div> </div>             |

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HellÃn
Rejas
Rosas
Salvador
Simancas
</div></td></tr><tr><th class="navbox-group" scope="row" style="width:1%;text-align: left;">TetuÃn</th><td class="navbox-list navbox-odd hlist" style="text-align:left;border-left-width:2px;border-left-style:solid;width:100%;padding:0px"><div style="padding:0em 0.25em">
Almenara
Bellas Vistas
Berruguete
Castillejos
Cuatro Caminos
Valdeacederas
</div></td></tr><tr><th class="navbox-group" scope="row" style="width:1%;text-align: left;">Usera</th><td class="navbox-list navbox-even hlist" style="text-align:left;border-left-width:2px;border-left-style:solid;width:100%;padding:0px"><div style="padding:0em 0.25em">
Almendrales
MoscardÃs
Orcasitas
Orcasur
Pradolongo
San FermÃn
ZofÃo
</div></td></tr><tr><th class="navbox-group" scope="row" style="width:1%;text-align: left;">VicÃlvaro</th><td class="navbox-list navbox-odd hlist" style="text-align:left;border-left-width:2px;border-left-style:solid;width:100%;padding:0px"><div style="padding:0em 0.25em">
Ambroz
Casco HistÃrico de VicÃlvaro
</div></td></tr><tr><th class="navbox-group" scope="row" style="width:1%;text-align: left;">VicÃlvaro</th><td class="navbox-list navbox-odd hlist" style="text-align:left;border-left-width:2px;border-left-style:solid;width:100%;padding:0px"><div style="padding:0em 0.25em">
Ambroz
Casco HistÃrico de VicÃlvaro
</div></td></tr><tr><th class="navbox-group" scope="row" style="width:1%;text-align: left;">VicÃlvaro</th><td class="navbox-list navbox-odd hlist" style="text-align:left;border-left-width:2px;border-left-style:solid;width:100%;padding:0px"><div style="padding:0em 0.25em">
Ambroz
Casco HistÃrico de VicÃlvaro
</div></td></tr><tr><th class="navbox-group" scope="row" style="width:1%;text-align: left;">VicÃlvaro</th><td class="navbox-list navbox-odd hlist" style="text-align:left;border-left-width:2px;border-left-style:solid;width:100%;padding:0px"><div style="padding:0em 0.25em">
Ambroz
Casco HistÃrico de VicÃlvaro
</div></td></tr>

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align: left;">Villa
de Vallecas</th><td class="navbox-list navbox-even hlist" style="text-
align:left;border-left-width:2px;border-left-
style:solid;width:100%;padding:0px"><div style="padding:0em 0.25em">
<a href="/wiki/Casco_Hist%C3%B3rico_de_Vallecas" title="Casco Hist rico
de Vallecas">Casco Hist rico de Vallecas
Santa
Eugenia
</div></td></tr><tr><th class="navbox-group" scope="row" style="width:1%;text-
align: left;"><a href="/wiki/Villaverde_(Madrid)" title="Villaverde
(Madrid)">Villaverde</th><td class="navbox-list navbox-odd hlist"
style="text-align:left;border-left-width:2px;border-left-
style:solid;width:100%;padding:0px"><div style="padding:0em 0.25em">
Butarque
Los
  ngeles
Los
Rosales
<a class="mw-redirect" href="/wiki/San_Crist%C3%B3bal_de_los_%C3%81ngeles"
title="San Crist bal de los   ngeles">San Crist bal de los   ngeles</
ul>
</div></td></tr></tbody></table></div>
<!--
NewPP limit report
Parsed by mw1269
Cached time: 20200418184349
Cache expiry: 2592000
Dynamic content: false
Complications: [vary  revision  sha1]
CPU time usage: 0.548 seconds
Real time usage: 3.145 seconds
Preprocessor visited node count: 1709/1000000
Post  expand include size: 54208/2097152 bytes
Template argument size: 604/2097152 bytes
Highest expansion depth: 15/40
Expensive parser function count: 1/500
Unstrip recursion depth: 1/20
Unstrip post  expand size: 15785/5000000 bytes
Number of Wikibase entities loaded: 1/400
Lua time usage: 0.269/10.000 seconds
Lua memory usage: 5.6 MB/50 MB
-->
<!--
Transclusion expansion time report (%,ms,calls,template)
100.00% 2812.082 1 -total
 39.98% 1124.178 1 Template:Short_description
 37.87% 1064.801 1 Template:Pagetype

```

|        |         |    |                            |
|--------|---------|----|----------------------------|
| 28.23% | 793.748 | 66 | Template:Nts               |
| 16.03% | 450.811 | 2  | Template:Reflist           |
| 13.17% | 370.297 | 1  | Template:Citation          |
| 9.00%  | 253.133 | 1  | Template:Original_research |
| 8.31%  | 233.654 | 1  | Template:Ambox             |
| 2.15%  | 60.377  | 8  | Template:Convert           |
| 2.05%  | 57.579  | 1  | Template:Commonscat-inline |

-->

<!-- Saved in parser cache with key enwiki:pcache:idhash:10147562-0!canonical and timestamp 20200418184346 and revision id 932631329

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<div class="printfooter">Retrieved from "<a dir="ltr" href="https://en.wikipedia
.org/w/index.php?title=Districts_of_Madrid&oldid=932631329">https://en.wikip
edia.org/w/index.php?title=Districts_of_Madrid&oldid=932631329"</div>
<div class="catlinks" data-mw="interface" id="catlinks"><div class="mw-normal-
catlinks" id="mw-normal-catlinks"><a href="/wiki/Help:Category"
title="Help:Category">Categories: <a
href="/wiki/Category:Districts_of_Madrid" title="Category:Districts of
Madrid">Districts of Madrid</div><div class="mw-hidden-catlinks
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Spanish-language sources (es)">CS1 Spanish-language sources (es)<a
href="/wiki/Category:Articles_with_short_description" title="Category:Articles
with short description">Articles with short description<a href="/wi
ki/Category:Articles_that_may_contain_original_research_from_March_2014"
title="Category:Articles that may contain original research from March
2014">Articles that may contain original research from March 2014<a
href="/wiki/Category:All_articles_that_may_contain_original_research"
title="Category:All articles that may contain original research">All articles
that may contain original research<a
href="/wiki/Category:Commons_category_link_from_Wikidata"
title="Category:Commons category link from Wikidata">Commons category link from
Wikidata</div></div>
<div class="visualClear"></div>
</div>
</div>
<div id="mw-data-after-content">
<div class="read-more-container"></div>
</div>
<div id="mw-navigation">
<h2>Navigation menu</h2>
<div id="mw-head">
<div aria-labelledby="p-personal-label" class="" id="p-personal"
role="navigation">

```



```

<h3 id="p-personal-label">Personal tools</h3>

<li id="pt-anonuserpage">Not logged in<li id="pt-anontalk"><a accesskey="n"
href="/wiki/Special:MyTalk" title="Discussion about edits from this IP address
[n]">Talk<li id="pt-anoncontribs"><a accesskey="y"
href="/wiki/Special:MyContributions" title="A list of edits made from this IP
address [y]">Contributions<li id="pt-createaccount"><a
href="/w/index.php?title=Special:CreateAccount&returnto=Districts+of+Madrid"
title="You are encouraged to create an account and log in; however, it is not
mandatory">Create account<li id="pt-login"><a accesskey="o"
href="/w/index.php?title=Special:UserLogin&returnto=Districts+of+Madrid"
title="You're encouraged to log in; however, it's not mandatory. [o]">Log
in

</div>
<div id="left-navigation">
<div aria-labelledby="p-namespaces-label" class="vectorTabs" id="p-namespaces"
role="navigation">
<h3 id="p-namespaces-label">Namespaces</h3>

<li class="selected" id="ca-nstab-main"><a accesskey="c"
href="/wiki/Districts_of_Madrid" title="View the content page
[c]">Article<li id="ca-talk"><a accesskey="t"
href="/wiki/Talk:Districts_of_Madrid" rel="discussion" title="Discuss
improvements to the content page [t]">Talk

</div>
<div aria-labelledby="p-variants-label" class="vectorMenu emptyPortlet"
id="p-variants" role="navigation">
<input aria-labelledby="p-variants-label" class="vectorMenuCheckbox"
type="checkbox"/>
<h3 id="p-variants-label">
Variants
</h3>
<ul class="menu">

</div>
</div>
<div id="right-navigation">
<div aria-labelledby="p-views-label" class="vectorTabs" id="p-views"
role="navigation">
<h3 id="p-views-label">Views</h3>

<li class="collapsible selected" id="ca-view">Read<li class="collapsible" id="ca-
edit"><a accesskey="e"
href="/w/index.php?title=Districts_of_Madrid&action=edit" title="Edit this

```

```

page [e]">Edit<li class="collapsible" id="ca-history"><a accesskey="h"
href="/w/index.php?title=Districts_of_Madrid&action=history" title="Past
revisions of this page [h]">View history

</div>
<div aria-labelledby="p-cactions-label" class="vectorMenu emptyPortlet"
id="p-cactions" role="navigation">
<input aria-labelledby="p-cactions-label" class="vectorMenuCheckbox"
type="checkbox"/>
<h3 id="p-cactions-label">
More
</h3>
<ul class="menu">

</div>
<div id="p-search" role="search">
<h3>
<label for="searchInput">Search</label>
</h3>
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<div id="simpleSearch">
<input accesskey="f" id="searchInput" name="search" placeholder="Search
Wikipedia" title="Search Wikipedia [f]" type="search"/>
<input name="title" type="hidden" value="Special:Search"/>
<input class="searchButton mw-fallbackSearchButton" id="mw-searchButton"
name="fulltext" title="Search Wikipedia for this text" type="submit"
value="Search"/>
<input class="searchButton" id="searchButton" name="go" title="Go to a page with
this exact name if it exists" type="submit" value="Go"/>
</div>
</form>
</div>
</div>
</div>
<div id="mw-panel">
<div id="p-logo" role="banner">

</div>
<div aria-labelledby="p-navigation-label" class="portal" id="p-navigation"
role="navigation">
<h3 id="p-navigation-label">
Navigation
</h3>
<div class="body">
<li id="n-mainpage-description"><a accesskey="z" href="/wiki/Main_Page"
title="Visit the main page [z]">Main page<li id="n-contents"><a
href="/wiki/Wikipedia:Contents" title="Guides to browsing

```

```

Wikipedia">Contents<li id="n-featuredcontent"><a
href="/wiki/Wikipedia:Featured_content" title="Featured content â– the best of
Wikipedia">Featured content<li id="n-currentevents"><a
href="/wiki/Portal:Current_events" title="Find background information on current
events">Current events<li id="n-randompage"><a accesskey="x"
href="/wiki/Special:Random" title="Load a random article [x]">Random
article<li id="n-sitesupport"><a href="https://donate.wikimedia.org/wik
i/Special:FundraiserRedirector?utm_source=donate&utm_medium=sidebar&utm_
campaign=C13_en.wikipedia.org&uselang=en" title="Support us">Donate to
Wikipedia<li id="n-shoplink"><a href="//shop.wikimedia.org"
title="Visit the Wikipedia store">Wikipedia store
</div>
</div>
<div aria-labelledby="p-interaction-label" class="portal" id="p-interaction"
role="navigation">
<h3 id="p-interaction-label">
 Interaction
</h3>
<div class="body">
<li id="n-help"><a href="/wiki/Help:Contents" title="Guidance on how to use
and edit Wikipedia">Help<li id="n-aboutsite">About
Wikipedia<li id="n-portal"><a href="/wiki/Wikipedia:Community_portal"
title="About the project, what you can do, where to find things">Community
portal<li id="n-recentchanges"><a accesskey="r"
href="/wiki/Special:RecentChanges" title="A list of recent changes in the wiki
[r]">Recent changes<li id="n-contactpage"><a
href="//en.wikipedia.org/wiki/Wikipedia:Contact_us" title="How to contact
Wikipedia">Contact page
</div>
</div>
<div aria-labelledby="p-tb-label" class="portal" id="p-tb" role="navigation">
<h3 id="p-tb-label">
 Tools
</h3>
<div class="body">
<li id="t-whatlinkshere"><a accesskey="j"
href="/wiki/Special:WhatLinksHere/Districts_of_Madrid" title="List of all
English Wikipedia pages containing links to this page [j]">What links
here<li id="t-recentchangeslinked"><a accesskey="k"
href="/wiki/Special:RecentChangesLinked/Districts_of_Madrid" rel="nofollow"
title="Recent changes in pages linked from this page [k]">Related
changes<li id="t-upload"><a accesskey="u"
href="/wiki/Wikipedia:File_Upload_Wizard" title="Upload files [u]">Upload
file<li id="t-specialpages"><a accesskey="q"
href="/wiki/Special:SpecialPages" title="A list of all special pages
[q]">Special pages<li id="t-permalink"><a

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href="/w/index.php?title=Districts_of_Madrid&oldid=932631329"
title="Permanent link to this revision of the page">Permanent link<li
id="t-info"><a href="/w/index.php?title=Districts_of_Madrid&action=info"
title="More information about this page">Page information<li
id="t-wikibase"><a accesskey="g"
href="https://www.wikidata.org/wiki/Special:EntityPage/Q3032114" title="Link to
connected data repository item [g]">Wikidata item<li id="t-cite">Cite this page
</div>
</div>
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<h3 id="p-wikibase-otherprojects-label">
 In other projects
</h3>
<div class="body">
<li class="wb-otherproject-link wb-otherproject-commons">Wikimedia Commons
</div>
</div>
<div aria-labelledby="p-coll-print_export-label" class="portal" id="p-coll-print_export" role="navigation">
<h3 id="p-coll-print_export-label">
 Print/export
</h3>
<div class="body">
<li id="coll-create_a_book">Create a book<li id="coll-download-as-rl">Download as PDF<li id="t-print">Printable version
</div>
</div>
<div aria-labelledby="p-lang-label" class="portal" id="p-lang" role="navigation">
<h3 id="p-lang-label">
 Languages
</h3>
<div class="body">
<li class="interlanguage-link interwiki-an">AragonÃŖs<li

```



07:38

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</div>

```

<script>(RLQ=window.RLQ||[]).push(function(){mw.config.set({"wgPageParseReport":
{"limitreport":{"cputime":"0.548","walltime":"3.145","ppvisitednodes":{"value":1
709,"limit":1000000},"postexpandincludesize":{"value":54208,"limit":2097152},"te
mplateargumentsize":{"value":604,"limit":2097152},"expansiondepth":{"value":15,"
limit":40},"expensivefunctioncount":{"value":1,"limit":500},"unstrip-
depth":{"value":1,"limit":20},"unstrip-size":{"value":15785,"limit":5000000},"en
tityaccesscount":{"value":1,"limit":400},"timingprofile":["100.00% 2812.082
1 -total"," 39.98% 1124.178 1 Template:Short_description"," 37.87% 1064.801
1 Template:Pagetype"," 28.23% 793.748 66 Template:Nts"," 16.03% 450.811
2 Template:Reflist"," 13.17% 370.297 1 Template:Citation"," 9.00%
253.133 1 Template:Original_research"," 8.31% 233.654 1
Template:Ambox"," 2.15% 60.377 8 Template:Convert"," 2.05% 57.579
1 Template:Commonscat-inline"]},"scribunto":{"limitreport-
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71244,"limit":52428800}},"cachereport":{"origin":"mw1269","timestamp":"202004181
84349","ttl":2592000,"transientcontent":false}}));});</script>
<script type="application/ld+json">{"@context":"https://schema.org","@type":"A
rticle","name":"Districts of Madrid","url":"https://en.wikipedia.org/wiki/Di
stricts_of_Madrid","sameAs":"http://www.wikidata.org/entity/Q3032114","mainE
ntity":"http://www.wikidata.org/entity/Q3032114","author":{"@type":"Organiza
tion","name":"Contributors to Wikimedia
projects"},"publisher":{"@type":"Organization","name":"Wikimedia Foundation, Inc
.", "logo":{"@type":"ImageObject","url":"https://www.wikimedia.org/static/ima
ges/wmf-hor-googpub.png"},"datePublished":"2007-03-19T20:55:43Z","dateModified
":"2019-12-27T07:38:59Z","headline":"21 administrative units of
Madrid"}}</script>
<script>(RLQ=window.RLQ||[]).push(function(){mw.config.set({"wgBackendResponseTi
me":98,"wgHostname":"mw1349"}));});</script></body></html>

```

## Cleaning scraped\_data

```
[3]: data_rows = scraped_data.select('.wikitable tr')
```

```
[4]: data_header = data_rows[0]
data_content = data_rows[1:]
```

```
[5]: data_columns = []

for column in data_header.select('th'):
 column_name = column.getText()
 data_columns.append(column_name.replace('\n', ''))

data_columns
```

```
[5]: ['District Number',
 'Name',
 'District area[n 1] (Ha.)',
```

```
'Population',
'Population density(Hab./Ha.)',
'Location',
'Administrative wards']
```

```
[6]: final_data = []

for row in data_content:
 data_row = []
 for data in row.select('td'):
 data_row.append(data.getText().replace('\n', ''))
 final_data.append(data_row)
```

### Creating Pandas DataFrame with districts

```
[26]: MadridDF = pd.DataFrame(data=final_data, columns=data_columns)
MadridDF.head()
```

```
[26]: District Number Name District area[n 1] (Ha.) Population \
0 1 Centro 522.82 131,928
1 2 Arganzuela 646.22 151,965
2 3 Retiro 546.62 118,516
3 4 Salamanca 539.24 143,800
4 5 Chamart  n 917.55 143,424

Population density(Hab./Ha.) Location \
0 252.34
1 235.16
2 216.82
3 266.67
4 156.31

Administrative wards
0 Palacio (11)Embajadores (12)Cortes (13)Justici...
1 Imperial (21)Acacias (22)Chopera (23)Legazpi (...
2 Pac  fico (31)Adelfas (32)Estrella (33)Ibiza (...
3 Recoletos (41)Goya (42)Fuente del Berro (43)Gu...
4 El Viso (51)Prosperidad (52)Ciudad Jard  n (53)...
```

```
[27]: MadridDF.shape
```

```
[27]: (22, 7)
```

```
[28]: MadridDF.tail()
```

```
[28]: District Number Name District area[n 1] (Ha.) Population \
17 18 Villa de Vallecas 5,146.72 104,421
```



|    |      |                     |          |         |
|----|------|---------------------|----------|---------|
| 18 | 19   | Vicalvaro          | 3,526.67 | 70,051  |
| 19 | 20   | San Blas-Canillejas | 2,229.24 | 154,357 |
| 20 | 21   | Barajas             | 4,192.28 | 46,876  |
| 21 | None | None                | None     | None    |

|    | Population density(Hab./Ha.) | Location | \ |
|----|------------------------------|----------|---|
| 17 | 19.86                        |          |   |
| 18 | 19.86                        |          |   |
| 19 | 69.24                        |          |   |
| 20 | 11.18                        |          |   |
| 21 | None                         | None     |   |

|    | Administrative wards                               |
|----|----------------------------------------------------|
| 17 | Casco Histrico de Vallecas (181)Santa Eugenia...  |
| 18 | Casco Histrico de Vicalvaro (191)Valdebernard... |
| 19 | Simancas (201)Helln (202)Aposta (203)Arcos (...)  |
| 20 | Alameda de Osuna (211)Aeropuerto (212)Casco Hi...  |
| 21 | None                                               |

```
[29]: MadridDF = MadridDF.drop(['Location', 'Administrative wards'], axis=1)
```

```
[31]: MadridDF = MadridDF.drop([21], axis=0)
MadridDF.tail()
```

|    | District Number | Name District       | area[n 1] (Ha.) | Population | \ |
|----|-----------------|---------------------|-----------------|------------|---|
| 16 | 17              | Villaverde          | 2,018.76        | 142,608    |   |
| 17 | 18              | Villa de Vallecas   | 5,146.72        | 104,421    |   |
| 18 | 19              | Vicalvaro          | 3,526.67        | 70,051     |   |
| 19 | 20              | San Blas-Canillejas | 2,229.24        | 154,357    |   |
| 20 | 21              | Barajas             | 4,192.28        | 46,876     |   |

|    | Population density(Hab./Ha.) |
|----|------------------------------|
| 16 | 70.64                        |
| 17 | 19.86                        |
| 18 | 19.86                        |
| 19 | 69.24                        |
| 20 | 11.18                        |

### Creating Pandas Dataframe with coordinates

```
[69]: coordinates = pd.read_csv('/Users/jgonzalez/Desktop/projects/
↳Peer-graded-Assignment-Capstone-Project---The-Battle-of-Neighborhoods-/Data/
↳CALLEJERO_VIGENTE_DISTritos_201809.csv')
```

```
[70]: coordinates
```

```
[70]: district Number Latitude Longitude
0 1 40.415347 -3.707371
1 2 40.402733 -3.695403
2 3 40.408072 -3.676729
3 4 40.429722 -3.679750
4 5 40.462059 -3.676600
5 6 40.459751 -3.697500
6 7 40.434040 -3.703790
7 8 40.478611 -3.709722
8 9 40.435151 -3.718765
9 10 40.411360 -3.708417
10 11 40.383670 -3.727990
11 12 40.381389 -3.706944
12 13 40.398204 -3.669059
13 14 40.409869 -3.644436
14 15 40.445049 -3.651320
15 16 40.469457 -3.640482
16 17 40.349998 -3.701143
17 18 40.379597 -3.621347
18 19 40.404200 -3.608060
19 20 40.426001 -3.612764
20 21 40.470278 -3.585000
```

```
[71]: Final_MadridDF = pd.concat([MadridDF,coordinates], axis=1, sort=False)
Final_MadridDF = Final_MadridDF.drop(['district Number'], axis=1)
```

```
[72]: Final_MadridDF
```

```
[72]: District Number Name District area[n 1] (Ha.) Population \
0 1 Centro 522.82 131,928
1 2 Arganzuela 646.22 151,965
2 3 Retiro 546.62 118,516
3 4 Salamanca 539.24 143,800
4 5 Chamartín 917.55 143,424
5 6 Tetuán 537.47 153,789
6 7 Chamberlín 467.92 137,401
7 8 Fuencarral-El Pardo 23,783.84 238,756
8 9 Moncloa-Aravaca 4,653.11 116,903
9 10 Latina 2,542.72 233,808
10 11 Carabanchel 1,404.83 243,998
11 12 Usera 777.77 134,791
12 13 Puente de Vallecas 1,496.86 227,595
13 14 Moratalaz 610.32 94,197
14 15 Ciudad Lineal 1,142.57 212,529
15 16 Hortaleza 2,741.98 180,462
16 17 Villaverde 2,018.76 142,608
17 18 Villa de Vallecas 5,146.72 104,421
```

|    |    |                     |          |         |
|----|----|---------------------|----------|---------|
| 18 | 19 | Vic~alvaro          | 3,526.67 | 70,051  |
| 19 | 20 | San Blas-Canillejas | 2,229.24 | 154,357 |
| 20 | 21 | Barajas             | 4,192.28 | 46,876  |

|    | Population density(Hab./Ha.) | Latitude  | Longitude |
|----|------------------------------|-----------|-----------|
| 0  | 252.34                       | 40.415347 | -3.707371 |
| 1  | 235.16                       | 40.402733 | -3.695403 |
| 2  | 216.82                       | 40.408072 | -3.676729 |
| 3  | 266.67                       | 40.429722 | -3.679750 |
| 4  | 156.31                       | 40.462059 | -3.676600 |
| 5  | 286.13                       | 40.459751 | -3.697500 |
| 6  | 293.64                       | 40.434040 | -3.703790 |
| 7  | 10.04                        | 40.478611 | -3.709722 |
| 8  | 25.12                        | 40.435151 | -3.718765 |
| 9  | 91.95                        | 40.411360 | -3.708417 |
| 10 | 173.68                       | 40.383670 | -3.727990 |
| 11 | 173.30                       | 40.381389 | -3.706944 |
| 12 | 152.05                       | 40.398204 | -3.669059 |
| 13 | 154.34                       | 40.409869 | -3.644436 |
| 14 | 186.01                       | 40.445049 | -3.651320 |
| 15 | 65.81                        | 40.469457 | -3.640482 |
| 16 | 70.64                        | 40.349998 | -3.701143 |
| 17 | 19.86                        | 40.379597 | -3.621347 |
| 18 | 19.86                        | 40.404200 | -3.608060 |
| 19 | 69.24                        | 40.426001 | -3.612764 |
| 20 | 11.18                        | 40.470278 | -3.585000 |

Map of Madrid with districts superimposed on top.

```
[73]: import folium
```

```
[74]: # Coordinates of Madrid
latitude = 40.418889
longitude = -3.691944

create map of New York using latitude and longitude values
map_madrid = folium.Map(location=[latitude, longitude], zoom_start=10)

add markers to map
for lat, lng, district in zip(Final_MadridDF['Latitude'],
 ↪Final_MadridDF['Longitude'], Final_MadridDF['Name']):
 label = '{}'.format(district)
 label = folium.Popup(label, parse_html=True)
 folium.CircleMarker(
 [lat, lng],
 radius=5,
 popup=label,
```

```

 color='blue',
 fill=True,
 fill_color='#3186cc',
 fill_opacity=0.7,
 parse_html=False).add_to(map_madrid)

map_madrid

```

[74]: <folium.folium.Map at 0x23cdcd17688>

### 1.3 3.Methodology

#### Define Foursquare Credentials

```

[75]: CLIENT_ID = 'PKOBLYCFF1NEKHLDPGTGWIJKRMGJENMPWPL4WEEZAKZZKL2L1' # your Foursquare_
 ↪ ID
CLIENT_SECRET = 'M4LTSJGUGTGBPGL1RWX20F3TD3NPTSQRAZE3X5WCKDGEMZEG' # your_
 ↪ Foursquare Secret
VERSION = '20180605' # Foursquare API version

print('Your credentails:')
print('CLIENT_ID: ' + CLIENT_ID)
print('CLIENT_SECRET:' + CLIENT_SECRET)

```

Your credentails:

CLIENT\_ID: PKOBLYCFF1NEKHLDPGTGWIJKRMGJENMPWPL4WEEZAKZZKL2L1

CLIENT\_SECRET:M4LTSJGUGTGBPGL1RWX20F3TD3NPTSQRAZE3X5WCKDGEMZEG

This is a function to process all the districts in Madrid.

```

[76]: def getNearbyVenues(names, latitudes, longitudes, radius=500, limit=100):

 venues_list=[]
 for name, lat, lng in zip(names, latitudes, longitudes):
 print(name)

 # create the API request URL
 url = 'https://api.foursquare.com/v2/venues/explore?
 ↪ &client_id={}&client_secret={}&v={}&ll={},{}&radius={}&limit={}'.format(
 CLIENT_ID,
 CLIENT_SECRET,
 VERSION,
 lat,
 lng,
 radius,
 limit)

```

```

 # make the GET request
 results = requests.get(url).json()["response"]['groups'][0]['items']

 # return only relevant information for each nearby venue
 venues_list.append([
 name,
 lat,
 lng,
 v['venue']['name'],
 v['venue']['location']['lat'],
 v['venue']['location']['lng'],
 v['venue']['categories'][0]['name']) for v in results])

 nearby_venues = pd.DataFrame([item for venue_list in venues_list for item in
→venue_list])
 nearby_venues.columns = ['District',
 'District Latitude',
 'District Longitude',
 'Venue',
 'Venue Latitude',
 'Venue Longitude',
 'Venue Category']

 return(nearby_venues)

```

Creating a new dataframe with Madrid venues.

```

[77]: Madrid_venues = getNearbyVenues(names=Final_MadridDF['Name'],
 latitudes=Final_MadridDF['Latitude'],
 longitudes=Final_MadridDF['Longitude']
)

```

Centro  
 Arganzuela  
 Retiro  
 Salamanca  
 Chamartín  
 Tetuán  
 Chamberlín  
 Fuencarral-El Pardo  
 Moncloa-Aravaca  
 Latina  
 Carabanchel  
 Usera  
 Puente de Vallecas  
 Moratalaz  
 Ciudad Lineal

Hortaleza  
Villaverde  
Villa de Vallecas  
Vic~alvaro  
San Blas-Canillejas  
Barajas

```
[78]: Madrid_venues.head()
```

```
[78]: District District Latitude District Longitude \
0 Centro 40.415347 -3.707371
1 Centro 40.415347 -3.707371
2 Centro 40.415347 -3.707371
3 Centro 40.415347 -3.707371
4 Centro 40.415347 -3.707371

 Venue Venue Latitude Venue Longitude \
0 Plaza Mayor 40.415527 -3.707506
1 Mercado de San Miguel 40.415443 -3.708943
2 La Taberna de Mister Pinkleton 40.414536 -3.708108
3 The Hat Madrid 40.414343 -3.707120
4 Bodegas Ricla 40.414266 -3.708077

 Venue Category
0 Plaza
1 Market
2 Other Nightlife
3 Hotel
4 Wine Bar
```

Getting the number of venues per District

```
[95]: Number_venues_district = Madrid_venues.groupby('District').count()
```

```
[96]: Number_venues_district
```

```
[96]: District Latitude District Longitude Venue \
District
Arganzuela 89 89 89
Barajas 31 31 31
Carabanchel 8 8 8
Centro 75 75 75
Chamart~n 24 24 24
Chamber~n 100 100 100
Ciudad Lineal 31 31 31
Fuencarral-El Pardo 40 40 40
Hortaleza 19 19 19
Latina 100 100 100
```

|                     |    |    |    |
|---------------------|----|----|----|
| Moncloa-Aravaca     | 56 | 56 | 56 |
| Moratalaz           | 13 | 13 | 13 |
| Puente de Vallecas  | 28 | 28 | 28 |
| Retiro              | 40 | 40 | 40 |
| Salamanca           | 46 | 46 | 46 |
| San Blas-Canillejas | 10 | 10 | 10 |
| TetuÅan             | 41 | 41 | 41 |
| Usera               | 13 | 13 | 13 |
| VicÅalvaro          | 13 | 13 | 13 |
| Villa de Vallecas   | 7  | 7  | 7  |
| Villaverde          | 8  | 8  | 8  |

|                     | Venue Latitude | Venue Longitude | Venue Category |
|---------------------|----------------|-----------------|----------------|
| District            |                |                 |                |
| Arganzuela          | 89             | 89              | 89             |
| Barajas             | 31             | 31              | 31             |
| Carabanchel         | 8              | 8               | 8              |
| Centro              | 75             | 75              | 75             |
| ChamartÅan          | 24             | 24              | 24             |
| ChamberÅan          | 100            | 100             | 100            |
| Ciudad Lineal       | 31             | 31              | 31             |
| Fuencarral-El Pardo | 40             | 40              | 40             |
| Hortaleza           | 19             | 19              | 19             |
| Latina              | 100            | 100             | 100            |
| Moncloa-Aravaca     | 56             | 56              | 56             |
| Moratalaz           | 13             | 13              | 13             |
| Puente de Vallecas  | 28             | 28              | 28             |
| Retiro              | 40             | 40              | 40             |
| Salamanca           | 46             | 46              | 46             |
| San Blas-Canillejas | 10             | 10              | 10             |
| TetuÅan             | 41             | 41              | 41             |
| Usera               | 13             | 13              | 13             |
| VicÅalvaro          | 13             | 13              | 13             |
| Villa de Vallecas   | 7              | 7               | 7              |
| Villaverde          | 8              | 8               | 8              |

### Breakdown by categories

```
[97]: Number_venues_district_category = Madrid_venues.groupby('District')['Venue_
 ↳Category'].value_counts()
```

```
[99]: Number_venues_district_category
```

```
[99]: District Venue Category
 Arganzuela Restaurant 10
 Spanish Restaurant 8
 Grocery Store 5
```

|            |                          |   |
|------------|--------------------------|---|
|            | Bakery                   | 4 |
|            | Tapas Restaurant         | 4 |
|            | ..                       |   |
| Villaverde | Grocery Store            | 4 |
|            | Gastropub                | 1 |
|            | Mediterranean Restaurant | 1 |
|            | Spanish Restaurant       | 1 |
|            | Train Station            | 1 |

Name: Venue Category, Length: 486, dtype: int64

Number of hotels per district

```
[115]: Madrid_Hotels = Madrid_venues[Madrid_venues['Venue Category'] == 'Hotel']
Madrid_Hotels.groupby('District')['Venue'].count()
```

```
[115]: District
Arganzuela 2
Barajas 7
Centro 2
Chamberñ 1
Ciudad Lineal 2
Latina 6
Moncloa-Aravaca 1
Puente de Vallecas 2
Salamanca 1
Tetuñ 2
Name: Venue, dtype: int64
```

Name of the hotels in each district

```
[135]: values = Madrid_Hotels.groupby('District')['Venue'].value_counts()
values
```

```
[135]: District Venue
Arganzuela AC Hotel by Marriott Atocha 1
 AC Hotel by Marriott Carlton Madrid 1
Barajas Hostal Aeropuerto 1
 Hotel Clement Barajas 1
 Hotel Ibis Madrid Aeropuerto Barajas 1
 Hotel Villa de Barajas 1
 Meliñ Barajas 1
 Tach Hotel Madrid 1
 Tryp Alameda Aeropuerto 1
Centro Hotel Liabeny 1
 The Hat Madrid 1
Chamberñ Gran Hotel Conde Duque 1
Ciudad Lineal ILUNION Atrium 1
 hotel artiem madrid fresh people 1
```



|                    |                            |   |
|--------------------|----------------------------|---|
| Latina             | Eurostars Plaza Mayor      | 1 |
|                    | HRC Madrid                 | 1 |
|                    | Hotel chic&basic Mayerling | 1 |
|                    | Pestana Plaza Mayor Madrid | 1 |
|                    | Posada del Leñn de Oro     | 1 |
|                    | The Hat Madrid             | 1 |
| Moncloa-Aravaca    | Hotel Exe Moncloa          | 1 |
| Puente de Vallecas | Hotel NH Madrid Sur        | 1 |
|                    | Ibis Budget Calle M30      | 1 |
| Salamanca          | Bless Hotel Madrid         | 1 |
| Tetuñ              | Erase Un Hotel             | 1 |
|                    | Meliñ Castilla             | 1 |

Name: Venue, dtype: int64

Analyze each district

```
[138]: # one hot encoding
Madrid_onehot = pd.get_dummies(Madrid_venues[['Venue Category']], prefix="",
 ↪prefix_sep="")

add neighborhood column back to dataframe
Madrid_onehot['District'] = Madrid_venues['District']

move neighborhood column to the first column
fixed_columns = [Madrid_onehot.columns[-1]] + list(Madrid_onehot.columns[:-1])
Madrid_onehot = Madrid_onehot[fixed_columns]

Madrid_onehot
```

```
[138]:
```

|     | District | American Restaurant | Arcade | Arepa Restaurant | \ |
|-----|----------|---------------------|--------|------------------|---|
| 0   | Centro   | 0                   | 0      | 0                |   |
| 1   | Centro   | 0                   | 0      | 0                |   |
| 2   | Centro   | 0                   | 0      | 0                |   |
| 3   | Centro   | 0                   | 0      | 0                |   |
| 4   | Centro   | 0                   | 0      | 0                |   |
| ..  | ...      | ...                 | ...    | ...              |   |
| 787 | Barajas  | 0                   | 0      | 0                |   |
| 788 | Barajas  | 0                   | 0      | 0                |   |
| 789 | Barajas  | 0                   | 0      | 0                |   |
| 790 | Barajas  | 0                   | 0      | 0                |   |
| 791 | Barajas  | 0                   | 0      | 0                |   |

  

|   | Argentinian Restaurant | Art Gallery | Art Museum | Asian Restaurant | \ |
|---|------------------------|-------------|------------|------------------|---|
| 0 | 0                      | 0           | 0          | 0                |   |
| 1 | 0                      | 0           | 0          | 0                |   |
| 2 | 0                      | 0           | 0          | 0                |   |
| 3 | 0                      | 0           | 0          | 0                |   |

|     |     |     |     |     |
|-----|-----|-----|-----|-----|
| 4   | 0   | 0   | 0   | 0   |
| ..  | ... | ... | ... | ... |
| 787 | 0   | 0   | 0   | 0   |
| 788 | 0   | 0   | 0   | 0   |
| 789 | 0   | 0   | 0   | 0   |
| 790 | 0   | 0   | 0   | 0   |
| 791 | 0   | 0   | 0   | 0   |

|     | Athletics & Sports | BBQ Joint | ... | Theme Restaurant | Toy / Game Store | \ |
|-----|--------------------|-----------|-----|------------------|------------------|---|
| 0   | 0                  | 0         | ... | 0                | 0                |   |
| 1   | 0                  | 0         | ... | 0                | 0                |   |
| 2   | 0                  | 0         | ... | 0                | 0                |   |
| 3   | 0                  | 0         | ... | 0                | 0                |   |
| 4   | 0                  | 0         | ... | 0                | 0                |   |
| ..  | ...                | ...       | ... | ...              | ...              |   |
| 787 | 0                  | 0         | ... | 0                | 0                |   |
| 788 | 0                  | 0         | ... | 0                | 0                |   |
| 789 | 0                  | 0         | ... | 0                | 0                |   |
| 790 | 0                  | 0         | ... | 0                | 0                |   |
| 791 | 0                  | 0         | ... | 0                | 0                |   |

|     | Trade School | Train Station | Udon Restaurant | \ |
|-----|--------------|---------------|-----------------|---|
| 0   | 0            | 0             | 0               |   |
| 1   | 0            | 0             | 0               |   |
| 2   | 0            | 0             | 0               |   |
| 3   | 0            | 0             | 0               |   |
| 4   | 0            | 0             | 0               |   |
| ..  | ...          | ...           | ...             |   |
| 787 | 0            | 0             | 0               |   |
| 788 | 0            | 0             | 0               |   |
| 789 | 0            | 0             | 0               |   |
| 790 | 0            | 0             | 0               |   |
| 791 | 0            | 0             | 0               |   |

|     | Vegetarian / Vegan Restaurant | Video Game Store | Wine Bar | Wine Shop | \ |
|-----|-------------------------------|------------------|----------|-----------|---|
| 0   | 0                             | 0                | 0        | 0         |   |
| 1   | 0                             | 0                | 0        | 0         |   |
| 2   | 0                             | 0                | 0        | 0         |   |
| 3   | 0                             | 0                | 0        | 0         |   |
| 4   | 0                             | 0                | 1        | 0         |   |
| ..  | ...                           | ...              | ...      | ...       |   |
| 787 | 0                             | 0                | 0        | 0         |   |
| 788 | 0                             | 0                | 0        | 0         |   |
| 789 | 0                             | 0                | 0        | 0         |   |
| 790 | 0                             | 0                | 0        | 0         |   |
| 791 | 0                             | 0                | 0        | 0         |   |

```

 Women's Store
0 0
1 0
2 0
3 0
4 0
.. ...
787 0
788 0
789 0
790 0
791 0

```

[792 rows x 157 columns]

Let's explore the mean of the frequency of occurrence of each category by district

```
[143]: Madrid_grouped = Madrid_onehot.groupby('District').mean().reset_index()
Madrid_grouped
```

```
[143]:
```

|    | District            | American Restaurant | Arcade   | Arepa Restaurant \ |
|----|---------------------|---------------------|----------|--------------------|
| 0  | Arganzuela          | 0.000000            | 0.000000 | 0.022472           |
| 1  | Barajas             | 0.000000            | 0.000000 | 0.000000           |
| 2  | Carabanchel         | 0.000000            | 0.000000 | 0.000000           |
| 3  | Centro              | 0.013333            | 0.000000 | 0.000000           |
| 4  | Chamartín           | 0.000000            | 0.041667 | 0.000000           |
| 5  | Chamberí            | 0.010000            | 0.000000 | 0.000000           |
| 6  | Ciudad Lineal       | 0.000000            | 0.000000 | 0.000000           |
| 7  | Fuencarral-El Pardo | 0.000000            | 0.000000 | 0.000000           |
| 8  | Hortaleza           | 0.000000            | 0.000000 | 0.000000           |
| 9  | Latina              | 0.010000            | 0.000000 | 0.000000           |
| 10 | Moncloa-Aravaca     | 0.000000            | 0.000000 | 0.000000           |
| 11 | Moratalaz           | 0.000000            | 0.000000 | 0.000000           |
| 12 | Puente de Vallecas  | 0.000000            | 0.000000 | 0.000000           |
| 13 | Retiro              | 0.000000            | 0.000000 | 0.000000           |
| 14 | Salamanca           | 0.021739            | 0.000000 | 0.000000           |
| 15 | San Blas-Canillejas | 0.000000            | 0.000000 | 0.000000           |
| 16 | Tetuán              | 0.000000            | 0.000000 | 0.000000           |
| 17 | Usera               | 0.000000            | 0.000000 | 0.000000           |
| 18 | Vicálvaro           | 0.000000            | 0.000000 | 0.000000           |
| 19 | Villa de Vallecas   | 0.000000            | 0.000000 | 0.000000           |
| 20 | Villaverde          | 0.000000            | 0.000000 | 0.000000           |

|   | Argentinian Restaurant | Art Gallery | Art Museum | Asian Restaurant \ |
|---|------------------------|-------------|------------|--------------------|
| 0 | 0.000000               | 0.000000    | 0.000000   | 0.011236           |
| 1 | 0.032258               | 0.000000    | 0.000000   | 0.000000           |
| 2 | 0.000000               | 0.000000    | 0.000000   | 0.000000           |

|    |          |          |          |          |
|----|----------|----------|----------|----------|
| 3  | 0.013333 | 0.000000 | 0.013333 | 0.000000 |
| 4  | 0.000000 | 0.000000 | 0.000000 | 0.000000 |
| 5  | 0.000000 | 0.000000 | 0.000000 | 0.010000 |
| 6  | 0.000000 | 0.000000 | 0.000000 | 0.000000 |
| 7  | 0.000000 | 0.000000 | 0.000000 | 0.000000 |
| 8  | 0.052632 | 0.000000 | 0.000000 | 0.000000 |
| 9  | 0.000000 | 0.010000 | 0.000000 | 0.000000 |
| 10 | 0.000000 | 0.000000 | 0.000000 | 0.017857 |
| 11 | 0.000000 | 0.000000 | 0.000000 | 0.000000 |
| 12 | 0.000000 | 0.000000 | 0.000000 | 0.000000 |
| 13 | 0.000000 | 0.025000 | 0.000000 | 0.000000 |
| 14 | 0.000000 | 0.021739 | 0.000000 | 0.000000 |
| 15 | 0.000000 | 0.000000 | 0.000000 | 0.100000 |
| 16 | 0.000000 | 0.000000 | 0.000000 | 0.024390 |
| 17 | 0.000000 | 0.000000 | 0.000000 | 0.076923 |
| 18 | 0.000000 | 0.000000 | 0.000000 | 0.076923 |
| 19 | 0.000000 | 0.000000 | 0.000000 | 0.000000 |
| 20 | 0.000000 | 0.000000 | 0.000000 | 0.000000 |

|    | Athletics & Sports | BBQ Joint | ... | Theme Restaurant | Toy / Game Store | \ |
|----|--------------------|-----------|-----|------------------|------------------|---|
| 0  | 0.000000           | 0.000000  | ... | 0.011236         | 0.000            |   |
| 1  | 0.000000           | 0.000000  | ... | 0.000000         | 0.000            |   |
| 2  | 0.000000           | 0.000000  | ... | 0.000000         | 0.000            |   |
| 3  | 0.000000           | 0.000000  | ... | 0.000000         | 0.000            |   |
| 4  | 0.000000           | 0.000000  | ... | 0.000000         | 0.000            |   |
| 5  | 0.000000           | 0.010000  | ... | 0.000000         | 0.010            |   |
| 6  | 0.032258           | 0.000000  | ... | 0.000000         | 0.000            |   |
| 7  | 0.000000           | 0.000000  | ... | 0.000000         | 0.025            |   |
| 8  | 0.000000           | 0.000000  | ... | 0.000000         | 0.000            |   |
| 9  | 0.000000           | 0.000000  | ... | 0.000000         | 0.000            |   |
| 10 | 0.017857           | 0.000000  | ... | 0.000000         | 0.000            |   |
| 11 | 0.000000           | 0.000000  | ... | 0.000000         | 0.000            |   |
| 12 | 0.000000           | 0.035714  | ... | 0.000000         | 0.000            |   |
| 13 | 0.000000           | 0.000000  | ... | 0.000000         | 0.000            |   |
| 14 | 0.000000           | 0.000000  | ... | 0.000000         | 0.000            |   |
| 15 | 0.000000           | 0.000000  | ... | 0.000000         | 0.000            |   |
| 16 | 0.000000           | 0.000000  | ... | 0.000000         | 0.000            |   |
| 17 | 0.000000           | 0.000000  | ... | 0.000000         | 0.000            |   |
| 18 | 0.000000           | 0.000000  | ... | 0.000000         | 0.000            |   |
| 19 | 0.000000           | 0.000000  | ... | 0.000000         | 0.000            |   |
| 20 | 0.000000           | 0.000000  | ... | 0.000000         | 0.000            |   |

|   | Trade School | Train Station | Udon Restaurant | \ |
|---|--------------|---------------|-----------------|---|
| 0 | 0.011236     | 0.011236      | 0.000           |   |
| 1 | 0.000000     | 0.000000      | 0.000           |   |
| 2 | 0.000000     | 0.000000      | 0.000           |   |
| 3 | 0.000000     | 0.000000      | 0.000           |   |

|    |          |          |       |
|----|----------|----------|-------|
| 4  | 0.000000 | 0.000000 | 0.000 |
| 5  | 0.000000 | 0.000000 | 0.000 |
| 6  | 0.000000 | 0.000000 | 0.000 |
| 7  | 0.000000 | 0.000000 | 0.025 |
| 8  | 0.000000 | 0.000000 | 0.000 |
| 9  | 0.000000 | 0.000000 | 0.000 |
| 10 | 0.000000 | 0.000000 | 0.000 |
| 11 | 0.000000 | 0.000000 | 0.000 |
| 12 | 0.000000 | 0.000000 | 0.000 |
| 13 | 0.000000 | 0.000000 | 0.000 |
| 14 | 0.000000 | 0.000000 | 0.000 |
| 15 | 0.000000 | 0.000000 | 0.000 |
| 16 | 0.000000 | 0.000000 | 0.000 |
| 17 | 0.000000 | 0.000000 | 0.000 |
| 18 | 0.000000 | 0.000000 | 0.000 |
| 19 | 0.000000 | 0.000000 | 0.000 |
| 20 | 0.000000 | 0.125000 | 0.000 |

|    | Vegetarian / Vegan Restaurant | Video Game Store | Wine Bar | Wine Shop \ |
|----|-------------------------------|------------------|----------|-------------|
| 0  | 0.00                          | 0.000            | 0.000000 | 0.000000    |
| 1  | 0.00                          | 0.000            | 0.032258 | 0.000000    |
| 2  | 0.00                          | 0.000            | 0.000000 | 0.000000    |
| 3  | 0.00                          | 0.000            | 0.026667 | 0.000000    |
| 4  | 0.00                          | 0.000            | 0.000000 | 0.000000    |
| 5  | 0.02                          | 0.000            | 0.010000 | 0.000000    |
| 6  | 0.00                          | 0.000            | 0.000000 | 0.000000    |
| 7  | 0.00                          | 0.025            | 0.000000 | 0.000000    |
| 8  | 0.00                          | 0.000            | 0.000000 | 0.000000    |
| 9  | 0.03                          | 0.000            | 0.020000 | 0.000000    |
| 10 | 0.00                          | 0.000            | 0.000000 | 0.000000    |
| 11 | 0.00                          | 0.000            | 0.000000 | 0.000000    |
| 12 | 0.00                          | 0.000            | 0.000000 | 0.000000    |
| 13 | 0.00                          | 0.000            | 0.000000 | 0.000000    |
| 14 | 0.00                          | 0.000            | 0.000000 | 0.021739    |
| 15 | 0.00                          | 0.000            | 0.000000 | 0.000000    |
| 16 | 0.00                          | 0.000            | 0.000000 | 0.000000    |
| 17 | 0.00                          | 0.000            | 0.000000 | 0.000000    |
| 18 | 0.00                          | 0.000            | 0.000000 | 0.000000    |
| 19 | 0.00                          | 0.000            | 0.000000 | 0.000000    |
| 20 | 0.00                          | 0.000            | 0.000000 | 0.000000    |

|   | Women's Store |
|---|---------------|
| 0 | 0.000000      |
| 1 | 0.000000      |
| 2 | 0.000000      |
| 3 | 0.000000      |
| 4 | 0.000000      |

```

5 0.000000
6 0.000000
7 0.000000
8 0.000000
9 0.000000
10 0.017857
11 0.000000
12 0.000000
13 0.000000
14 0.000000
15 0.000000
16 0.000000
17 0.000000
18 0.000000
19 0.000000
20 0.000000

```

[21 rows x 157 columns]

Let's explore the mean of the frequency of occurrence of each hotel category by district

```

[144]: Madrid_hotels_grouped = Madrid_onehot.groupby('District')['Hotel'].mean().
 ↪reset_index()
 Madrid_hotels_grouped

```

```

[144]:
 District Hotel
0 Arganzuela 0.022472
1 Barajas 0.225806
2 Carabanchel 0.000000
3 Centro 0.026667
4 Chamartín 0.000000
5 Chamberlín 0.010000
6 Ciudad Lineal 0.064516
7 Fuencarral-El Pardo 0.000000
8 Hortaleza 0.000000
9 Latina 0.060000
10 Moncloa-Aravaca 0.017857
11 Moratalaz 0.000000
12 Puente de Vallecas 0.071429
13 Retiro 0.000000
14 Salamanca 0.021739
15 San Blas-Canillejas 0.000000
16 Tetuán 0.048780
17 Usera 0.000000
18 Vicálvaro 0.000000
19 Villa de Vallecas 0.000000
20 Villaverde 0.000000

```

Showing the top 5 most common venues for each district

```
[145]: num_top_venues = 5

for district in Madrid_grouped['District']:
 print("----"+district+"----")
 temp = Madrid_grouped[Madrid_grouped['District'] == district].T.reset_index()
 temp.columns = ['venue', 'freq']
 temp = temp.iloc[1:]
 temp['freq'] = temp['freq'].astype(float)
 temp = temp.round({'freq': 2})
 print(temp.sort_values('freq', ascending=False).reset_index(drop=True).
 ↪head(num_top_venues))
 print('\n')
```

----Arganzuela----

|   | venue              | freq |
|---|--------------------|------|
| 0 | Restaurant         | 0.11 |
| 1 | Spanish Restaurant | 0.09 |
| 2 | Grocery Store      | 0.06 |
| 3 | Tapas Restaurant   | 0.04 |
| 4 | Bakery             | 0.04 |

----Barajas----

|   | venue              | freq |
|---|--------------------|------|
| 0 | Hotel              | 0.23 |
| 1 | Spanish Restaurant | 0.10 |
| 2 | Restaurant         | 0.10 |
| 3 | Coffee Shop        | 0.06 |
| 4 | Tapas Restaurant   | 0.06 |

----Carabanchel----

|   | venue                | freq |
|---|----------------------|------|
| 0 | Pizza Place          | 0.12 |
| 1 | Fast Food Restaurant | 0.12 |
| 2 | Plaza                | 0.12 |
| 3 | Burger Joint         | 0.12 |
| 4 | Soccer Field         | 0.12 |

----Centro----

|   | venue              | freq |
|---|--------------------|------|
| 0 | Tapas Restaurant   | 0.13 |
| 1 | Spanish Restaurant | 0.11 |
| 2 | Plaza              | 0.07 |
| 3 | Hostel             | 0.07 |

4                   Bistro   0.05

----Chamartín----

|   | venue                    | freq |
|---|--------------------------|------|
| 0 | Restaurant               | 0.21 |
| 1 | Spanish Restaurant       | 0.08 |
| 2 | Tapas Restaurant         | 0.08 |
| 3 | Mediterranean Restaurant | 0.04 |
| 4 | Plaza                    | 0.04 |

----Chamberí----

|   | venue              | freq |
|---|--------------------|------|
| 0 | Spanish Restaurant | 0.10 |
| 1 | Restaurant         | 0.10 |
| 2 | Bar                | 0.06 |
| 3 | Tapas Restaurant   | 0.06 |
| 4 | Bakery             | 0.05 |

----Ciudad Lineal----

|   | venue              | freq |
|---|--------------------|------|
| 0 | Spanish Restaurant | 0.19 |
| 1 | Grocery Store      | 0.10 |
| 2 | Pizza Place        | 0.06 |
| 3 | Coffee Shop        | 0.06 |
| 4 | Hotel              | 0.06 |

----Fuencarral-El Pardo----

|   | venue                | freq |
|---|----------------------|------|
| 0 | Clothing Store       | 0.10 |
| 1 | Fast Food Restaurant | 0.08 |
| 2 | Italian Restaurant   | 0.08 |
| 3 | Restaurant           | 0.05 |
| 4 | Tapas Restaurant     | 0.05 |

----Hortaleza----

|   | venue              | freq |
|---|--------------------|------|
| 0 | Pizza Place        | 0.11 |
| 1 | Supermarket        | 0.11 |
| 2 | Spanish Restaurant | 0.11 |
| 3 | Breakfast Spot     | 0.11 |
| 4 | Pharmacy           | 0.05 |



----Latina----

|   | venue              | freq |
|---|--------------------|------|
| 0 | Tapas Restaurant   | 0.13 |
| 1 | Spanish Restaurant | 0.10 |
| 2 | Bar                | 0.07 |
| 3 | Plaza              | 0.06 |
| 4 | Hotel              | 0.06 |

----Moncloa-Aravaca----

|   | venue              | freq |
|---|--------------------|------|
| 0 | Spanish Restaurant | 0.05 |
| 1 | Restaurant         | 0.05 |
| 2 | Bar                | 0.04 |
| 3 | Coffee Shop        | 0.04 |
| 4 | Sandwich Place     | 0.04 |

----Moratalaz----

|   | venue      | freq |
|---|------------|------|
| 0 | Brewery    | 0.08 |
| 1 | Bar        | 0.08 |
| 2 | Plaza      | 0.08 |
| 3 | Park       | 0.08 |
| 4 | Restaurant | 0.08 |

----Puente de Vallecas----

|   | venue                | freq |
|---|----------------------|------|
| 0 | Fast Food Restaurant | 0.11 |
| 1 | Tapas Restaurant     | 0.07 |
| 2 | Hotel                | 0.07 |
| 3 | Caf                  | 0.07 |
| 4 | Grocery Store        | 0.07 |

----Retiro----

|   | venue              | freq |
|---|--------------------|------|
| 0 | Spanish Restaurant | 0.15 |
| 1 | Tapas Restaurant   | 0.05 |
| 2 | Grocery Store      | 0.05 |
| 3 | Bakery             | 0.05 |
| 4 | Bar                | 0.05 |

----Salamanca----

|   | venue              | freq |
|---|--------------------|------|
| 0 | Spanish Restaurant | 0.13 |

|   |                          |      |
|---|--------------------------|------|
| 1 | Restaurant               | 0.09 |
| 2 | Boutique                 | 0.09 |
| 3 | Mediterranean Restaurant | 0.07 |
| 4 | Tapas Restaurant         | 0.07 |

----San Blas-Canillejas----

|   | venue         | freq |
|---|---------------|------|
| 0 | Metro Station | 0.2  |
| 1 | Gas Station   | 0.1  |
| 2 | Gym           | 0.1  |
| 3 | Shopping Mall | 0.1  |
| 4 | Snack Place   | 0.1  |

----TetuÃn----

|   | venue                | freq |
|---|----------------------|------|
| 0 | Spanish Restaurant   | 0.22 |
| 1 | Restaurant           | 0.07 |
| 2 | Brazilian Restaurant | 0.05 |
| 3 | Chinese Restaurant   | 0.05 |
| 4 | Brewery              | 0.05 |

----Usera----

|   | venue                | freq |
|---|----------------------|------|
| 0 | Spanish Restaurant   | 0.15 |
| 1 | Chinese Restaurant   | 0.15 |
| 2 | Seafood Restaurant   | 0.15 |
| 3 | Theater              | 0.08 |
| 4 | Fast Food Restaurant | 0.08 |

----VicÃlvaro----

|   | venue                | freq |
|---|----------------------|------|
| 0 | Spanish Restaurant   | 0.15 |
| 1 | Pizza Place          | 0.15 |
| 2 | Fast Food Restaurant | 0.08 |
| 3 | Ice Cream Shop       | 0.08 |
| 4 | Breakfast Spot       | 0.08 |

----Villa de Vallecas----

|   | venue              | freq |
|---|--------------------|------|
| 0 | Spanish Restaurant | 0.14 |
| 1 | Plaza              | 0.14 |
| 2 | Soccer Field       | 0.14 |
| 3 | Park               | 0.14 |

```
4 Bar 0.14
```

```
----Villaverde----
```

```
 venue freq
0 Grocery Store 0.50
1 Spanish Restaurant 0.12
2 Gastropub 0.12
3 Train Station 0.12
4 Mediterranean Restaurant 0.12
```

A function to sort the venues in descending order.

```
[146]: def return_most_common_venues(row, num_top_venues):
 row_categories = row.iloc[1:]
 row_categories_sorted = row_categories.sort_values(ascending=False)

 return row_categories_sorted.index.values[0:num_top_venues]
```

Let's put data into a pandas dataframe with the top 10 venues for each district.

```
[147]: num_top_venues = 10

 indicators = ['st', 'nd', 'rd']

 # create columns according to number of top venues
 columns = ['District']
 for ind in np.arange(num_top_venues):
 try:
 columns.append('{}{} Most Common Venue'.format(ind+1, indicators[ind]))
 except:
 columns.append('{}th Most Common Venue'.format(ind+1))

 # create a new dataframe
 Madrid_districts_venues_sorted = pd.DataFrame(columns=columns)
 Madrid_districts_venues_sorted['District'] = Madrid_grouped['District']

 for ind in np.arange(Madrid_grouped.shape[0]):
 Madrid_districts_venues_sorted.iloc[ind, 1:] = \
 return_most_common_venues(Madrid_grouped.iloc[ind, :], num_top_venues)

 Madrid_districts_venues_sorted.head()
```

```
[147]: District 1st Most Common Venue 2nd Most Common Venue \
0 Arganzuela Restaurant Spanish Restaurant
1 Barajas Hotel Restaurant
```

|   |             |                  |                    |
|---|-------------|------------------|--------------------|
| 2 | Carabanchel | Soccer Field     | Tapas Restaurant   |
| 3 | Centro      | Tapas Restaurant | Spanish Restaurant |
| 4 | Chamartín   | Restaurant       | Tapas Restaurant   |

  

|   | 3rd Most Common Venue | 4th Most Common Venue | 5th Most Common Venue | \ |
|---|-----------------------|-----------------------|-----------------------|---|
| 0 | Grocery Store         | Bakery                | Tapas Restaurant      |   |
| 1 | Spanish Restaurant    | Tapas Restaurant      | Gastropub             |   |
| 2 | Fast Food Restaurant  | Pizza Place           | Plaza                 |   |
| 3 | Plaza                 | Hostel                | Bistro                |   |
| 4 | Spanish Restaurant    | Sushi Restaurant      | Seafood Restaurant    |   |

  

|   | 6th Most Common Venue  | 7th Most Common Venue | 8th Most Common Venue | \ |
|---|------------------------|-----------------------|-----------------------|---|
| 0 | Gym / Fitness Center   | Beer Garden           | Hotel                 |   |
| 1 | Coffee Shop            | Café                  | Wine Bar              |   |
| 2 | Burger Joint           | Bakery                | Nightclub             |   |
| 3 | Cocktail Bar           | Hotel                 | Wine Bar              |   |
| 4 | Furniture / Home Store | Plaza                 | Big Box Store         |   |

  

|   | 9th Most Common Venue | 10th Most Common Venue |
|---|-----------------------|------------------------|
| 0 | Market                | Brewery                |
| 1 | Mexican Restaurant    | Diner                  |
| 2 | Flea Market           | Farmers Market         |
| 3 | Restaurant            | Bar                    |
| 4 | Gastropub             | Steakhouse             |

Run k-means to cluster the neighborhood into 5 clusters.

```
[151]: from sklearn.cluster import KMeans

set number of clusters
kclusters = 5

Madrid_grouped_clustering = Madrid_grouped.drop('District', 1)

run k-means clustering
kmeans = KMeans(n_clusters=kclusters, random_state=0).
 →fit(Madrid_grouped_clustering)

check cluster labels generated for each row in the dataframe
kmeans.labels_[0:10]
```

```
[151]: array([0, 0, 2, 0, 0, 0, 4, 0, 0, 0])
```

```
[162]: # add clustering labels
Madrid_districts_venues_sorted.insert(0, 'Cluster Labels', kmeans.labels_)

Madrid_merged = Final_MadridDF
```

```
merge toronto_grouped with toronto_data to add latitude/longitude for each
→neighborhood
Madrid_merged = Madrid_merged.join(Madrid_districts_venues_sorted.
→set_index('District'), on='Name')

Resulting Clusters labels are float. Converted to int because folium.
→CircleMarker need int values to color.
Madrid_merged['Cluster Labels'] = Madrid_merged['Cluster Labels'].astype(int)

Madrid_merged.head()
```

```
[162]:
```

|   | District Number | Name District | area[n 1] (Ha.) | Population | \ |
|---|-----------------|---------------|-----------------|------------|---|
| 0 | 1               | Centro        | 522.82          | 131,928    |   |
| 1 | 2               | Arganzuela    | 646.22          | 151,965    |   |
| 2 | 3               | Retiro        | 546.62          | 118,516    |   |
| 3 | 4               | Salamanca     | 539.24          | 143,800    |   |
| 4 | 5               | Chamartín     | 917.55          | 143,424    |   |

  

|   | Population density(Hab./Ha.) | Latitude  | Longitude | Cluster Labels | \ |
|---|------------------------------|-----------|-----------|----------------|---|
| 0 | 252.34                       | 40.415347 | -3.707371 | 0              |   |
| 1 | 235.16                       | 40.402733 | -3.695403 | 0              |   |
| 2 | 216.82                       | 40.408072 | -3.676729 | 0              |   |
| 3 | 266.67                       | 40.429722 | -3.679750 | 0              |   |
| 4 | 156.31                       | 40.462059 | -3.676600 | 0              |   |

  

|   | 1st Most Common Venue | 2nd Most Common Venue | 3rd Most Common Venue | \ |
|---|-----------------------|-----------------------|-----------------------|---|
| 0 | Tapas Restaurant      | Spanish Restaurant    | Plaza                 |   |
| 1 | Restaurant            | Spanish Restaurant    | Grocery Store         |   |
| 2 | Spanish Restaurant    | Bakery                | Grocery Store         |   |
| 3 | Spanish Restaurant    | Boutique              | Restaurant            |   |
| 4 | Restaurant            | Tapas Restaurant      | Spanish Restaurant    |   |

  

|   | 4th Most Common Venue | 5th Most Common Venue    | 6th Most Common Venue  | \ |
|---|-----------------------|--------------------------|------------------------|---|
| 0 | Hostel                | Bistro                   | Cocktail Bar           |   |
| 1 | Bakery                | Tapas Restaurant         | Gym / Fitness Center   |   |
| 2 | Supermarket           | Museum                   | Tapas Restaurant       |   |
| 3 | Bakery                | Mediterranean Restaurant | Tapas Restaurant       |   |
| 4 | Sushi Restaurant      | Seafood Restaurant       | Furniture / Home Store |   |

  

|   | 7th Most Common Venue | 8th Most Common Venue | 9th Most Common Venue | \ |
|---|-----------------------|-----------------------|-----------------------|---|
| 0 | Hotel                 | Wine Bar              | Restaurant            |   |
| 1 | Beer Garden           | Hotel                 | Market                |   |
| 2 | Bar                   | Gym                   | Board Shop            |   |
| 3 | Coffee Shop           | Mexican Restaurant    | Hotel                 |   |
| 4 | Plaza                 | Big Box Store         | Gastropub             |   |

|   | 10th Most Common Venue |
|---|------------------------|
| 0 | Bar                    |
| 1 | Brewery                |
| 2 | Boutique               |
| 3 | Liquor Store           |
| 4 | Steakhouse             |

Visualizing the resulting clusters in a map

```
[164]: import matplotlib.cm as cm
import matplotlib.colors as colors
import k-means from clustering stage
from sklearn.cluster import KMeans

create map
Madrid_map_clusters = folium.Map(location=[latitude, longitude], zoom_start=11)

set color scheme for the clusters
x = np.arange(kclusters)
ys = [i + x + (i*x)**2 for i in range(kclusters)]
colors_array = cm.rainbow(np.linspace(0, 1, len(ys)))
rainbow = [colors.rgb2hex(i) for i in colors_array]

add markers to the map,
markers_colors = []
for lat, lon, poi, cluster in zip(Madrid_merged['Latitude'],
 ↪Madrid_merged['Longitude'], Madrid_merged['Name'], Madrid_merged['Cluster_
 ↪Labels']):
 label = folium.Popup(str(poi) + ' Cluster ' + str(cluster), parse_html=True)
 folium.CircleMarker(
 [lat, lon],
 radius=5,
 popup=label,
 color=rainbow[cluster-1],
 fill=True,
 fill_color=rainbow[cluster-1],
 fill_opacity=0.7).add_to(Madrid_map_clusters)

Madrid_map_clusters
```

```
[164]: <folium.folium.Map at 0x23cded55888>
```

We repeat the same process only for the hotel category

```
[166]: #from sklearn.cluster import KMeans

set number of clusters
```

```

kclusters = 3

Madrid_hotels_grouped_clustering = Madrid_hotels_grouped.drop('District', 1)

run k-means clustering
kmeans = KMeans(n_clusters=kclusters, random_state=0).
 →fit(Madrid_hotels_grouped_clustering)

check cluster labels generated for each row in the dataframe
kmeans.labels_[0:10]

```

[166]: array([1, 2, 1, 1, 1, 1, 0, 1, 1, 0])

```

[168]: # add clustering labels
Madrid_districts_hotels = Madrid_hotels_grouped
Madrid_districts_hotels.insert(0, 'Cluster Labels', kmeans.labels_)

Madrid_hotels_merged = Final_MadridDF

merge toronto_grouped with toronto_data to add latitude/longitude for each_
 →neighborhood
Madrid_hotels_merged = Madrid_hotels_merged.join(Madrid_districts_hotels.
 →set_index('District'), on='Name')

Resulting Clusters labels are float. Converted to int because folium.
 →CircleMarker need int values to color.
Madrid_hotels_merged['Cluster Labels'] = Madrid_hotels_merged['Cluster Labels'].
 →astype(int)

Madrid_hotels_merged.head()

```

[168]:

|   | District Number | Name District | area[n 1] (Ha.) | Population | \ |
|---|-----------------|---------------|-----------------|------------|---|
| 0 | 1               | Centro        | 522.82          | 131,928    |   |
| 1 | 2               | Arganzuela    | 646.22          | 151,965    |   |
| 2 | 3               | Retiro        | 546.62          | 118,516    |   |
| 3 | 4               | Salamanca     | 539.24          | 143,800    |   |
| 4 | 5               | Chamartín     | 917.55          | 143,424    |   |

  

|   | Population density(Hab./Ha.) | Latitude  | Longitude | Cluster Labels | Hotel    |
|---|------------------------------|-----------|-----------|----------------|----------|
| 0 | 252.34                       | 40.415347 | -3.707371 | 1              | 0.026667 |
| 1 | 235.16                       | 40.402733 | -3.695403 | 1              | 0.022472 |
| 2 | 216.82                       | 40.408072 | -3.676729 | 1              | 0.000000 |
| 3 | 266.67                       | 40.429722 | -3.679750 | 1              | 0.021739 |
| 4 | 156.31                       | 40.462059 | -3.676600 | 1              | 0.000000 |

```
[169]: #import matplotlib.cm as cm
#import matplotlib.colors as colors
import k-means from clustering stage
#from sklearn.cluster import KMeans

create map
Madrid_hotels_map_clusters = folium.Map(location=[latitude, longitude],
 ↪zoom_start=11)

set color scheme for the clusters
x = np.arange(kclusters)
ys = [i + x + (i*x)**2 for i in range(kclusters)]
colors_array = cm.rainbow(np.linspace(0, 1, len(ys)))
rainbow = [colors.rgb2hex(i) for i in colors_array]

add markers to the map,
markers_colors = []
for lat, lon, poi, cluster in zip(Madrid_hotels_merged['Latitude'],
 ↪Madrid_hotels_merged['Longitude'], Madrid_hotels_merged['Name'],
 ↪Madrid_hotels_merged['Cluster Labels']):
 label = folium.Popup(str(poi) + ' Cluster ' + str(cluster), parse_html=True)
 folium.CircleMarker(
 [lat, lon],
 radius=5,
 popup=label,
 color=rainbow[cluster-1],
 fill=True,
 fill_color=rainbow[cluster-1],
 fill_opacity=0.7).add_to(Madrid_hotels_map_clusters)

Madrid_hotels_map_clusters
```

[169]: <folium.folium.Map at 0x23cded66bc8>

Examine Cluster 1.

```
[171]: Madrid_merged.loc[Madrid_merged['Cluster Labels'] == 0, Madrid_merged.
 ↪columns[[1] + list(range(5, Madrid_merged.shape[1]))]]
```

```
[171]:
```

|   | Name                | Latitude  | Longitude | Cluster Labels | \ |
|---|---------------------|-----------|-----------|----------------|---|
| 0 | Centro              | 40.415347 | -3.707371 | 0              |   |
| 1 | Arganzuela          | 40.402733 | -3.695403 | 0              |   |
| 2 | Retiro              | 40.408072 | -3.676729 | 0              |   |
| 3 | Salamanca           | 40.429722 | -3.679750 | 0              |   |
| 4 | Chamartín           | 40.462059 | -3.676600 | 0              |   |
| 6 | Chamberí            | 40.434040 | -3.703790 | 0              |   |
| 7 | Fuencarral-El Pardo | 40.478611 | -3.709722 | 0              |   |



|    |                    |           |           |   |
|----|--------------------|-----------|-----------|---|
| 8  | Moncloa-Aravaca    | 40.435151 | -3.718765 | 0 |
| 9  | Latina             | 40.411360 | -3.708417 | 0 |
| 12 | Puente de Vallecas | 40.398204 | -3.669059 | 0 |
| 13 | Moratalaz          | 40.409869 | -3.644436 | 0 |
| 15 | Hortaleza          | 40.469457 | -3.640482 | 0 |
| 18 | Vic~alvaro         | 40.404200 | -3.608060 | 0 |
| 20 | Barajas            | 40.470278 | -3.585000 | 0 |

|    | 1st Most Common Venue | 2nd Most Common Venue | 3rd Most Common Venue | \ |
|----|-----------------------|-----------------------|-----------------------|---|
| 0  | Tapas Restaurant      | Spanish Restaurant    | Plaza                 |   |
| 1  | Restaurant            | Spanish Restaurant    | Grocery Store         |   |
| 2  | Spanish Restaurant    | Bakery                | Grocery Store         |   |
| 3  | Spanish Restaurant    | Boutique              | Restaurant            |   |
| 4  | Restaurant            | Tapas Restaurant      | Spanish Restaurant    |   |
| 6  | Spanish Restaurant    | Restaurant            | Bar                   |   |
| 7  | Clothing Store        | Italian Restaurant    | Fast Food Restaurant  |   |
| 8  | Spanish Restaurant    | Restaurant            | Japanese Restaurant   |   |
| 9  | Tapas Restaurant      | Spanish Restaurant    | Bar                   |   |
| 12 | Fast Food Restaurant  | Hotel                 | Tapas Restaurant      |   |
| 13 | Park                  | Bakery                | Shopping Mall         |   |
| 15 | Breakfast Spot        | Spanish Restaurant    | Supermarket           |   |
| 18 | Pizza Place           | Spanish Restaurant    | Beer Bar              |   |
| 20 | Hotel                 | Restaurant            | Spanish Restaurant    |   |

|    | 4th Most Common Venue | 5th Most Common Venue    | \ |
|----|-----------------------|--------------------------|---|
| 0  | Hostel                | Bistro                   |   |
| 1  | Bakery                | Tapas Restaurant         |   |
| 2  | Supermarket           | Museum                   |   |
| 3  | Bakery                | Mediterranean Restaurant |   |
| 4  | Sushi Restaurant      | Seafood Restaurant       |   |
| 6  | Tapas Restaurant      | Bakery                   |   |
| 7  | Restaurant            | Tapas Restaurant         |   |
| 8  | Pub                   | Ice Cream Shop           |   |
| 9  | Plaza                 | Hotel                    |   |
| 12 | Gym                   | Grocery Store            |   |
| 13 | Soccer Field          | Caf~                     |   |
| 15 | Pizza Place           | Plaza                    |   |
| 18 | Breakfast Spot        | Fast Food Restaurant     |   |
| 20 | Tapas Restaurant      | Gastropub                |   |

|   | 6th Most Common Venue  | 7th Most Common Venue | 8th Most Common Venue | \ |
|---|------------------------|-----------------------|-----------------------|---|
| 0 | Cocktail Bar           | Hotel                 | Wine Bar              |   |
| 1 | Gym / Fitness Center   | Beer Garden           | Hotel                 |   |
| 2 | Tapas Restaurant       | Bar                   | Gym                   |   |
| 3 | Tapas Restaurant       | Coffee Shop           | Mexican Restaurant    |   |
| 4 | Furniture / Home Store | Plaza                 | Big Box Store         |   |
| 6 | Caf~                   | Brewery               | Coffee Shop           |   |

|    |                               |                |                  |
|----|-------------------------------|----------------|------------------|
| 7  | Burger Joint                  | Pizza Place    | Shopping Mall    |
| 8  | Bakery                        | Bar            | Pizza Place      |
| 9  | Vegetarian / Vegan Restaurant | Café           | Restaurant       |
| 12 | Supermarket                   | Café           | Breakfast Spot   |
| 13 | Food Truck                    | Restaurant     | Plaza            |
| 15 | Sandwich Place                | Donut Shop     | Restaurant       |
| 18 | Ice Cream Shop                | Sandwich Place | Asian Restaurant |
| 20 | Coffee Shop                   | Café           | Wine Bar         |

|    | 9th Most Common Venue    | 10th Most Common Venue |
|----|--------------------------|------------------------|
| 0  | Restaurant               | Bar                    |
| 1  | Market                   | Brewery                |
| 2  | Board Shop               | Boutique               |
| 3  | Hotel                    | Liquor Store           |
| 4  | Gastropub                | Steakhouse             |
| 6  | Italian Restaurant       | Plaza                  |
| 7  | Kebab Restaurant         | Sandwich Place         |
| 8  | Mediterranean Restaurant | Burger Joint           |
| 9  | Mediterranean Restaurant | Bistro                 |
| 12 | Market                   | Pub                    |
| 13 | Bar                      | Nightclub              |
| 15 | Chinese Restaurant       | Pub                    |
| 18 | Grocery Store            | Café                   |
| 20 | Mexican Restaurant       | Diner                  |

Examine Cluster 2.

```
[172]: Madrid_merged.loc[Madrid_merged['Cluster Labels'] == 1, Madrid_merged.
 ↪columns[[1] + list(range(5, Madrid_merged.shape[1]))]]
```

```
[172]:
```

|    | Name                   | Latitude              | Longitude             | Cluster Labels | \ |
|----|------------------------|-----------------------|-----------------------|----------------|---|
| 19 | San Blas-Canillejas    | 40.426001             | -3.612764             | 1              |   |
|    | 1st Most Common Venue  | 2nd Most Common Venue | 3rd Most Common Venue |                | \ |
| 19 | Metro Station          | Shopping Mall         | Snack Place           |                |   |
|    | 4th Most Common Venue  | 5th Most Common Venue | 6th Most Common Venue |                | \ |
| 19 | Pizza Place            | Gym                   | Grocery Store         |                |   |
|    | 7th Most Common Venue  | 8th Most Common Venue | 9th Most Common Venue |                | \ |
| 19 | Asian Restaurant       | Supermarket           | Gas Station           |                |   |
|    | 10th Most Common Venue |                       |                       |                |   |
| 19 | Electronics Store      |                       |                       |                |   |

Examine Cluster 3.

```
[173]: Madrid_merged.loc[Madrid_merged['Cluster Labels'] == 2, Madrid_merged.
 ↪columns[[1] + list(range(5, Madrid_merged.shape[1]))]]
```

```
[173]:
```

|    | Name                  | Latitude              | Longitude               | Cluster Labels | 1st Most Common Venue \ |
|----|-----------------------|-----------------------|-------------------------|----------------|-------------------------|
| 10 | Carabanchel           | 40.38367              | -3.72799                | 2              | Soccer Field            |
|    | 2nd Most Common Venue | 3rd Most Common Venue | 4th Most Common Venue \ |                |                         |
| 10 | Tapas Restaurant      | Fast Food Restaurant  | Pizza Place             |                |                         |
|    | 5th Most Common Venue | 6th Most Common Venue | 7th Most Common Venue \ |                |                         |
| 10 | Plaza                 | Burger Joint          | Bakery                  |                |                         |
|    | 8th Most Common Venue | 9th Most Common Venue | 10th Most Common Venue  |                |                         |
| 10 | Nightclub             | Flea Market           | Farmers Market          |                |                         |

Examine Cluster 4.

```
[174]: Madrid_merged.loc[Madrid_merged['Cluster Labels'] == 3, Madrid_merged.
 ↪columns[[1] + list(range(5, Madrid_merged.shape[1]))]]
```

```
[174]:
```

|    | Name                  | Latitude                 | Longitude               | Cluster Labels | 1st Most Common Venue \ |
|----|-----------------------|--------------------------|-------------------------|----------------|-------------------------|
| 16 | Villaverde            | 40.349998                | -3.701143               | 3              | Grocery Store           |
|    | 2nd Most Common Venue | 3rd Most Common Venue    | 4th Most Common Venue \ |                |                         |
| 16 | Spanish Restaurant    | Mediterranean Restaurant | Train Station           |                |                         |
|    | 5th Most Common Venue | 6th Most Common Venue    | 7th Most Common Venue \ |                |                         |
| 16 | Gastropub             | Women's Store            | Electronics Store       |                |                         |
|    | 8th Most Common Venue | 9th Most Common Venue    | 10th Most Common Venue  |                |                         |
| 16 | Flea Market           | Fast Food Restaurant     | Farmers Market          |                |                         |

Examine Cluster 5.

```
[175]: Madrid_merged.loc[Madrid_merged['Cluster Labels'] == 4, Madrid_merged.
 ↪columns[[1] + list(range(5, Madrid_merged.shape[1]))]]
```

```
[175]:
```

|    | Name                  | Latitude              | Longitude               | Cluster Labels \ |
|----|-----------------------|-----------------------|-------------------------|------------------|
| 5  | TetuÅan               | 40.459751             | -3.697500               | 4                |
| 11 | Usera                 | 40.381389             | -3.706944               | 4                |
| 14 | Ciudad Lineal         | 40.445049             | -3.651320               | 4                |
| 17 | Villa de Vallecas     | 40.379597             | -3.621347               | 4                |
|    | 1st Most Common Venue | 2nd Most Common Venue | 3rd Most Common Venue \ |                  |
| 5  | Spanish Restaurant    | Restaurant            | Hotel                   |                  |
| 11 | Seafood Restaurant    | Spanish Restaurant    | Chinese Restaurant      |                  |
| 14 | Spanish Restaurant    | Grocery Store         | Hotel                   |                  |
| 17 | Bar                   | Plaza                 | Spanish Restaurant      |                  |

|    | 4th Most Common Venue | 5th Most Common Venue | 6th Most Common Venue | \ |
|----|-----------------------|-----------------------|-----------------------|---|
| 5  | Brazilian Restaurant  | Grocery Store         | Supermarket           |   |
| 11 | Grocery Store         | Bubble Tea Shop       | Fast Food Restaurant  |   |
| 14 | Italian Restaurant    | Coffee Shop           | Pizza Place           |   |
| 17 | Church                | Grocery Store         | Soccer Field          |   |

|    | 7th Most Common Venue | 8th Most Common Venue | 9th Most Common Venue | \ |
|----|-----------------------|-----------------------|-----------------------|---|
| 5  | Brewery               | Chinese Restaurant    | Coffee Shop           |   |
| 11 | CafÃ                  | Theater               | Noodle House          |   |
| 14 | Bakery                | Office                | Chinese Restaurant    |   |
| 17 | Park                  | Dessert Shop          | Fabric Shop           |   |

|    | 10th Most Common Venue |
|----|------------------------|
| 5  | Pizza Place            |
| 11 | Asian Restaurant       |
| 14 | Restaurant             |
| 17 | Food                   |

#### Examine Cluster 1. Only Hotels

```
[170]: Madrid_hotels_merged.loc[Madrid_hotels_merged['Cluster Labels'] == 0,
↳Madrid_hotels_merged.columns[[1] + list(range(5, Madrid_hotels_merged.
↳shape[1]))]]
```

|    | Name               | Latitude  | Longitude | Cluster Labels | Hotel    |
|----|--------------------|-----------|-----------|----------------|----------|
| 5  | TetuÃ              | 40.459751 | -3.697500 | 0              | 0.048780 |
| 9  | Latina             | 40.411360 | -3.708417 | 0              | 0.060000 |
| 12 | Puente de Vallecas | 40.398204 | -3.669059 | 0              | 0.071429 |
| 14 | Ciudad Lineal      | 40.445049 | -3.651320 | 0              | 0.064516 |

#### Examine Cluster 2. Only Hotels

```
[176]: Madrid_hotels_merged.loc[Madrid_hotels_merged['Cluster Labels'] == 1,
↳Madrid_hotels_merged.columns[[1] + list(range(5, Madrid_hotels_merged.
↳shape[1]))]]
```

|    | Name                | Latitude  | Longitude | Cluster Labels | Hotel    |
|----|---------------------|-----------|-----------|----------------|----------|
| 0  | Centro              | 40.415347 | -3.707371 | 1              | 0.026667 |
| 1  | Arganzuela          | 40.402733 | -3.695403 | 1              | 0.022472 |
| 2  | Retiro              | 40.408072 | -3.676729 | 1              | 0.000000 |
| 3  | Salamanca           | 40.429722 | -3.679750 | 1              | 0.021739 |
| 4  | ChamartÃ            | 40.462059 | -3.676600 | 1              | 0.000000 |
| 6  | ChamberÃ            | 40.434040 | -3.703790 | 1              | 0.010000 |
| 7  | Fuencarral-El Pardo | 40.478611 | -3.709722 | 1              | 0.000000 |
| 8  | Moncloa-Aravaca     | 40.435151 | -3.718765 | 1              | 0.017857 |
| 10 | Carabanchel         | 40.383670 | -3.727990 | 1              | 0.000000 |
| 11 | Usera               | 40.381389 | -3.706944 | 1              | 0.000000 |

|    |                     |           |           |   |          |
|----|---------------------|-----------|-----------|---|----------|
| 13 | Moratalaz           | 40.409869 | -3.644436 | 1 | 0.000000 |
| 15 | Hortaleza           | 40.469457 | -3.640482 | 1 | 0.000000 |
| 16 | Villaverde          | 40.349998 | -3.701143 | 1 | 0.000000 |
| 17 | Villa de Vallecas   | 40.379597 | -3.621347 | 1 | 0.000000 |
| 18 | Vicalvaro          | 40.404200 | -3.608060 | 1 | 0.000000 |
| 19 | San Blas-Canillejas | 40.426001 | -3.612764 | 1 | 0.000000 |

Examine Cluster 3. Only Hotels

```
[177]: Madrid_hotels_merged.loc[Madrid_hotels_merged['Cluster Labels'] == 2,
 ↪Madrid_hotels_merged.columns[[1] + list(range(5, Madrid_hotels_merged.
 ↪shape[1]))]]
```

```
[177]: Name Latitude Longitude Cluster Labels Hotel
20 Barajas 40.470278 -3.585 2 0.225806
```

## 1.4 4.Results

Based on the information provided by Foursquare, we can see how most of the districts of Madrid are well provided with restaurants and other venues that can attract the attention of tourists.

The Barajas district is the one with the highest concentration of hotels. This makes sense, because it is the district where the international airport is located. Therefore this district should be avoided. It is also located on the outskirts of town.

Among the most central districts we can highlight two of them. Salamanca and Retiro.

Salamanca is well known for being one of the wealthiest and expensive areas in Madrid, with a high living cost and one of the highest real estate prices in the city. Serrano street is listed as the third most expensive street in Spain. A significant number of diplomatic missions are set in Salamanca district, such as the Swiss embassy at Nusez de Balboa with Goya street, the French embassy at Villalar Street, the United States embassy at 74 Serrano street, or the Italian embassy in Juan Bravo Street.(wikipedia)

Retiro's history has been strongly determined by the presence of the park with the same name and the railway facilities located at the south and west of this District. Retiro Park, together with Paseo del Prado, has given its own personality to the area of Los Jernimos, while the rest of the District is determined by Atocha Railway Station and previously also by Niso Jess Station. During the 20th Century, the area consolidated as residential areas for people with a growing economic power.(wikipedia)

Both districts are well-stocked with tourist resources and have a low concentration of hotels. The biggest drawback is finding soil to build a hotel. Perhaps it would be easier to find a building to reform as a hotel.

## **1.5 5.Conclusion**

Based on the analyzed data, my advice would be to focus on only two Madrid districts, Salamanca and Retiro, when investing on a new hotel. Especially being a high standing or luxury hotel.