



UNIVERSITÉ  
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Institut de Recherche  
en Informatique de Toulouse

# Job-Candidate Matching

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# **1. Introduction**

**-IRIT**

**- Agile methodology**

# **2. Description**

**- Working sprints**

# **3. Conclusion**

**- User profile**

**- Personal Experience**

# **4. References**

# 1. Abstract

The aim of this internship is to explore the impact of machine learning techniques on job-candidate matching. Based on a sample of data containing both job offers and CVs.

In a second phase, the goal was to implement a system of vigilance against unfairness due to sensitive features.

# 1. IRIT

This project was proposed and funded by by IRIT a Joint Research Unit of the Centre National de la Recherche Scientifique, the Institut National Polytechnique de Toulouse, the Université Toulouse 3 Paul Sabatier, the Université Toulouse Capitole and the Université Toulouse Jean Jaurès.



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# 1. Team

## **Umberto Grandi**

IRIT affiliated and Computer Science professor in Master MIAAGE 2 IS.

## **Marion Fortin**

Organizational Behavior professor at TSM and Vice President of International Relations at UT Capitole

## **Sylvie Doutre**

Intelligence department of IRIT and Computer Science professor at UT Capitole.

## **Laurent Perrussel**

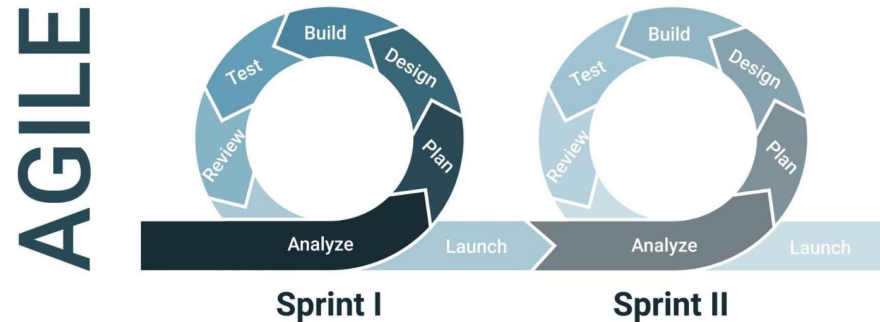
IRIT affiliated and Computer Science professor at UT Capitole

# 1. Agile methodology

We followed iterative and incremental approaches, breaking the project into smaller parts and adjusting to changing requirements.

Agile methodologies prioritize:

- Flexibility
- Collaboration
- Customer satisfaction



## 2. Job - candidate matching

In this internship, I study the design of matching markets which address problems of assignment where each participant is matched in some way, and where participants differ in preferences for their part of a match.

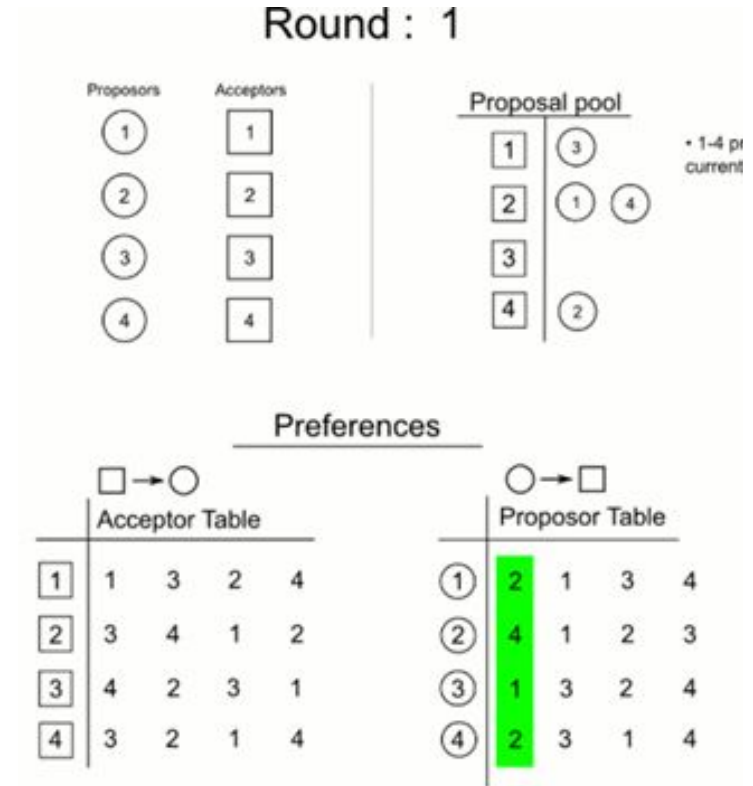
Matching markets are used in a number of real-world settings:

- assigning graduating medical students to hospitals
- public school assignment

## 2. Gale-Shapley algorithm

A.k.a a proposed-reject algorithm, proved that a stable matching does indeed always exist.

It verifies that any candidate and item not matched to each other, do not prefer each other over their actual match.





## 2. Recsys Challenge 2017

It was organised by XING, Politecnico Milano and Free University of Bozen-Bolzano. This edition of the Recsys Challenge aimed to better **connect job seekers and recruiters** via job recommendations.

Its dataset contains interactions between users and jobs, where we could obtain also preferences from both parties.

0: impression, 1:click 2: bookmark,

3: reply, 5: recruiter intertest

```
user,item,interaction,timestamp  
1,46763,0,1483991416  
1,173483,0,1483991262
```

## 2. Recsys Challenge 2017

18.7 M  
interactions

1 M users

0.5 M items

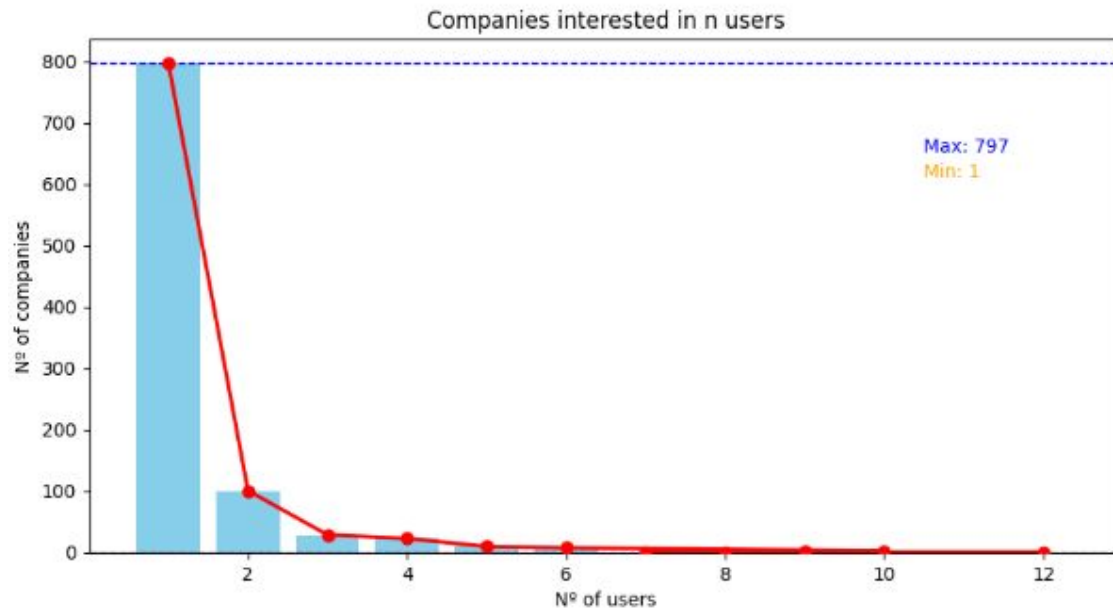


Figure 1. Number of companies interested in n users.

## 2. Recsys Challenge 2017

In the first stage we considered “match” as the situation where job  $j$  saw the profile of user  $u$  and  $u$  replies back to  $j$ :

Match 3

$A[\text{interaction} = 3]$

$\cap$

$A[\text{interaction} = 5]$

**Table 1: Statistics about interactions, from 2 different subsets.**

	Interactions 3	Interactions 123
mode	1 (23,476 users)	1 (188,953 users)
max/user	150	695
average/user	1.8	6.8
total	62,321	3,727,897

## 2. Recsys Challenge 2017

1360 views from  
jobs

977 unique jobs

81 matches

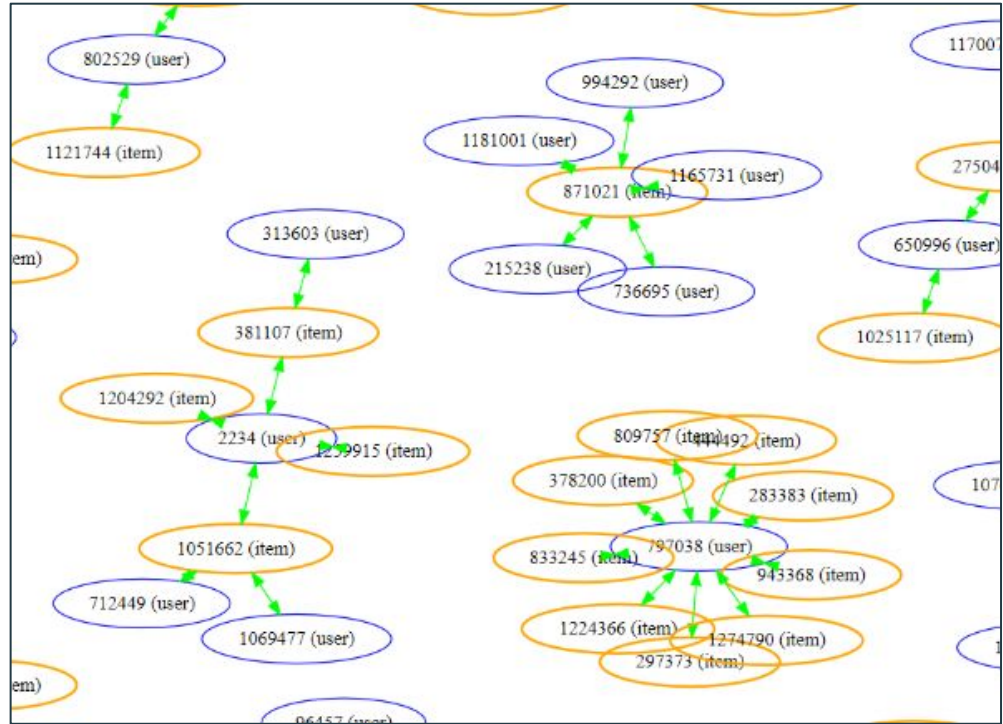


Figure 2. Fragment of graph showing all interactions from users who at least have 1 match.

## 2. Recsys Challenge 2017

We thought it would be interesting to know the total interactions of those users from previous graph, even if there was no match.

754 vertices

60 users

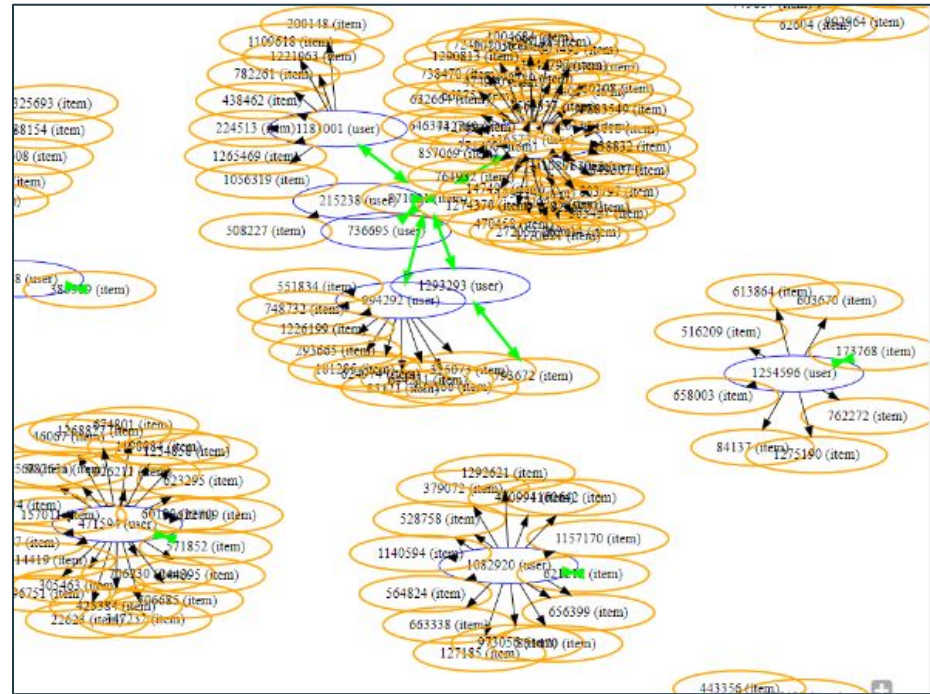


Figure 3. Fragment of graph showing all interactions from users who at least have 1 match.

### 3. Extensions points

- Find **correlation** between users attributes and the number of interactions that these users receive from jobs. Solution: Decision Tree Classifier.
- **Fairness assessment**: evaluating fairness-related metrics and mitigating disparity. Solution: sensitive features.
- Train a machine learning model to **recommend a job** for a given user according to its attributes.

### 3. Technologies



### 3. User profile of the research

The internship was dedicated to research about job-candidate matchings and how to effectively choose the most adequate person for each position. The conclusion of this study aims to:

- facilitate users from platforms like XING, to understand the features which companies are interested in.
- Implement new technologies in job platforms or other recommender services to assure the best possible match.



### 3. Personal experience

This experience has allowed me to become more familiar to the domain of scientific research, and learn more about the roles of PhD students and professors in IRIT.

The seminars that I attended during this period of time have provided me with new interesting topics in current computer science research, letting me know about the work done from important members from IRIT.

## 4. References

- IRIT. (n. d.). Presentation. Retrieved from <https://www.irit.fr/en/laboratory/laboratory-presentation/>
- GeeksforGeeks. What is Agile Methodology? Retrieved 11/03/2024, from <https://www.geeksforgeeks.org/what-is-agile-methodology/>
- Wagner, Roy (April 2009). "Mathematical marriages: Intercourse between mathematics and semiotic choice". *Social Studies of Science*. 39 (2): 289–308.
- ACM RecSys Challenge 2017. (n. d.). Homepage. Retrieved from <https://www.recsyschallenge.com/2017/>

A top-down photograph of a wooden-framed letterboard with a black felt surface. The words "Thank You" are written in white, serif, all-caps letter tiles, centered on the board. The board is placed on a dark, weathered wooden plank surface. In the bottom-left corner, a portion of a vintage orange rotary telephone is visible. In the bottom-right corner, a portion of a vintage typewriter is visible. A green leafy plant is in the top-right corner.

Thank  
You