

Defining a Novel Ontology For Educational Counselling based on Professional Indicators

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*Workshop on Applied and Practical Learning Analytics
(WAPLA 2016), in conjunction with ECTEL 2016*



BigDataLab

- Control and Communications Systems Department UNED -

OUTLINE

- **Motivation and Proposal**
- Data Sources
- Data Analysis
- The Proposed Ontology
- Conclusions and Future Work

MOTIVATION (I)

- Current necessity of **comparing personal studies with professional profiles** in order to make **recommendations** about employability needs
 - Objective:
 - To **improve** users' professional **career**
 - Example:
 - A user holds a particular degree, but most of his/her jobs of interest require a higher degree
 - It would be desirable to recommend him/her to start a particular post-degree

MOTIVATION (II)

- **The problem:**
 - **Several sources of information** oriented to the professional market:
 - About educational resources: universities web sites, companies websites, MOOCs websites, ...
 - About job offers: professional social networks such as Infojobs, LinkedIn, Monster, ...

PROPOSAL

- We propose **common vocabulary/ontology**, needed to make professional recommendations
- Thanks to this, a similar language is spoken, independently of the source of information

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DATA SOURCES (I)

- There are two ways of accessing data sources:
 - Some of them provide with **APIs** to access the requested information
 - For instance, if you request access to the LinkedIn API, it may not be allowed
 - Using **crawling/scraping techniques** to access the desirable information

DATA SOURCES (II)

- *Infojobs* and *Monster* professional networks have been explored for this work:
 - Crawling/Scraping techniques have been employed to obtain the selected information
 - Technology employed to do this:
 - Scrapy framework on Python 2.7
 - XPath that look into HTML in order to extract items at different levels of granularity:
 - A set of offers at the same time
 - Details about a particular offer

DATA SOURCES (III)

- The organization of information is not clear and depends on the particular professional network:
 - For this reason, it is essential to build an ontology, which includes the most relevant parameters, in order to make professional recommendations
 - Each offer is composed of a set of parameters, such as location, category, minimum degree, years of experience...

The screenshot shows a job search interface with a left sidebar for filters and a main content area for job listings. The browser address bar at the top contains the URL: `em_showFilters=false&item_showExtraFilters=false&f2=20&f3=Informática&f4=0&f5=8`.

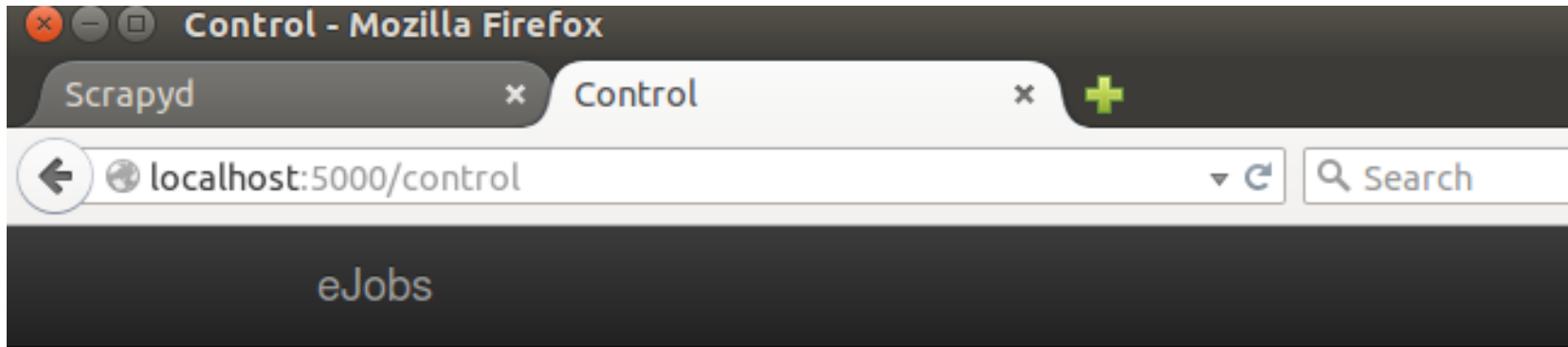
Filters (Left Sidebar):

- Población:** Madrid (252), Alcobendas (17), Pozuelo de Alarcón (8), Tres Cantos (7). [Mostrar todas](#)
- Categoría del puesto:** Informática y telecomunicaciones (212), Ingenieros y técnicos (26), Comercial y ventas (23), Administración de empresas (14). [Mostrar más](#)
- Estudios mínimos:** Ingeniero Técnico (109), Formación Profesional Grado Superior (65), Ingeniero Superior (31), Ciclo Formativo Grado Superior (24). [Mostrar más](#)
- Experiencia (años):**

Job Listings (Main Content):

- COMERCIAL SECTOR INFORMÁTICA**
Madrid | 02 de jun
Contrato Indefinido | Jornada parcial - mañana | Salario no especificado
- Madrid | Hace 3d
Contrato Indefinido | Jornada completa | Salario no especificado
- Formación**
CURSO
Madrid
- INGENIERO Telecomunicaciones/Informática (WIFI)**
Madrid | Hace 22h **Nueva**
Contrato Indefinido | Jornada completa | Salario no especificado
- IT BUSINESS PARTNER**
Madrid | 24 de may

DATA SOURCES (IV)



Control

Intervalo entre analisis

- infojobs (Running...)ccf08ed2268711e68d3e080027ebbf1c
- moster (Running...)ccf5abb0268711e68d3e080027ebbf1c

Aplicar

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DATA ANALYSIS (I)

- Applying some filters for establishing the most relevant information
- Selected indicators:
 - Title
 - Description
 - Duration
 - Category and sub-category
 - Company name and type
 - Location: city/province
 - Requirements: experience, degree title, degree title type, and other requirements
 - Salary: min-salary, max-salary, currency, and frequency
 - Source: Infojobs, Monster...
 - Creation date, old and new offers are stored and maintained in the system

DATA ANALYSIS (II)

- Example:
 - Java programmer
 - This position focuses on programming physical devices
 - 2 years duration
 - Computers and telecommunications categories / Programming sub-category
 - Intel company
 - Location: Madrid, Madrid
 - Requirements: 3 years experience, Master in Computer Science, B2 English
 - Salary: 24.000-27.000 euros per year
 - Infojobs source
 - Creation date: 2016-06-12

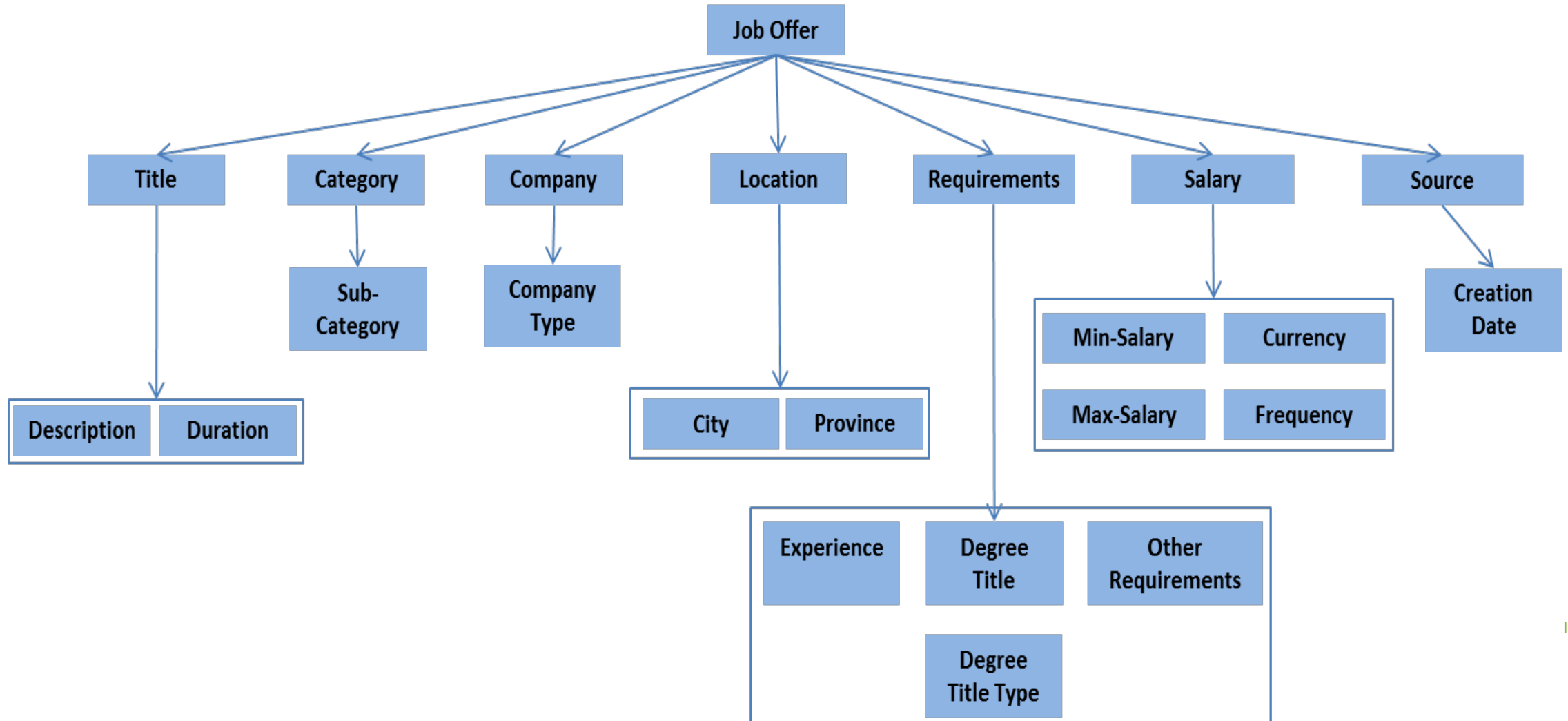
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THE PROPOSED ONTOLOGY (I)

- The proposed ontology is based on the selected indicators/parameters
- It shows the relationship among them, and how some general parameters are deconstructed into several simpler parameters
- For several professional networks, some of the indicators are empty.
 - So, this information must be inferred or calculated
- This ontology has to be linked with students' profiles, in order to make recommendations

THE PROPOSED ONTOLOGY (II)



THE PROPOSED ONTOLOGY (III)

- As a first approximation to making recommendations:
 - An educational profile includes the last and previous *Degree Titles* and *Degree Title Types*, and the student' location
 - Possible recommendations:
 - A set of offers according to his/her degrees and locations
 - Additional studies if he/she wants to reach a set of offers with a higher position, more salary, or a more prestigious company
 - ...

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CONCLUSIONS

- Learning does not take place in an isolated context, it is linked with the professional life of students
- A novel ontology is proposed to match personal studies with professional profiles, by selecting a set of relevant indicators from the studied professional sources
- Several professional sources of information, such as InfoJobs and Monster, have been studied in this work

FUTURE WORK

- Developing a web application in order to recommend job offers to University students (in progress)
 - Students will additionally be able to perform searches according to certain criteria and offer position features, such as location, type of company, duration...
- Adding new professional sources of information, and other kinds of social networks to become complementary
 - Twitter, LinkedIn...
- Linking/extending the ontology with advanced students' educational profiles

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