

Data Mining

Données ouvertes liées (Linked Open Data)

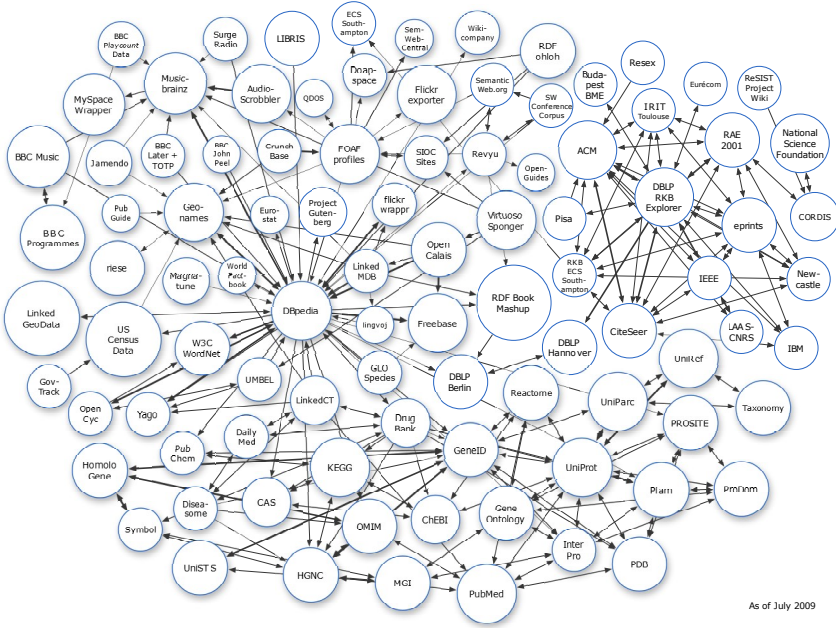
John Samuel
CPE Lyon

Year: 2020-2021

Email: john(dot)samuel(at)cpe(dot)fr



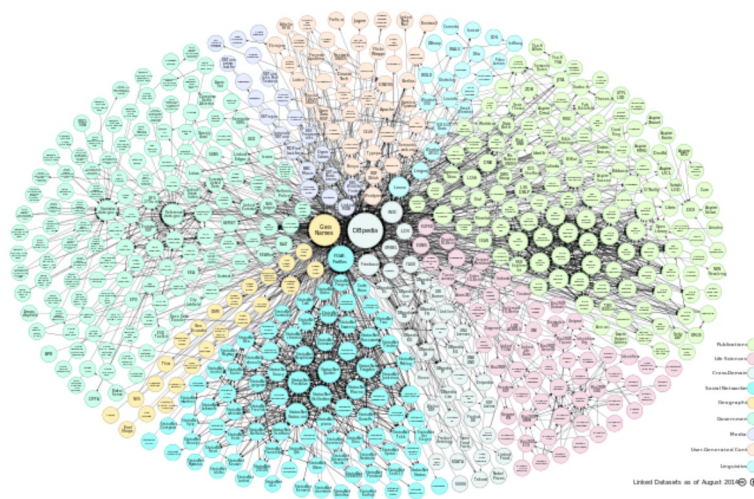
Linked Open Data



Linked Open Data: Représentation des relations (2009)

1. https://commons.wikimedia.org/wiki/File:Lod-datasets_2009-07-14.svg

Linked Open Data



Données ouvertes liées (Linked Open data: LOD), 2010







1. https://commons.wikimedia.org/wiki/File:Lod-datasets_2010-09-22_colored.png

- Wikidata

- Début en 2012
- Une base de connaissances libre, ouverte, liée, structurée, collaborative et multilingue
- Des sites Wikipédia multilingues à plusieurs sous-domaines à un site multilingue à un seul domaine



Wikipédia: Articles multilingues

EN	FR	IT	DE	NL																																																																																																																																																																																								
<table><tr><td>Country</td><td>France</td></tr><tr><td>Region</td><td>Provence-Alpes-Côte d'Azur</td></tr><tr><td>Département</td><td>Vaucluse</td></tr><tr><td>Arrondissement</td><td>Avignon</td></tr><tr><td>Canton</td><td>Avignon-1, Avignon-2, Avignon-3</td></tr><tr><td>Intercommunality</td><td>CA Grand Avignon</td></tr><tr><td>Government</td><td></td></tr><tr><td> • Mayor (2014-2020)</td><td>Cécile Helle (PS)</td></tr><tr><td>Area¹</td><td>64.78 km² (25.01 sq mi)</td></tr><tr><td>Population (2015)²</td><td>92,130</td></tr><tr><td> • Density</td><td>1,400/km² (3,700/sq mi)</td></tr><tr><td>Time zone</td><td>CET (GMT +1) (UTC+1)</td></tr><tr><td> • Summer (DST)</td><td>CEST (UTC+2)</td></tr><tr><td>INSEE/Postal code</td><td>84007@ /84000</td></tr><tr><td>Elevation</td><td>10-122 m (33-400 ft) (avg. 23 m or 75 ft)</td></tr><tr><td>UNESCO World Heritage Site</td><td></td></tr><tr><td>Official name</td><td>Historic Centre of Avignon: Papal Palace, Episcopal Ensemble and Avignon Bridge</td></tr><tr><td>Criteria</td><td>Cultural: i, ii, iv</td></tr><tr><td>Reference</td><td>228@</td></tr><tr><td>Inscription</td><td>1995 (19th Session)</td></tr><tr><td>Area</td><td>8.2 ha</td></tr></table>	Country	France	Region	Provence-Alpes-Côte d'Azur	Département	Vaucluse	Arrondissement	Avignon	Canton	Avignon-1, Avignon-2, Avignon-3	Intercommunality	CA Grand Avignon	Government		 • Mayor (2014-2020)	Cécile Helle (PS)	Area ¹	64.78 km ² (25.01 sq mi)	Population (2015) ²	92,130	 • Density	1,400/km ² (3,700/sq mi)	Time zone	CET (GMT +1) (UTC+1)	 • Summer (DST)	CEST (UTC+2)	INSEE/Postal code	84007@ /84000	Elevation	10-122 m (33-400 ft) (avg. 23 m or 75 ft)	UNESCO World Heritage Site		Official name	Historic Centre of Avignon: Papal Palace, Episcopal Ensemble and Avignon Bridge	Criteria	Cultural: i, ii, iv	Reference	228@	Inscription	1995 (19th Session)	Area	8.2 ha	<table><tr><td>Pays</td><td> France</td></tr><tr><td>Région</td><td>Provence-Alpes-Côte d'Azur</td></tr><tr><td>Département</td><td>Vaucluse (préfecture)</td></tr><tr><td>Arrondissement</td><td>Avignon (chef-lieu)</td></tr><tr><td>Canton</td><td>Bureau centralisateur de Avignon-1 Avignon-2 Avignon-3</td></tr><tr><td>Intercommunalité</td><td>Grand Avignon (siège)</td></tr><tr><td>Maire</td><td>Cécile Helle</td></tr><tr><td>Mandat</td><td>2014-2020</td></tr><tr><td>Code postal</td><td>84000 / 84140</td></tr><tr><td>Code commune</td><td>84007</td></tr><tr><td>Démographie</td><td></td></tr><tr><td>Gentile</td><td>Avignonnais</td></tr><tr><td>Population municipale</td><td>92 130 hab. 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Wikipédia: Articles multilingues

Élément de Wikidata: Étiquettes,

<div> <div>Bogotá (Q2841)</div> <div>Identifier</div> </div>			
<div>capital city of Colombia and Cundinamarca department</div> <div>Santa Fe de Bogotá Santafé de Bogotá Bogota</div> <div>edit</div>			
<div> <div>In more languages</div> <div>Configure</div> </div>			
Language	Label	Description	Also known as
English	Bogotá	capital city of Colombia and Cundinamarca department	Santa Fe de Bogotá Santafé de Bogotá Bogota
French	Bogota	capitale de la Colombie	Bogotá Santa Fe de Bogotá
Spanish	Bogotá	capital de Colombia y del departamento de Cundinamarca	Santafé de Bogotá Bogota Santafe de Bogota
German	Bogotá	Hauptstadt Kolumbiens und der Provinz Cundinamarca	Bogota Santa Fe de Bogotá Santafe de Bogota

Languages
 Labels
 Descriptions
 Alias

Exemple: Bogotá(Q2841)

Élément (item) de Wikidata: Étiquettes et

Avignon (Q6397)...

commune in Vaucluse, France

▼ In more languages Configure

Language	Label	Description	Also known as
English	Avignon	commune in Vaucluse, France	

[All entered languages](#)


Statements

instance of

- commune of France ...
► 1 reference [edit](#)
- city ...
▼ 0 references [edit](#)

[+ add reference](#)
[+ add value](#)

image

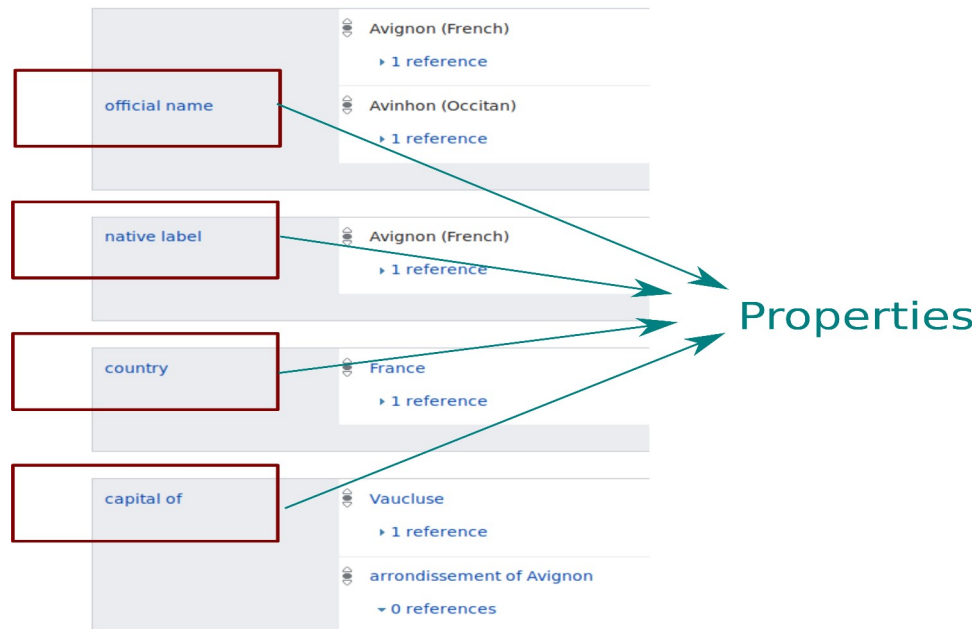


[edit](#)

Avignon, Palais des Papes depuis Tour Philippe le Bel by JM Rosier.jpg

Exemple: Avignon (Q6397)

Propriétés de Wikidata



Propriétés de Wikidata

Propriétés: Étiquettes et descriptions

country (P17)

sovereign state of this item; don't use on humans

sovereign state | state | land

~ In more languages [Configure](#)

Language	Label	Description
English	country	sovereign state of this item; don't use on humans
French	pays	État souverain de cet élément
Spanish	país	estado soberano de este elemento
German	Staat	souveräner Staat, in dem sich das Objekt befindet

[All entered languages](#)

Language	Label	Description
Data type		
Item		

<https://www.wikidata.org/wiki/Property:P17>

Exemple: pays (P17)

Propriétés

instance of ^(P31)

that class of which this subject is a particular example and member (subject typically an individual member with a proper name label); different from P279; using this property as a qualifier is deprecated—use P2868 or P3831 instead

is a | is an | has class | has type | is a particular | is a specific | is an individual | is a unique | is an example of | member of | unique individual of | distinct member of | non-type member of | subclassable example of | uninstanciable instance of | unsubclassifiable member of | not a type but is instance of | unsubtypable particular | unitary element of class | distinct element of | distinct individual member of | occurrence of | rdf:type | type

▼ In more languages

Configure

Language	Label	Description	Also known as
English	instance of	that class of which this subject is a particular example and member (subject typically an individual member with a proper name label); different from P279; using this property as a qualifier is deprecated—use P2868 or P3831 instead	is a is an has class has type is a particular is a specific is an individual is a unique is an example of member of unique individual of distinct member of non-type member of subclassable example of uninstanciable instance of unsubclassifiable member of not a type but is instance of unsubtypable particular unitary element of class distinct element of distinct individual member of occurrence of rdf:type type

Étiquettes, descriptions et alias de Property:P31 en anglais

Propriétés de l'Infobox de Wikipedia

Bogotá

Capital city of Colombia

Bogotá, Distrito Capital

From the top: Central Bogotá, La Candelaria, Torre Colpatria, Capitolio Nacional and Gold Museum.

Flag

Seal

Nickname(s): "La Atenas Suramericana" ("The South American Athens") "Muy Noble y Muy Leal Ciudad" ("Most Noble and Most Loyal City")^{[1][2]}
Motto(s): "Bogotá Mejor Para Todos" ("A Better Bogotá For All", 2016–2019)

Location in Colombia and South America

☒ Show map of Colombia
☐ Show map of South America
☐ Show all

Coordinates: 4°42′40″N 74°4′20″W﻿ / ﻿

Country	Colombia
Department	Capital District Cundinamarca (see text)
Founded	6 August 1538 (traditional) ^[4]
Founded by	Gonzalo Jiménez de Quesada
Government	
 • Mayor	Enrique Peñalosa (2016–2019)
Area	
 • Capital city of Colombia	1,587 km ² (613 sq mi)
 • Urban	307.36 km ² (118.67 sq mi)
Area rank	32nd
Elevation ^[7]	2,640 m (8,660 ft)

Population (2018) ^{[8][9][5][6]}	7,181,469 ^[3]
 • Capital city of Colombia	
 • Rank	1st
 • Metro	10,700,000 ^{[5][6]}
Demonym(s)	Rolo, Cachaco, Bogotan bogotano, -na (es)
Time zone	UTC−5
Postal code	11XXXX
Area code(s)	+57 1
HDI (2017)	0.794 ^[10] high 1st
GDP (PPP) (2014)	USD 160 billion ^[11]
GDP (PPP) per capita (2014)	USD 17,500 ^[11]
Primary Airport	EL DORADO BOG (Major/International)
Secondary Airport	CATAM <i>none</i> (Military) Guaymaral Airport <i>none</i> (Private Activities) La Vanguardia Airport VVC (Regional)
Bus rapid transit	
Bike Paths	R2-R29
Rapid Transit	(UC)
Tramway	Trams in Bogotá Teleférico de Monserrate
Website	City Official Site Bogotá Tourism (in Spanish)

Propriétés existantes de l'Infobox de Wikipedia en anglais pour une ville colombienne

Identifiant, étiquettes, descriptions et alias

<div> <div>Bogotá (Q2841)</div> <div>Identifier</div> </div>			
<div>capital city of Colombia and Cundinamarca department</div> <div>Santa Fe de Bogotá Santafé de Bogotá Bogota</div> <div>edit</div>			
<div> <div>In more languages</div> <div>Configure</div> </div>			
Language	Label	Description	Also known as
English	Bogotá	capital city of Colombia and Cundinamarca department	Santa Fe de Bogotá Santafé de Bogotá Bogota
French	Bogota	capitale de la Colombie	Bogotá Santa Fe de Bogotá
Spanish	Bogotá	capital de Colombia y del departamento de Cundinamarca	Santafé de Bogotá Bogota Santafe de Bogota
German	Bogotá	Hauptstadt Kolumbiens und der Provinz Cundinamarca	Bogota Santa Fe de Bogotá Santafe de Bogota

All entered languages

Languages Labels

Descriptions

Alias









Traductions actuelles: Bogotá (Q2841)

Wikidata: Informations, propriétés,

Property		Colombia	edit
		▼ 0 references	Statement 1 + add reference
	capital of	Viceroyalty of New Granada	edit
		▼ 0 references	Statement 2 + add reference
		Cundinamarca Department	edit
		▼ 0 references	+ add reference
		Gran Colombia	edit
		start time 1819 end time 1831	Qualifiers
References		▼ 0 references	+ add reference
		Capital District	edit
		start time 1905 end time 1910	
		▼ 0 references	+ add reference

Informations actuelles: Bogotá (Q2841)

Wikidata: External identifiers

<p>GND ID</p>	<div> <div>  4007557-6 </div> <div>  edit </div> </div> <p>► 1 reference</p> <div>Statement</div> <div>+ add value</div>
<p>Global Anabaptist Mennonite Encyclopedia Online ID</p>	<div> <div>  Bogotá (Colombia) </div> <div>  edit </div> </div> <p>▼ 0 references</p> <div>+ add reference</div> <div>+ add value</div>
<p>VIAF ID</p>	<div> <div>  127299962 </div> <div>  edit </div> </div> <p>► 1 reference</p> <div>External Identifier</div> <div>+ add value</div>
<p>SUDOC authorities ID</p> <p>Properties</p>	<div> <div>  082115958 </div> <div>  edit </div> </div> <p>▼ 0 references</p> <div>+ add reference</div> <div>+ add value</div>

Identifiants externes actuels: Bogotá (Q2841)

Requêtes SPARQL

The screenshot displays the Wikidata Query interface. At the top, there's a header with the Wikidata logo, 'Wikidata Query', and navigation links like 'Examples', 'Help', and 'Tools'. Below this is a 'Query Helper' sidebar on the left with a filter set to 'instance of' and 'programming language', and a 'Show' button with a 'Limit 100' option. The main area contains a SPARQL query:

```
1 SELECT ?languageLabel (YEAR(?inception) as ?year)
2 WHERE
3 {
4   #instances of programming language
5   ?language wdt:P31 wd:Q9143;
6   wdt:P571 ?inception;
7   rdfs:label ?languageLabel.
8   FILTER(lang(?languageLabel) = "en")
9 }
10 ORDER BY ?year
11 LIMIT 100
```

Below the query editor, a status bar indicates '100 results in 123 ms'. A 'Download' dropdown menu is open, showing options: 'JSON file', 'JSON file (verbose)', 'TSV file', 'TSV file (verbose)', and 'CSV file'. The results table below shows the following data:

languageLabel
ENIAC coding system
ENIAC Short Code
Von Neumann and Goldstine graphing system

Interface web

Requêtes SPARQL

Les noms de 100 langages de programmation.

```
SELECT ?languageLabel (YEAR(?inception) as ?year)
WHERE
{
  #instances of programming language
  ?language wdt:P31 wd:Q9143;
  wdt:P571 ?inception;
  rdfs:label ?languageLabel.
  FILTER(lang(?languageLabel) = "en")
}
ORDER BY ?year
LIMIT 100
```


Requêtes SPARQL

Les noms de 100 langages de programmation et leurs paradigmes.

```
SELECT ?languageLabel ?paradigmLabel (YEAR(?inception) as ?year)
WHERE
{
  #instances of programming language
  ?language wdt:P31 wd:Q9143;
    wdt:P571 ?inception; #inception
    wdt:P3966 ?paradigm; #programming language paradigm
    rdfs:label ?languageLabel. #label
  ?paradigm rdfs:label ?paradigmLabel #label
  FILTER(lang(?languageLabel) = "en" && lang(?paradigmLabel) = "en") #English
}
ORDER BY ?year ?paradigmLabel
LIMIT 100
```

Requêtes SPARQL

Les informations disponibles sur la population des différents pays à différentes périodes.

```
SELECT DISTINCT ?countryLabel (YEAR(?date) as ?year) ?population
WHERE {
  ?country wdt:P31 wd:Q6256; #Country
    p:P1082 ?populationStatement;
    rdfs:label ?countryLabel. #Label
  ?populationStatement ps:P1082 ?population; #population
    pq:P585 ?date. #period in time
  FILTER(lang(?countryLabel)="en") #Label in English
}
ORDER by ?countryLabel ?year
LIMIT 1000
```

Ressources en ligne

- [Resource Description Framework \(RDF\)](https://www.w3.org/RDF/) *https://www.w3.org/RDF/*
- [Resource Description Framework](https://en.wikipedia.org/wiki/Resource_Description_Framework) *https://en.wikipedia.org/wiki/Resource_Description_Framework*

Couleurs

- [Color Tool - Material Design](#)

Images

- [Wikimedia Commons](#)