

Matching algorithms @ ADEM

International workshop Latvia – 07/12/2023

ADEM's context

eADEM: Development of a new matching tool by external providers (deadline Dec/2025)

New paradigms:

- Opening up matching solution directly to external users (incl. non-registered)
- Skills-based matching in addition to other criteria (transition to ESCO framework)
 - Using AI techniques for skills identification and learning from job portal data
- Matching not only with specific job ads but also trainings (& potential professions through up/reskilling)

Strategic objectives



- Finding more & less obvious matches to reduce labour shortages
- Guide toward relevant trainings to reduce skills gap
- Self-service possibility / Ease of use for jobseekers & employers
- Automation where possible / Freeing up time of counsellors
- Counsellor trust & buy-in
- Inclusivity of candidates with less skills/experience or need for reskilling & of employers with less formalized recruitment capacity
- Transparency & Fairness

Questions arising in this project

- ? Capturing skills (in job ads and candidate profiles), where relevant and in good quality → Incentives for data input & skills validation?
- ? Added value of AI vs other approaches & complementarity of rule-based/AI-based/counselor-based matching
- ? Explainability of skills extraction and matching scores; avoiding bias
- ? Improving machine learning models through feedback loops
- ? Multi-language capacity
- ? Future organizational/HR needs to work with new matching tool

Support via **Mutual Assistance Programme (MAP)**
from European Commission, VDAB (BE – Flanders) & Arbetsförmedlingen (SE)

Insights from 1st MAP workshop

- ❖ Capturing transferrable skills can broaden matching opportunities and “nudge” users to “open their minds” to new possibilities
- ❖ Matching is broader than a skills equation, “softer elements” (preferences, values, etc.) also play a role as well as hard constraints
- ❖ PES needs to decide how much freedom they want to give to candidates/employers when it comes to defining skills and taking into account preferences in the matching (preferences vs labour market reality)
- ❖ Improving matching is not only about filling skills gaps in candidates but also getting employers to be more flexible; skills-based approach only works if employers play the game
- ❖ AI is not a solution for everything and can be “overkill” in some cases → Matching solution can be a multi-model architecture, using different techniques
- ❖ Matching solutions and guidance solutions are currently often separated → need to work on an integrated user journey
- ❖ PES cannot take automated decisions based on AI, human intervention is critical, but then we need to properly engage counsellors and external users
- ❖ More efforts need to be put into evaluating the success of the tools, especially what works/doesn't work for specific user groups
- ❖ Important resources are needed for these developments and even more for their maintenance/improvement/“nurturing”

Skills tagging algorithms – current experience

Description publique (JobBoard, Bornes, ...)

Qualifications:

Degree in Data Science, Computer Science, Statistics, or a related field.
 Proven experience as a Data Analyst/Scientist or Technical Product Manager.
 2+ years of experience producing statistics and analytical reviews of complex data sets
 Proficiency in R, Python, **SQL**, and data visualization. Experience using known BI reporting tools or others.
 Ability to set up clear automated dashboards and reports for consumption by key stakeholders.

When we find a match,
we record the skill in a flatfile

vacancy_id	language_ad	skill
xxxxxxx	English	SQL

Search skills

SQL Find Show filters

Hierarchy view

SQL

Search result

- SQL
- SQL Server
- SQL Server Integration Services
- database management systems
- NoSQL
- operate relational database management system

software and applications development and analysis >
 knowledge > information and communication technologies (icts) >
 information and communication technologies (icts) >
 software and applications development and analysis > query languages > SQL

Description

Description

The computer language SQL is a query language for retrieval of information

ESCO
taxonomy

Skills tagging algorithms – current experience

- Different actors developed a variety of approaches
- 3 broad groups of approaches for NLP:

used

- **Text matching**: Experts define labels for each skill → labels are searched in the text

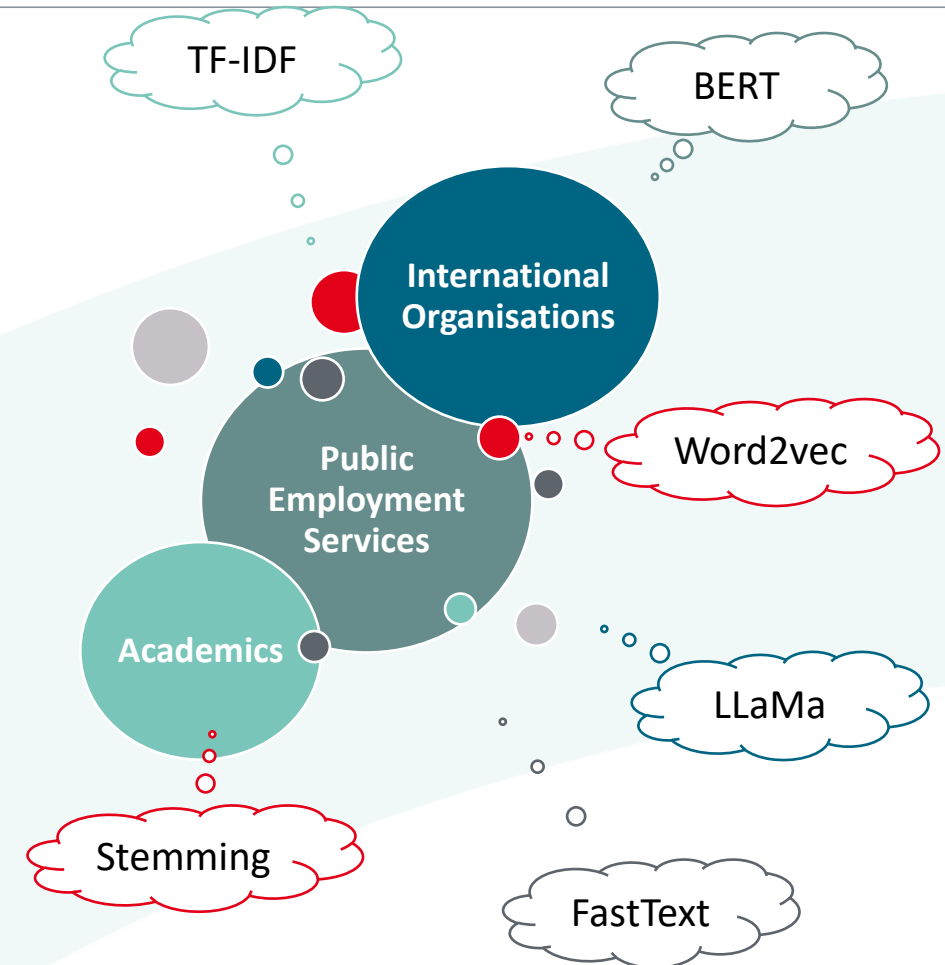
tested

- **Augmented text matching**: Similar to text matching → but before labels are searched, they are augmented through NLP techniques to find similar expressions

planned

- **Paragraph embedding**: NLP models transform job ads and skill descriptions into numeric vectors → A skill is required by an ad when the two vectors are “close enough”

- To be **complemented by a machine learning model** (based on human annotation) for higher-order ESCO skills



Skills tagging algorithms – current experience

Conclusions:

- Results today are already useful for decision-making (and the ESCO resources were a big help!)
- When a skill is detected, the probability is high that it is actually there (important anomalies can be detected and corrected)
- The biggest problems are the (often generic) skills that are not detected (→ complement workflow with machine learning approach or paragraph embedding)
- Input language (& translation) seems to play a role in the quality of results
- In-depth evaluation of results is time-consuming but fundamental
- Importance for more collaboration across countries (and with European Commission)