InfoJobs INNOVATION

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innoquant
advanced analytics computing

EXPLOITING SOCIAL NETWORK ANALYSIS FOR CAREER PATH RECOMMENDATIONS

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OBJECTIVES AND METHODOLOGY

OBJECTIVES

The online job search market has rapidly evolved and has attracted millions of candidates expecting improvement in the process of looking for jobs, and recruiters expecting to find them. There are large employment databases where both candidates and employers store their information, but the knowledge from that data has not yet been fully exploited.

We develop a large-scale graph-based prediction model of labor market and a recommendation system to provide answers to the questions of:

- ***What options you have in your career path?***
- ***Do you need to enhance your skills to move ahead?***
- ***How you compare with people like you?***
- ***What is the social influence of an education center?***

and generate suitable recommendations for both job seekers and employers. Our model has been built from about 1.2 millions of real-world curriculum vitaes, including information on job experiences, skills and education data, and is growing due to new subscribers since the beginning of the year.

INTRODUCTION

- Today, **unemployment** is one of the most pressing socio-economic problems in the European Community.
- In particular, Spain ranks first in unemployment rate among young people under 25 years.
- According to data from Eurostat[3] most people have found their last job through recommendations from family and friends, despite being active job seekers on the Internet.
- **InfoJobs** is the leading online job search portal in Spain with about 47% of market share in 2009 and is ranked third in Europe.
  - The site manages more than 60.000 employers and 4.5 millions of candidates.
  - Last year the site registered 800.000 job offers and more than 51 millions of subscriptions that lead to 250.000 job deals.
  - Each employer contributes an average of 13.3 jobs and that each offer receives an average of 63 subscriptions per year.
- **InnoQuant** is a high-tech startup founded in 2009 in Barcelona, Spain. The company is specialized in exploiting social network analysis for business intelligence applications.
  - Their tools are scientific methodology, advanced algorithms and the state-of-the-art in information technology to exploit network data and improve business processes.
  - The company develops large-scale parallel graph mining framework.

METHODOLOGY

- In our approach, we build a social network model by representing individual actors as nodes and their relationships as links within **career-path graph**.
- A job seeker is related to education centers by its **academic career** and to positions, companies and industry sectors through its **professional trajectory**. Employers generate offers directed to the candidates and education centers provide them training necessary to obtain education and qualifications.
- The relationships between the actors are characterized by duration, management level, salary and other relevant attributes.

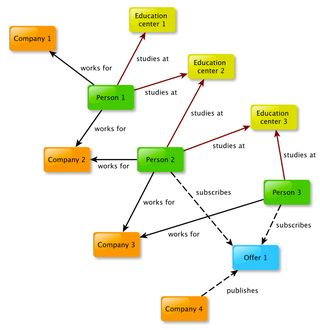

Figure 1. Career-path graph example.

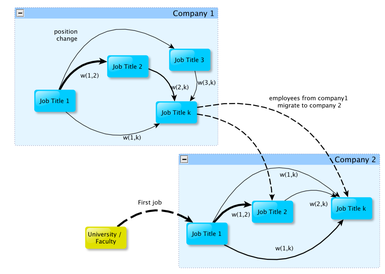

Figure 2. Job position migrations graph.

- To provide recommendations we use a hybrid approach that combines collaborative filtering with social network analysis into ***graph-based collaborative filtering***.
- This approach operates on career-path graph, and also includes attributes of job seeker nodes, offer nodes, and potentially other relevant entities.
- We discover and group similar career paths by analyzing user links in the graph-path perspective and finding cohesive sub-groups.
- To feed the model with the real data, we developed a software infrastructure that tracks evolving career paths from CV of candidates.

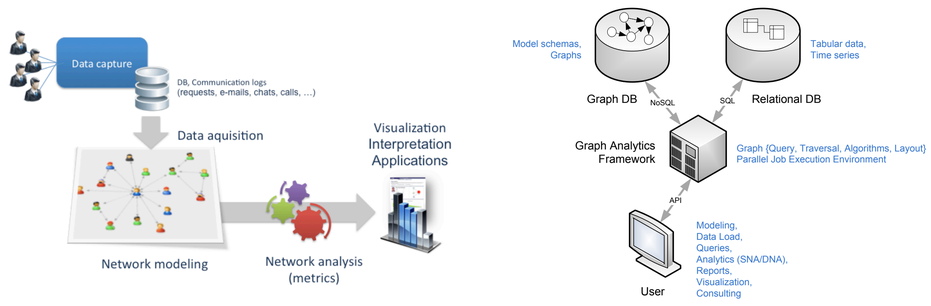

Figure 3. Analysis process and software infrastructure.

RESULTS AND CONCLUSIONS

RESULTS

- We have found that education and professional trajectory network is scale-free.
- Our recommender offers job seekers personalized suggestions on training curses, missing skills, and professional experiences to guide them into successful career paths.
- We discover career path patterns of similar candidates and apply graph-based influence scoring functions to rank the suggestions.
- For example, we measure social and economical impact of each education center on the society in function of jobs, positions, management level and salaries achieved by their graduates.
- In that sense, highly influential centers (such as MBA centers) are more likely to be recommended to candidates with career paths aiming at executive jobs and high salary ranges.

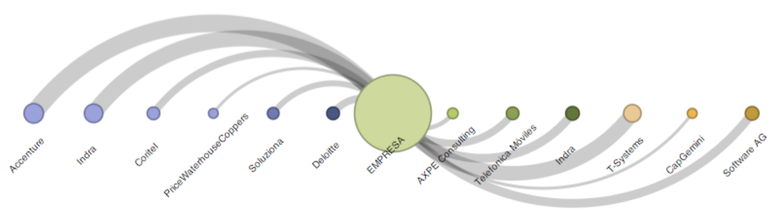

Figure 4. Origin and destination of employees of a sample company.

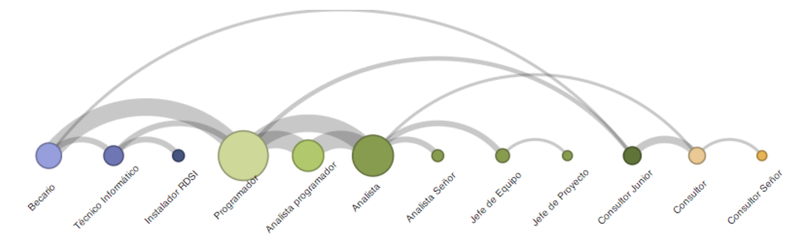

Figure 5. Career paths of employees of a sample company.

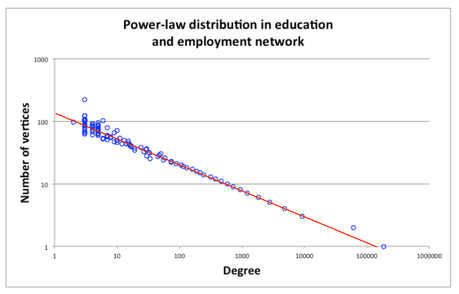

Figure 6. Education and employment network is scale-free.

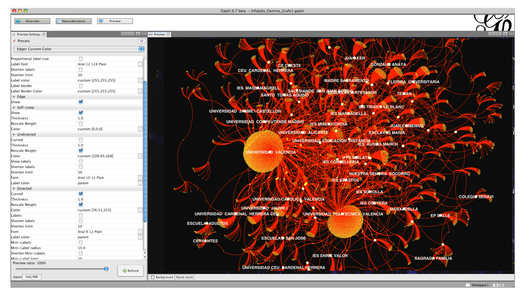

Figure 7. Example education centers network in Valencian Community (Spain). The graph shows relationships between individual students and education centers. The biggest nodes reflect the most influential centers.

CONCLUSIONS

- The wealth of available information enables studying job market trends and user behavior on the education and employment decisions during their careers.
- This collective knowledge can be exploited to help users discover career paths that suit them best and promise to meet their expectations.
- In this work, we apply social network analysis to make better job recommendations. We find that graph-based approach to be a powerful tool that provides great potential in making recommendations.
- Moreover, we demonstrate that out approach operates in high-traffic environment, produces results in real-time, and scales well to large datasets.

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