Rise of the machines:

Artificial Intelligence and Job Matching

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# **Introduction**

Well performing labour markets depend on effective job matching processes. All other things being equal, an efficient job matching system will connect people with vacancies quickly and lead to higher employment. On the other hand, if it takes too long to match people with jobs, unemployment will be higher, incomes will be lower as will economic growth. Another aspect is that the quality of job matches is also important as poor job matching imposes economic and social costs. Having less productive workers in a job lowers productivity.

Job matching can, however, be costly, and time-consuming, and cause market failure due to asymmetric and imperfect information. Artificial Intelligence (AI) offers potential for improving the speed and quality of job matching.

Although the use of AI in Australia is new, it has been estimated that there are now more than 250 commercial AI recruitment/job matching tools available in Australia. As noted in the Guardian Australia, one in three Australian organisations reported that they had used AI tools when filling vacancies[[1]](#footnote-1). A 2023 survey conducted by SmartRecruiters revealed that over 75 per cent of Australian recruitment professionals are using AI technology in their recruitment decisions[[2]](#footnote-2).Broecke (2023) has noted that:

… a range of Artificial Intelligence (AI) applications have emerged in recent years that can be used at various stages of the matching process. These tools claim they can bring efficiencies and cost savings, faster and better quality matching using larger applicant pools, as well as ways of improving diversity and addressing human bias and discrimination[[3]](#footnote-3).

This paper surveys the state of AI in recruitment and job matching. The primary source for this paper is a 2023 OECD paper by Broecke.

# **Artificial Intelligence and how it is being used in job matching**

The OECD defines AI in the following terms:

An AI system is a machine-based system that, for explicit or implicit objectives, infers, from the input it receives, how to generate outputs such as predictions, content, recommendations, or decisions that can influence physical or virtual environments. Different AI systems vary in their levels of autonomy and adaptiveness after deployment[[4]](#footnote-4).

In practical terms AI is being used for various stages of the job matching process, from developing job descriptions, attracting the best candidates, applicant sourcing and screening, and even interviewing candidates and making job offers.

John Shields, Professor of Human Resource Management and Organisational Studies at the University of Sydney Business School, notes that AI is about “quickly and effectively managing huge bodies of information on candidates” thereby achieving “a strong alignment between individual and organisation, or individual and job, mitigating the issues and cost of a mis-hire.” Sue Williamson, Associate Professor of Human Resources Management at the University of New South Wales states that employers are turning to AI because the typical, traditional recruiting process – application, interview, work test, referee contact – is onerous and time-consuming” and does not always result in the best person for a job[[5]](#footnote-5).

## **Job Descriptions and advertisements**

Drafting a job description is often the first stage in the job matching process. It is important because the quality of a job description can determine whether candidates will choose to apply. AI tools that help with job descriptions use data from large quantities of published vacancies. These tools analyse the content of résumés and job vacancies, as well as that of occupational classifications to recommend what to include in the job description.

AI tools offer the capability to help employers, employment service providers and recruitment companies optimise the search for the best candidates by identifying the core skills, qualifications, and responsibilities for a particular job or role. They can use this information to develop a job advertisement that is attractive to candidates and ensure that language and branding is consistent across other job advertisements.

An example of using AI in an employment services setting is in Belgium where the Public Employment Service (VDAB) uses AI to identify skills and competencies that an employer may consider, adding these to the job description and identifying the occupation that best matches the particular job vacancy. The tool estimates the vacancy’s ‘distance’ from 600 occupations included in the Belgian occupational classification as well as competencies and labels the job description and job advertisement with the ‘closest’ matching occupation.

AI tools can also help recruiters avoid language which might deter certain candidates from applying (for example, women and people from cultural minorities) so as to attract a greater diversity in applicants. According to Broecke (2023, p.20) research has shown that men and women react differently to words used in job vacancies. For example, job advertisements with more ‘masculine’ wording such as “leader”, “competitive” and “dominant” attract fewer women.

## **Résumé building and analysis**

There are AI tools that help candidates write résumés and cover letters. These tools draw on databases of résumés and job vacancies to look for similarities in skills and experience. They then recommend keywords and terms to include that will make a candidate’s résumé or cover letter more likely to be picked for shortlisting or an interview. AI can also improve the quality of a candidate’s résumé and cover letter, for example, by identifying and suggesting skills that they may possess but may have forgotten to include. These ‘recommendations’ are based on skills typically associated with various qualifications.

AI can help job seekers save time and effort by extracting relevant formation from their résumé and other documents (e.g., LinkedIn profiles) to automatically complete online applications. Black and van Esch (p. 19) note that Unilever asks candidates to submit their LinkedIn profile and their AI system combs through the candidate’s profile to complete the application. Another example is in Belgium where the VDAB’s Competency-Seeker tool is used by Public Employment Service case workers to help job seekers identify their skills and competencies. The Competency-Seeker tool analyses the content of the job seeker’s résumé and application as well as the job advertisement to suggest skills and competencies not mentioned by the job seeker in their uploaded application. For example, it will propose specifying the job seeker has a forklift licence for a job application where the advertisement is for a warehousing job (Broecke, 2023, p.20).

## **Sourcing candidates**

AI allows employers to reach out and even target potential candidates. This can be done by searching on-line profiles and behaviours (e.g., LinkedIn and Indeed) to identify who might be interested in a particular job advertisement. These approaches mean that employers can reach candidates on social media who may not have been looking for a particular vacancy. There are tools (e.g., Entelo) that can be used to target individuals based on the predicted likelihood of leaving their current job, using company staff turnover rates and negative social media posts.

AI can also help reach out to specific target audiences, such as racial minorities or certain professions. For example, the Belgian VDAB uses a tool called Talent API which selects the candidate profiles that are most similar to those the employer has already looked at and wants to consider.

## **Job search**

AI tools can help individuals by tailoring job recommendations. Algorithms measure similarities between a job seeker’s profile and advertised vacancy descriptions to suggest potential matching opportunities, ranked in order of relevance. Recommendations also learn from a job seeker’s online job search history (through a process called ‘content based filtering’) to recommend vacancies aligned with their skills, experience, and interests. The Belgian VDAB application Talent API provides job seekers with a shortlist of job vacancies that best match their profile. Some tools also use ‘collaborative filtering’, which seeks to predict the kind of vacancies the job seeker might be interested in, based on the types of jobs people with similar backgrounds are applying for[[6]](#footnote-6).

## **Screening and shortlisting**

Screening and shortlisting are often the most time consuming part of a recruitment process for employers. AI parsing tools can help employers review résumés and rank/shortlist candidates according to how well their qualifications, skills and experience match the job description, taking into account the employer’s past screening and hiring decisions. There are also tools that allow employers to undertake background checks on applicants, including social media activities. For example, the AI tool Fame, looks for and flags social media and online history related to misogyny, bigotry, racism, violence, and antisocial behaviour.

There are chat bots that engage with candidates after they apply for a job to assess and check whether they meet certain minimum requirements for the position, such as certain experience/qualifications, tickets/licenses, drivers’ licences and other requirements, thereby removing the need for manual searches. Candidates without these are eliminated from the pool of applicants, thereby saving time.

## **Interviewing**

AI tools can help automate administrative tasks such as organising and scheduling of interviews. Other tools, particularly chat bots, help communicate with candidates, answering basic and common questions. Chat bots can also provide immediate feedback to applicants whose skills or qualifications do not meet the job requirements, so they are not left hanging on.

AI solutions are starting to be introduced to help save time and improve candidate assessment at interview. Tools (such as HireVue) claim to be able help recruiters analyse data collected during the interview. These tools use computer vision, natural language processing and audio analysis to assess the pace, body language, dress standards, eye contact, facial motion, etc. of candidates to score them on communication, professionalism, sociability, and attitude. Some AI tools (for example Begom) assist employers in post-interview negotiations, particularly around pay, benefits and conditions.

There are also tools that job seekers can use to help prepare for interviews (for example, Mya, Interviewing.IO, and Final Round AI Interview Copilot). These give feedback to help applicants improve their verbal communication and interpersonal skills.

# **Potential benefits of Artificial Intelligence in job matching**

Proponents of using AI in recruitment and job matching make many claims about its potential benefits such as improved efficiency and reduced costs, better quality job matching, better candidate experiences, and overcoming bias and discrimination.

In relation to improved efficiency and cost savings, a number of studies point to AI offering lower recruitment costs and faster recruitment times. It is highly likely that this is the case, particularly for companies with high volumes of applicants. However, there is very little independent research with most studies coming from firms developing and marketing AI tools.

It is claimed that AI can result in higher quality job matching by making recruitment quicker and cheaper, which in turn allows employers to have access to a larger pool off external candidates with the right skill set. Recruiters and employers also benefit from improved data on candidates leading to better recruitment decisions. There are also benefits from reducing the time recruitment staff spend on administration, enabling them to focus on value added tasks such as interviewing candidates and negotiating with successful candidates.

A potential benefit is that AI can improve the experience candidates have with the recruitment process and that this has spin-off benefits by increasing the attractiveness of the organisation. It is claimed that many job applicants are often dissatisfied with the lack of communication from employers about their application and that quick decisions due to AI and/or use of chat bots to provide personalised feedback can help overcome this. However, as outlined below, many job seekers report negative attitudes toward AI recruitment tools.

As noted previously, a common claim is that AI can help overcome human bias and reduce discrimination against women and minority groups by introducing objectivity and neutrality in the selection process. Broecke (2023) points to efforts to develop tools that seek to reduce bias by (a) setting quotas for the share of candidates from identified diversity groups, and (b) feeding AI tools artificial profiles so they learn to select a more diverse pool of candidates.

AI has not, however, always delivered on the promise of removing biases. There is research showing that some AI-assessed job applications reinforce biases against women and other minorities. An oft stated example of this was Amazon, where the AI tool used gave preference to men because it had been trained on historical hiring data, which consisted primarily of male candidates. Another example is from Australia where, in 2022, the Merit Protection Commissioner issued new guidance for public sector agencies after overturning 11 promotion decisions made by Services Australia because they were made using AI-assisted and automated selection techniques with no human review, leading to meritorious applicants missing out on promotions[[7]](#footnote-7).

# **Potential risks associated with Artificial Intelligence**

Broecke (2023, p. 34-5) indicates that while there is not a great deal of evidence on the take-up of AI in recruitment and job matching, it does appear that larger, particularly multinational firms are the greatest adopters. He proposes that that the market for and use of AI recruitment and job matching tools is expected to grow significantly over the coming few years but that the speed of adoption will depend on the extent to which the risks associated with widespread adoption can be overcome.

A key risk is a high of level negative attitudes amongst job seekers with the use of AI technology. A number of studies point to a lack of enthusiasm amongst job candidates in applying for jobs with companies that use AI recruitment tools. For example, a study by the American Staffing Association (2016, p.101 cited in Broecke (2023), p.39), found that 77% of job seekers preferred human interaction when applying for jobs. There is some evidence that negative attitudes towards AI decision-making affect candidates’ perception of companies and can result in smaller applicant pools.Gonzales, et.al., (2019, p.105) found that job seekers have less trust in organisations using AI to make recruitment decisions.

Another concern is that by automating and removing humans and personal interaction, AI dehumanises the recruitment and job matching process. This in turn will impact negatively on an organisation’s attractiveness for potential candidates, leading to fewer quality applicants. Gonzalez et al. (2019, p.105) found that job applicants reacted less favourably to AI decision makers than to human ones, raising concerns about the lack of dignified treatment and communication.

A number of AI tools have received negative publicity as a result of biased recommendations (e.g., the Amazon case cited above). Bias is harmful to both candidates and recruiting employers. Employers face reputational and legal risks if the tools they use, and decisions made are found to be discriminatory. Furthermore, employers using biased AI tools are likely to miss out on the best candidates. Bias in AI tools can arise when the quality and the representativeness of data used to train AI vary in ways that correlate with certain group membership. For example, the quality of data for Indigenous applicants might be poorer for certain jobs because they have not historically applied for them. Bias can also enter into AI algorithms because the humans who code them are themselves biased. Human beings are often biased and, if AI is trained on historical data that reflects biased human decisions, then it will tend to replicate, and possibly exacerbate these biases. Related to this, some studies have shown that AI developers come from a narrow ‘gene pool.’ Simonite (2018, cited in Broecke (2023), p.45), for example, estimated that just 12% of machine learning researchers were women.

Privacy is a key issue for the use of AI, particularly given privacy legislation in countries such as Australia. In particular there are concerns that AI can be used to put data and information, particularly from social media, for purposes for which it was not intended and used to discriminate against certain cohorts. Kosinski, et.al., ((2013) cited in Broecke (2013), p.48) notes what he calls a “particularly worrying phenomenon” of using social media data to infer protected characteristics such as gender, ethnicity, likelihood of becoming pregnant, sexual orientation, and religious, and political views.

# **What Artificial Intelligence can’t yet do**

As we have seen, AI offers many advantages for employers and employment service providers in improving the speed and quality of job matching and recruitment. However, it is not yet, if it ever will be, at the stage where it can take humans totally out of the process. This is not to say that people are flawless. All humans have biases and prejudices that impact on their daily life, and which also enter into the job matching and recruitment process.

AI is good at recognising patterns and using these to respond and make decisions based on predefined algorithms. However, because AI lacks an understanding of human emotions and behaviour, it does not possess emotional intelligence and empathy. Emotional intelligence is essential in human interactions. People are social animals and day to day interactions, including those in the workplace, involve interpreting subtle cues, understanding context, and adapting on the fly. This limitation means that while AI can introduce efficiencies and help with various stages of job matching and recruitment decisions it is not a substitute for human involvement. Recruitment decisions often come down to intuition based on life-long experience and subtle cues picked up in interactions with candidates.

Related to this, AI seems to lack common sense. Common sense is the ability to think and behave in a reasonable way and to make good decisions. As noted by Choi (2022):

One of the fundamental limitations of AI can be characterized as its lack of commonsense intelligence: the ability to reason intuitively about everyday situations and events, which requires rich background knowledge about how the physical and social world works.

While AI systems are very good at specific tasks, they often lack the broader understanding and intuition that humans have based on having a broader perspective. This means that people are still best placed to identify personal and other traits (such as interpersonal communication skills, soft skills, workstyle, work ethic, etc) that can make a candidate a good fit for the organisation. This is particularly the case for ‘outliers’ who may appear on the face of it to be unsuitable, but who may be good fits. Several years ago, a public sector agency I worked in used video résumés and early AI tools to select graduates. The end result was a failure to select data analysts because they did not possess strong presentational and interpersonal skills, leading to a capability gap that lasted several years. Quite simply, there was a failure of common sense to understand that the key requirement was data and analytical skills and that other employability skills for these crucial roles could be developed in the job.

# **Conclusions**

Whether we like it or not, AI is here to stay, and it is inevitable that there will be greater take-up of these tools over the coming decade. AI job matching and recruitment tools offer many benefits to employers, employment service providers and job seekers. AI tools will continue to play a greater role in helping employers at all stages of the recruitment process from developing job descriptions and advertisements to screening applicants, interviewing and even selection. Employment service providers will also make greater use of these tools to help job seekers write quality résumés and cover letters, tailor vacancy recommendations and help them prepare for interviews.

However, like any new technology, there are risks that cannot be ignored. In particular, there are concerns around dehumanising the recruitment/job matching experience, entrenching bias and discrimination, and privacy. Over time society and governments will deal with these issues, just as we have dealt with the downsides associated with other technologies.

There remain tasks that humans perform better at than AI technologies. This is because, unlike AI, people possess emotional intelligence and empathy, and use common sense in everyday decision making. This means that people will continue to play the central role in the job matching and recruitment process for some time yet.

# **References**

Black, J. and van Esch. P (2020). “AI-enabled recruiting: What is it and how should a manager use it?”, *Business Horizons*, Vol. 63/2, pp. 215-226. Available at: <https://doi.org/10.1016/J.BUSHOR.2019.12.001>

Bogen, M. and Rieke, A. (2018). *Help Wanted: An Examination of Hiring Algorithms, Equity, and Bias*. Available at: [https://www.upturn.org/static/reports/2018/hiring-algorithms/files/Upturn%20--%20Help%20Wanted%20-%20An%20Exploration%20of%20Hiring%20Algorithms,%20Equity%20and%20Bias.pdf](https://www.upturn.org/static/reports/2018/hiring-algorithms/files/Upturn%20--%20Help%20Wanted%20-%20An%20Exploration%20of%20Hiring%20Algorithms%2C%20Equity%20and%20Bias.pdf)

Broecke, S. (2023). Artificial Intelligence and Labour Market Matching, OECD Social, Employment and Migration Working Papers No. 283. Available at: <https://www.theguardian.com/technology/2023/oct/23/ai-recruitment-job-search-artificial-intelligence-employment>

Choi, Y (2022). “The Curious Case of Commonsense Intelligence” *Daedalus*, 151 (2), pp.139–155. Available at: <https://direct.mit.edu/daed/article/151/2/139/110627/The-Curious-Case-of-Commonsense-Intelligence>

Dequito, Imre (2023). “Australian recruiters increasingly utilising AI in talent acquisition, survey shows”, *CFOtech*. Available at: <https://cfotech.com.au/story/australian-recruiters-increasingly-utilising-ai-in-talent-acquisition-survey-shows>

Gonzales, et.al., (2019). “Where’s the I-O?” Artificial Intelligence and Machine Learning in Talent Management Systems”, *Personnel Assessment and Decisions*, Vol. 5(3). Available at: <https://doi.org/10.25035/pad.2019.03.005>

Guardian Australia (2023). “Recruitment by robot: how AI is changing the way Australian get jobs”, 23 October 2023. Available at: <https://www.theguardian.com/technology/2023/oct/23/ai-recruitment-job-search-artificial-intelligence-employment>

Raj, D. (2023). “Humans at Work”, *Make Use of*, 8 November 2023. Available at: <https://www.makeuseof.com/reasons-artificial-intelligence-cant-replace-humans/>

Toews, R, (2021). “What Artificial Intelligence still can’t do”, *Forbes*, 1 June 2021. Available at: <https://www.forbes.com/sites/robtoews/2021/06/01/what-artificial-intelligence-still-cant-do/>

1. See *The Guardian*, “Recruitment by robot: how AI is changing the way Australian get jobs”, 23 October 2023 available at: <https://www.theguardian.com/technology/2023/oct/23/ai-recruitment-job-search-artificial-intelligence-employment> [↑](#footnote-ref-1)
2. I. Dequito (2023) Australian recruiters increasingly utilising AI in talent acquisition, survey shows, CFOtech, available a:t <https://cfotech.com.au/story/australian-recruiters-increasingly-utilising-ai-in-talent-acquisition-survey-shows> [↑](#footnote-ref-2)
3. Stijn Broecke (2023) *Artificial Intelligence and Labour Market Matching*, OECD Social, Employment and Migration Working Papers No. 283, p. 10. [↑](#footnote-ref-3)
4. See S. Russell et.al., (2023) “Updates to the OECD’s definition of an AI system explained” at <https://oecd.ai/en/wonk/ai-system-definition-update> [↑](#footnote-ref-4)
5. See *Guardian Australia*, “Recruitment by robot: how AI is changing the way Australian get jobs”, 23 October 2023 available at: <https://www.theguardian.com/technology/2023/oct/23/ai-recruitment-job-search-artificial-intelligence-employment> [↑](#footnote-ref-5)
6. See Bogen and Riecke (2018) Help Wanted: An Examination of Hiring Algorithms, Equity, and

Bias, p.20, available at: [https://www.upturn.org/static/reports/2018/hiring-algorithms/files/Upturn%20--%20Help%20Wanted%20-%20An%20Exploration%20of%20Hiring%20Algorithms,%20Equity%20and%20Bias.pdf](https://www.upturn.org/static/reports/2018/hiring-algorithms/files/Upturn%20--%20Help%20Wanted%20-%20An%20Exploration%20of%20Hiring%20Algorithms%2C%20Equity%20and%20Bias.pdf) [↑](#footnote-ref-6)
7. *Guardian Australia*, “Recruitment by robot: how AI is changing the way Australian get jobs”, 23 October 2023 available at: <https://www.theguardian.com/technology/2023/oct/23/ai-recruitment-job-search-artificial-intelligence-employment> [↑](#footnote-ref-7)