



Submission to the Australian
Human Rights Commission

Human Rights and Technology

2 October 2018

Introduction

Pymetrics is pleased to provide a submission to the Australian Human Rights Commission in support of its project on Human Rights and Technology.

We are an enterprise Software as a Service (SaaS) company that uses gold standard neuroscience and artificial intelligence (AI) to make the recruitment process more effective, accurate, and unbiased.

In the following submission, we have provided our views on several of the issues and questions raised in the Human Rights and Technology Issues Paper. Given hiring and workforce insights is our area of expertise, we have provided our input within that construct.

Access to employment is a lifeline. Sexism and racism in hiring, crushing job loss from automation for the working class, and stunning lack of access to good jobs for disadvantaged populations all prevent access to employment. Pymetrics tackles all these with deceptively simple neuroscience games and AI.

Founded in 2013 by Harvard and MIT-trained PhDs, pymetrics uses neuroscience data and AI to help global clients like Unilever, Accenture and LinkedIn make their hiring and internal mobility more predictive and less biased. We have over 60 enterprise clients and offices in New York City, London, Singapore and Sydney. More than one million job candidates around the world have played pymetrics' games and we are live and compliant in 68 countries, in 16 languages, and across web, Android and iOS apps.

Pymetrics was named a [Technology Pioneer by the World Economic Forum](#) for its breakthrough work to bring efficacy and equality to the hiring process. The World Economic Forum's Technology Pioneers community are early-stage companies from around the world that are involved in the design, development and deployment of new technologies and innovations, and are poised to have a significant impact on business and society.

Pymetrics replaces the resume as a first-pass filter by using online game play to assess candidates based on their true potential – their inherent cognitive and emotional make-up. Using algorithms that are trained on high-performing employees at a company, pymetrics builds a trait profile of a company's top performers to select best fit talent. These algorithms are proactively audited for demographic bias using an algorithmic bias detection tool, which evaluates candidates based on their cognitive and emotional traits rather than their resume, reducing the likelihood of implicit bias against applicants based on gender or race that is sadly common in the traditional hiring context. If a person is not appropriate for the initial job, pymetrics will match the individual to other opportunities within the same or at a different company.

The pymetrics platform also helps companies with workforce insights and internal mobility, matching existing employees with new roles within their organization.

Companies like Unilever, Accenture and others have seen results like doubling hire yield, increasing diversity of hires up to 20 percent and increasing retention by 65 percent using the pymetrics platform.

We agree with the assertion in the Human Rights and Technology Issues Paper that AI-informed decision-making systems run the risk of being unjust. As creators of technology, we feel strongly that it is our responsibility to build AI that is creating a future in which we all want to live. This year, pymetrics open-sourced its algorithmic bias detection tool, [Audit-AI](#), in an effort to help technology creators who share the vision of fairness in machine learning and AI-assisted decision making detect bias in their technology.

We have broken down our submission into the following areas:

1. Pymetrics: A practical example of how AI can be used to promote diversity in hiring;
2. Technology and gender equity in hiring;
3. The Fourth Industrial Revolution and re-skilling our workforce;
4. Supporting people who face barriers to economic participation; and
5. Removing bias from algorithms.

1. Pymetrics: A practical example of how AI can be used to promote diversity

For decades, traditional hiring practices have led companies and candidates to make critical employment decisions using an archaic, analog process: matching a resume to a job description. This process has been a terrible predictor of success -- with 30 to 50 percent of new hires failing within the first year -- and has been proven to be biased against women, minorities and people from lower socioeconomic backgrounds. It is no wonder given that even if a resume makes it past the electronic applicant tracking system (ATS) which filters resumes for keywords, a [study found recruiters spend an average of only six seconds](#) reviewing an individual resume.

pymetrics is reinventing hiring by evaluating a person's fit for a job using neuroscience-based games and AI that evaluate their inherent cognitive, emotional and personality traits instead of their resume.

The process is as follows: a company's own high-performing incumbents play the pymetrics games, which evaluate a range of cognitive, social and emotional traits. Pymetrics builds an algorithm that identifies the trait profile that predicts success in the role. The algorithms are then tested and iteratively processed to remove any gender, ethnic, or other biases introduced by historical hiring patterns.

Next, job candidates play the same neuroscience-based games. Machine learning algorithms are then used to match between the traits of the candidate and the predictive model deduced from the traits of the high performing incumbents. If the candidate is determined to be a fit, they are immediately moved to the next stage of the application process. If they are not a fit based on their inherent traits, pymetrics can recommend other jobs to the candidate based on their traits.

Unlike a standardised test where there is a "good" and "bad" score, pymetrics simply matches role profiles to a candidate's profile, each of which are as unique as a DNA blueprint. Both companies and people are matched with diverse options rather than assuming a winner-loser scenario where "top" companies get "great" employees, and "average" companies get "the rest".

Putting this technology to use, pymetrics entirely reinvented Unilever's global entry-level hiring process. Unilever threw out the resume, using pymetrics to assess and sort 300,00 candidates in 70 countries into roles ranging from marketing to operations. The results were unprecedented: candidates matched through pymetrics were twice as likely to get hired than those selected the previous year through the resume-based process. They hired their most diverse class in history across gender, ethnic, and socioeconomic status -- proving that people's inherent traits are much more predictive than their pedigree. They reduced a four-month process to a two-week process. Finally, their recruiting process was ranked the highest ever by candidates, in large part due to immediate personalised feedback and the opportunity for Unilever's rejected candidates to match to other partner companies where their trait profile was well-fit, and many were hired by those companies.

Other companies that pymetrics has worked with have experienced similar types of results, such as:

- A client experienced a 20 percent increase in minority interns hired into technical roles;
- A client attained a 90 percent increase in diversity of universities represented in a hired class; and,
- A client realised a 28 percent increase in diversity across gender, ethnic and socio-economic status.

2. Technology and gender equity in hiring

Pymetrics believes that only an active approach, which systematically, consistently and thoroughly removes bias, can lead to gender equality in employment. Furthermore, pymetrics believes that advancements in technology mandate such a methodical approach.

The Glass Ceiling

Gender inequality in the workplace is pervasive and well-documented, permeating across industries and organisations, from the first rung of the ladder all the way to the very top.

According to the [Gender Indicators, Australia](#) report released by the Australian Bureau of Statistics (ABS) on 25 September 2018 good progress has been made, however there are still big challenges for gender equality.

In Australia, young women achieve higher levels of education than young men. As of 2017, about 45 percent of women had attained a bachelor's degree or above by the age of 30, compared to 32 percent of men. After graduating, the median starting salary in 2017 for full-time employed women was \$59,000, while for men it was \$60,100.

Yet, fewer women overall are in the labour force than men, and those in the labour force are more likely to be in part-time and casual employment, and more likely to be under-employed than men. In 2017-18, almost two-thirds of women (64 percent) and three quarters of men (75 percent) aged 20-74 years old were employed. These numbers are the highest labour force participation rates ever for women, having slowly increased five percent over the last decade, from 59 percent in March 2009.

The picture at the top is also improving. According to the ABS, progress has been made, however women are under-represented on boards, as CEOs, ministers and parliamentarians, judges and justices. The worst performers are non-public sector companies, where females represent just 17 percent of CEOs.

The Sex Discrimination Act, which came into force in 1984, and the subsequent Amendments in 2011 and 2013, has helped change community attitudes and advance gender equality in Australia.

However, gender equality is challenged by conscious and unconscious biases, of which no human is completely free. Human brains recognise and learn from patterns in the environment, causing biases that exist in a society to be encoded in the mental make-up of individuals. Unfortunately, the current patterns of bias that exist in the workplace are reinforced in the ways we think and the way we hire.

The only way to loosen the bonds of our own brains is to set up systems based on behavioural science insights and innovative technologies for creating a fairer future for all.

The Case for Gender Equality

Beyond what the law recommends and good conscious demands, diversity also propels business and economic success. This has been shown in many studies: gender diverse teams perform better than homogenous teams, even after controlling for factors like individual intelligence¹.

¹ Woolley, A.W., Chabris, C.F., Pentland, A., Hashmi, N., & Malone, T.W. (2010). Evidence for a collective intelligence factor in the performance of human groups. *Science*, 330 (6004), 686-688.

Breaking the glass ceiling requires a shift in standards. To move the needle, we must actively design selection tools to be bias-free. Only then, over time, as more women enter the workforce and excel at their jobs, can bias against women decline and gender parity be achieved.

Achieving gender equity in hiring

In building its predictive models, pymetrics methodically tackles bias using an active three-step process. Each step is imperative and is meticulously designed to eliminate bias. The end result is consistently bias-free.

The three steps are:

1. Gamified solution
2. Blind auditions
3. Fairness through algorithms

Step 1: Gamified solution

Women fare worse than men on standardised tests, multiple-choice type tests and self-assessments. This gap does not stem from inferior competence, rather it stems from proven gender differences in test taking.

Research shows that on multiple-choice tests men tend to guess while women prefer to skip questions. This tendency leads to a significant gender gap. In the US, an analysis of the gender gap in Mathematics SAT (Scholastic Aptitude Test) scores, in 2001, uncovered that 40 percent of the gap could be explained by the hesitancy of women at guessing². Additionally, the SAT scores of the women, but not men, fluctuated based on the gender of the other people present in the test environment. The results of this SAT analysis can be extrapolated to all similarly structured and administered assessment tools, including employment assessments.

Another prominent form of employment assessment, self-reporting questionnaires, are influenced by men's tendency to overvalue their abilities and women's inclination to underrate theirs³. For example, if a job analysis⁴ finds that communication skills are a strong indicator of job success and applications are asked to self-report their communication skills, men would likely exaggerate their communication skills, while women would likely understate theirs.

The above examples show that even a selection test which shows a strong relatedness to job performance and is facially neutral can still be inherently divisive if not designed properly.

In contrast, pymetrics avoids the multiple-choice and self-reporting assessments and instead employs behavior-based gaming assessments that can be played online, in any location, at any time, based on the preference and need of the test taker.

The pymetrics games are closely adapted from well-validated neuroscience and psychology behavioural tasks. Adding as few layers as possible to the original task is crucial; by adding design elements, there are more openings for bias to creep in. Research supports the intuition that men play video games more than women. The

² Baldiga, K. (2013). Gender differences in willingness to guess. *Management Science*, 60(2), 434-448.

³ Tannenbaum, D.I. (2012). Do gender differences in risk aversion explain the gender gap in SAT scores? Uncovering risk attitudes and the test score gap; Ben-Shakhar, G., & Sinai, Y. (1991). Gender differences in multiple-choice tests: the role of differential guessing tendencies. *Journal of Educational Measurement*, 28(1), 23-35; Bohnet, I. (2016). *What Works: Gender Equality by Design*. Harvard University Press. Pg 169-170.

⁴ Reuben, E., ReyOBiel, P., Sapienza, P., & Zingales, L. (2012). The emergence of male leadership in competitive environments. *Journal of Economic Behavior & Organization*, 83(1), 111-117.

greater familiarity that male test takers would have with a video game structured test allows for a gender advantage in test taking. In contrast to this, pymetrics maintains a very simple gamified assessment to eliminate any advantage.

The pymetrics science-based game design removes the gender bias propagated by standardized tests and self-assessments.

Step 2: Blind auditions

Recruiters, both male and female, fall prey to bias when reviewing applicants. Even champions for women in the workplace have rated the same resume as more qualified when it had a male-gendered name, compared to a female one⁵.

Mitigating recruiting bias is pivotal but can be difficult to implement. One major breakthrough was in hiring patterns of orchestras. In 1970, the top five U.S. orchestras had fewer than five percent women. A number of orchestras adopted “blind” auditions where screens were used to conceal the identity and gender of the musician from evaluators. In the years after these changes were instituted, the percentage of hired women musicians increased from five percent to 35 percent⁶.

pymetrics serves as a blind audition for job candidates. Candidates move through the platform completely anonymously, and the prediction algorithm does not use any demographic information to assess career fit.

Step 3: Fairness through algorithms

Adding this third step to the bias removal methodology is essential for ensuring a bias free final outcome. This step is detailed further in Section 5 of this document: Removing bias from algorithms. A bias free methodology should match a balanced proportion of male and female candidates to a specific job.

Case studies

- a. *30% increase in the percentage of females matched to financial services position after using pymetrics.*
pymetrics sourced candidates for a multinational financial services corporation. The pymetrics recommendation pool consisted of 43% women as opposed to their traditional turnout of 31% women. The use of pymetrics increased the number of females in first round interviews by 19%. In the overall pool, the use of pymetrics increased the number of females matched by 30%.
- b. *20% to 50%: the percentage of women hired into an investment analyst role before and after using pymetrics.*
pymetrics helped a global financial institution achieve a 50/50 gender balance for two straight years, in an investment analyst role that was traditionally 80% male and 20% female.

⁵ McGinn, K.L., & Tempest, N. (2000). Heidi Roizen; Bohnet, I. (2016). What Works: Gender Equality by Design. Harvard University Press. Pg.21-22

⁶ Goldin, C., & Rouse, C. (1997). Orchestrating impartiality: The impact of ‘blind’ auditions on female musicians (No. w5903). National bureau of economic research; Goldin, C., & Rouse, C. (2000). Orchestrating impartiality: The impact of ‘Blind’ auditions on female musicians. The American Economic Review, 90(4), 715-741; Bohnet, I. (2016). What Works: Gender Equality by Design. Harvard University Press. Pg.1.

- c. *44%: the percentage of offers extended to women after a professional services company used pymetrics.*
A global professional services company used pymetrics to source applicants. Pymetrics' methodology recommended approximately 48% women and 52% men. Our recommendations led to a gender balanced hiring outcome – of the total extended offers, 4% were women and 56% were men.

3. The Fourth Industrial Revolution and Reskilling our Workforce

We are in the midst of what has been termed the ‘Fourth Industrial Revolution,’ which will see the likes of data and analytics and technologies such as automation, AI, augmented and virtual reality and robotics increasingly integrate into the workforce. As it has in the past, the labour market will change in response to new technology – as well as other developments including demographics, consumer preferences and government policy.

Presently, more than one million Australian workers - almost one tenth of the workforce - change jobs (600,000 change industry, around 450,000 change occupations)⁷. As the pace of technology disruption continues, we can expect to see even greater change in our workforce. For example, following its *2018 Global Human Capital Trends* survey [Deloitte reports](#) that 42 percent of companies believe that AI will be widely deployed at their organisations within three to five years⁸.

There are three primary trends that we have identified that will impact Australia’s workforce as a result of the exponential growth of technology:

- a) As companies transform, many roles will be eliminated or radically altered. This will require a strategy to prepare for issues such as the adjustment and re-employment of workers who are displaced.
- b) We are seeing the creation of new roles, which gives rise to a different problem of the ‘skills gap’. There simply aren’t enough people trained in how to work with new technologies, and as the pace of change continues, this will likely remain a challenge. **Rather than replacing humans outright, the introduction of new machines *changes* the skills and requirements the workforce needs to be able to take advantage of the new technologies.**
- c) Despite the surge of interest in AI and automation, ‘hard’ skills such as technology know-how won’t be sought after in isolation. Deloitte’s survey also predicts tremendous future demand for human skills such as complex problem solving (63 percent), cognitive abilities (55 percent), social skills (52 percent) and process skills (54 percent). Reinforcing this view, a [World Economic Forum study](#) found that the top 10 skills for the next decade include essential human skills such as critical thinking, creativity, and people management⁹.

Using pymetrics AI-based algorithms workers with jobs that are becoming obsolete can find new jobs in growth fields. It is an excellent tool for identifying promising new paths for people who are currently reliant on jobs that will soon be automated.

Likewise, as companies transform to take advantage of new technologies they are focused on anticipating the skills required in the future. Rather than concentrating on existing skills and experience, companies will need to hire based on potential, rather than pedigree, and train employees to acquire the necessary skills.

Indeed, companies may already have employees with the inherent traits to be successful in these new roles and can effectively move and re-skill people. This is where big data and AI through platforms such as pymetrics can offer a significant advantage, by providing workforce insights such as the patterns and traits that lead to success in a role and then highlighting where we might find others within the organisation that fit the same trait profile.

⁷ CEDA. The Future of Work 2015. Pg 102-104.

⁸ Deloitte. Human Capital Trends. AI, robotics and automation. 28 March 2018.

⁹ World Economic Forum. Gray, Alex. The 10 skills you need to thrive in the Fourth Industrial Revolution. 19 January 2016.

The benefits are significant and include reduced wage inflation, hiring people who you know are already a good culture fit, and increased engagement across the business as people see that they are being invested in.

4. Supporting people who face barriers to economic participation

Given employment is such a lifeline, it is unfortunate that certain groups are unemployed or under-employed due to the fact they don't fit the 'mould' of pre-determined expectations. For example, those from underprivileged backgrounds may not fit the right pedigree, or those with neurological differences such as autism spectrum disorder, may not be recognised for their talents due to the traditional recruitment and interview process.

We believe that new technologies can help change that. Used appropriately, pymetrics' neuroscience-based games and AI have the potential to help people who face barriers to economic participation.

In 2017, pymetrics received a grant from [The Rockefeller Foundation](#) in the US to help At-Risk and Opportunity Youth find meaningful employment opportunities. Opportunity Youth are aged 18-24 from disadvantaged socioeconomic backgrounds and have a disproportionately high unemployment rate of over 12 percent, nearly triple the US national average.

Possessing often sparse or non-existent resumes, underprivileged youth have trouble showing they have the potential for anything beyond part-time or low-skill work. Through pymetrics' collaboration with The Rockefeller Foundation, these individuals can be evaluated on their *inherent potential*, even if they haven't yet been given the opportunity to shine given their life circumstances.

In Australia, pymetrics has partnered with the [DXC Dandelion Program](#) to help people on the autism spectrum with employability.

The DXC Dandelion Program is an initiative designed to build valuable information technology skills and careers for individuals on the autism spectrum. Combining the use of robotics with commercial IT industry teaching and methodology, the focus of the program is on building and developing technical, life and executive functioning skills. Companies are beginning to realise the benefits of creating a more neurodiverse workplace and many are now introducing autism employment programs. DXC currently has 67 people on the autism spectrum employed in the areas of cyber security, data analytics, and software testing with participating organisations including Australian Government departments and financial services companies.

Through this partnership, the DXC Dandelion program will utilise the pymetrics recruitment and assessment models based on cognitive and emotional potential, to identify hidden talent that would otherwise be overlooked in standard recruitment practices.

As a result, people on the autism spectrum will have greater opportunity to access stable employment and careers, contributing to a healthier and productive lifestyle, while companies build a stronger and more inclusive workforce.

5. Removing bias from algorithms

The Human Rights and Technology Issues Paper is right to call out concerns about potentially unjust consequences from AI-informed decision making. The use of data-driven algorithms does not automatically guarantee fairness. The conclusions drawn from a data set can only be as inclusive as the input data itself.

To demonstrate this point, in the US if an AI system was used to choose candidates for a CEO role, it would be more likely to choose men named John than it is to choose *any* female. This is because if the AI were to study current inputs, there are fewer large companies run by women than by men named John¹⁰.

The use of sophisticated algorithms alone cannot remove bias. Fairness will only be achieved through active debiasing of the data on which the tools rest.

To guarantee the removal of all bias when evaluating and recommending a candidate, pymetrics complements its fairness promoting game design and blinding process with the removal of any residual bias found in the data through our bias detection tool, Audit-AI.

Once data is acquired from candidates and from high performing incumbents at a specific job or companies, statistical methods are then used to measure bias in the incumbent dataset. Once bias has been identified, this information is used to guide the model parameter selection process so that the final candidate recommendation is bias free.

To confirm the absence of bias in the predictive model, several steps of analyses are employed: the model predictions are rigorously tested to ensure zero bias and hiring outcomes are analysed to validate the model.

Removing data that carry bias serves an additional purpose: it reduces the number of false positives, ie. candidates who would have been selected due to partiality rather than abilities. Therefore, this data removal is also advantageous to the task of picking future high-performers.

Employing statistical methods to actively debias the dataset and validate the method on which the predictive models lie is imperative to ensure the selection procedure is promoting fairness rather than perpetuating barriers. Only then is the result a bias-free prediction model that recommends future best performers.

This year, pymetrics open-sourced [Audit-AI](#), in an effort to help technology creators who share the vision of fairness in machine learning and AI-assisted decision making detect bias in their technology. The tool has been developed so it can take the output out of virtually any machine learning technique, whether it's to predict if a person will pay back a loan, be accepted into a university program, or be a good candidate for parole.

While Audit-AI is designed to detect bias, removal of any imbalance in an algorithm is up to the creator.

As technology progresses, we believe that more sharing of resources and knowledge will be imperative to ensure companies avoid any unjust consequences from AI-informed decision making.

¹⁰ Wolfers, J., Fewer women run big companies than men named John., *The New York Times*. 2 March 2015.

Conclusion

Employment is first and foremost a lifeline to offset the cost of living. A basic human right. Yet, it is also so much more. For most of us, we'll spend more time working during our adult lives than doing any other activity. For many, jobs create feelings of self-worth and importance, as individuals contribute to their communities and society.

We are about to experience a seismic shift in the employment landscape, as the use of data and analytics and technologies such as automation, AI, augmented and virtual reality, and robotics increasingly integrate into the workforce. Jobs will go away, and new jobs will be created too. There will likely be a 'skills gap' where there simply aren't enough people with the hands-on experience to do certain roles.

This will be a challenging period for many people and companies as economies and workforces transition. Yet, despite the importance of hiring the right people in the right roles from both an employer and employee perspective, traditional hiring practices are still leading companies and candidates to make critical employment decisions using an archaic, analogue process: matching a resume to a job description.

Unfortunately, resume-based hiring has many problems.

- It's inefficient: The average job gets 250 resumes, which recruiters scan for an average of six seconds each.
- It's failure-prone: This process leads to high failure rates -- specifically, 30-50 percent in the first year.
- It's biased: It also introduces well-documented gender and ethnic bias into recruiting -- women and minorities are at a 1.5 to 2x disadvantage in the resume-based recruiting process.
- It's outdated.

We have shown that the combination of gold standard neuroscience and AI can make bias-free decisions better than humans can. We envision a world in which every person is evaluated on their potential, not pedigree, and all job candidates can be matched with their ideal 'fit'. We believe that when used correctly, AI can maximise human potential.

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