# Artificial Intelligence In Recruiting

CONTENTS

# Artificial Intelligence Fundamentals

Most of us have come to know the advancement of artificial intelligence **(AI)** only a few decades back, when Terminator's Skynet or Iron Man's Jarvis *(**J**ust **A R**ather **V**ery **I**ntelligent **S**ystem)* were merely fictional. In fact, the [inception of AI](#) actually started as early as the 1950s, first given the name by John McCarthy in his conference known as "The Dartmouth summer research project on artificial intelligence" (1956).

Artificial Intelligence (AI) is a broad discipline of computer science designed to perform tasks that are traditionally done by humans; such as visual perception, speech recognition, and language translation.
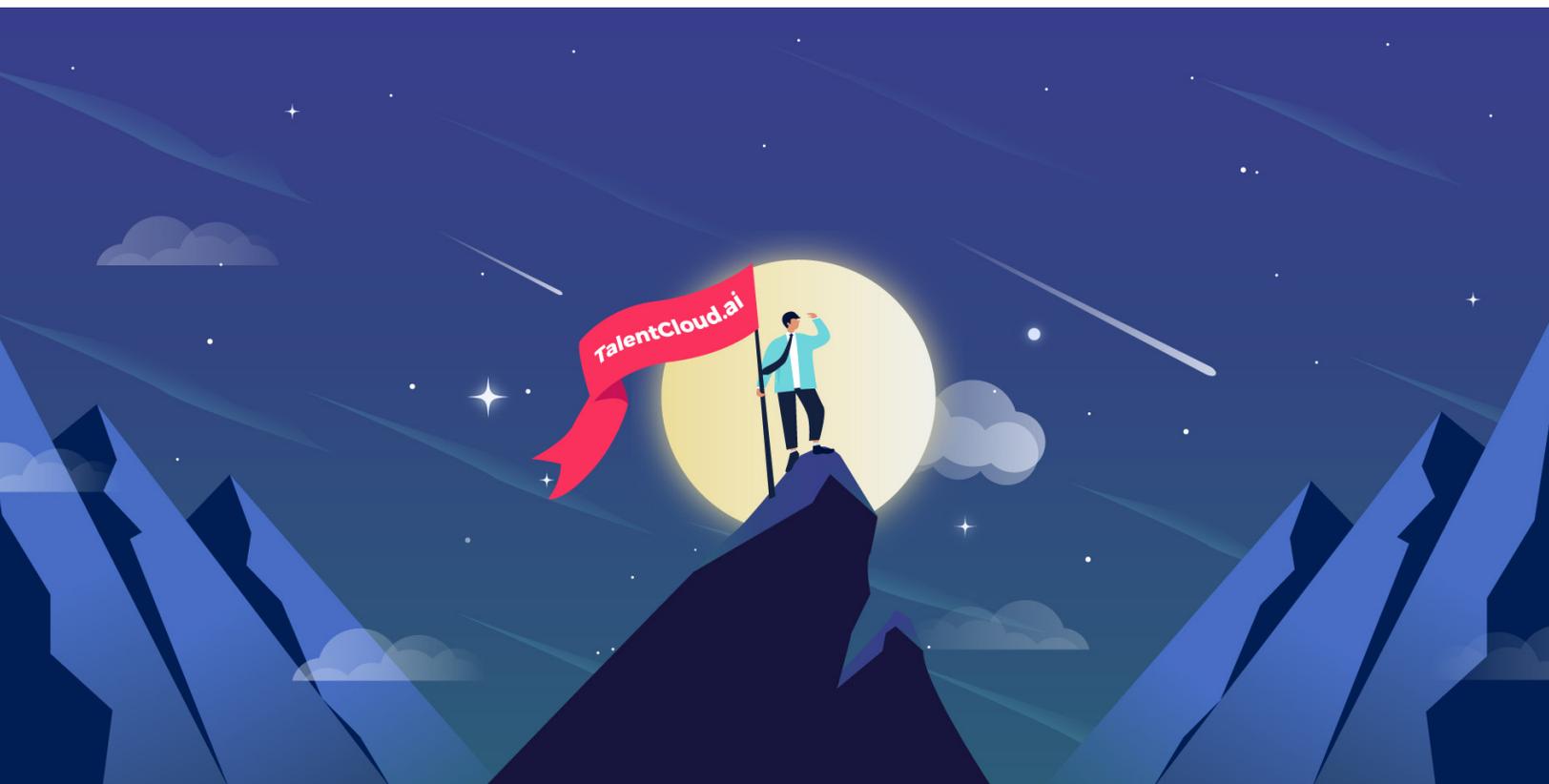
A common application of AI in the modern days is virtual assistant, namely Apple's Siri, Google Assistant, and Amazon's Alexa. These real-time machine conversations are powered by natural language processing **(NLP),** an area of computer science and artificial intelligence concerning the interactions between computers and human languages.

(Source: Wikipedia)
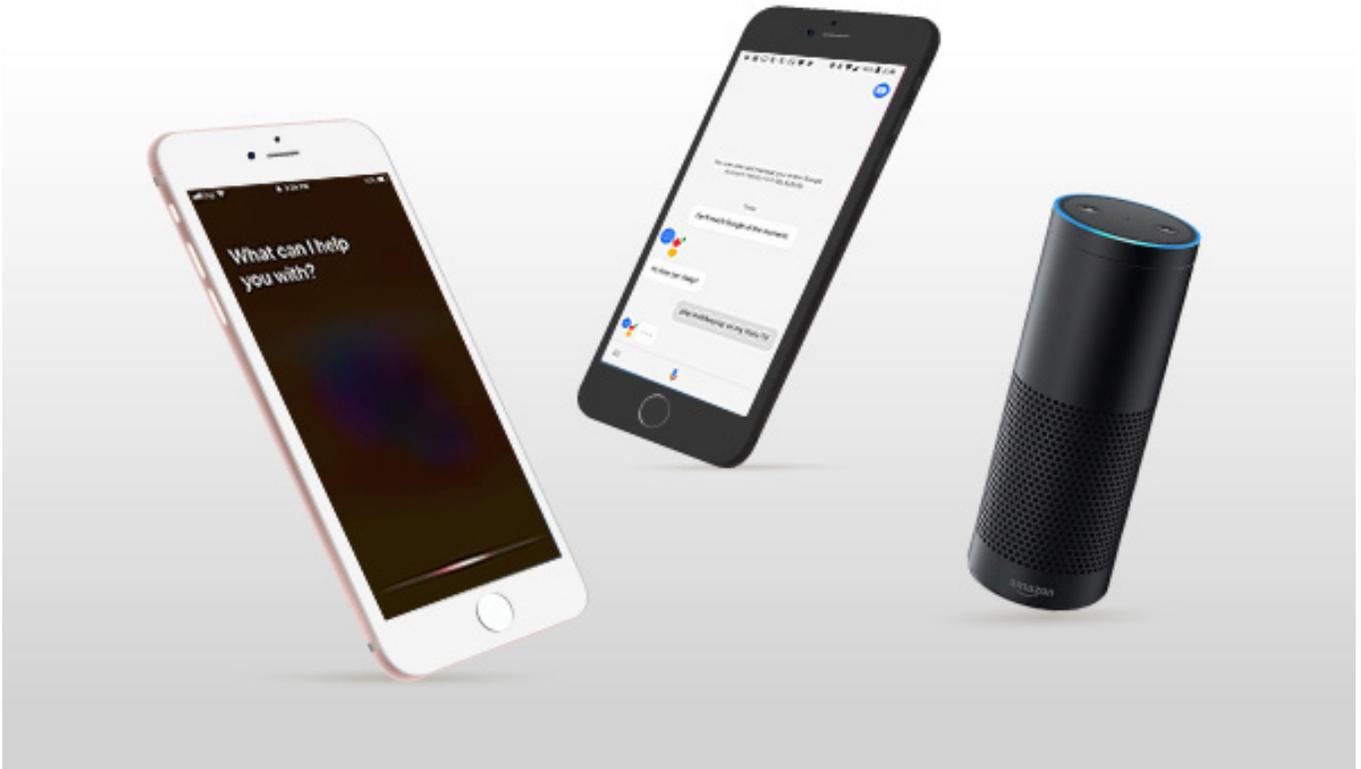
Another AI example that you might have already been interacting with, particularly in the workplace, is Google's Smart Reply in Gmail (first released in 2015). Smart Reply suggests a trio of one-click responses to your email (that's already filtered from promotional and spam emails) based on the content of the message. This feature is formulated by Google's *neural networks* (a computer system modelled on the human brain and nervous system), which are programmed to learn behaviours through training.

(Source: Google)
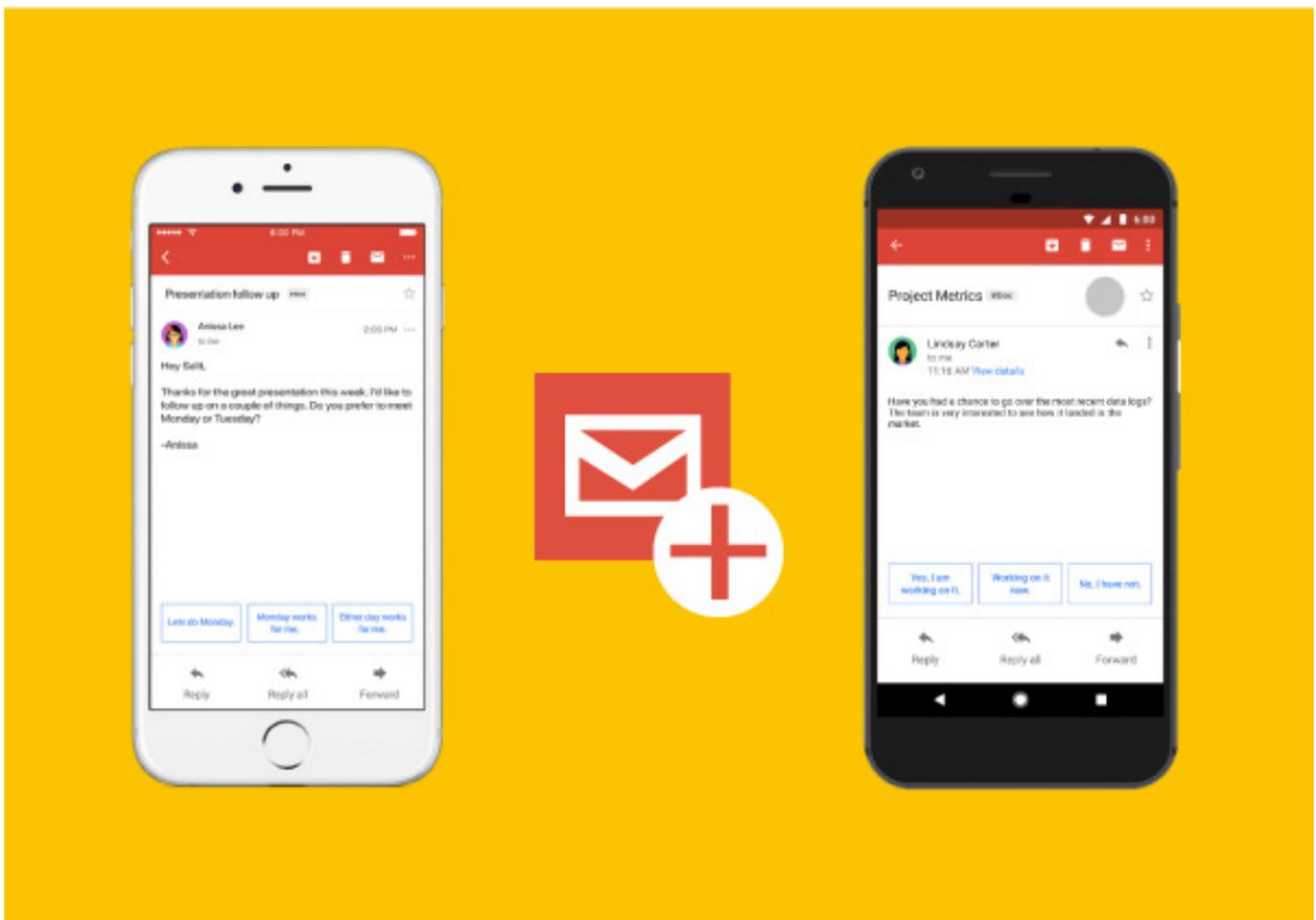
According to a market intelligent firm, Tractica, AI technologies are reshaping existing business models while simultaneously creating new ones. It also forecasts that annual worldwide AI revenue will grow from $643.7 million in 2016 to $36.8 billion by 2025. As a result, your business, regardless of which industry, cannot afford to ignore the exponential growth of AI.

With the tremendous breakthroughs in technological capabilities (especially in data storage and computational speed), artificial intelligence is changing the world as we know it. Its impact is even more substantial in the environments where complicated and repetitive tasks can be automated but there are still mixed reactions towards the future of AI, specifically the trepidation of the death of various occupations in light of the maturation of AI technologies.
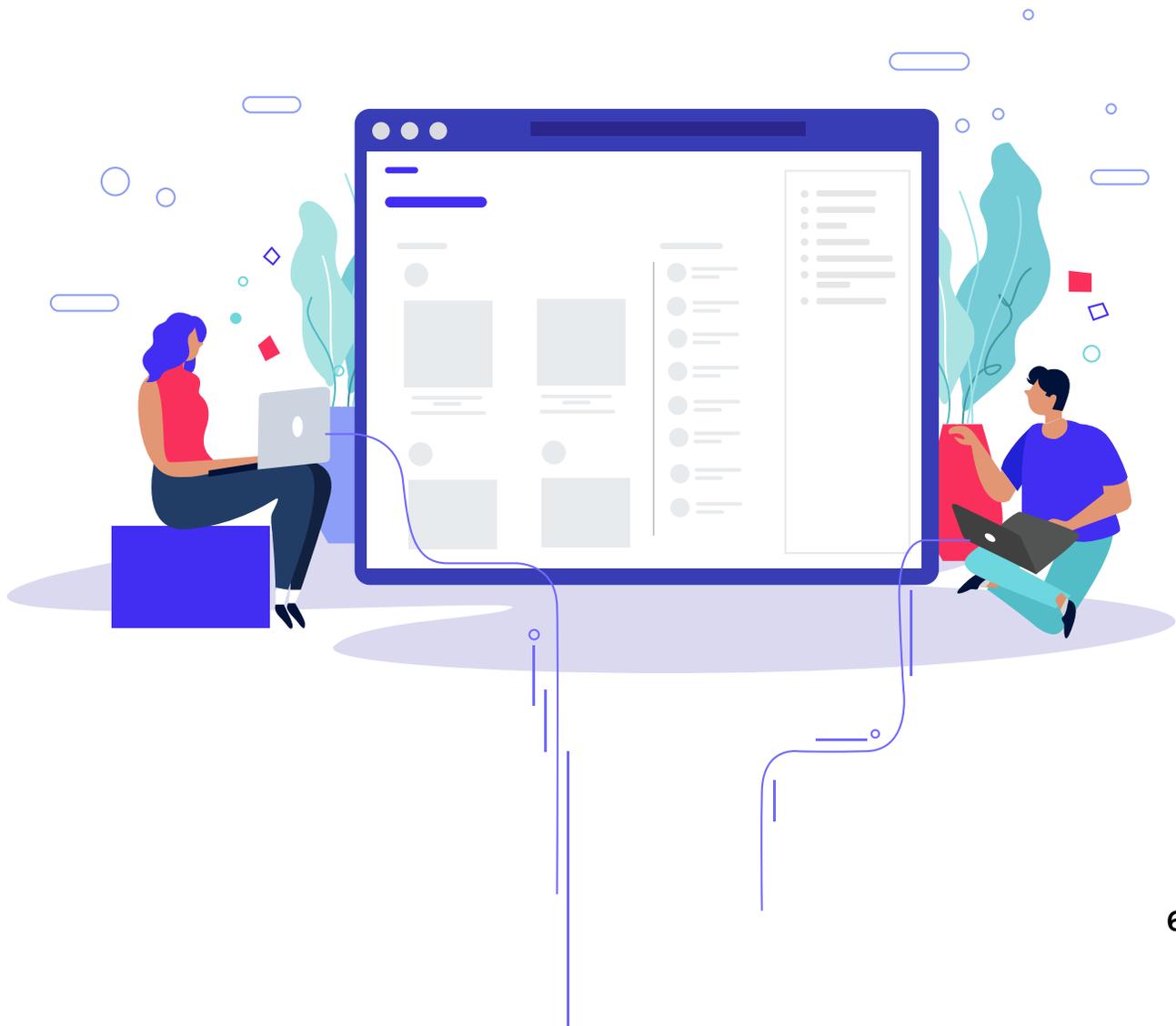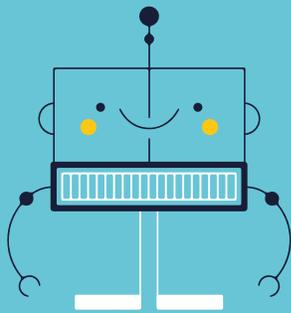
To have a better understanding of how intelligent machines work and how they affect our lives, let's look into the two most important fields of AI: **machine learning and deep learning.**

Understanding Machine Learning and Deep Learning

ARTIFICIAL INTELLIGENCE

A program that can sense, reason, act, and adapt.

MACHINE LEARNING

Algorithms whose performance improve as they are exposed to more data over time
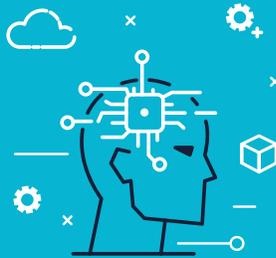
DEEP LEARNING

Subset of machine learning in which multilayered neural networks learn from vast amounts of data
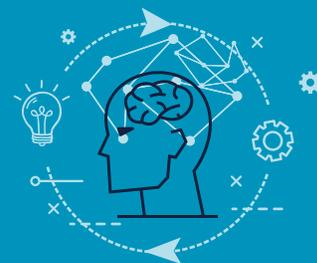
The relationship of Artificial Intelligence, Machine Learning, and Deep Learning

Machine learning, as self-explanatory as it is, refers to an algorithm that enables machines to learn on its own from a certain volume of data fed by humans. These two terms are often interchangeable but they are not the same. Likewise, deep learning is a subfield of machine learning, concerning algorithms inspired by the structure and function of artificial neural networks.

Machine Learning Definition

Machine learning is an application of artificial intelligence that provides systems the ability to **automatically learn** and improve from experience without being explicitly programmed *(Arthur Samuel, 1959).*

Data is the foundation of machine learning (it is what enables machines to learn). With sophisticated self-learning algorithms, machine learning applications try to find hidden patterns and correlations in large data sets or big data to develop models that can predict behaviour and make decisions.

Machine learning can be categorized into three learning types:

Supervised Learning

To teach or train machine using labeled data. The greater the dataset the more the machine can learn about the given subject. Once training is complete, the algorithm will apply what was learned to new set of data.

Unsupervised Learning

Where machines do not need to be trained with desired outcome data (labeled data). Instead, they use an iterative approach called deep learning to review data and arrive at conclusions. Once the unlabeled data has been processed it only takes one example of labeled data to make the learning algorithm fully effective.
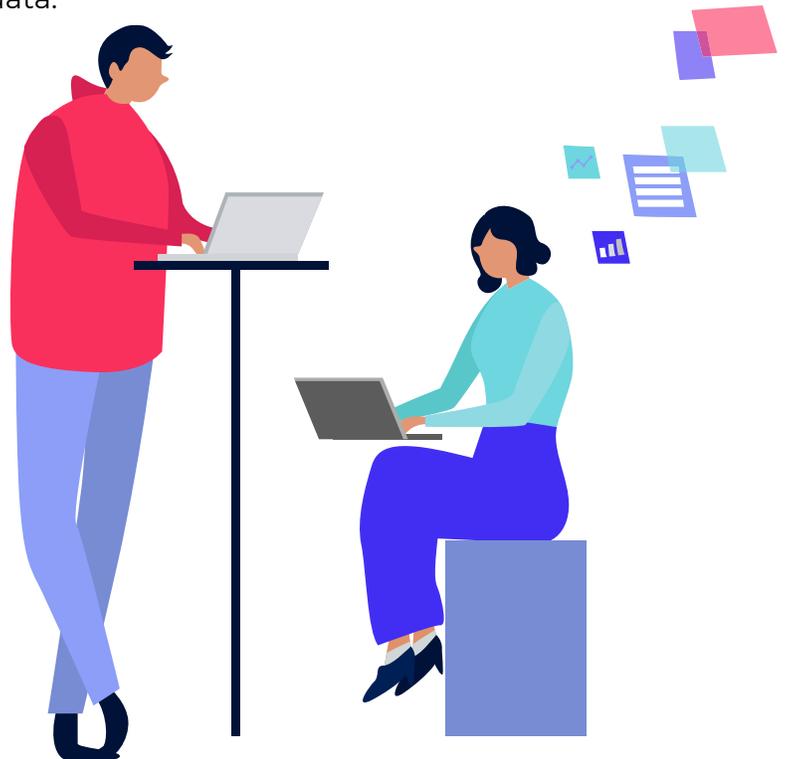
Semi-Supervised learning (SSL)

Falls between unsupervised learning and supervised learning, SSL is one of the newer AI methods that have become popular in 2017.

Semi-supervised learning (SSL) is one of the **artificial intelligence** (AI) methods that have become popular in the last few months.

Reinforcement Learning

Similar to unsupervised training in a way that the training data is unlabeled. However, when asked a question about the data, the outcome will be graded.
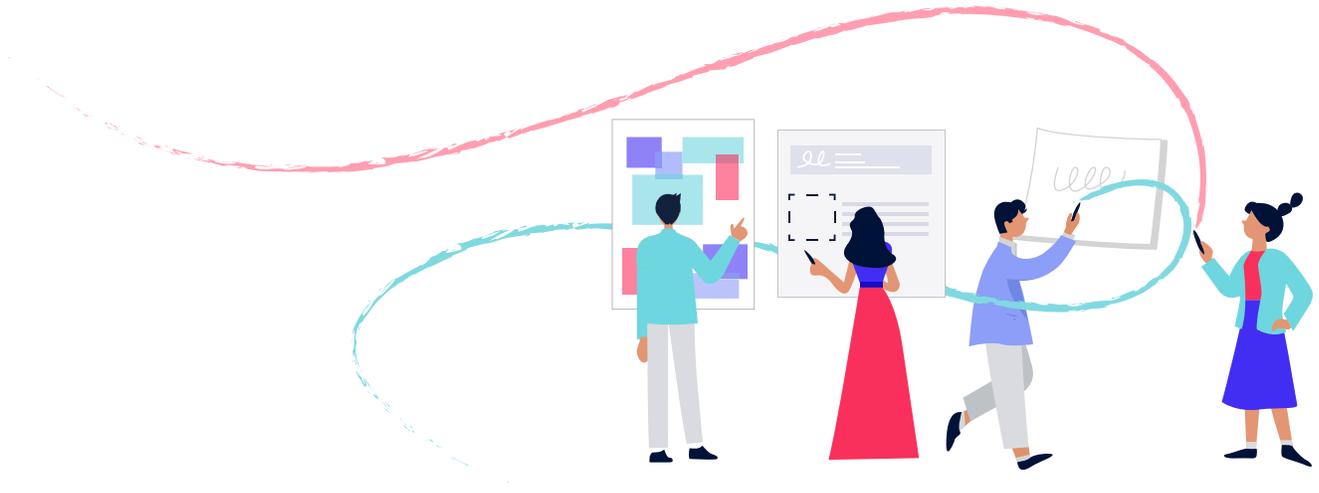
Sample application for the four learning types:

Supervised Learning

Stock market prices prediction, housing price prediction, speech recognition, weather forecast, email spam filtering.

Unsupervised Learning

Visual recognition to identify pattern, group online articles into different stories (Google News), group customers into different marketing segment, social network analysis.

Semi-Supervised learning (SSL)

Resume parsing (this will be covered in details later), Web Content Classification, Speech Analysis.

Reinforcement Learning

Game playing like Go or chess, robotics, self-driving cars, automated financial trading.

Deep Learning Definition

Deep learning is a new area of machine learning research, which has been introduced with the objective of moving machine learning closer to achieving a more comprehensive intelligent machine.

Deep-learning software attempts to mimic the activity in the layers of neurons in the neocortex; the wrinkly 80 percent of the brain where thinking occurs. The software learns, in a very real sense, to recognize patterns in digital representations of sounds, images, and other data.

Source: technologyreview.com

Artificial Intelligence in Recruiting

In the case of recruiting, the level of technology penetration is only on the surface with applicant tracking system being the primary digital adoption. The role of HR software is mainly to remove the paperwork, not to automate the recruiting process. The reason is because many organisations are still skeptical about having AI to assist or even to make hiring decisions.

Despite some controversies around the practicality of AI in recruiting, it is certain that the industry is in dire need of change in order to catch up with the [millennials] candidate expectations.

AI applications in HR can range from avoiding human bias in recruiting to predicting the candidate's suitability through sentiment analysis (utilised natural language processing), or other available recruiting data. Among which, there are three main areas where TalentCloud's AI-powered solutions will benefit your organisation - **job application, talent screening** as well as talent **sourcing and matching.**

It's worth noting that AI does not replace the role of recruiters, especially in situations where empathy and emotional engagement are required. The ultimate goal of AI is to help humans achieve more strategic tasks and make informed decisions.

Resume Parsing
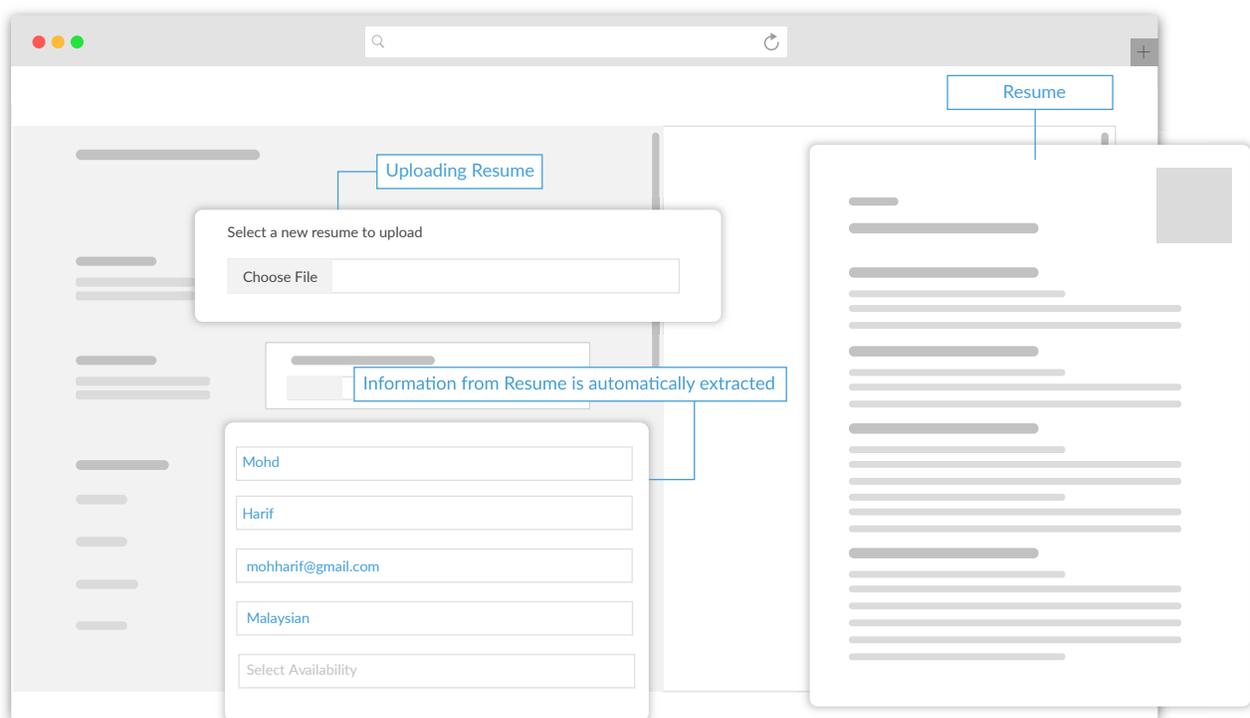
One of the long-standing problems with the conventional job application process is the tedious application form which applicants may take more than 5 minutes to fill out the required fields. In fact, 60 percent of job seekers abandon the application process due to the length and complex online form. (Source: SHRM.org)

On the other side, recruiters also suffer the rising costs of high candidate abandonment rate, which directly affect the recruiting effectiveness and the organisation's bottom line. However, skimping on the data collection from candidates might create great challenges for recruiters in terms of their ability to screen and search for the right candidates among the piles of resumes.

This is where resume parsing comes to your rescue. This feature allows the candidates to simply upload their resume and have their information automatically extracted and filled into the online job application form, including the mandatory fields such as personal details, employment history, and education background.

The goal is to streamline the job application process by cutting down on the time spent filling out forms. From the candidate's perspective, this level of automation will also give a good first impression of your employer brand.

Resume Parsing is not only important for better candidate experience, it is also a useful case for Employer who had a lot of resumes collected from roadshows, previous applications and want to import these into a resume database with all the key information extracted.
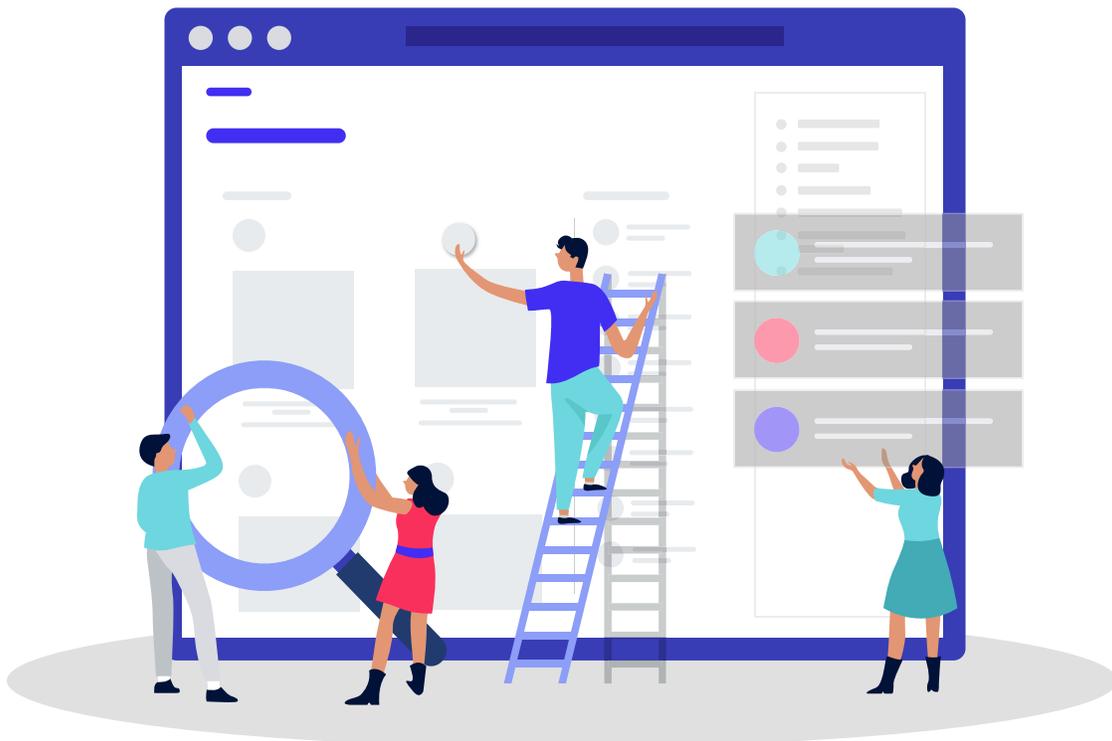
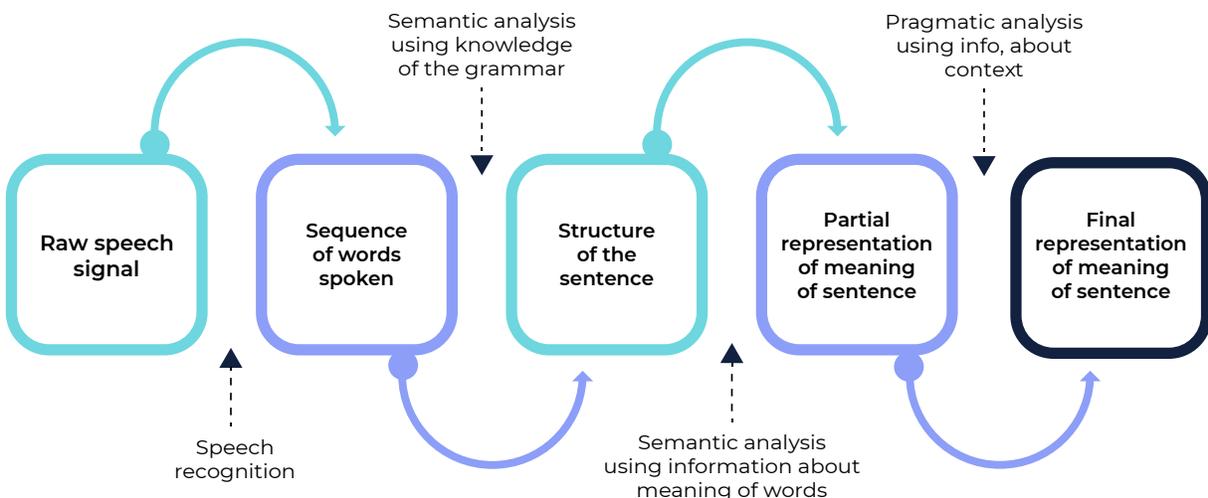# How AI is Applied in Resume Parsing and the Challenges

While the system parses resumes in seconds, the implementation behind the scene requires complex and continuous learning algorithms.

It is due to the huge variety of resumes available and there's hardly any standard for all applicants, for instance, the date formats, education grading levels, or international addresses, as well as the structure of the information, not to mention the amount of new job titles popping up every day in these recent years (e.g. Data Engineer, Cloud Architect or Customer Hero).

Also, a lot of resumes now adopted the more contemporary design where there are two to three column-layout, creative use of colors and shading to define sections. While these eye-catching designs and advanced formatting can be easily understand by human recruiters, it makes it really hard for machines to understand the contents as these are confusing to the machine.

All these challenges means there needs to be a variety of methods and techniques utilising statistical algorithms, machine learning, deep learning, as well as using data sets to train the resume parser to do its job well. However, it won't be perfect and there needs to be a continuous enhancement to keep up with the evolution of the job industry.

One of the techniques that the TalentCloud team employs in resume parsing is natural language understanding (NLU), which is a subset of natural language processing (NLP).

Semantic analysis using knowledge of the grammar

Pragmatic analysis using info, about context

| Raw speech signal | Sequence of words spoken | Structure of the sentence | Partial representation of meaning of sentence | Final representation of meaning of sentence |

Speech recognition

Semantic analysis using information about meaning of words

Basically, NLU refers to machine's ability to analyze, understand, and generate human speech, or in this case, the content of resumes. It is achieved by distilling natural language into a structured ontology where entities are extracted and identified to derive the meanings in written contexts. For example, "Java" is a software programming language but it is also used to refer to coffee and an Indonesian island - that is a candidate can have Java as a skill or he may come from Java, Indonesia. For this, if "Java" is used in the context where it is in a group of programming skills, especially if there are other programming skills also exist in the resume , like "PHP, .NET, J2EE", then it's most likely a skill.

Understanding the proper nouns contextually is another challenge for TalentCloud's resume parser. For example, a machine may read the name Lee Tong Fong and understands that Lee is the candidate's first name while it's actually a last name. We have to feed the machine a vast amount of resume data sets to train it to recognise names more accurately.

> **"When we run our resume parser initially, it has difficulty detecting the names of the candidates, especially Chinese names, and identifying the first name and last name as compared to Western name orders. Fortunately, there are machine learning techniques, which can be used to detect entities and solve these sequence labelling issues."**
> *Nour Alhabbal - Artificial Intelligence Specialist at TalentCloud*

> **"To determine which is the best AI approach to solve these problems",** *Nour* **explained, "we look at how accurate the model can become with the available training data, the speed of processing and the number of different entity types to be learned simultaneously. For TalentCloud, we want the resume parser to reach maximum efficiency because we want the candidates to see the result immediately after uploading their resumes, hence creating a better experience for them".**

Talent Screening with Resume Scoring
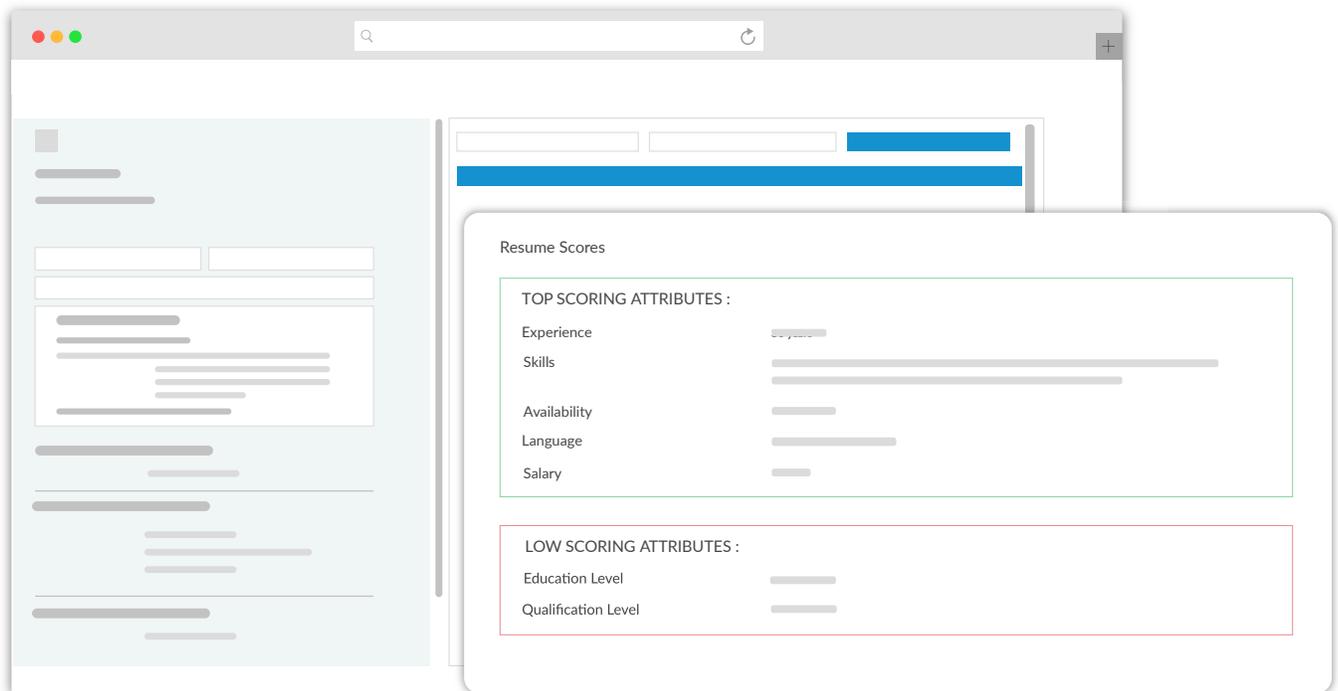
In traditional recruitment, an enormous amount of time is wasted in the screening process, especially for major corporations who receive hundreds of resumes every day. Also, a study showed that the best candidates are off the market within 10 days. Thus, it is crucial to make sure the process to screen, assess, interview and offer made to the candidate can happen within the shortest time possible.

AI-powered resume scorer is used to automate the candidate evaluation process, specifically their resumes based on the job requirements. The scoring criteria range from the standard ones such as salary, skills, qualifications, etc. to a more obscure quality like culture fit. Recruiters can leverage on the resume scores to quickly shortlist the potential candidates. This helps to speed up the hiring process significantly and at the same time, avoid human-bias in resume screening.

With Talentcloud's AI-powered screening, recruiters can quickly filter out irrelevant and disqualified candidates. They can then immediately identify, review and shortlist the top fit (top scoring) candidates. In essence, recruiters can focus on doing what they do best - engage and close talents.

How AI is used in Resume Scoring

Our Head of Product, Susan Lim, shared her insights on TalentCloud's technical implementation behind the resume scorer: "We developed the scoring algorithm to emulate human recruiters as close as possible. Being a recruiter in the IT sector for more than 12 years myself, the team and I have already established a few benchmarks to evaluate a resume during the initial development stage. For instance, the candidate's expected salary is an important factor as it has to match the organisation's budget. However, we also take into account the slight variances when screening a candidate, especially if he or she is likely to contribute to the organisation's bottom line in the long run (based on his or her past employment history or added skills)."

As more data is collected, these attributes will be refined to adapt to the variety of job categories, industries as well as by individual employer. Another potential of AI in talent screening is to assess a candidate personality profile to predict whether a person will make a good cultural fit. To do this, AI has to understand the unique culture of the company by analyzing data for previous candidates rejected by recruiters and also existing employees.

Additionally, work performance data of the hired candidates or existing employees can also be provided for the machine to learn what make the candidate a successful hire. This can improve the resume scoring. The ultimate objective of recruiting is still to hire candidates who can perform well in their jobs and fit the company culture so performance data is also crucial to the recruiting process.

Talent Sourcing and Candidate Matching
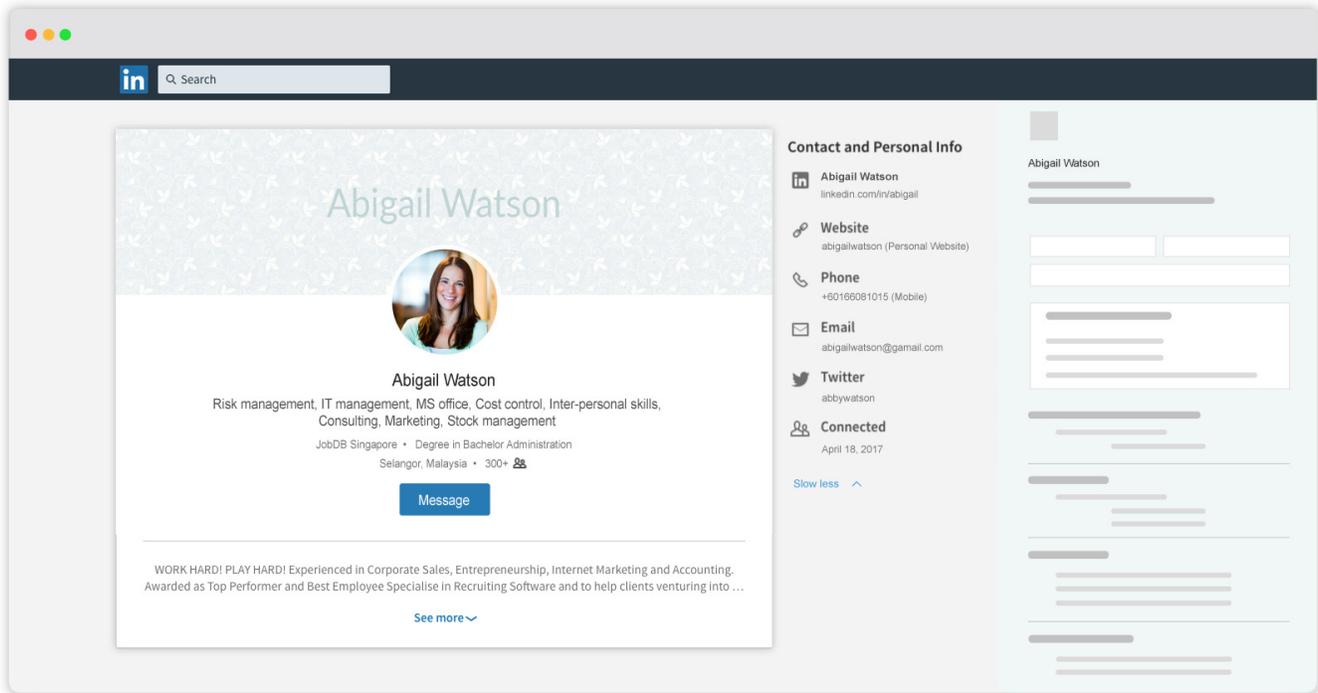
Candidate sourcing is an integral part of a company's recruiting strategy to meet long-term recruiting goals.

To find qualified candidates, recruiters can no longer just depends on the active candidates, who are actively looking for work. They have to find and reach out to the passive candidates. Since passive candidates are not looking for new jobs, and probably won't be interviewing with anyone, this presents great opportunities for recruiters to find them and get them interested to apply for the job. Many recruiters also believe that passive candidates are the cream of the crop, whereas the active job-seeking masses may be lower quality.

In candidate sourcing, AI technology is used to search for passive candidates either in candidate database or from online data (e.g., resumes, professional portfolios, or social media profiles) to automatically find candidates that match your job requirements. This replaces the need to manually search and prescreen candidates, thus greatly reduces the sourcing times and complexity.

Furthermore, the success of great hiring of passive candidates may hinge on finding that 1% of passive candidates that you just reached out on the right time when they can be influenced to consider the job, had a relationship with you and not yet applied or sourced by other companies yet. Thus, AI can play a crucial role here in terms of the right timings because AI can always work 24/7.

How AI is used in Talent Sourcing and Matching and the challenges

Boolean and Semantic Search

Reaching Out To Top Scorers

Scoring profiles or resumes
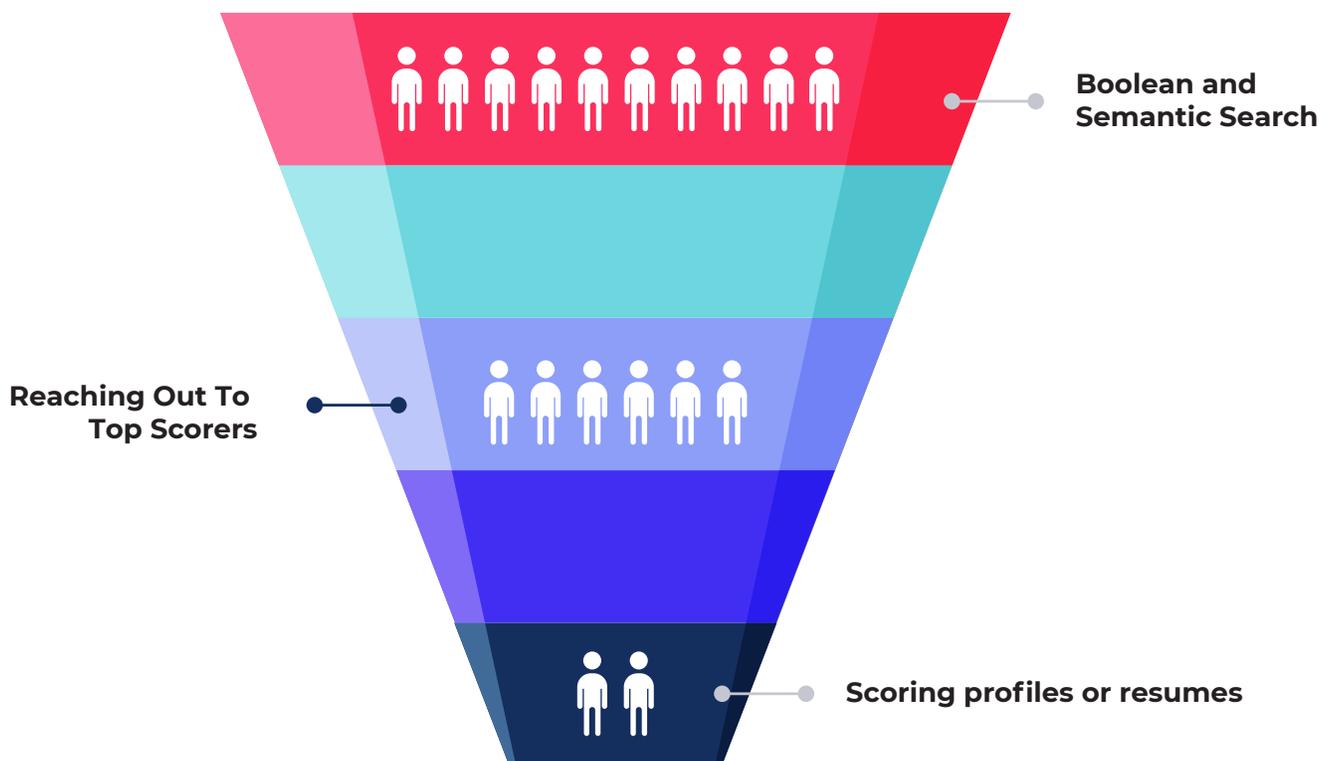
1 Boolean and Semantic Search

The first step for sourcing is to search through millions of resumes in a database to return a pool of candidates that are possibly qualified for the job. This is done using a combination of boolean search and semantic search using Natural Language Processing (NLP) to determine related terms for the search.

For better understanding, here are the definitions from Wikipedia:

Boolean search is a type of search allowing users to combine keywords with operators (or modifiers) such as AND, NOT and OR to further produce more relevant results.

Semantic search seeks to improve search accuracy by understanding the searcher's intent and the contextual meaning of terms as they appear in the searchable dataspace to generate more relevant results.

For example, to search for a machine learning engineer, terms such as python developer, data science, big data can be included in the search. Thus the search will be (machine learning OR python developer OR data science OR big data)

A more intelligent system will also try to perform multiple searches based on a different combination of keywords and combine the results. This is to prevent the search from only favouring keyword rich resumes/ profiles and eliminate the resumes that did not have the right keywords. Favouring keyword rich resumes will potentially eliminate some of the best talents due to reasons **1)** *many of the best people actually have average resumes.* **2)** *Many people have skills and experience that are simply not mentioned anywhere in their resumes.* **3)** *passive candidates that are not really looking for job may not keep their resumes up-to-date.*

Crafting this search using AI can be a competitive edge for recruiting the best talent. It is not good enough to return a pool of good candidates for the jobs. It is important to ensure this pool contains the best candidate that may have been missed out if we do not dig deep enough to find the needle in the haystack.

2   **Scoring Profiles or Resumes with Matching To Job**

Using the pool from the first step, the candidates can be further scored to determine the relevance and can be presented to the users.

While resume scoring described in screening process can be used for sourcing, it may be more impactful to include additional metrics, such as the likelihood candidates will leave their job during the time of the sourcing. This insight can be significant as when recruiters can approach the right talents at the right times, the hiring result can be spectacular. There are certain trends in specific industries and job titles that can assist in this insight. For example, if the current trend shows that the average tenure of a software engineer is only 2 years, machine learning could predict there is a high change for a software engineer to leave his job if his current tenure is about to reach 2 years. Thus, the resume score for such candidates can be higher and recruiters can take immediate actions to reach out to them.

3   **Reaching out to top scorers**

AI can go even further to approach those candidates with top scores by sending them personalised emails. Personalised emails are friendly and designed to build long-term relationships between recruiters and candidates. Candidates may be indifferent or even annoyed by those generic recruiting emails that propose jobs that are not even suitable for the candidates. This results in low open and response rate.
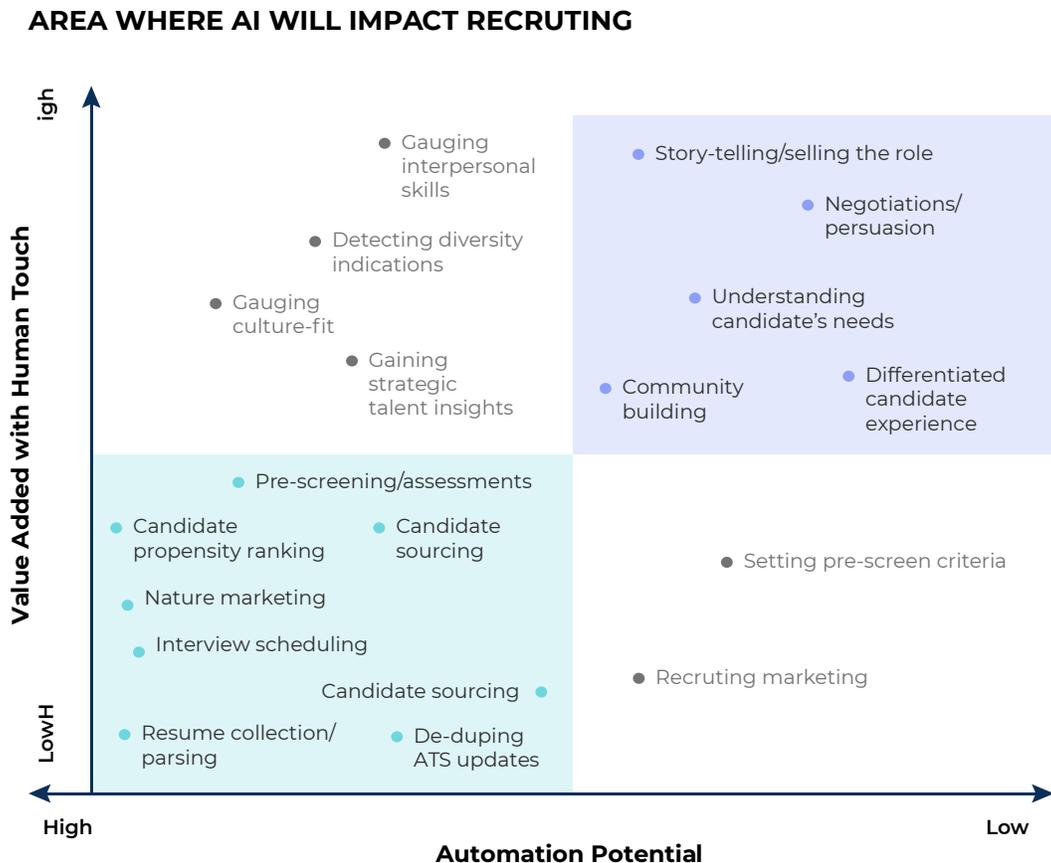
It is also essential to build long-term relationships with these top candidates. They might not be looking for jobs the first time you reached out to them, but may be opened after 6 months or 1 year. When these relationships are maintained well, it is also very likely for the candidates to reach out to you when they are looking for jobs.
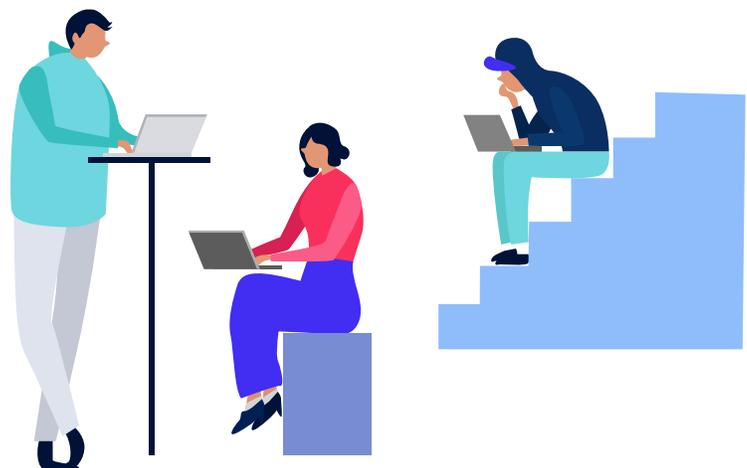
Embracing Artificial Intelligence: Disrupt or Get Disrupted

Whether it's necessary to integrate artificial intelligence into your HR playbook is not a question, but it is a strategic move in order to stay relevant in the world of work. In fact, LinkedIn's 2018 Global Recruiting Trends reports that 76% of surveyed HR professionals say AI's impact on recruiting will be at least somewhat significant.

Just as AI is disrupting all facets of our lives, recruiters and employers alike must take the initiatives to change. The good news is, AI is not here to "steal" our jobs. In contrary, the impact of AI increases where there's a human touch in the process. Below is a graph illustrating the automation potential in recruitment, according to LinkedIn Research:

AREA WHERE AI WILL IMPACT RECRUTING

Value Added with Human Touch (vertical axis, High / LowH)

Automation Potential (horizontal axis, High / Low)

- Gauging interpersonal skills
- Story-telling/selling the role
- Negotiations/persuasion
- Detecting diversity indications
- Understanding candidate's needs
- Gauging culture-fit
- Gaining strategic talent insights
- Community building
- Differentiated candidate experience
- Pre-screening/assessments
- Candidate propensity ranking
- Candidate sourcing
- Setting pre-screen criteria
- Nature marketing
- Interview scheduling
- Candidate sourcing
- Recruiting marketing
- Resume collection/parsing
- De-duping ATS updates

As mentioned in an article on Fast Company,

> **"a major part of every company's employer brand is its hiring process. Focusing on improving how candidates feel about your hiring practices can lead not only to better quality hires and cost-savings on recruiting, it can also drive sales — creating a virtuous circle."**
>
> *It means that embracing AI in recruitment directly affects your organization's bottom line one way or another.*

Technology brings about exciting yet terrifying changes to the way we work. Without the right mindset for technological adoption, you'll easily get left behind, especially when the competition for talents has become increasingly tough.
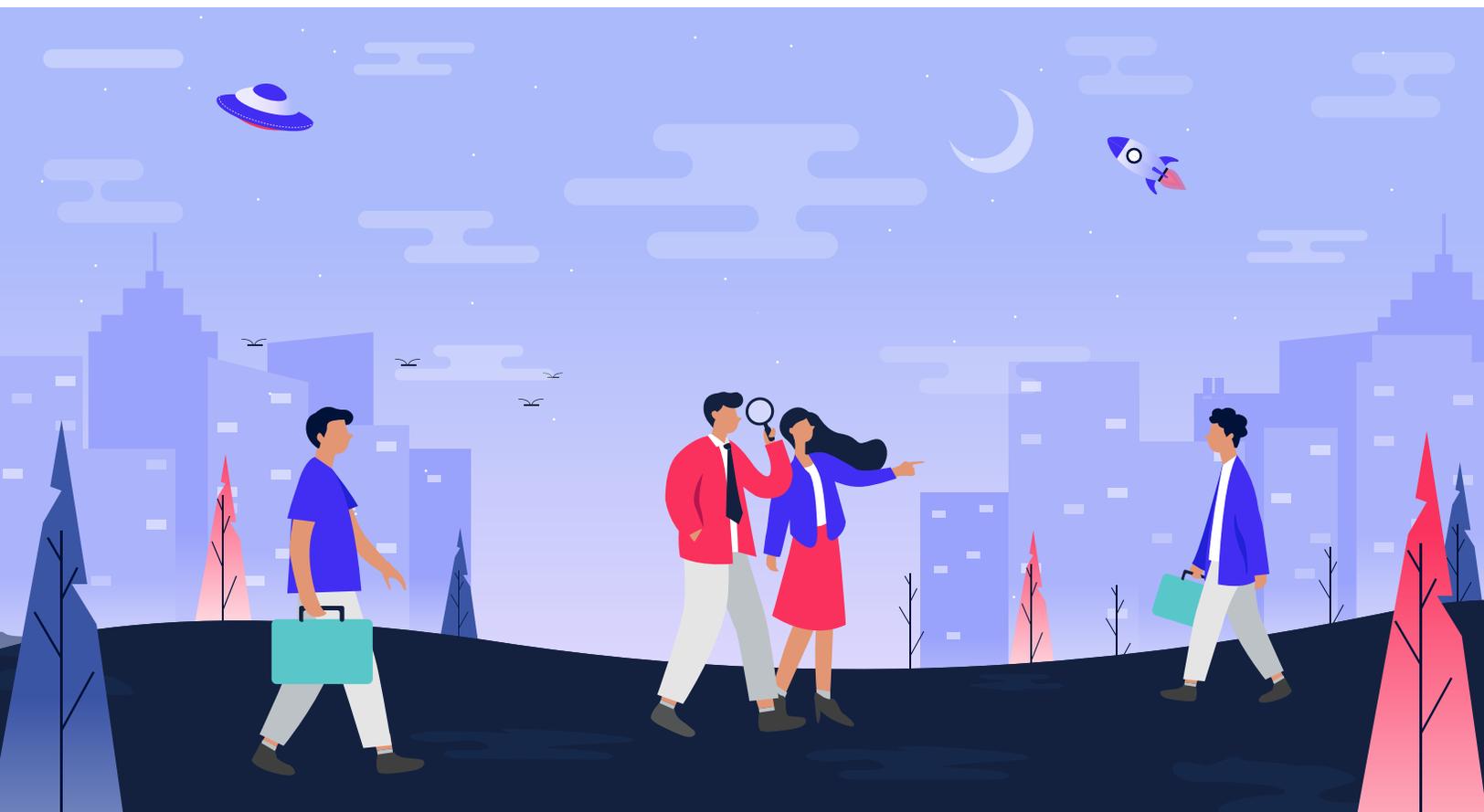
Be part of AI-revolution process, find out more from us now!

GET FREE CONSULTATION ON AI IN RECRUITMENT

Contact us at *corporate@talentcloud.ai* or +603-27165199

ABOUT US

TalentCloud, a Jobstore company, is the first and only AI-powered human capital management system in the region. Founded in 2015, Jobstore aims to tackle bedrock issues in modern recruitment and help organizations build an A-team from day one. Our product is designed with people-focused values, leveraging collaboration, transparency, and humanity to build an efficient and unbiased recruiting platform.

Following Jobstore Group's expansion roadmap, the company is set to IPO on the Australian Securities Exchange. As the largest job distribution platform and recruiting software provider, we continue to deliver hiring solutions that will transform the recruiting system that drives business growth.

Website :
www.talentcloud.ai

Address :
Suite 10.06, Level 10, The Gardens North Tower,
Mid Valley City, Lingkaran Syed Putra,
59200 Kuala Lumpur, Malaysia