Creation of Web Pages with Semantic Markups for a Research Group

TRABAJO FIN DE MÁSTER
MÁSTER UNIVERSITARIO EN INTELIGENCIA ARTIFICIAL

AUTOR: Daqi Lin
TUTOR/ES: Oscar Corcho

2019
Abstract

It is the age of web 3.0 now. The Semantic Web is being built by converting web content into machine-readable data, so it is also called "web of data". The main approach for this goal is to describe the web pages with semantic markups. The markups apply terms from certain vocabularies in a specialized format for corresponding content. They are written in the web page documents. And when the search engines read these documents, the markups are detected to help to match better results to users' searches. In this project, new responsive web page templates are designed for a research group of UPM. The responsive feature means that the pages can be displayed properly in different devices with diverse screen sizes. And then these templates are marked up to produce machine-readable data. The markup method used is RDFa and the vocabulary applied is Schema.org vocabulary. The code of each template has to pass the test using a structured data testing tool developed by Google to ensure that the markups work without errors. The templates made in the project will be used for future development of more pages when the website of the research group is really implemented.
# Contents

Abstract iii

1 Introduction 1

2 Background and state of the art 3
   2.1 Background .......................... 3
       2.1.1 Hypertext Markup Language (HTML) .... 3
       2.1.2 Bootstrap ........................ 3
   2.2 State of the art ........................ 3
       2.2.1 RDF triple ......................... 4
       2.2.2 Turtle ............................ 4
       2.2.3 Markup methods for HTML document . 5
       2.2.4 Vocabularies ........................ 7

3 Approaches 9

4 Templates 11
   4.1 Home page ............................. 11
       4.1.1 Web design ........................ 11
       4.1.2 Structured data .................... 16
   4.2 Sidebar page: type A .................... 19
       4.2.1 Web design ........................ 20
       4.2.2 Structured Data ................... 23
   4.3 Sidebar page: type B .................... 25
   4.4 Sidebar page: type C .................... 27
   4.5 Item list page: type A .................. 28
       4.5.1 Web design ........................ 29
       4.5.2 Structured Data ................... 30
   4.6 Item list page: type B .................. 31
       4.6.1 Web design ........................ 32
       4.6.2 Structured Data ................... 34
   4.7 Item list page: type C .................. 36
       4.7.1 Web design ........................ 36
       4.7.2 Structured data .................... 38
   4.8 Item page: type A ....................... 38
4.8.1 Web design .................................. 38
4.8.2 Structured data ................................ 40
4.9 Item page: type B ................................ 43
  4.9.1 Web design ................................ 44
  4.9.2 Structured data ................................ 45
4.10 Item page: type C ................................ 45
  4.10.1 Web design ................................ 45
  4.10.2 Structured data ................................ 46
4.11 Contact page .................................. 46
  4.11.1 Web design ................................ 46
  4.11.2 Structured data ................................ 46

5 Conclusions ...................................... 67
A oeg.css ........................................ 69
B index.html ........................................ 75
C investigacion.html ................................ 81
D unete.html ........................................ 87
E doctorado.html ................................... 91
F profesores.html ................................... 97
G proyectos-actuales.html ......................... 105
H ofertas-de-trabajo.html ......................... 111
I oscar-corcho.html ................................ 117
J theybuyforyou.html ................................ 125
K beca-para-desarrollo-de-ontology-deadline-10-05-2019.html 131
L contacto.html .................................... 137

Bibliografia ........................................ 143
List of Figures

2.1 Grid options of Bootstrap[6] .................................. 4
2.2 Two examples of RDF triple[7] ................................ 5
2.3 Example of RDF graph[7] .................................. 5
2.4 Example of prefixes and base[7] ......................... 5
2.5 Example of Turtle[7] .................................. 5
2.6 Example of RDFa[9] .................................. 6
2.7 Example of Microdata[9] ................................ 6
2.8 Example of JSON-LD[9] ................................ 7
2.9 Example of domain and range[7] ..................... 8
2.10 Example of inference[7] .......................... 8

3.1 Logo of OEG ............................................. 10

4.1 Home page in extra small screen ....................... 12
4.2 Hamburger menus in extra small screen ................. 12
4.3 Hamburger menus (Quiénes somos clicked) in extra small screen .... 13
4.4 Content input in search box ............................ 13
4.5 Language options (ES clicked) .......................... 13
4.6 Carousel in extra small screen ....................... 13
4.7 Info cards (Únete al OEG clicked) in extra small screen .... 14
4.8 Footer (Github icon clicked) in extra small screen .... 14
4.9 Home page in small screen ............................. 15
4.10 Home page in medium screen ....................... 16
4.11 Home page in large & extra large screen ............ 17
4.12 Home page (English version) in large & extra large screen .... 17
4.13 Header (Quiénes somos clicked) in large & extra large screen ..... 18
4.14 Elements detected of home page ..................... 18
4.15 WebSite of home page ................................ 19
4.16 Example of info box in the search result[15] .......... 20
4.17 Turtle of WebSite of home page ..................... 21
4.18 WHeader of home page ................................ 21
4.19 WPFooter of home page ................................ 21
4.20 SiteNavigationElement of home page ............... 22
4.21 Example of navigation displayed in the search result[16] ....... 22
4.22 Sidebar page A in extra small screen ................. 23
LIST OF FIGURES

4.23 Page title & breadcrumbs in extra small screen .................. 23
4.24 Page title & breadcrumbs (Inicio clicked) in extra small screen ... 23
4.25 Sidebar in extra small screen .......................................................... 23
4.26 Sidebar (Proyectos actuales clicked) in extra small screen ........ 23
4.27 Sidebar page A in small & medium screen ........................... 24
4.28 Sidebar page A in large & extra large screen .................... 25
4.29 Elements detected of sidebar page ........................... 25
4.30 WebPage of sidebar page .......................................................... 26
4.31 Example of breadcrumbs in the search result[17] ................... 26
4.32 Turtle of WebPage of sidebar page A ........................... 27
4.33 WPSideBar of sidebar page ...................................................... 27
4.34 Sidebar page B in large & extra large screen .................... 28
4.35 Sidebar page C in large & extra large screen .................... 28
4.36 Item list page A in extra small screen ........................... 29
4.37 Item list page A in large & extra large screen ................. 30
4.38 Elements detected of item list page A ....................... 31
4.39 CollectionPage of item list page A ........................... 32
4.40 Turtle of CollectionPage of item list page A ....................... 33
4.41 Item list page B in extra small screen ........................... 34
4.42 Pagination ("next" clicked) in extra small screen .......... 34
4.43 proyectos-actuales.html in large & extra large screen .......... 35
4.44 ontologias.html in large & extra large screen ............... 36
4.45 ultimas-noticias.html in large & extra large screen ........ 37
4.46 Elements detected of item list page B ........................... 38
4.47 CollectionPage of item list page B ........................... 39
4.48 Example of recipe carousel in the search result[18] .......... 40
4.49 Turtle of CollectionPage of item list page B ................. 41
4.50 Item list page C in extra small screen ........................... 41
4.51 Item list page C in large & extra large screen ............... 42
4.52 CollectionPage in large & extra large screen ............ 43
4.53 Turtle of CollectionPage of item list page C ................. 44
4.54 Item page A in extra small screen ........................... 48
4.55 Item page A in large & extra large screen ............... 49
4.56 Elements detected of item page A ........................... 50
4.57 WebPage of item page A .......................................................... 51
4.58 Turtle of WebPage of item page A ........................... 52
4.59 ScholarlyArticle of item page A ...................................................... 53
4.60 Item page B in extra small screen ........................... 54
4.61 Item page B in large & extra large screen ................... 55
4.62 Elements detected of type B .......................................................... 55
4.63 WebPage of type B .......................................................... 56
4.64 Turtle of WebPage of item page B ...................................................... 57
4.65 Item page C in extra small screen ...................................................... 58
4.66 Item page C in large & extra large screen ............... 58
<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.67</td>
<td>WebPage of item page C</td>
<td>59</td>
</tr>
<tr>
<td>4.68</td>
<td>Turtle of WebPage of item page C</td>
<td>60</td>
</tr>
<tr>
<td>4.69</td>
<td>Contact page in extra small screen</td>
<td>61</td>
</tr>
<tr>
<td>4.70</td>
<td>Contact page in large &amp; extra large screen</td>
<td>62</td>
</tr>
<tr>
<td>4.71</td>
<td>Elements detected of contact page</td>
<td>63</td>
</tr>
<tr>
<td>4.72</td>
<td>ContactPage of contact page</td>
<td>64</td>
</tr>
<tr>
<td>4.73</td>
<td>Turtle of ContactPage of contact page</td>
<td>65</td>
</tr>
</tbody>
</table>
Chapter 1

Introduction

As many things else in the world, the Web also evolves continuously over time. At the age of Web 1.0, users can only read the content published on the Internet. However, Web 2.0 allows users to be not only receivers of information, but also providers. And users can also interact with each other. Nowadays, people talk about Web 3.0. Although there is not a concrete definition for the Web 3.0, one of the most important features deserved to mention is that it involves the Semantic Web.

"The Semantic Web is a web of data"[1] according to the World Wide Web Consortium (W3C). Its core is to add semantic and ontological metadata to the World Wide Web in order to describe the content, meaning and relation of the data making them machine-readable. If the data can be understood by machines as by humans, the search engines can match up more precise results with the searches. Additionally, this also allows search engines to display results in a specific and much richer way. A common manner to produce machine-readable data is to add structured data markups to existing documents in the Web. The most used markups are RDFa, Microdata and JSON-LD.

By 2013, more than four million Web domains had contained these markups[2]. Unfortunately, the Ontology Engineering Group (OEG) as a research group in the field of ontology, still doesn’t have its web pages marked up. Besides, the web design of the current website (http://mayor2.dia.fi.upm.es/oeg-upm/) seems out of date, the pages are a little disordered, and they are even not made using HTML 5. Hence, it is necessary to create new web pages with structured data markups to existing documents in the Web. The most used markups are RDFa, Microdata and JSON-LD.

This work will analyze firstly the state of the art, and then show how the new web design look and explain the markups in detail. At the end, there will be conclusions and some discusses about possible future improvements.
Chapter 2

Background and state of the art

2.1 Background

2.1.1 Hypertext Markup Language (HTML)

"Hypertext Markup Language (HTML) is the standard markup language for creating web pages and web applications. With Cascading Style Sheets (CSS) and JavaScript, it forms a triad of cornerstone technologies for the World Wide Web."[3] In 2014, W3C released HTML 5 as a stable W3C Recommendation to subsume not only HTML 4, but also XHTML 1 in order to improve the language with support for the latest multimedia and other new features[4]. The main novelty is that it introduces semantic tags like <header>, <footer>, etc. This helps web browsers to render the HTML documents into multimedia web pages and search engines to index web pages.

2.1.2 Bootstrap

"Bootstrap is a free and open-source CSS framework developed by Twitter. It contains CSS- and (optionally) JavaScript-based design templates for typography, forms, buttons, navigation and other interface components"[5] with the purpose of simplifying the development of web pages. It focuses especially on responsive, mobile-first front-end web development. The grid system uses a series of containers, rows, and columns to layout and align content making it fully responsive to the screen size. There are five preset grid options for Bootstrap working across multiple devices(see Figure 2.1). The last version, Bootstrap 4, was released in 2018.

2.2 State of the art

There is a wealth of information on the web. More and more web data are produced every day. They are mostly only towards humans as end-users. Humans can read and understand the content on the web pages, know the background information and infer new knowledge using the context. If the information available online can
be machine-readable, the web will become a huge database in which all the web data are stored and grows every minute. It will be very easy to retrieve relevant document and extract precisely the wanted information for certain researches. Additionally, everyone can take advantage of the database in everyday life. Website masters and companies can provide data understandable by search engines such as Google on their websites in order to increase the visibility to users. This process which improves the web traffic is known as search engine optimization (SEO). And common users will have better experiences when searching something because search engines can understand what the users want and match up much better search results with the input keywords. Therefore, it would be a good idea to make the new website of OEG a part of the database.

2.2.1 RDF triple

When the data are saved in a certain format that can be read by machines, they become structured data. The structured data which are interlinked with other data are named as linked data. To do so, it is necessary to convert the data into RDF triples (see Figure 2.2) to create data model. A triple consists of a subject, a predicate and an object. A subject is a resource which can be identified with a URI. An object can be a resource as well as literal. And a predicate uses a specific link to relate the subject to the object. The triples can be drawn as graphs (see Figure 2.3). The subjects and the objects are the nodes of the graphs, and the predicates become labels of arrows from the subjects to the objects. Blank nodes are allowed when there are unidentified resources used, but their use is not encouraged.

2.2.2 Turtle

There is a more readable syntax to express the triples: Terse RDF Triple Language (Turtle). The same basis shared by many URIs is simplified as prefix or base (see Figure 2.4). The semicolon separates two predicates that have the same subject. The comma separates two objects that a same predicate relates to. A complete triple

<table>
<thead>
<tr>
<th>Max container width</th>
<th>Extra small</th>
<th>Small</th>
<th>Medium</th>
<th>Large</th>
<th>Extra large</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt;576px</td>
<td>540px</td>
<td>720px</td>
<td>960px</td>
<td>1140px</td>
</tr>
<tr>
<td>Class prefix</td>
<td>.col-</td>
<td>.col-sm-</td>
<td>.col-md-</td>
<td>.col-lg-</td>
<td>.col-xl-</td>
</tr>
<tr>
<td># of columns</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gutter width</td>
<td>30px (15px on each side of a column)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nestable</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Column ordering</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 2.1: Grid options of Bootstrap[6]
2.2. STATE OF THE ART

When providing machine-readable data on web pages, it is necessary to use some kind of method to transcribe triples into specific markups used for HTML documents. As mentioned previously, there are three most used markup methods to add semantic metadata: RDFa, Microdata and JSON-LD. Google supports all of them.
They have different syntaxes and other smaller differences, but they work almost the same in practice, and moreover, they can be transcribed from one another. In the subsections below, there will be one example of each expressing the same content.

**RDFa**

"RDFa (Resource Description Framework in Attributes) is a W3C Recommendation that adds a set of attribute-level extensions to HTML, XHTML and various XML-based document types for embedding rich metadata within Web documents."[8] It can be inserted in both the head and body sections of the HTML document and allows to mix vocabularies.

```html
<div vocab="http://schema.org/" typeof="SportsTeam">
  <span property="name">San Francisco 49ers</span>
  <div property="member" typeof="OrganizationRole">
    <div property="member" typeof="http://schema.org/Person">
      <span property="name">Joe Montana</span>
    </div>
  </div>
  <span property="startDate">1979</span>
  <span property="endDate">1992</span>
  <span property="roleName">Quarterback</span>
</div>
```

Figure 2.6: Example of RDFa

**Microdata**

"Microdata is a WHATWG HTML specification used to nest metadata within existing content on web pages."[10] It also uses HTML tag attributes to add structured data. However, unlike RDFa, Microdata can only be used in HTML 5, and it is sometimes impossible to apply multiple vocabularies at the same time.

```html
<div itemscope itemtype="http://schema.org/SportsTeam">
  <span itemprop="name">San Francisco 49ers</span>
  <div itemprop="member" itemscope itemtype="http://schema.org/OrganizationRole">
    <div itemprop="member" itemscope itemtype="http://schema.org/Person">
      <span itemprop="name">Joe Montana</span>
    </div>
  </div>
  <span itemprop="startDate">1979</span>
  <span itemprop="endDate">1992</span>
  <span itemprop="roleName">Quarterback</span>
</div>
```

Figure 2.7: Example of Microdata
2.2. STATE OF THE ART

JSON-LD

"JSON-LD (JavaScript Object Notation for Linked Data) is a method of encoding Linked Data using JSON."[11] It is also a W3C Recommendation. This markup is embedded in a <script> tag instead of in attributes corresponding to the user-visible content. The <script> tag is typically situated in the head of the HTML document. This is beneficial for coding and maintenance from the point of view of developers, so "Google recommends using JSON-LD for structured data whenever possible."[12]

```html
<script type="application/ld+json">
 {
   "@context": "http://schema.org",
   "@type": "SportsTeam",
   "name": "San Francisco 49ers",
   "member": [ {
     "@type": "OrganizationRole",
     "member": [ {
       "@type": "Person",
       "name": "Joe Montana"
     },
     "startDate": "1979",
     "endDate": "1992",
     "roleName": "Quarterback"
   }
   ]
 }
</script>
```

Figure 2.8: Example of JSON-LD[9]

2.2.4 Vocabularies

A vocabulary in the context of structured data is a set of terms used for describing the content, meaning and relation of the data. There are several vocabularies practically in use like Schema.org vocabularies, Dublin Core and FOAF. The basic elements for the description of the vocabularies are provided by RDF Schema and OWL.

RDF Schema and OWL

The constructs of RDF Schema are classes and properties. A class means the type of a resource. The available properties for each class are different and limited. A property describes the relation between the subject and the object. For example, "mo:member" is a property that indicates a member of a music group. Each property has its domain and range. The domain includes the possible classes for the subject resource, and the range includes the possible classes for the object resource. For example, property "mo:member" can have subjects that belong to class "mo:MusicGroup" and objects that belong to class "foaf:Agent" (see Figure 2.9).
CHAPTER 2. BACKGROUND AND STATE OF THE ART

It is possible to perform inferences based on RDF Schema (see Figure 2.10). "mo:MusicGroup" is defined as a subclass of "foaf:Group". When something is "mo:MusicGroup", it must also be "foaf:Group".

"Web Ontology Language (OWL) provides more ontological constructs and avoid some of the potential confusion RDF Schema."[7] For example, sometimes a resource which belongs to class A can not belong to class B at the same time; two resources related with property A can not have relation property B at the same time. It also allows to define new classes and properties given some existing ones.

Schema.org

"Schema.org is a collaborative, community activity with a mission to create, maintain, and promote schemas for structured data on the Internet, on web pages, in email messages, and beyond."[13] It was founded by Google, Bing, Yahoo!, and Yandex in 2011, and the vocabulary is developed by an open community process through GitHub. Google, Bing and Yandex also published their validator tools for testing structured data markups. The Schema.org vocabulary covers entities, relationships between entities and actions, and can be used with many different formats, including RDFa, Microdata and JSON-LD.

Dublin Core and FOAF

The Dublin Core Schema and FOAF (friend of a friend) are much smaller sets of vocabulary terms in comparison with the Schema.org vocabulary. FOAF only focuses on describing persons. They can also be used with RDFa, Microdata and JSON-LD. However, they are not recognized by Google.
Chapter 3

Approaches

This chapter will explain generally the approaches of making web pages and testing them.

There are many pages to make for the website of OEG. However, all the pages are based on some templates. Once the templates are completed, a new page will be made very easily by replacing the page content and modifying some code. In this project, at least one page of each type will be made as template for future work.

For doing these templates with HTML 5, Bootstrap 4 will be used. As it specializes in mobile-first responsive web development, the web design will start from the smallest screen to the largest screen. The page elements will be organized well in the smallest screen first, then they will be reorganized to fit in bigger screens. The page display will change when the screen reaches certain widths. However, this doesn’t mean that every grid option shown in the Figure 2.1 will always be taken to do some changes in display. The page responsivity will be checked using the build-in developer tool of Google Chrome browser.

The web design will adopt the flat design style which is in fashion currently. This style gives users a simple and straight sensation that makes them to receive information more efficiently. In addition, a flat user interface is easier to be responsive to changes in screen size across different devices. With minimal design elements, webpages are able to load faster and resize easily, and the elements look clear and sharp as well for high definition. The two colors from the existing logo of OEG (see Figure 3.1) will be picked as theme colors for the web design. Their hex triplets are #3974b4 (theme blue) and #ef2818 (theme red) respectively.

After completing the HTML code, the structured data markups will be added to mark up the page content. As mentioned previously, there are three methods to mark up the data. JSON-LD is recommended by Google as it is simpler to handle all structured data in the head of the HTML document when doing a commercial project. However, as a master student work, it’s necessary to demonstrate the ability of truly understanding the whole structure of the data and their relation with the corresponding page content. Hence, it would be better to use a method which needs the markups to go throughout the whole document accompanying their corresponding content. The Microdata has more limitations in comparison with RDFa,
such as the difficulty to use multiple vocabularies and the applicability in files of other formats. Therefore, RDFa will be used as markup method in this project. The vocabulary applied will be Schema.org because it is supported perfectly by Google Search, and has a large quantity of terms that can satisfy the necessity of this project. The markups will be tested by using the structured data testing tool developed by Google (https://search.google.com/structured-data/testing-tool/). The testing results will be analyzed and transcribed into Turtle for each template. The HTML code (containing markups) and the customized CSS code can be checked in the appendixes at the end of this document.
Chapter 4

Templates

In this chapter, different page templates will be explained one by one. Each section has two parts: web design and structured data. The first one is about the visual and aesthetic aspect of the page at issue. And the second one will focus on the structured data markup and the testing result.

4.1 Home page

The home page is the initial or main web page of a website. It is usually the page which users see when visiting the website from the search engine. It should provide basically links to other pages and important contents, and possibly language options, login/sign up options and a search box.

The old website of OEG has Spanish and English versions. The only difference between them is the language. It doesn’t make sense to do one template for each language, so there will be only the home page in English as example (see Figure 4.12).

4.1.1 Web design

Extra small screen

The starting size, extra small, is usually for smart phones. As the screen width is very small, the page elements are organized vertically (see Figure 4.1).

Header: The header is fixed on the top of the browser. When the users scroll down the page, it will not disappear. It contains the logo, navigation bar, search box and language options.

1. Logo: The logo has been designed already for the old website. It is still used for the new website.
2. Navigation: For this screen size, the navigation bar is folded and converted into a hamburger menus or navigation drawer. By clicking at the hamburger button, the hidden menus will pop up for further selection, and the outline of the hamburger button will be highlighted with theme blue (see Figure 4.2). The font color of the navigation is also in theme blue. When one navigation option is clicked, it turns theme red (see Figure 4.3).

3. Search box: The theme blue is used here too. The content input in the box to search has the font color of theme blue (see Figure 4.4).

4. Language options: The font color is theme blue, and it turns theme red when clicked (see Figure 4.5).
4.1. HOME PAGE

Figure 4.3: Hamburger menus (Quiénes somos clicked) in extra small screen

![Hamburger menus](image)

Figure 4.4: Content input in search box

![Search box](image)

Figure 4.5: Language options (ES clicked)

![Language options](image)

_Carousel:_ "The carousel is a slideshow for cycling through a series of content, built with CSS 3D transforms and a bit of JavaScript. It works with a series of images, text, or custom markup. It also includes support for previous/next controls and indicators."[14] In this page, there are three recent news articles as the carousel content (see Figure 4.6) to let users know the latest activities of OEG. Some important announcements can also be published here. The aspect ratio of the image is 16:9.

![Carousel](image)

Figure 4.6: Carousel in extra small screen

_Info card:_ The info card is a box that contains the title of a link and its short description with or without an image. The aspect ratio of the image is 16:9. It
can be used for some important and useful links. When the title is clicked, it turns theme red as always, and additionally it is underlined (see Figure 4.7).

![Info cards](image1)

Figure 4.7: Info cards (Únete al OEG clicked) in extra small screen

**Footer:** The footer is an additional navigation method for the website. It can contain links, entity contact information, copyright information, etc. In this project, the footer provide a quick access to some most used pages, links to social media pages of OEG, and copyright information at the end. When a link is clicked, it turns theme red (4.8).

![Footer](image2)

Figure 4.8: Footer (Github icon clicked) in extra small screen

**Small screen**

This size is generally for tablets. Some of the page elements are organized horizontally if possible (see Figure 4.9). There will be no repetitive explanations here or in following sections and sections for those elements that have nothing changed in comparison with themselves in the extra small screen.

**Info cards:** The three cards change their positions. One is on the top, and two stay below in the same row.
4.1. HOME PAGE

Figure 4.9: Home page in small screen

Footer: The internal links are divided into two columns. And the external links still stay below.

Medium screen

This size is for tablets too, and maybe some small laptops. There are no big differences in the page neither (see Figure 4.10).

Carousel: The article title and the short description show up in the carousel as there is more space.

Large & extra large screen

This size is for computer monitors and any other devices with such big screen. Many elements are unfolded and organized horizontally (see Figure 4.11). There is also an example of English version (see Figure 4.12). When visiting the pages with a computer, the links turns theme red if the cursor hovers over them while they must be clicked to change the color in mobile devices.
CHAPTER 4. TEMPLATES

Figure 4.10: Home page in medium screen

**Header:** The header becomes wider. The hamburger button disappears and the navigation bar shows up. A navigation link still turns theme red when clicked (see Figure 4.13).

**Carousel:** When the screen is wide enough, the carousel will show a blurred background of the main image.

**Info cards:** All the three cards are in the same row now.

**Footer:** The internal links and the external links are situated at the two sides of the footer respectively.

### 4.1.2 Structured data

There is the testing result of the home page below (see Figure 4.14). Several elements are detected. They will be explained one by one.
4.1. HOME PAGE

Figure 4.11: Home page in large & extra large screen

Figure 4.12: Home page (English version) in large & extra large screen

WebSite

By clicking at the WebSite element, the detailed structured data are unfolded (see Figure 4.15). http://schema.org/WebSite is declared in the <html> tag. It is not a
specific type of http://schema.org/WebPage. As the home page is the initial page of the website, it can be marked up with http://schema.org/WebSite to represent the entire website. The markups here will be describing a website, no matter what the page content is. http://schema.org/mainEntity of the website is the OEG which is marked up as a type http://schema.org/Organization. The UPM is also marked up using http://schema.org/parentOrganization to represent the relation between the OEG and the UPM. The link of DBpedia is used as the resource of UPM. http://schema.org/sameAs is for social profiles of an entity. When this entity is searched in Google, the result will show a detailed information box with links to social profiles (see Figure 4.16).

http://schema.org/logo is connected to the logo image of OEG. This image will be shown in the information box (see Figure 4.16).

http://schema.org/copyrightYear is 2019 and http://schema.org/copyrightHolder is the OEG. These two will appear in all the pages, so there will be no repetitive explanation for them.

Turtle of the structured data is as below (see Figure 4.17).

**WPHeader & WPFooters & SiteNavigationElement**

These three elements are specific types of http://schema.org/WebPageElement. They correspond to the header, footer and navigation bar respectively. They don’t contain other information (see Figure 4.18, 4.19 and 4.20). They simply tell the search engine where they are. It is necessary to do so although there are corresponding semantic tags `<header>`, `<footer>`, `<nav>`. This is because that there could be more than one `<header>` or `<footer>` or `<nav>` or none of them in one document with the purpose of solving some problem. In this case, the markups can help the
4.2. SIDEBAR PAGE: TYPE A

Figure 4.15: WebSite of home page

search engine to recognize the true header, footer and navigation bar of the page. There will be no repetition of these elements for other templates.

When http://schema.org/SiteNavigationElement is detected by Google search, it will display the navigation directly in the search result like below (see Figure 4.21). This allows the users to access faster to the page they are interested in.

4.2 Sidebar page: type A

This type of template is for the pages investigacion.html, resultados.html and unete.html. These pages show a sidebar for further selection and provide two info cards as quick access to the most relevant item pages of this section.
4.2.1 Web design

Extra small screen

There are some new page elements in this template (see Figure 4.22).

Page title & breadcrumbs: The page title is put below the header. And the breadcrumbs are below the title. They indicate the location of the current page within a navigational hierarchy. As the current page is investigation.html, "Investigación" in the breadcrumbs is unclickable (see Figure 4.23). "Inicio" can be clicked, and it turns theme red when clicked (see Figure 4.24).

Sidebar: The sidebar contains several links for the navigation of other pages (see Figure 4.25). They will be underlined and switch to theme red when clicked (see Figure 4.26).

Small & medium screen

The internal links in the footer are divided into two columns (see Figure 4.27).
Figure 4.17: Turtle of WebSite of home page

Figure 4.18: WPHeader of home page

Figure 4.19: WPFooter of home page

Large & extra large screen

The navigation bar is unfolded, and "Investigación" turns white and its background becomes theme blue. The sidebar goes to the left of the info cards, and the info
cards are organized horizontally. The links in the footer change their positions like in the home page. (see Figure 4.28). The footer is steaky which means that it always stays on the bottom of the page even when there is much space between the page content and the footer.
4.2. SIDEBAR PAGE: TYPE A

There are several elements detected (see Figure 4.29). Some of them have never appeared before.
WebPage

By clicking at WebPage element, the detailed structured data are unfolded (see Figure 4.30). http://schema.org/WebPage is used instead of http://schema.org/WebSite because the markups are describing a webpage now, not a website. This page doesn’t have a main entity. There is http://schema.org/BreadcrumbList related to the page via http://schema.org/breadcrumb. This term will appear in other templates, so it might be omitted to avoid unnecessary repetitions. "Google Search uses breadcrumb markup in the body of a web page to categorize the information from the page in search results."[17] Users can arrive at a page from very different types of search queries. While each search may return the same web page, the breadcrumb categorizes the content within the context of the Google Search query. Anyway, it will replace the original path with the breadcrumbs in the search result (see Figure 4.31). http://schema.org/position indicates the order of the breadcrumbs.

Turtle of the structured data is as below (see Figure 4.32).

WPSideBar

http://schema.org/WPSideBar is a specific type of http://schema.org/WebPageElement. It indicates which element in the page is the sidebar (see Figure 4.33).
4.3  SIDEBAR PAGE: TYPE B

This type of template is for the page unete.html. The only difference between the type A and type B is that there are no images in the info cards of type B because the job postings don’t need them. This section will only show the page in large & extra large screen (see Figure 4.34) only to avoid unnecessary repetitions. The structured data markups are the same as the type A, so it will be omitted in this section.
Figure 4.30: WebPage of sidebar page

Figure 4.31: Example of breadcrumbs in the search result

December 10, 2017 Posted by Adrea Leave a Comment - Is This What Your Cat Does When You Aren’t Home? Do you know what your cat does when you aren’t home? Perhaps this kitty will give you a bit of insight.
4.4 Sidebar page: type C

The only difference here is that this template doesn’t have info cards. Any simple information which doesn’t need a specific format can be published. There are several pages done based on this template: publicaciones.html (containing BIBBASE API), doctorado.html, postdocs-y-profesionales.html, docencia.html. This section will only show the page doctorado.html in large & extra large screen (see Figure 4.35) only to avoid unnecessary repetitions. The structured data markups are the same as the type A, so it will be omitted in this section. Actually, some pages based on this template would probably have some markups for some specific content if necessary.
4.5  Item list page: type A

The item list page shows a list of items. In this template, the items are persons. The template can be used for the undone pages of these links: Post-Docs Estudiantes de doctorado, Estudiantes de máster, etc.
4.5. ITEM LIST PAGE: TYPE A

4.5.1 Web design

Extra small screen

![Item list page A in extra small screen](image)

**Sidebar:** The selected link turns white and the background turns theme blue (see Figure 4.36).

**Item list:** Each item has a title, an image, and some basic information. They are organized vertically because of the narrow width (see Figure 4.36). There are some items omitted by image editing to avoid too big height. The titles and the images are clickable for the navigation of item pages. The title will be underlined and will turn theme red when clicked.
Small & medium screen
The organization of the page keeps the same except the footer. It’s internal links split into two columns as always.

Large & extra large screen
The items are organized in two columns, five in each (see Figure 4.37).

![Figure 4.37: Item list page A in large & extra large screen](image)

### 4.5.2 Structured Data

There is an element never seen before: CollectionPage (see Figure 4.38).

CollectionPage

Fig. 4.38: Elements detected of item list page A

(see Fig. 4.39). http://schema.org/ItemList is related to these ten professors of type http://schema.org/Person via http://schema.org/itemListElement. For each person, there is the corresponding information added using diverse terms. The item page of each person is related via http://schema.org/url. The portrait image file is the resource related to the page via http://schema.org/image. The term http://schema.org/worksFor relates the page to the OEG as resource. And http://schema.org/workLocation is for describing the direction of the office.

It’s supposed to be a bug of the testing tool when using http://schema.org/email. After testing all the three examples of Microdata, RDFa, and JSON-LD given in https://schema.org/email, only the RDFa example can’t be recognized correctly. This image of testing result is edited to show only one item as example because all items have the same format. The parts of http://schema.org/copyrightHolder, http://schema.org/copyrightYear and http://schema.org/breadcrumb are also omitted in this image.

Turtle of structured data is as below (see Fig. 4.40). Repetitive elements are omitted.

4.6 Item list page: type B

In this template, the items are articles. There are three pages made based on this template: proyectos-actuales.html (see Figure 4.43), ontologias.html (see Figure 4.44) and ultimas-noticias.html (see Figure 4.45). It can also be used for the unfinished pages of these links: Áreas de investigación, Proyectos completos, Tecnologías y modelos, Tecnologías antiguas, Notas de prensa, Notas anteriores, etc.
4.6.1 Web design

Extra small screen

The page is similar to the type A.

Item list: The item list is different now. A item here is similar to a info card, but with an additional "Leer más" button and the date and author in the card footer.
4.6. ITEM LIST PAGE: TYPE B

(see Figure 4.41). The aspect ratio of the image is 16:9. The figure is edited to omit some articles in order to avoid too big image height.

**Pagination:** As there could be many articles that would make the page too long, it’s necessary to publish them into several pages. The "previous", page number and "next" are in theme blue. They will turn theme red and change the background color when clicked (see Figure 4.42).

**Small & medium screen**

The organization is the same as the type A.

**Large & extra large screen**

The sidebar goes to the left side of the item list. There are the three pages based on this template type B (see Figure 4.43, figure 4.44 and figure 4.45).
4.6.2 Structured Data

There are the same elements detected as in type A (see Figure 4.46), but there is something different in the CollectionPage element.

CollectionPage

The difference between type A and type B is below http://schema.org/itemListElement. In the type B, the items’ type is http://schema.org/Article now instead of type
http://schema.org/Person (see Figure 4.47).

When the items in a http://schema.org/itemList are marked up as the type http://schema.org/Recipe or http://schema.org/Course or http://schema.org/Article, Google will display the search result in a list-like format called "carousel" (see Figure 4.48).

Carousels typically appear only on mobile devices, and only for the three content types mentioned. There are two ways to implement a list format for the structured data: summary page + multiple full details pages, or a single all-in-one-page list. For this project, the second option is taken putting all data below the term http://schema.org/itemListElement.

Figure 4.44: ontologias.html in large & extra large screen

Turtle of structured data is as below (see Figure 4.49). Repetitive elements are omitted.

### 4.7 Item list page: type C

In this template, the items are job postings.

#### 4.7.1 Web design

**Extra small screen**

The page is similar to the type A and type B.
Item list: The only two differences between the item lists of type B and type C are that there are no images or author in the job postings (see Figure 4.50).

Small & medium screen
The organization is the same as the type A and type B.

Large & extra large screen
The sidebar goes to the left side of the item list as always (see Figure 4.51).
Figure 4.46: Elements detected of item list page B

4.7.2 Structured data

There are the same elements detected, but there is something different in the CollectionPage element.

CollectionPage

In the type C, the items' type is http://schema.org/JobPostings (see Figure 4.52). There are many terms used to describe the job like http://schema.org/workHours, http://schema.org/validThrough, http://schema.org/baseSalary, etc. The markup http://schema.org/hiringOrganization relate the page to the OEG as resource. The parts of http://schema.org/copyrightHolder, http://schema.org/copyrightYear and http://schema.org/breadcrumb are omitted.

Turtle of structured data is as below (see Figure 4.53). Repetitive elements are omitted.

4.8 Item page: type A

By clicking at any item in the item list, the users will access to the item page. The template type A is for persons. There are two finished item pages based on this template: asuncion-gomez-perez.html and oscar-corcho.html. It will also be used for Other persons' pages below Quiénes somos.

4.8.1 Web design

Extra small screen

The item has a headline which is the person's name, an portrait image and some detailed text information (see Figure 4.54).
### 4.8. ITEM PAGE: TYPE A

<table>
<thead>
<tr>
<th>@type</th>
<th>CollectionPage</th>
</tr>
</thead>
<tbody>
<tr>
<td>name</td>
<td>Ultimas noticias</td>
</tr>
<tr>
<td>mainEntity</td>
<td>HTML list</td>
</tr>
<tr>
<td>name</td>
<td>List of articles</td>
</tr>
<tr>
<td>ItemListElement</td>
<td>Article</td>
</tr>
<tr>
<td>headline</td>
<td>Asuncion Gomez Perez ingresa en la European Academy of Sciences</td>
</tr>
<tr>
<td>image</td>
<td><a href="https://search.google.com/img/sun_foto.jpg">https://search.google.com/img/sun_foto.jpg</a></td>
</tr>
<tr>
<td>datePublished</td>
<td>2019-01-01</td>
</tr>
<tr>
<td>dateModified</td>
<td>2019-01-01</td>
</tr>
<tr>
<td>editor</td>
<td>Organization</td>
</tr>
<tr>
<td>gdoi</td>
<td><a href="https://search.google.com/structured-data/testing-tool/OEG">https://search.google.com/structured-data/testing-tool/OEG</a></td>
</tr>
<tr>
<td>url</td>
<td><a href="https://search.google.com/structured-data/index.html">https://search.google.com/structured-data/index.html</a></td>
</tr>
<tr>
<td>name</td>
<td>Ontology Engineering Group</td>
</tr>
<tr>
<td>alternateName</td>
<td>OEG</td>
</tr>
<tr>
<td>sxmls</td>
<td><a href="https://github.com/oeg-upm">https://github.com/oeg-upm</a></td>
</tr>
<tr>
<td>sxmlsA</td>
<td><a href="http://www.slideshare.net/search/slideshow/searchfrom-header&amp;q-oeg-upm">http://www.slideshare.net/search/slideshow/searchfrom-header&amp;q-oeg-upm</a></td>
</tr>
<tr>
<td>sxmlsAs</td>
<td><a href="https://plus.google.com/communities/10080465775573458679">https://plus.google.com/communities/10080465775573458679</a></td>
</tr>
<tr>
<td>sxmlsAsA</td>
<td><a href="https://www.linkedin.com/company/ontology-engineering-group">https://www.linkedin.com/company/ontology-engineering-group</a></td>
</tr>
<tr>
<td>logo</td>
<td>ImageObject</td>
</tr>
<tr>
<td>contentObject</td>
<td><a href="https://search.google.com/img/logo.png">https://search.google.com/img/logo.png</a></td>
</tr>
<tr>
<td>url</td>
<td><a href="https://search.google.com/structured-data/index.html">https://search.google.com/structured-data/index.html</a></td>
</tr>
<tr>
<td>parentOrganization</td>
<td>CollegeOfUniversity</td>
</tr>
<tr>
<td>name</td>
<td>Universidad Politecnica de Madrid</td>
</tr>
<tr>
<td>publisher</td>
<td>Organization</td>
</tr>
<tr>
<td>gdoi</td>
<td><a href="https://search.google.com/structured-data/testing-tool/OEG">https://search.google.com/structured-data/testing-tool/OEG</a></td>
</tr>
<tr>
<td>url</td>
<td><a href="https://search.google.com/structured-data/index.html">https://search.google.com/structured-data/index.html</a></td>
</tr>
<tr>
<td>name</td>
<td>Ontology Engineering Group</td>
</tr>
<tr>
<td>alternateName</td>
<td>OEG</td>
</tr>
<tr>
<td>sxmls</td>
<td><a href="https://github.com/oeg-upm">https://github.com/oeg-upm</a></td>
</tr>
<tr>
<td>sxmlsA</td>
<td><a href="http://www.slideshare.net/search/slideshow/searchfrom-header&amp;q-oeg-upm">http://www.slideshare.net/search/slideshow/searchfrom-header&amp;q-oeg-upm</a></td>
</tr>
<tr>
<td>sxmlsAs</td>
<td><a href="https://plus.google.com/communities/10080465775573458679">https://plus.google.com/communities/10080465775573458679</a></td>
</tr>
<tr>
<td>sxmlsAsA</td>
<td><a href="https://www.linkedin.com/company/ontology-engineering-group">https://www.linkedin.com/company/ontology-engineering-group</a></td>
</tr>
<tr>
<td>logo</td>
<td>ImageObject</td>
</tr>
<tr>
<td>contentObject</td>
<td><a href="https://search.google.com/img/logo.png">https://search.google.com/img/logo.png</a></td>
</tr>
<tr>
<td>url</td>
<td><a href="https://search.google.com/structured-data/index.html">https://search.google.com/structured-data/index.html</a></td>
</tr>
<tr>
<td>parentOrganization</td>
<td>CollegeOfUniversity</td>
</tr>
<tr>
<td>name</td>
<td>Universidad Politecnica de Madrid</td>
</tr>
</tbody>
</table>

---

**Figure 4.47: CollectionPage of item list page B**

**Small medium screen**

The internal links in the footer split into two columns as always.
Large & extra large screen

The basic information goes to the right of the image (see Figure 4.55).

4.8.2 Structured data

ScholarlyArticle elements appear (see Figure 4.56).

WebPage

http://schema.org/mainEntity is the item of type http://schema.org/Person. In comparison with the item list page, there are some new terms to describe the person: http://schema.org/award, http://schema.org/knowsAbout, http://schema.org/alumniOf and http://schema.org/memberOf (see Figure 4.57).

http://schema.org/memberOf describes the projects that the person is member of. There is only one project shown as example when others are omitted by editing the image. http://schema.org/copyrightHolder, http://schema.org/copyrightYear and http://schema.org/breadcrumb are also omitted.

Turtle of structured data is as below (see Figure 4.58). Repetitive elements are omitted.
For expressing "someone creates something", there is no term like http://schema.org/create. It can only be expressed as "something’s author is someone" by using the term
There are eight ScholarlyArticle elements with the same format. They are declared as the type `http://schema.org/ScholarlyArticle`. The link of the article is used as the resource. `http://schema.org/author` relates the article to the person who is the mainEntity of the page. There is a warning recommending to mark up the image of the article (see Figure 4.59), but there isn’t any image available. The warning can be ignored as it is not detected as an error. The detailed structured data of the person are omitted because they are the same as in Figure 4.57.
4.9 Item page: type B

This template is used for articles. There are three finished pages based on the template type B: theybuyforyou.html, buscamedia-ontologies-m3.html and asuncion-
CHAPTER 4. ITEM LIST PAGE: TYPE C

Figure 4.53: Turtle of CollectionPage of item list page C

gomez-perez-ingresa-en-la-european-academy-of-sciences.html. Other article pages below Investigación, Resultados and Diseminación will also be based on this template.

4.9.1 Web design

Extra small screen

The components of the article are the headline, date, author, image and article body (see Figure 4.60). The aspect ratio of the image is 16:9.
4.10. ITEM PAGE: TYPE C

Small& medium screen

The internal links in the footer split into two columns as always.

Large & extra large screen

The sidebar goes to the left as always (see Figure 4.61).

4.9.2 Structured data

The elements detected are different from those detected in type A (see Figure 4.62).

WebPage

The article is http://schema.org/mainEntity of the page. And the project TheyBuy-ForYou is http://schema.org/mainEntity of the article. http://schema.org/member relates the project to the two project members (see Figure 4.63). http://schema.org/author and http://schema.org/publisher are omitted because they are the same as in the item list page type B. A part of content in http://schema.org/articleBody has to be omitted because of its extra longitude. http://schema.org/copyrightHolder, http://schema.org/copyrightYear and http://schema.org/breadcrumb are also omitted.

Turtle of structured data is as below (see Figure 4.64). Repetitive elements are omitted.

4.10. Item page: type C

This template is used for job postings

4.10.1 Web design

Extra small screen

There is a headline, date and detailed information of the job (see Figure 4.65).

Small& medium screen

The internal links in the footer split into two columns as always.

Large & extra large screen

The sidebar goes to the left as always (see Figure 4.66).
4.10.2 Structured data

WebPage

http://schema.org/mainEntity of this page is of type http://schema.org/jobPostings. In comparison with the item list page type C, there is a new markup in this page: http://schema.org/educationRequirements (see Figure 4.67). The parts of http://schema.org/copyrightHolder, http://schema.org/copyrightYear and http://schema.org/breadcrumb are omitted.

Turtle of structured data is as below (see Figure 4.68). Repetitive elements are omitted.

4.11 Contact page

The contact page should provide basically contact information to users. It would be better if there is a map, and detailed transportation information for arriving.

4.11.1 Web design

Extra small screen

There are three sections in the page: Dirección, Cómo llegar and Plano (see Figure 4.69).

Dirección: An API of Google Maps is included. There is basic contact information under the map.

Cómo llegar: There is a metro map and text information about the transportation.

Plano: It shows a detailed map of the campus.

Small & medium screen

The internal links in the footer split into two columns as always.

Large & extra large screen

The text goes to the right of the two maps (see Figure 4.70).

4.11.2 Structured data

WPSideBar element disappears because there is no sidebar in this page. ContactPage element is the new element here (see Figure 4.71).
4.11. CONTACT PAGE

WebPage

http://schema.org/mainEntity is the OEG. Below http://schema.org/hasMap, the Google Maps link is the resource related to the map via http://schema.org/url (see Figure 4.72). The page is also related to two http://schema.org/ImageObject via http://schema.org/about.


Turtle of structured data is as below (see Figure 4.73). Repetitive elements are omitted.
Figure 4.54: Item page A in extra small screen
Figure 4.55: Item page A in large & extra large screen
<table>
<thead>
<tr>
<th>Detected</th>
<th>Errors</th>
<th>Warnings</th>
<th>Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>WebPage</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>WPSideBar</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>WPHeader</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>ScholarlyArticle</td>
<td>0</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>WPFooter</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>SiteNavigationElement</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

Figure 4.56: Elements detected of item page A
### 4.11. CONTACT PAGE

<table>
<thead>
<tr>
<th>WebPage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>@type</strong></td>
</tr>
<tr>
<td><strong>@id</strong></td>
</tr>
<tr>
<td><strong>name</strong></td>
</tr>
<tr>
<td><strong>mainEntity</strong></td>
</tr>
<tr>
<td><strong>@type</strong></td>
</tr>
<tr>
<td><strong>name</strong></td>
</tr>
<tr>
<td><strong>jobTitle</strong></td>
</tr>
<tr>
<td><strong>telephone</strong></td>
</tr>
<tr>
<td><strong>faxNumber</strong></td>
</tr>
<tr>
<td><strong>description</strong></td>
</tr>
<tr>
<td><strong>award</strong></td>
</tr>
<tr>
<td><strong>award</strong></td>
</tr>
<tr>
<td><strong>award</strong></td>
</tr>
<tr>
<td><strong>award</strong></td>
</tr>
<tr>
<td><strong>award</strong></td>
</tr>
<tr>
<td><strong>award</strong></td>
</tr>
<tr>
<td><strong>knowsAbout</strong></td>
</tr>
<tr>
<td><strong>knowsAbout</strong></td>
</tr>
<tr>
<td><strong>knowsAbout</strong></td>
</tr>
<tr>
<td><strong>worksFor</strong></td>
</tr>
<tr>
<td><strong>@type</strong></td>
</tr>
<tr>
<td><strong>@id</strong></td>
</tr>
<tr>
<td><strong>url</strong></td>
</tr>
<tr>
<td><strong>name</strong></td>
</tr>
<tr>
<td><strong>alternateName</strong></td>
</tr>
<tr>
<td><strong>sameAs</strong></td>
</tr>
<tr>
<td><strong>sameAs</strong></td>
</tr>
<tr>
<td><strong>sameAs</strong></td>
</tr>
<tr>
<td><strong>sameAs</strong></td>
</tr>
<tr>
<td><strong>logo</strong></td>
</tr>
<tr>
<td><strong>@type</strong></td>
</tr>
<tr>
<td><strong>contentUrl</strong></td>
</tr>
<tr>
<td><strong>parentOrganization</strong></td>
</tr>
<tr>
<td><strong>@type</strong></td>
</tr>
<tr>
<td><strong>@id</strong></td>
</tr>
<tr>
<td><strong>name</strong></td>
</tr>
<tr>
<td><strong>workLocation</strong></td>
</tr>
<tr>
<td><strong>@type</strong></td>
</tr>
<tr>
<td><strong>name</strong></td>
</tr>
<tr>
<td><strong>streetAddress</strong></td>
</tr>
<tr>
<td><strong>addressLocality</strong></td>
</tr>
<tr>
<td><strong>addressCountry</strong></td>
</tr>
<tr>
<td><strong>@type</strong></td>
</tr>
<tr>
<td><strong>name</strong></td>
</tr>
<tr>
<td><strong>email</strong></td>
</tr>
<tr>
<td><strong>@type</strong></td>
</tr>
<tr>
<td><strong>about</strong></td>
</tr>
<tr>
<td><strong>@type</strong></td>
</tr>
<tr>
<td><strong>@id</strong></td>
</tr>
<tr>
<td><strong>name</strong></td>
</tr>
<tr>
<td><strong>memberOf</strong></td>
</tr>
<tr>
<td><strong>@type</strong></td>
</tr>
<tr>
<td><strong>name</strong></td>
</tr>
</tbody>
</table>

---

**Figure 4.57:** WebPage of item page A
@prefix schema: <https://schema.org/>.

<https://search.google.com/structured-data/testing-tool/#Profesores-002>
schema:typeof schema:WebPage;
schema:name "Oscar Corcho";
schema:mainEntity [
  schema:typeof schema:Person;
  schema:name "Oscar Corcho";
  schema:jobTitle "Catedrático de Universidad";
  schema:telephone "+34 910672911";
  schema:faxNumber "+34 913524819";
  schema:description "Oscar Corcho es Catedrático de Universidad en la Universidad Politécnica de Madrid (UPM). Pertenece al Departamento de Inteligencia Artificial de la Escuela Técnica Superior de Ingenieros Informáticos, y codirige el Grupo de Ingeniería Ontológica (OEG) de la citada Escuela. Anteriormente trabajó como investigador Marie Curie en la Universidad de Manchester y como gestor de investigación en la empresa ISOCO.",
  schema:award "Premio Juan López de Peñalver",
  "Primer Premio en el Semantic Web Challenge 2015",
  "Fujitsu Laboratories of Europe Innovation Award 2015",
  "Open Track. Triplification Challenge (I-SEMANTICS 2011)",
  "Premio al mejor artículo científico en la conferencia ESWC2011",
  "mención honorífica Open Goverment Data Track",
  "Triplification Challenge (I-SEMANTICS 2010)"
  schema:knowsAbout "Web Semántica",
  "Web de Datos Enlazados",
  "Ingeniería Ontológica"
  schema:workLocation [
    schema:typeof schema:PostalAddress;
    schema:name "An office in UPM"
    schema:streetAddress "Despacho 2105 Facultad de Informática"
    schema:addressLocality "Boadilla del Monte"
    schema:addressCountry [
      schema:typeof schema:Country;
      schema:name "España"
    ]
  ];
  schema:email <mailto:oorcho@fi.upm.es>;
    schema:typeof schema:CollegeOrUniversity;
    schema:name "Universidad Politécnica de Madrid"
  ];
  schema:memberOf [
    schema:typeof schema:Project;
    schema:name "STARS4ALL"
  ];
];
]

Figure 4.58: Turtle of WebPage of item page A
4.11. CONTACT PAGE

Figure 4.59: ScholarlyArticle of item page A
Figure 4.60: Item page B in extra small screen
Figure 4.61: Item page B in large & extra large screen

Figure 4.62: Elements detected of type B
## Figure 4.63: WebPage of type B

<table>
<thead>
<tr>
<th>WebPage</th>
<th>0 ERRORS 0 WARNINGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>@type</td>
<td>WebPage</td>
</tr>
<tr>
<td>name</td>
<td>TheyBuyForYou</td>
</tr>
<tr>
<td>mainEntity</td>
<td>Article</td>
</tr>
<tr>
<td>headline</td>
<td>TheyBuyForYou</td>
</tr>
<tr>
<td>datePublished</td>
<td>2019-01-01</td>
</tr>
<tr>
<td>dateModified</td>
<td>2019-01-01</td>
</tr>
<tr>
<td>mainEntityOfPage</td>
<td><a href="https://search.google.com/structured-data/testing-tool/theybuyforyou.html">https://search.google.com/structured-data/testing-tool/theybuyforyou.html</a></td>
</tr>
<tr>
<td>image</td>
<td><a href="https://search.google.com/reg/TFBY.jpg">https://search.google.com/reg/TFBY.jpg</a></td>
</tr>
<tr>
<td>articleBody</td>
<td>and services. Our first objective will be to build a technology platform, consisting of a set of modular, Web-based services and APIs to publish, curate, integrate, analyze, and visualize a comprehensive, cross-border and cross-lingual procurement knowledge graph, including public spending and corporate data from</td>
</tr>
<tr>
<td>mainEntity</td>
<td>Project</td>
</tr>
<tr>
<td>name</td>
<td>TheyBuyForYou</td>
</tr>
<tr>
<td>alternateName</td>
<td>TFBY</td>
</tr>
<tr>
<td>member</td>
<td>Person</td>
</tr>
<tr>
<td>url</td>
<td><a href="https://search.google.com/quiemes-soamos/profesores/oscar-corch.html">https://search.google.com/quiemes-soamos/profesores/oscar-corch.html</a></td>
</tr>
<tr>
<td>name</td>
<td>Oscar Cordho</td>
</tr>
<tr>
<td>member</td>
<td>Person</td>
</tr>
<tr>
<td>name</td>
<td>Francisco Yedro</td>
</tr>
</tbody>
</table>
@prefix schema: <https://schema.org/>.

<https://search.google.com/structured-data/testing-tool/#Proyectos_actuales-001>
  schema:typeof schema:CollectionPage;
  schema:name "TheyBuyForYou";
  schema:mainEntity [
    schema:typeof schema:Article;
    schema:headline "TheyBuyForYou";
    schema:image <https://search.google.com/img/TBFY.png>;
    schema:datePublished "2019-01-01";
    schema:dateModified "2019-01-01";
    schema:author <https://search.google.com/structured-data/testing-tool/#OEIG>;
    schema:publisher <https://search.google.com/structured-data/testing-tool/#OEIG>;
    schema:mainEntity [
      schema:typeof schema:Project;
      schema:name "TheyBuyForYou";
      schema:alternateName "TBFY";
      schema:member [
        schema:typeof schema:Person;
        schema:name "Oscar Corcho"
      ],
      schema:typeof schema:Person;
      schema:name "Francisco Yedro"
    ],
    schema:articleBody "Procurement managers, whether accountable to taxpayers or company boards, need novel decision-making tools that can tackle the complexities of modern supply chains and business transactions, while leveraging the large amounts of data and advanced analytics capabilities available..."
  ].

Figure 4.64: Turtle of WebPage of item page B
### WebPage

<table>
<thead>
<tr>
<th>@type</th>
<th>WebPage</th>
</tr>
</thead>
<tbody>
<tr>
<td>name</td>
<td>Becas para desarrollo de Ontología - Deadline 10-05-2019</td>
</tr>
<tr>
<td>mainEntity</td>
<td>JobPosting</td>
</tr>
<tr>
<td>name</td>
<td>Becas para desarrollo de Ontología - Deadline 10-05-2019</td>
</tr>
<tr>
<td>datePosted</td>
<td>2019-01-01</td>
</tr>
<tr>
<td>description</td>
<td>El OEG ofrece una beca de 2,5 meses para el desarrollo de nuevas versiones de Ontología para gty sum.</td>
</tr>
<tr>
<td>title</td>
<td>student</td>
</tr>
<tr>
<td>workHours</td>
<td>20 h/week</td>
</tr>
<tr>
<td>validThrough</td>
<td>2019-05-10</td>
</tr>
<tr>
<td>employmentType</td>
<td>part time</td>
</tr>
<tr>
<td>educationRequirements</td>
<td>Educational</td>
</tr>
<tr>
<td>educationalLevel</td>
<td>undergraduate or graduate</td>
</tr>
<tr>
<td>jobLocation</td>
<td>Place</td>
</tr>
<tr>
<td>address</td>
<td>PostalAddress</td>
</tr>
<tr>
<td>streetAddress</td>
<td>c/ Donike 2</td>
</tr>
<tr>
<td>postalCode</td>
<td>28160</td>
</tr>
<tr>
<td>addressLocality</td>
<td>Buadilla del Monte</td>
</tr>
<tr>
<td>addressRegion</td>
<td>Madrid</td>
</tr>
<tr>
<td>baseSalary</td>
<td>MonetaryAmount</td>
</tr>
<tr>
<td>currency</td>
<td>EUR</td>
</tr>
<tr>
<td>value</td>
<td>QuantitativeValue</td>
</tr>
<tr>
<td>value</td>
<td>400,00</td>
</tr>
<tr>
<td>unitText</td>
<td>MONTH</td>
</tr>
<tr>
<td>hiringOrganization</td>
<td>Organization</td>
</tr>
<tr>
<td>g:org</td>
<td><a href="https://search.google.com/structured-data/testing-tool/OEG">https://search.google.com/structured-data/testing-tool/OEG</a></td>
</tr>
<tr>
<td>url</td>
<td><a href="https://search.google.com/index.html">https://search.google.com/index.html</a></td>
</tr>
<tr>
<td>name</td>
<td>Ontology Engineering Group</td>
</tr>
<tr>
<td>alternateName</td>
<td>OEG</td>
</tr>
<tr>
<td>sameAs</td>
<td><a href="https://github.com/oeq-upm">https://github.com/oeq-upm</a></td>
</tr>
<tr>
<td>sameAs</td>
<td><a href="http://www.allaboutthis.net/search/.slideshow?searchfrom=slideshow&amp;oeq-upm">http://www.allaboutthis.net/search/.slideshow?searchfrom=slideshow&amp;oeq-upm</a></td>
</tr>
<tr>
<td>sameAs</td>
<td><a href="https://plus.google.com/communities/180800465775674348679">https://plus.google.com/communities/180800465775674348679</a></td>
</tr>
<tr>
<td>sameAs</td>
<td><a href="https://www.linkedin.com/company/ontology-engineering-group">https://www.linkedin.com/company/ontology-engineering-group</a></td>
</tr>
<tr>
<td>logo</td>
<td>ImageObject</td>
</tr>
<tr>
<td>contentUrl</td>
<td><a href="https://search.google.com/img/logo.png">https://search.google.com/img/logo.png</a></td>
</tr>
<tr>
<td>url</td>
<td><a href="https://search.google.com/index.html">https://search.google.com/index.html</a></td>
</tr>
<tr>
<td>parentOrganization</td>
<td>CollegeOfUniversity</td>
</tr>
<tr>
<td>name</td>
<td>Universidad Politécnica de Madrid</td>
</tr>
</tbody>
</table>

Figure 4.67: WebPage of item page C
@prefix schema: <https://schema.org>.

<https://search.google.com/structured-data/testing-tool/#Ofertas_de_trabajo-001>  
  schema:typeof schema:WebPage;  
  schema:name "Beca para desarrollo de Ontology - Deadline 10-05-2019";  
  schema:mainEntity [ 
    schema:typeof schema:JobPosting;  
    schema:name "Beca para desarrollo de Ontology - Deadline 10-05-2019";  
    schema:educationRequirements [ 
      schema:type of schema:EducationOccupationalCredential;  
      schema:educationalLevel "undergraduate or graduate"  
    ];  
    schema:description "El EOG oferta una beca de 2,5 meses para el desarrollo de nuevas versiones de Ontology para git y svn ";  
    schema:workHours "20 h/week";  
    schema:datePosted "2019-01-01";  
    schema:validThrough "2019-05-10";  
    schema:title "student";  
    schema:employmentType "part-time";  
    schema:baseSalary [ 
      schema:typeof schema:MonetaryAmount;  
      schema:currency "EUR";  
      schema:value schema:typeof schema:QuantitativeValue;  
      schema:value "460,00";  
      schema:unitText "MONTH"  
    ];  
    schema:jobLocation [ 
      schema:typeof schema:Place;  
      schema:address [ 
        schema:typeof schema:PostalAddress;  
        schema:streetAddress "c/ Ciruelos 2";  
        schema:postalCode "26660";  
        schema:addressLocality "Boadilla del Monte";  
        schema:addressRegion "Madrid";  
      ]  
    ];  
  ];  
  schema:hiringOrganization <https://search.google.com/structured-data/testing-tool/#EOG>  
}

Figure 4.68: Turtle of WebPage of item page C
Figure 4.69: Contact page in extra small screen
Figure 4.70: Contact page in large & extra large screen
### 4.11. CONTACT PAGE

#### Figure 4.71: Elements detected of contact page

<table>
<thead>
<tr>
<th>Detected</th>
<th>0 ERRORS</th>
<th>0 WARNINGS</th>
<th>1 ITEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>WPHeader</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ContactPage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WPFooter</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SiteNavigationElement</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ID</td>
<td>ContactPage</td>
<td>ContactPage</td>
<td>Contacto</td>
</tr>
<tr>
<td>----</td>
<td>-------------</td>
<td>-------------</td>
<td>----------</td>
</tr>
<tr>
<td>name</td>
<td>mainEntity</td>
<td>gtype</td>
<td>@type</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>ContactPage</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><a href="https://search.google.com/structured-data/testing-tool/#Contacto">https://search.google.com/structured-data/testing-tool/#Contacto</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td>name</td>
<td>Contacto</td>
</tr>
<tr>
<td></td>
<td>sameAs</td>
<td>url</td>
<td><a href="https://search.google.com/structured-data/testing-tool/#OEG">https://search.google.com/structured-data/testing-tool/#OEG</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td>name</td>
<td>Ontology Engineering Group</td>
</tr>
<tr>
<td></td>
<td></td>
<td>alternativeName</td>
<td>OEG</td>
</tr>
<tr>
<td></td>
<td></td>
<td>sameAs</td>
<td><a href="https://github.com/ogp-upm">https://github.com/ogp-upm</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td>sameAs</td>
<td><a href="http://www.slidehow.net/search/slidehow/searchform-header&amp;lg=en&amp;upm">http://www.slidehow.net/search/slidehow/searchform-header&amp;lg=en&amp;upm</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td>sameAs</td>
<td><a href="https://plus.google.com/communities/100880465775674348679">https://plus.google.com/communities/100880465775674348679</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td>sameAs</td>
<td><a href="https://www.linkedin.com/company/ontology-engineering-group">https://www.linkedin.com/company/ontology-engineering-group</a></td>
</tr>
<tr>
<td>logo</td>
<td>gtype</td>
<td>parentOrganization</td>
<td>ImageObject</td>
</tr>
<tr>
<td></td>
<td>contentUrl</td>
<td></td>
<td><a href="https://search.google.com/structured-data/img/logo.png">https://search.google.com/structured-data/img/logo.png</a></td>
</tr>
<tr>
<td>parentOrganization</td>
<td>gtype</td>
<td>CollegeOrUniversity</td>
<td>CollegeOrUniversity</td>
</tr>
<tr>
<td></td>
<td></td>
<td>name</td>
<td>Universidad Politécnica de Madrid</td>
</tr>
<tr>
<td>location</td>
<td>gtype</td>
<td>Place</td>
<td>Place</td>
</tr>
<tr>
<td>hasMap</td>
<td>gtype</td>
<td>Map</td>
<td>Map</td>
</tr>
<tr>
<td></td>
<td>url</td>
<td><a href="https://www.google.com/maps/embed?pb=!1m18!1m12!1m3!1d389076!2d520753!3d40.42034294616974!2m1!3d181052939!3m2!1i1024!2i768">https://www.google.com/maps/embed?pb=!1m18!1m12!1m3!1d389076!2d520753!3d40.42034294616974!2m1!3d181052939!3m2!1i1024!2i768</a></td>
<td></td>
</tr>
<tr>
<td>address</td>
<td>gtype</td>
<td>PostalAddress</td>
<td>PostalAddress</td>
</tr>
<tr>
<td></td>
<td>streetAddress</td>
<td>Laboratorio 3206 Escuela Tecnica Superior de Ingenieros Informaticos (ETSIINF) Universid</td>
<td></td>
</tr>
<tr>
<td></td>
<td>addressLocality</td>
<td>Universidad Politécnica de Madrid Avda. Moncloa, s/n</td>
<td></td>
</tr>
<tr>
<td></td>
<td>postalCode</td>
<td>28660</td>
<td></td>
</tr>
<tr>
<td></td>
<td>telephone</td>
<td>913 36 73 99</td>
<td></td>
</tr>
<tr>
<td>addressCountry</td>
<td>gtype</td>
<td>Country</td>
<td>Country</td>
</tr>
<tr>
<td></td>
<td>name</td>
<td>España</td>
<td>España</td>
</tr>
<tr>
<td>about</td>
<td>gtype</td>
<td>ImageObject</td>
<td>ImageObject</td>
</tr>
<tr>
<td></td>
<td>name</td>
<td>Cómo llegar</td>
<td>Cómo llegar</td>
</tr>
<tr>
<td></td>
<td>description</td>
<td>Hay varios alternativas para llegar al Campus en transporte público.</td>
<td>Hay varios alternativas para llegar al Campus en transporte público.</td>
</tr>
</tbody>
</table>

Figure 4.72: ContactPage of contact page
Figure 4.73: Turtle of ContactPage of contact page
Chapter 5

Conclusions

This document has presented a project of developing webpage templates for the new OEG website. Each template is responsive and is marked up with RDFa. The pages are opened with the developer tool of Chrome browser to check the proper display in different screen sizes. And the markups pass the tests without errors using the structured data testing tool of Google. The main goals of the project are reached successfully. There are still some things to do at the future work to implement the new website.

Finish all pages

First of all, it is necessary to make all pages in both Spanish and English using the templates developed in this project. This is easy to do by replacing page content and modifying some code.

There might be some other templates in the future. The old website doesn’t have login/sign up option, so in this project, there is no login/sign up page neither. The OEG is a research group of UPM. It should be available to access to the website with UPM accounts. If so, the login page or login window should be made. There is a search box in the header, but the search result page is left to do. Besides, the 404 page is needed as well. The 404 page is a page that shows up when the server can not respond.

Possible page modifications

There is also something to add in finished template. In the article pages, there could be a comment area to allow users to submit comments if the website allows them to log in. The contact page probably needs forms to let users to send messages directly to the email of OEG. This would facilitate a lot the communication between the OEG and users.
Use JSON-LD

The RDFa markups work well in the testing. However, JSON-LD could be used instead of RDFa for future development and maintenance. As shown in the appendixes, the RDFa markups are disperse in the HTML tags. It is very probable to miss some markups, and is hard to add and find them. This would be terrible for a really complicated project. When using JSON-LD, all markups can be gathered in the <head> of the HTML document. The development and the maintenance will be much simpler. Additionally, it is easier to add some markups that are not related to the page content, but beneficial for SEO. In fact, different markup methods can also be applied at the same time, so both JSON-LD and RDFa could be used together depending on the occasions. Maybe in some cases, RDFa would be more proper to use.

URI as resource

Many blank nodes have been used when marking up the data. For example, blank nodes are used for the professors since there is no corresponding resource available online. This is not beneficial for providing linked data because the data produced in this project are not interlinked with data on the web. To solve this, it is necessary to find URIs of these resources or to create terms in DBPedia or somewhere else if they still don’t exist. There is no blank node for UPM because the term of UPM in DBPedia is used as resource.

Back-end

This project only focuses on the front-end development of the new website. For making a complete website, it is also necessary to do the back-end. Some points of future work mentioned above will be available only if the back-end is up. However, the work on back-end is out of range of this project. Completing the entire website must a challenging work.
Appendix A

oeg.css
```html
html {
  height: 100%;
}
body {
  padding-top: 56px;
  min-height: 100%;
  display: flex;
  flex-direction: column;
}
@media only screen and (min-width: 992px) {
  body {
    padding-top: 86px;
    min-height: 100%;
    display: flex;
    flex-direction: column;
  }
  a {
    color: #3974B4;
  }
  a:hover {
    color: #ef283b;
  }
  /* Navbar logo */
  .navbar-brand {
    background-image: url(../img/logo.png);
    background-repeat: no-repeat;
    background-size: contain;
    background-position: left center;
    margin-right: 10px;
    width: 75px;
    height: 50px;
  }
  @media only screen and (min-width: 992px) {
    .navbar-brand {
      background-image: url(../img/logo.png);
      background-repeat: no-repeat;
      background-size: contain;
      background-position: left center;
      margin-right: 40px;
      width: 120px;
      height: 80px;
    }
  }
  /* Navbar nav */
  .navbar-light .navbar-nav .nav-link {
    color: #3974B4;
  }
  .navbar-light .navbar-nav .nav-link:hover {
    color: #ef283b;
  }
  .navbar-light .navbar-nav .active .nav-link {
    color: #3974B4;
    font-weight: bold;
  }
  .nav .active {
    background-color: #3974B4;
  }
  @media only screen and (min-width: 992px) {
```
```css
.nav .nav-link {
  height: 86px;
  line-height: 86px;
  padding-top: 0;
  padding-bottom: 0;
}

/* Navbar form */
.navbar-form form {
  position: relative;
  width: 130px;
  margin: 0;
}

.navbar-form input {
  width: 100%;
  padding-left: 13px;
  padding-right: 46px;
  outline: none;
  border: 2px solid #3974b4;
  border-radius: 5px;
  background: #f8f9fa;
  color: #3974b4
}

.navbar-form button {
  outline: none;
  width: 30px;
  height: 30px;
  border: 2px solid #3974b4;
  cursor: pointer;
  position: absolute;
  top: 0;
  right: 0;
  background: #3974b4;
  border-radius: 0 5px 5px 0;
}

.navbar-form button:before {
  content: "\f06c";
  font-family: FontAwesome;
  font-size: 16px;
  color: white;
}

/*
.navbar-toggler-icon{
  background-color: blue;
}
*/

/*
.navbar-toggler-border*/
.navbar-toggler:focus {
  outline: transparent;
  border: 2px solid #3974b4;
}

/*Carousel*/
.carousel-item {
  min-height: 250px;
  height: 55vh;
}

.carousel-item-ORIGINAL, .carousel-item-blury {
  background-image: url(../img/mon_foto.jpg);
  position: absolute;
  height: 100%;
  width: 100%;
  background-repeat: no-repeat;
}
APPENDIX A. OEG.CSS

```css
/* CSS for carousel images */
.carousel-img1-original, .carousel-img2-blury {
  background-image: url('http://example.com/mariano-aorta.jpg');
  position: absolute;
  height: 100%;
  width: 100%;
  background-repeat: no-repeat;
  -webkit-background-size: auto 100%;
  -moz-background-size: auto 100%;
  background-size: auto 100%;
}

.carousel-img1-blury, .carousel-img2-blury, .carousel-img3-blury {
  -webkit-filter: blur(20px);
  -moz-filter: blur(20px);
  -o-filter: blur(20px);
  filter: blur(20px);
}

.carousel-img1-original, .carousel-img2-original, .carousel-img3-original{
  -webkit-filter: drop-shadow(0 0 20px grey);
  -moz-filter: drop-shadow(0 0 20px grey);
  -o-filter: drop-shadow(0 0 20px grey);
  filter: drop-shadow(0 0 20px grey);
}

.carousel-caption {
  text-shadow: 1px 1px grey;
}

/* Portfolio */
.portfolio-item {
  height: auto;
  width: 100%;
  display: block;
  margin-left: auto;
  margin-right: auto;
}
.card-title a{
  color: #3f74b4;
}
.card-title a:hover{
  color: #f2f2f2;
}
.portfolio-item {
  margin-bottom: 30px;
}
```
/* Footer */
footer a {
  color: #f0f0f0;
}

footer a:hover {
  font-weight: bold;
  color: #ff8282;
}

/* Breadcrumbs */
@media only screen and (max-width: 995px) {
  nav .breadcrumb {
    margin-left: auto;
  }
}

nav .breadcrumb {
  background-color: transparent;
  margin-bottom: 0;
}

nav .breadcrumb-item + .breadcrumb-item:after {
  content: "\"; /*
  color: #3974b4;
  */
  .breadcrumb-item a {
    color: #3974b4;
  }
  .breadcrumb-item a:hover{
    color: #ff8282;
  }
  text-decoration: none;
}

/* Sidebar */
.list-group-item {
  border: 0px;
  border-radius: 5px;
  color: #3974b4;
}

.list-group a:hover{
  color: #ff8282;
}

/* Read more button */
.btn-primary {
  color: #ff8282;
  background-color: #3974b4;
  border-color: #3974b4;
}

.btn-primary:hover {
  color: #ff8282;
  background-color: #3974b4;
  border-color: #3974b4;
APPENDIX A. OEG.CSS

```css
/* Profile Image */
.profile-img {
  width: 133.5px;  
}

@media only screen and (min-width: 992px) {
  .profile-img {
    width: 100%;
  }
}

/* Pagination */
.page-link {
  color: #3974b4;
}

.page-link:hover {
  color: #fa211b;
}
```
Appendix B

index.html
```html
<!DOCTYPE html>
<html lang="en" xmlns="http://schema.org/WebSite" resource="#Website">
<head>
<meta charset="utf-8">
<meta name="viewport" content="width=device-width, initial-scale=1, shrink-to-fit=no">
<meta name="description" content="">
<meta name="author" content="">
<title>Ontology Engineering Group</title>
<!-- Bootstrap core CSS -->
<link rel="stylesheet" href="/static/bootstrap.min.css"/>
<!-- Font Awesome -->
<link rel="stylesheet" href="/static/font-awesome-4.7.0/css/font-awesome.min.css"/>
<!-- Custom styles for this template -->
<link rel="stylesheet" href="/static/055.css"/>
<!-- Bootstrap core JavaScript -->
<script src="/static/jquery-3.3.1.min.js"></script>
<script src="/static/bootstrap.min.js"></script>
<script src="/static/popper.min.js"></script>

<body vocab="http://schema.org/">
<meta property="mainEntity" resource="#OEG">

<!-- Navigation -->
<nav class="navbar navbar-expand-lg navbar-light bg-light" type="#MNavigation" resource="#MHeader">
<div class="container">
<meta property="contentURL" resource="/img/logo.png"/>
<meta property="logot" resource="#OEG">
<span type="Organization" resource="#OEG">
<a class="navbar-brand" href="/" property="url"/>
</span>

</div>
</nav>
<button class="navbar-toggler m-auto" type="button" data-toggle="collapse" data-target="#navbarsResponsive" aria-controls="navbarsResponsive" aria-expanded="false" aria-label="Toggle navigation">
</button>
</div>
</nav>
</body>
</html>
```
APPENDIX B. INDEX.HTML
Appendix C

investigacion.html
83

```html
<!DOCTYPE html>
<html lang="es">
<head>
  <meta name="viewport" content="width=device-width, initial-scale=1">
  <title>Navegación</title>
</head>
<body>
  <header>
    <nav>
      <div class="search">
        <form action="/action_page.php" method="get">
          <input type="text" placeholder="Buscar" name="q">
          <button type="submit">BUSCAR</button>
        </form>
      </div>
    </nav>
  </header>
  <main>
    <article>
      <h1>Navegación</h1>

    <nav>
      <ol class="breadcrumb">
        <li><a href="/es/investigacion.html" role="button">Inicio</a></li>
        <li><a href="/es/servicios.html" role="button">Servicios</a></li>
        <li class="active"><span>Navegación</span></li>
      </ol>
    </nav>

    <section>
      <h2>Investigación</h2>
      <p>Investigación es un campo amplio y diverso que abarca todas las áreas de conocimiento científicas. Aquí presentamos algunos de los temas más destacados:</p>
      <ul>
        <li><a href="/es/areas-de-investigacion.html">Áreas de Investigación</a></li>
        <li><a href="/es/proyectos-actuales.html">Proyectos Actuales</a></li>
        <li><a href="/es/proyectos-completados.html">Proyectos Completados</a></li>
        <li><a href="/es/actividades-estandarizadas.html">Actividades Estandarizadas</a></li>
        <li><a href="/es/convenios-de-collaboration.html">Convenios de colaboración</a></li>
      </ul>
    </section>

    <footer>
      <p>© 2023 Instituto de Investigaciones. Todos los derechos reservados.</p>
    </footer>
  </article>
</main>
</body>
</html>
```
while leveraging the large amounts of data and advanced analytics capabilities available. A project will deliver these tools, alongside enabling technologies and data to make procurement across the EU more efficient, competitive, accountable, and fair.</p>

</div>
</div>
</div>

</div>
</div>

<footer class="py-1 mt-auto" style="background-color: #3974a4;" type="wpFooter" resource="#WPFooter">
  <div class="container">
    <div class="row">
      <div class="nav-item">
        <a class="nav-link" href="/unete/doctorado.html" target="_blank">Doctorado</a>
      </div>
      <div class="nav-item">
        <a class="nav-link" href="/unete/ultimas-noticias.html" target="_blank">Noticias</a>
      </div>
      <div class="nav-item">
        <a class="nav-link" href="/unete/postdocs-y-profesionales.html" target="_blank">Postdocs y profesionales</a>
      </div>
      <div class="nav-item">
        <a class="nav-link" href="/unete/proyectos-actuales.html" target="_blank">Proyectos actuales</a>
      </div>
      <div class="nav-item">
        <a class="nav-link" href="/unete/contacto.html" target="_blank">Contacto</a>
      </div>
    </div>
  </div>
</footer>
</Footer>

</body>

</html>
Appendix D
unete.html
APPENDIX D. UNETE.HTML
Appendix E

doctorado.html
<!DOCTYPE html>
<html lang="en" xmlns="http://schema.org/WebPage" resource="#Doctorado">
<head>
  <meta charset="utf-8">
  <meta name="viewport" content="width=device-width, initial-scale=1, shrink-to-fit=no">
  <meta name="description" content="">
  <meta name="author" content="">
  <title>Ontology Engineering Group</title>
  <!-- Bootstrap core CSS -->
  <link rel="stylesheet" href="../css/bootstrap.min.css">
  <!-- Font Awesome -->
  <link rel="stylesheet" href="../font-awesome-4.7.0/css/font-awesome.min.css">
  <!-- Custom styles for this template -->
  <link rel="stylesheet" href="../css/DEG.css">
  <!-- Bootstrap core JavaScript -->
  <script src="../js/jquery-3.3.1.min.js"></script>
  <script src="../js/bootstrap.min.js"></script>
  <script src="../js/popper.min.js"></script>
</head>
<body vocab="http://schema.org/">

</body>
</html>
El grupo de Ingeniería Ontológica (OTG - Ontology Engineering Group) tiene alrededor de 15 estudiantes de doctorado activos, con más de 20 doctorados que ya han terminado en años anteriores. Hay varias razones por las que pueden considerar realizar su doctorado con nosotros.

El grupo ofrece un excelente ambiente de investigación multicultural, con estudiantes de doctorado y mestiz

...
de diferentes nacionalidades. Nuestros seminarios de investigación, que se llevan a cabo una vez a la semana para el intercambio mutuo de las diferentes áreas de investigación de nuestro grupo, se realizan siempre en inglés y proporcionan una buena manera de intercambiar ideas y discutir sobre temas de investigación.

(p)

(p) Las áreas de investigación cubiertas por nuestro grupo están en la vanguardia de la investigación mundial, con publicaciones de alto impacto y altamente referenciadas. Por ejemplo, nuestro libro sobre Ingeniería Ontológica se utiliza en más de 58 cursos internacionales relacionados con la Web Semántica, datos enlazados (Linked Data) y Ingeniería Ontológica. Muchos de nuestros trabajos más importantes son comúnmente referenciados como parte de los más relevantes avances en nuestra área de investigación.

(p)

(p) Tenemos un buen número de proyectos internacionales y nacionales que se están llevando a cabo en nuestro grupo, con al menos 5 de las instituciones más relevantes en Europa y los Estados Unidos.

(p)

(p) Comúnmente, tenemos visitantes de otras instituciones internacionales que vienen a nuestro grupo por períodos cortos de tiempo para hablar con nosotros acerca de su investigación, enriqueciendo el contexto de la investigación de nuestro grupo.

(p)

(p) A nuestros estudiantes de doctorado se les ofrece siempre la posibilidad de obtener un doctorado europeo o internacional. Para ello, el estudiante debe pasar al menos tres meses durante su doctorado en otra institución internacional. Si los fondos lo permiten, tratamos de lograr que los estudiantes de doctorado visiten instituciones externas cada año, a solicitud de cursos de verano.

(p)


</div>

</div>

</div>

</div>

</div>

</footer class="py-1 mt-auto style="background-color: #9974b4;" type="#MPFooter" resource="#MPFooter">
<div class="container">
<div class="row">
<li class="nav-item">
<a class="nav-link" href="/unete/doctorado.html">Doctorado</a>
</li>
<li class="nav-item">
<a class="nav-link" href="/diseminacion/ultimas-noticias.html">Últimas noticias</a>
</li>
<li class="nav-item">
<a class="nav-link" href="/quienes-somos.html">Quiénes somos</a>
</li>
<li class="nav-item">
<a class="nav-link" href="/unete/postdocs-y-profesionales.html">Postdocs y profesionales</a>
</li>
<li class="nav-item">
<a class="nav-link" href="/investigacion/proyectos-actuales.html">Proyectos actuales</a>
</li>
<li class="nav-item">
<a class="nav-link" href="/unete/contacto.html">Contacto</a>
</li>
</div>
</div>
</div>
</footer>
Appendix F

profesores.html
<!DOCTYPE html>
<html lang="es" xmlns="http://schema.org/CollectionPage" resource="#Profesores">
<head>

<meta charset="utf-8"/>
<meta name="viewport" content="width=device-width, initial-scale=1, shrink-to-fit=no"/>
<meta name="description" content=""/>
<meta name="author" content=""/>
<title>Ontology Engineering Group</title>

<!-- Bootstrap core CSS -->
<link rel="stylesheet" href="../css/bootstrap.min.css"/>
<link rel="stylesheet" href="../css/fontawesome-4.7.0/css/font-awesome.min.css"/>
<link rel="stylesheet" href="../css/DEG.css"/>
<link rel="stylesheet" href="../css/bootstrap.min.js"></script>
<script src="../js/jquery-3.3.1.min.js"></script>
<script src="../js/bootstrap.min.js"></script>
<script src="../js/popper.min.js"></script>

<body vocab="http://schema.org/">

<!-- Navigation -->
<nav class="navbar py-0 fixed-top navbar-expand-lg navbar-light bg-light" type="#navbarHeader" resource="#navbarHeader">
<div class="container">
<meta property="content:URL" resource="/http://logo.png"/>
<meta rev="logo" resource="BOEG">
<span typeof="Organization" resource="BOEG">
  <a class="navbar-brand href="/index.html" property="url"></a>
  <meta property="name" content="Ontology Engineering Group"/>
  <meta property="alternateName" content="DEG"/>
    <meta property="name" resource="Universidad Politecnica de Madrid"/>
  </span>
</span>
</div>
</nav>

<button class="navbar-toggler mr-auto type="button" data-toggle="collapse" data-target="#navbarResponsive" aria-controls="navbarResponsive" aria-label="Toggle navigation">
</button>
</nav>

<div class="collapse navbar-collapse id="navbarResponsive">
<ul class="navbar-nav mr-auto">
  <li class="nav-item active" property="name">
    <a class="nav-link href="/quienes-somos.html" property="url" rel="quien-somos"/>
  </li>
  <li class="nav-item property="name">
    <a class="nav-link href="/investigation.html" property="url" rel="investigacion"/>
  </li>
  <li class="nav-item property="name">
    <a class="nav-link href="/resultados.html" property="url" rel="resultados"/>
  </li>
  <li class="nav-item property="name">
    <a class="nav-link href="/dissemination.html" property="url" rel="dissemination"/>
  </li>
  <li class="nav-item property="name">
    <a class="nav-link href="/meta.html" property="url" rel="meta"/>
  </li>
  <li class="nav-item property="name">
    <a class="nav-link href="/contact.html" property="url" rel="contact"/>
  </li>
</ul>
</div>

...</div>
APPENDIX F. PROFESORES.HTML
<div class="card-body">
<h4 class="card-title" property="name"><a href="/quienes-somos/profesores/eleno-mentiel-ponsoda.html" property="url">Elena Montiel Ponsoda</a> <span property="workLocation" property="PostalAddress">Ronda del Monegro 33. Madrid, 28046. España</span> <span property="telephone">91 336 5472</span> <span property="email">eplaintext@ups.es</span></h4>
</div>

<dev class="card-body">
<h4 class="card-title" property="name"><a href="/quienes-somos/profesores/mari-carmen-suarez-figueroa.html" property="url">Mari Carmen Suárez Figueroa</a> <span property="workLocation" property="PostalAddress">Ronda del Monegro 33. Madrid, 28046. España</span> <span property="telephone">91 336 5472</span> <span property="email">mc-suarez@ups.es</span></h4>
</div>
Appendix G

proyectos-actuales.html
APPENDIX G. PROYECTOS-ACTUALES.HTML
107
APPENDIX G. PROYECTOS-ACTUALES.HTML
APPENDIX G. PROYECTOS-ACTUALES.HTML
Appendix H

ofertas-de-trabajo.html
1 de enero de 2019
<meta property="validThrough" content="2019-04-12"/>
<meta property="hiringOrganization" resource="BOH"/>
<meta property="title" content="student"/>
<meta property="employmentType" content="part-time"/>

1 de enero de 2019
<meta property="validThrough" content="2019-04-12"/>
<meta property="hiringOrganization" resource="BOH"/>
<meta property="title" content="student"/>
<meta property="employmentType" content="part-time"/>

1 de enero de 2019
<meta property="validThrough" content="2019-04-12"/>
<meta property="hiringOrganization" resource="BOH"/>
<meta property="title" content="student"/>
<meta property="employmentType" content="part-time"/>
Appendix I

oscar-corcho.html
APPENDIX I. OSCAR-CORCHO.HTML
como en distintas universidades internacionales). Algunos de sus estudiantes de doctorado tienen destacadas posiciones en el panorama de la investigación científica e industrial, en instituciones como EPFL, Information Sciences Institute, Fujitsu, PMC Chile, etc.

- **Gestión de la Investigación (span):** Ha sido adjunto de la ANEP para la evaluación de proyectos de transferencia de tecnología. Es revisor y evaluador habitual de proyectos de la Comisión Europea, y ha participado en la elaboración de documentos estratégicos para la misma institución, la CE.

- **Innovación (span):** Ha sido co-fundador de la empresa LocalData (2013), en la que se aplican resultados de investigación en el área de datos abiertos y enlazados. Además, tiene varios registros de software en explotación por organizaciones públicas y privadas, y múltiples repositorios de software en código abierto, ampliamente utilizados.

- **Actividades para acercar la ciencia y la tecnología al ciudadano (span):** Entre sus actividades de difusión de la ciencia y la tecnología para los ciudadanos, destaca el proyecto europeo START5441, en el que ciudadanos y científicos colaboran en una plataforma de conciliación ciudadana sobre la contaminación lumínica. Asimismo, es colaborador habitual en el laboratorio ciudadano MedLab Prado, donde ha participado en actividades de formación y difusión general de sus resultados de investigación para periodistas de datos, niños o responsables gubernamentales, entre otros. Lleva a cabo múltiples actividades en el área de datos abiertos y transparencia.

4) **Proyectos:**

- **Abriendo el contexto de estas líneas de investigación, actualmente está participando en los siguientes proyectos:**

  - **CLARITY (span):** es un proyecto de soporte y coordinación (Coordination and Support action) en el que se están creando documentos de referencia, validados por una amplia comunidad de actores, para la descripción de las principales necesidades, oportunidades, brechas y recomendaciones para la adopción de una estrategia de Gobierno Electrónico Abierto en todos los estados miembros en el 2020.

  - **trans4mation (span):** es un proyecto financiado por la UE, que representa un gran consorcio de 47 actores líderes en transporte, logística y tecnología de la información en Europa.

  - **slide4all (span):** es un portal para la creación y administración de contenidos de aprendizaje abiertos.

- **Finalmente, ha participado en los siguientes proyectos, algunos de los cuales han tenido un gran impacto en las áreas mencionadas anteriormente:**

  - **OrInventor (span):** es un proyecto basado en la visión de que las tecnologías tienen un gran potencial para complementar el Ingenuo humano en ciencia mediante la superación de las limitaciones que sufren las personas en la búsqueda de descubrimientos cientíeficos.

  - **SLIDE (span):** está orientado a promover la vida independiente y la participación en sociedad de las personas con movilidad reducida.

  - **PlanetData (span):** es una red de excelencia cuyo objetivo es establecer una comunidad europea sostenible de investigadores.

  - **Cloude2020 (span):** está construyendo infraestructura para dar soporte a ciudades inteligentes (smart cities), incluyendo soporte para datos abiertos (open data).

  - **myBigData (span):** proporciona métodos, técnicas y herramientas para permitir a los científicos gestionar sus fuentes de datos utilizando tecnologías semánticas.

  - **4DFtrue (span):** se centra en la conservación, recuperación y reutilización eficiente de bibliotecas digitales de flujos de trabajo científico (scientific workflows).

  - **SensorGrid4Env (span):** de sensores, Sensor Grid for Rapid Application Development for Environmental Management (RAPID).
APPENDIX I. OSCAR-CORCHO.HTML

122

and Integration Research for Europe (FP7-215024)/11

»<li class="member" type="Project"
    href="#:005CAEMEDIA/"/span>
    Hacia una
    adaptación de modelos digitales multirred-multiterminal.
</li>

)122

»<li class="member" type="Project"
    href="#:005CAEMEDIA/"/span>
    Anotación
    y semántica colaborativa con dispositivos móviles en el camino de Santiago (/122

)122

»<li class="member" type="Project"
    href="#:005DAIXHT-ONL/"/span>
    Proveer un acceso a
    y razonando con UML metamodels (PERG-CT-2007-34645/122

)122

»<li class="member" type="Project"
    href="#:00554GRID/"/span>
    Razonamiento para el Semantic
    Grid (/TPG-2002-Mobility-S-000668/122

)122

»<li class="member" type="Project"
    href="#:005HALO/"/span>
    Digital Aristotle. Funded by Vulcan,
    Inc./122

)122

»<li class="member" type="Project"
    href="#:005DIP/"/span>
    Data, Information, and Process
    Integration with Semantic Web Services (TPG-507483/122

)122

»<li class="member" type="Project"
    href="#:005KPS/"/span>
    Enabling and Intelligent Natural
    Language Based Hub for the Deployment of Advanced Semantically Enriched Multi-channel Mass-scale Online Public
    Services (IST-2002-507967/122

)122

»<li class="member" type="Project"
    href="#:005SAG/"/span>
    Application Service Provision of
    Semantic Annotation, Aggregation, Indexing and Routing of Textual, Multimedia, and Multilingual Web Content (IST-
    2001-54873/122

)122

»<li class="member" type="Project"
    href="#:005SE/"/span>
    Semantic Web enabled Web Services (IST-
    2001-3714/122

)122

»<li class="member" type="Project"
    href="#:005KWE/"/span>
    Realizing the Semantic Web
    (EP-507483/122

)122

»<li class="member" type="Project"
    href="#:005DIESEL/"/span>
    Dynamic service discovery in
    WebDE (EF-2002-04011/122

)122

»<li class="member" type="Project"
    href="#:005TTE/"/span>
    Ontology Based Information exchange for knowledge management and electronic commerce (IST-2002-29245/122

)122

»<li class="member" type="Project"
    href="#:005KBD/"/span>
    Multilingual Knowledge Based
    European Electronic Marketplace (IST-1999-10589/122


</ul>

<p>&lt;b&gt;Algunas de las publicaciones más relevantes son:&lt;/p&gt;

<p>

[l gr rev author resource="#webde.dis.fia.upm.es/ontologicalengineering#"

<meta type="scholarlyarticle" resource="#webde.dis.fia.upm.es/ontologicalengineering#"

(a href="#webde.dis.fia.upm.es/ontologicalengineering#"/span>

property "url"="#span>

property "headline"="#Ontological Engineering/"


</li>

</ul>

<li class="member" type="Project"
    href="#mayor2.dis.fia.upm.es/ocorcho/documents/

<meta type="scholarlyarticle" resource="#mayor2.dis.fia.upm.es/ocorcho/documents/

(CISE2000_GomezPerezAndCorcho.pdf/"

(a href="#mayor2.dis.fia.upm.es/ocorcho/documents/CISE2000_GomezPerezAndCorcho.pdf/

property "url"="#span>

property "headline"="#Problem-Solving Methods for Understanding Process Executions/"


</li>

</ul>

<li class="member" type="Project"
    href="#mayor2.dis.fia.upm.es/ocorcho/documents/

<meta type="scholarlyarticle" resource="#mayor2.dis.fia.upm.es/ocorcho/documents/

(AlperAlpert.pdf/"

(a href="#mayor2.dis.fia.upm.es/ocorcho/documents/KA12008_AlperAlpert.pdf/

property "url"="#span>

property "headline"="#Understanding Semantic-Aware Grid Middleware for e-Services/"


</li>

</ul>

<li class="member" type="Project"
    href="#mayor2.dis.fia.upm.es/ocorcho/documents/

<meta type="scholarlyarticle" resource="#mayor2.dis.fia.upm.es/ocorcho/documents/

(Alpert.pdf/"

(a href="#mayor2.dis.fia.upm.es/ocorcho/documents/CA12008_Alpert.pdf/

property "url"="#span>

property "headline"="#An overview of S-OSOA: A Reference Semantic Grid Architecture/"


</li>

</ul>

<li class="member" type="Project"
    href="#mayor2.dis.fia.upm.es/ocorcho/documents/

<meta type="scholarlyarticle" resource="#mayor2.dis.fia.upm.es/ocorcho/documents/

(Alpert.pdf/"

(a href="#mayor2.dis.fia.upm.es/ocorcho/documents/CA12008_Alpert.pdf/

property "url"="#span>

property "headline"="#Understanding Semantic-Aware Grid Middleware for e-Services/"


</li>

</ul>

<li class="member" type="Project"
    href="#mayor2.dis.fia.upm.es/ocorcho/documents/

<meta type="scholarlyarticle" resource="#mayor2.dis.fia.upm.es/ocorcho/documents/

(Alpert.pdf/"

(a href="#mayor2.dis.fia.upm.es/ocorcho/documents/CA12008_Alpert.pdf/

property "url"="#span>

property "headline"="#An overview of S-OSOA: A Reference Semantic Grid Architecture/"


</li>

</ul>

<li class="member" type="Project"
    href="#mayor2.dis.fia.upm.es/ocorcho/documents/

<meta type="scholarlyarticle" resource="#mayor2.dis.fia.upm.es/ocorcho/documents/

(Alpert.pdf/"

(a href="#mayor2.dis.fia.upm.es/ocorcho/documents/CA12008_Alpert.pdf/

property "url"="#span>

property "headline"="#Understanding Semantic-Aware Grid Middleware for e-Services/"


</li>

</ul>
123
Appendix J

theybuyforyou.html
APPENDIX J. THEYBUYFORYOU.HTML
Appendix K

beca-para-desarrollo-de-ontology-deadline-10-05-2019.html
Appendix L

contacto.html
<html lang="es" xmlns="http://schema.org/ContactPage" resource="#Contacto">
<head>
  <meta charset="utf-8">
  <meta name="viewport" content="width=device-width, initial-scale=1, shrink-to-fit=no">
  <meta name="description" content="">
  <meta name="author" content="">
  <title>Ontology Engineering Group</title>
  <!-- Bootstrap core CSS -->
  <link rel="stylesheet" href="../css/bootstrap.min.css">
  <!-- Font Awesome -->
  <link rel="stylesheet" href="../font-awesome-4.7.0/css/font-awesome.min.css">
  <!-- Custom styles for this template -->
  <link rel="stylesheet" href="../css/OEG.css">
  <!-- Bootstrap core JavaScript -->
  <script src="js/jquery-3.3.1.min.js"></script>
  <script src="js/bootstrap.min.js"></script>
  <script src="js/popper.min.js"></script>
</head>
<body vocab="http://schema.org/">
  <!-- Navigation -->
  <nav class="navbar py-0 fixed-top navbar-expand-lg navbar-light bg-light" type="navigation" resource="#navigation">
    <div class="container">
      <div class="navbar-brand" type="ImageObject">
        <meta property="contentUrl" resource="/img/logo.png">
        <meta rev="logo" resource="#log" type="image">
        <span type="Organization" resource="#organization">
          <a class="navbar-brand" href="/index.html" property="url" type="url"></a>
        </span>
        <meta property="name" resource="#name" type="Ontology Engineering Group">
        <meta property="alternateName" content="#DEG" type="DEG">
        <span property="parentOrganization" resource="http://dmpedia.org/page/Technical_University_of_Madrid" type="CollegeOrUniversity">meta property="name" content="Universidad Politécnica de Madrid" type="DEG"></span>
      </div>
      <button class="navbar-toggler mr-auto" type="button" data-toggle="collapse" data-target="#navbarResponsive" aria-controls="navbarResponsive" aria-expanded="false" aria-label="Toggle navigation">
        <span class="navbar-toggler-icon"></span>
      </button>
      <div class="collapse navbar-collapse collapse navbar-responsive-collapse" id="navbarResponsive">
        <ul class="navbar-nav mr-auto" type="SiteNavigationElement" resource="#SiteNavigationElement">
          <li class="nav-item" property="name">
            <a class="nav-link" href="/quienes-somos.html" property="url" type="url">Quiénes somos</a>
          </li>
          <li class="nav-item" property="name">
            <a class="nav-link" href="/investigacion.html" property="url" type="url">Investigación</a>
          </li>
          <li class="nav-item" property="name">
            <a class="nav-link" href="/resultados.html" property="url" type="url">Resultados</a>
          </li>
          <li class="nav-item" property="name">
            <a class="nav-link" href="/disseminacion.html" property="url" type="url">Disseminación</a>
          </li>
          <li class="nav-item active" property="name">
            <a class="nav-link" href="/contacto.html" property="url" type="url">Contacto</a>
          </li>
        </ul>
      </div>
    </div>
  </nav>
</body>
</html>
APPENDIX L. CONTACTO.HTML
Bibliography


