

Natural Language Processing in Human Resources

Matthew N. O. Sadiku¹, Paul A. Adekunle², Janet O. Sadiku³

¹Roy G. Perry College of Engineering, Prairie View A&M University, Prairie View, TX, USA

²International Institute of Professional Security, Lagos, Nigeria

³Juliana King University, Houston, TX, USA

ABSTRACT

Natural language processing (NLP) is a branch of artificial intelligence that is rapidly reshaping the landscape of human resources (HR) by automating mundane tasks, enhancing decision-making, and improving the overall employee experience. NLP revolutionizes HR by significantly enhancing efficiency, mitigating bias in decision-making, and ultimately improving the overall employee experience across various functions. It allows for its application across numerous HR domains, fundamentally altering traditional practices. NLP models have the potential to transform HR processes, from recruitment to employee management. From automated resume screening to employee sentiment analysis, NLP promises unprecedented efficiency and data-driven decision-making. This paper explores the key applications of NLP in human resources.

KEYWORDS: *natural language processing (NLP), computational linguistics, human resources (HR), human resource management (HRM), applications.*

How to cite this paper: Matthew N. O. Sadiku | Paul A. Adekunle | Janet O. Sadiku "Natural Language Processing in Human Resources" Published in International

Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: 2456-6470, Volume-10 | Issue-3, June 2026, pp.323-330,

www.ijtsrd.com/papers/ijtsrd102028.pdf



IJTSRD102028

URL:

Copyright © 2026 by author (s) and International Journal of Trend in Scientific Research and Development Journal. This is an Open Access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0) (<http://creativecommons.org/licenses/by/4.0>)



INTRODUCTION

By enabling computers to understand, interpret, and generate human language, NLP offers profound opportunities to optimize various HR functions, from talent acquisition to employee sentiment analysis and operational efficiency. For example, resume parsing leverages NLP to extract structured data such as skills, experience, and educational qualifications from unstructured resumes, significantly reducing the manual effort involved in candidate screening. The integration of NLP fundamentally shifts the role of HR from a predominantly administrative function to a strategic business partner. By automating repetitive tasks and providing sophisticated analytical capabilities, NLP empowers HR professionals with actionable, data-driven insights into their workforce [1].

NLP in HR refers to using natural language processing technology to analyze and transform unstructured HR data into valuable insights. It has been a field that employs various computer science and computational linguistics techniques. It supports machines in interpreting and comprehending the

intricacies of spoken and written human languages. With NLP, algorithms can successfully translate and analyze human language, minimizing the communication gap between humans and computers. For example, in human resource management (HRM), NLP can analyze job descriptions and candidate resumes to make the recruitment process more efficient. NLP can automatically extract relevant information such as skills, experience, and education from job descriptions and candidate resumes and match them to each other. This can save time and effort for HR professionals who would otherwise have to review hundreds or thousands of resumes manually [2].

FUNDAMENTALS OF NLP

Natural language processing is a subfield of artificial intelligence that empowers computers to understand, interpret, and generate human language. It is a technique where machine can become more human and thereby making human to communicate with the machine easily. NLP seeks to make software intelligent enough to process a natural language as

humans. For example, imagine a machine that takes instructions by voice.

NLP analysis generally consists of the following three levels [3]:

- *Syntax*, the study of sentence structure. Syntax deals with the formation of a sentence from individual words. Syntax alone suggests the proper interpretation of “Jimmy loves Lucy.”
- *Semantics*, the study of context-independent meaning. This derives the meaning of a sentence based on the meanings of the words/phrases. For example, semantics determines whether the word “bank” refers to a river bank or to a financial institution.
- *Pragmatics*, the study of context-dependent meaning. Pragmatics deals with how meaning changes in the presence of a specific context and how the contexts affect the meaning of the sentences. This level is concerned with the purposeful use of language in situations.

As a foundational pillar of modern artificial intelligence, NLP encompasses a wide array of tasks, including speech recognition, text classification, natural language understanding (NLU), and natural language generation (NLG). NLP encompasses a wide range of tasks, such as information retrieval (IR), named entity recognition (NER), relation extraction, text classification, topic modeling, semantic textual similarity, machine translation, and question answering (QA). Figure 1 shows how NLP transforms raw acoustic data into meaningful interactions [4], while Figure 2 shows different components of NLP [5].

Recently, large language models (LLMs) have shown their ability in learning universal language representations, text understanding and generation. LLMs refer to a model with a large number of parameters, vast training data, and substantial compute, enabling it to capture complex language patterns. In LLM-based NLP, pre-processing is followed by prompt engineering, which guides LLMs to produce outputs that align with extraction requirements during inference without altering the model’s parameters. Models like GPT are pushing the boundaries of language understanding, enabling nuanced and context-aware applications. The GPT (Generative Pretrained Transformer) is a large-scale language model developed by OpenAI that consists of multiple layers of transformer blocks, each with a self-attention mechanism and a forward neural network [6]. GPT-based systems can summarize complex reports or generate creative content like essays, making them versatile in both academic and

professional environments. ChatGPT uses NLP techniques to understand prompts. When you enter a prompt, the chatbot comprehends it and provides relevant replies. Figure 3 shows how NLP works [7], where Figure 4 depicts some applications of NLP [8].

NLP IN HUMAN RESOURCES

The landscape of human resources (HR) is undergoing a profound transformation, driven by rapid advancements in artificial intelligence (AI). At the forefront of this revolution is natural language processing (NLP), a branch of AI that enables computers to understand, interpret, and generate human language. NLP encompasses various techniques that enable machines to understand, interpret, and respond to human language in a valuable way. From streamlining recruitment to fostering employee engagement, NLP is reshaping how organizations manage their most valuable asset: their people. Structured and unstructured data synergize to improve the quality of insights for HR. NLP offers powerful tools for analyzing unstructured text data, enabling organizations to extract meaningful insights from qualitative feedback. In systems where applications/resumes have semi-structured data points, NLP can act in conjunction with the structured data points for improving the quality and accuracy of classifications and inferences. Figure 5 shows NLP-HR model [9].

APPLICATIONS OF NLP HUMAN RESOURCES

From automating recruitment processes and personalizing employee support to extracting valuable insights from unstructured data, NLP’s applications are vast and continue to expand. Figure 6 shows key applications of NLP in HR [9]. Common applications of NLP in human resources include the following [1,2,10,11]:

- *Recruitment*: In any company, the human resources (HR) department plays a crucial role because it is critical to hire the appropriate personnel. Recruitment is traditionally one of the most time-consuming and resource-intensive functions within HR. The sheer volume of resumes and job applications can overwhelm even the most dedicated talent acquisition teams. NLP offers a solution by automating the initial stages of the hiring process, allowing recruiters to focus on strategic decision-making and candidate engagement. One of the most prominent applications of NLP in recruitment is resume screening and parsing. Advanced NLP algorithms can automatically extract critical information from resumes, such as skills, educational background, and work experience, regardless of

the document's format. This capability significantly reduces the time spent on manual review and ensures a more consistent evaluation process. Figure 7 shows NLP in hiring [9].

- *Sentiment Analysis:* Beyond recruitment, NLP is instrumental in employee sentiment analysis (text analytics). Understanding employee sentiment and addressing concerns proactively is vital for retention and productivity. NLP is increasingly used for sentiment analysis—monitoring employee emails, Slack messages, and feedback surveys to gauge morale. Sentiment analysis is a powerful NLP technique used to gauge employee morale and identify potential issues before they escalate. By analyzing text from employee surveys, internal communication platforms, and feedback forms, NLP models can determine the underlying emotional tone—whether positive, negative, or neutral. This provides HR leaders with actionable insights into the overall health of the organizational culture.
- *Employee Feedback:* Regularly soliciting and acting upon employee feedback fosters a culture of open communication and trust, which are essential for retaining talent and improving organizational performance. NLP is instrumental in gaining deeper insights from employee sentiment and feedback. NLP can be used in HR management to analyze employee feedback and comments to identify trends and areas for improvement in employee engagement and satisfaction. NLP can automatically classify feedback into different categories, such as communication, productivity, and work-life balance, and identify the most common complaints or areas for improvement. This can help HR professionals identify issues early on and take appropriate action to address them. Customers use NLP to better understand employee feedback, allowing them to identify trends and address concerns proactively, ultimately leading to a more engaged workforce. The ability to quantify and understand qualitative feedback empowers HR to move from reactive problem-solving to proactive strategic planning, directly impacting employee retention and satisfaction.
- *Performance Management:* Performance management is another area where NLP is making significant inroads. Traditional performance reviews can be subjective and time-consuming to analyze, especially in large organizations. NLP can automate the analysis of performance feedback, summarizing key themes

and identifying trends across departments or teams. This data-driven approach enables HR to design targeted learning and development programs, ensuring that training initiatives align with both individual career goals and organizational needs.

- *Chatbots:* The deployment of HR chatbots and virtual assistants has transformed how employees interact with HR departments. In HR operations and service delivery, NLP-powered AI chatbots handle routine employee queries regarding benefits, leave policies, and onboarding procedures, offering instant support. Powered by dialogue systems and language generation models, these virtual assistants can provide instant, 24/7 answers to common inquiries regarding benefits, payroll, and company policies. This not only improves the employee experience by providing immediate support but also frees up HR professionals to handle more complex, strategic tasks.

BENEFITS

The integration of NLP into HR processes yields several significant benefits. Foremost among these is enhanced efficiency. NLP offers unprecedented opportunities for automation, efficiency, objectivity, and enhanced employee experiences. Other benefits of NLP in human resources include the following [1]:

- *Automation:* NLP facilitates the automation of document analysis, such as processing legal documents, contracts, or internal communications, by extracting relevant information and flagging anomalies, thereby improving data quality and reducing manual effort. Automation of tasks such as resume screening, data extraction, and query resolution drastically reduces the time and resources traditionally allocated to administrative functions. This not only accelerates HR workflows but also allows HR professionals to focus on strategic initiatives that add greater value to the organization. Automated screening can filter candidates more consistently and at a larger scale than manual methods, leading to a higher pass rate in subsequent human interviews.
- *Enhanced Efficiency:* One of the most immediate and tangible benefits of NLP in HR is the dramatic increase in operational efficiency and automation, particularly in recruitment and talent acquisition. Traditionally, sifting through countless resumes and applications was a time-consuming and often inconsistent manual process. NLP-powered systems can now automate resume screening, extracting key skills, experience, and

qualifications to match candidates with job requirements with remarkable speed, accuracy, and efficiency.

- *Increased Objectivity:* Another crucial benefit is the potential for increased objectivity and reduced bias. While not without its own challenges, NLP, when properly implemented and audited, can help mitigate human biases inherent in traditional HR processes. By focusing on objective criteria extracted from language data, NLP tools can contribute to fairer candidate evaluations and more equitable talent management decisions. By analyzing the content of resumes and job descriptions for relevant competencies, NLP algorithms can help create more diverse and qualified candidate pools, mitigating human biases that might inadvertently creep into manual screening processes. This objective evaluation ensures that candidates are assessed based on merit, leading to fairer hiring outcomes.
- *Improved Decision-making:* NLP plays a crucial role in fostering more objective decision-making and reducing unconscious bias within HR processes. In talent acquisition, NLP enables skills-based matching, moving beyond traditional criteria like past job titles or educational institutions to focus on a candidate's demonstrated abilities and potential. The insights can be used to make data-driven decisions about HR policies and practices. NLP in HR transforms unstructured HR data into valuable insights that can aid decision-making and improve workplace performance.
- *Improved Employee Experience:* NLP significantly improves the employee experience. The availability of 24/7 support through AI chatbots and personalized communication fosters a more responsive and supportive work environment. For employees, this translates to quicker access to information and more efficient resolution of their concerns

CHALLENGES

In spite of its transformative potential, the adoption of NLP in HR is not without its challenges, particularly concerning ethical implications. The challenges of bias, privacy, fairness, ethics, transparency, and the inherent complexity of human language require a cautious and deliberate approach. Other challenges of NLP in human resources include the following [1]:

- *Ethical Concerns:* The most pressing concerns surrounding NLP in HR are ethical. Algorithms are not inherently objective; they learn from historical data, which often contains human biases. Organizations must be acutely aware of

the ethical implications and potential pitfalls associated with automated decision-making.

- *Data Privacy:* Data privacy and security represent another critical challenge. HR deals with highly sensitive personal employee information, and the use of NLP tools requires robust measures to protect this data and ensure compliance with stringent regulations such as GDPR and CCPA. Organizations must implement secure data handling practices and transparent policies regarding data usage.
- *Data Quality:* A primary technical obstacle is the quality and structure of the data itself. Resumes, cover letters, and performance reviews are highly unstructured documents filled with industry-specific jargon, acronyms, and varied formatting. General-purpose NLP models often struggle to accurately extract skills and experiences from these diverse formats.
- *Bias:* A primary concern is algorithmic bias. NLP models are trained on historical data, which often reflects existing societal biases. If not carefully curated and continuously monitored, these models can perpetuate and even amplify biases related to gender, race, or other protected characteristics in hiring and promotion decisions. This necessitates rigorous auditing and the development of bias mitigation strategies to ensure fairness and equity. For example, Amazon's new recruiting engine did not like women. The tool systematically discriminated against women applying for technical jobs, such as software engineer positions.
- *Complexity:* The complexity of human language, including nuances, sarcasm, and context, can pose difficulties for NLP algorithms. The complexities of human language, communication and dynamic decision making required by HR in the real world is complex. This implies that total automation is impractical and can be downright counterproductive. Machines find it complex to comprehend the finer nuances of human language. Like sarcasm, ambivalence, deformed compliments, passive aggression, regional norms, etc.
- *Collaboration:* The collaboration between human expertise and AI's analytical power promises a more effective, equitable, and employee-centric future for human resources. The goal is not to replace human HR professionals but to augment their capabilities, allowing them to leverage technology for greater efficiency and insight while retaining the essential human element of

empathy, judgment, and interpersonal communication.

- *Transparency:* The transparency of NLP models can be a significant hurdle. The “black box” nature of some AI systems makes it difficult to explain how certain decisions are reached, which can lead to distrust and legal challenges, especially in critical HR functions like hiring or performance evaluations. NLP models provide an output—such as a candidate ranking—without a clear explanation of how that conclusion was reached. In HR, where decisions impact livelihoods, this lack of explainability is problematic. Candidates have a right to know why they were rejected, and in many jurisdictions, individuals have a legal right to an explanation for automated decisions.
- *Organizational Resistance:* The successful deployment of NLP in HR faces significant organizational hurdles. There is often a natural resistance to adoption among HR professionals who may fear job displacement or distrust algorithmic recommendations. Conversely, there is the risk of “automation bias,” where employees become overly reliant on the NLP's outputs, accepting algorithmic suggestions without applying necessary human expertise and judgment.
- *Human Element:* The recruitment process is fundamentally a human interaction. Dehumanizing the applicant by reducing them to a set of parsed keywords or an algorithmic score can damage an employer's brand. Candidates value human connection and empathy, qualities that no NLP model can replicate. HR leaders must view NLP as a tool to augment human decision-making, not replace it.

FUTURE OF NLP HUMAN RESOURCES

Advances in natural language processing (NLP) have the potential to transform HR processes, from recruitment to employee management. The future of NLP in HR necessitates careful consideration of ethical implications and the importance of human-AI collaboration. While NLP can reduce bias, it is crucial to ensure that the algorithms themselves are developed and trained on diverse and unbiased datasets to prevent perpetuating existing societal prejudices. By mitigating bias and providing deeper insights into the workforce, NLP empowers HR to evolve into a more strategic and impactful function within organizations. As technology continues to advance, the integration of NLP will undoubtedly lead to further innovations, fostering a future where

HR is more agile, data-driven, and ultimately, more human-centric [1].

CONCLUSION

Natural language processing is no longer a futuristic concept; it is a practical tool that is actively transforming human resources. It has become a transformative technology for human resources. Its ability to process and derive meaning from vast amounts of text data has profound benefits, ranging from significantly enhancing efficiency in recruitment and HR operations to improving decision-making through objective candidate evaluation and nuanced sentiment analysis. By automating routine tasks, providing deep insights into employee sentiment, and facilitating data-driven decision-making, NLP empowers HR professionals to become strategic partners in driving organizational success. Organizations that successfully integrate NLP into their HR practices will be well-positioned to attract, retain, and develop top talent in an increasingly competitive landscape. More information about the integration of NLP in human resources can be found in [12-15] and the following related journals:

- Natural Language Processing Journal
- Journal of Emerging Technologies and Innovative Research

REFERENCES

- [1] <https://manus.im>
- [2] R. Panarin, “NLP applications for human resource management,” <https://maddevs.io/blog/nlp-applications-for-human-resource-management/>
- [3] J. Hirschberg, B. W. Ballard, and D. Hindle, “Natural language processing,” *AT&T Technical Journal*, Jan./Feb. 1988, vol. 67, no. 1, 1988.
- [4] A. Jain, “What is the role of NLP in voice assistants?” August 2024, https://www.analyticsinsight.net/nlp/what-is-the-role-of-nlp-in-voice-assistants#google_vignette
- [5] “How Google uses NLP to improve SERPs, featured Snippets & UX,” <https://digitalguider.com/blog/what-is-google-nlp/>
- [6] X. Jiang et al., “Applications of natural language processing and large language models in materials discovery,” *NPJ Computational Materials*, vol. 11, no.79, 2025.
- [7] “What is NLP? How it works, benefits, challenges, examples,” June 2025,

<https://www.shaip.com/blog/what-is-nlp-how-it-works-benefits-challenges-examples/>

- [8] A. Arif, “NLP in finance: Examining the impact of natural language processing in financial and banking services,” July 2023, <https://www.johnsnowlabs.com/examining-the-impact-of-nlp-in-financial-services/>
- [9] R. Sengupta, “How natural language processing can revolutionize human resources,” <https://www.aihr.com/blog/natural-language-processing-revolutionize-human-resources/>
- [10] N. Otani, N. Bhutani, and E. Hruschka, “Natural language processing for human resources: A survey,” <https://www.semanticscholar.org/reader/f44d7f6bd346ab16716647886c9d0de2ba25166b>
- [11] K. M. Jamuna, “Leveraging natural language processing to analyze employee feedback for enhanced HR insights,” *International Journal of Scientific Research in Engineering and Management*, vol. 8, no., 11, November 2024, pp. 1-6.
- [12] S. Vajjala et al., *Practical Natural Language Processing*. O’Reilly Media, 2020.
- [13] H. Lane and M. Dyshel, *Natural Language Processing in Action*. Manning Publications, 2nd edition, 2025.
- [14] P. Yadav, *Human Resource Strategies in the Era of Artificial Intelligence*. IGI Global, 2024.
- [15] W. Chen et al. (eds.), *Proceedings of the 2025 Conference of the Nations of the Americas Chapter of the Association for Computational Linguistics: Human Language Technologies (Volume 3: Industry Track)*, Albuquerque, New Mexico, April 2025.



Figure 1 A representation of NLP [4].

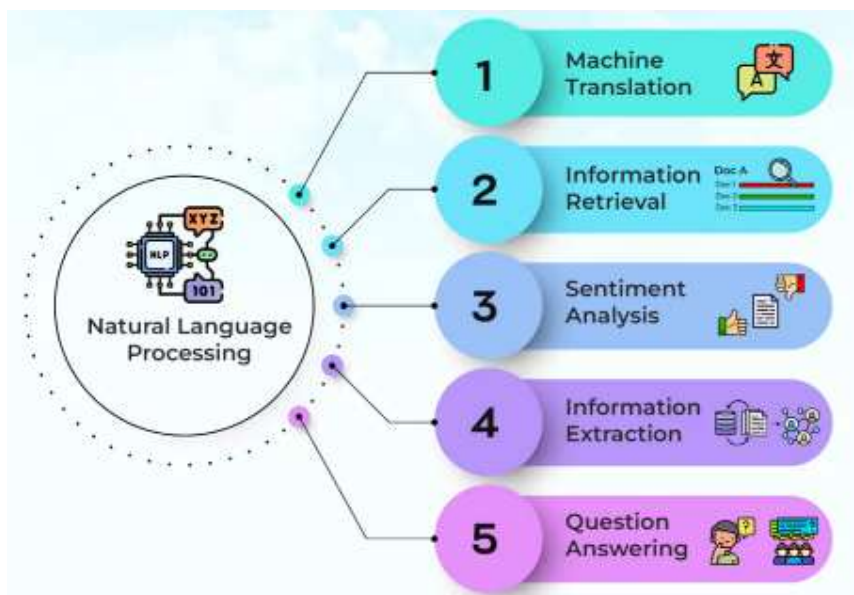


Figure 2 Different components of NLP [5].

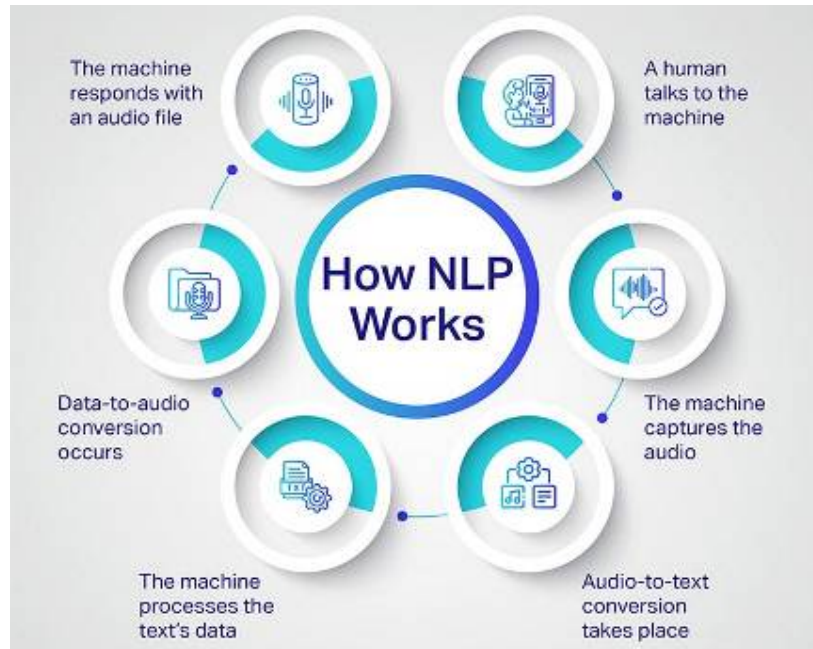


Figure 3 How NLP works [7].



Figure 4 Some applications of NLP [8].

NLP – HR MODEL

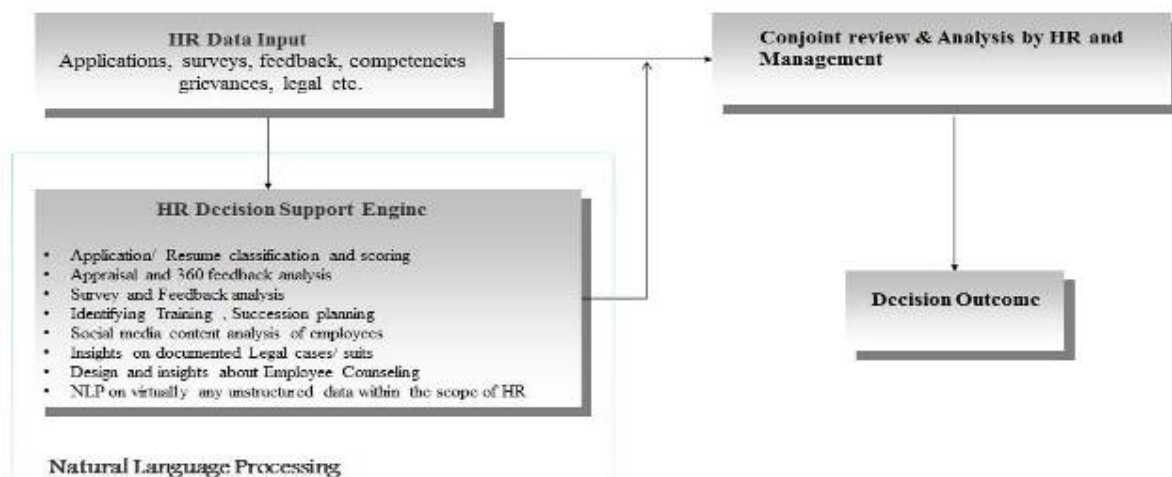


Figure 5 NLP-HR model [9].

Key application area of Natural Language Processing in HR

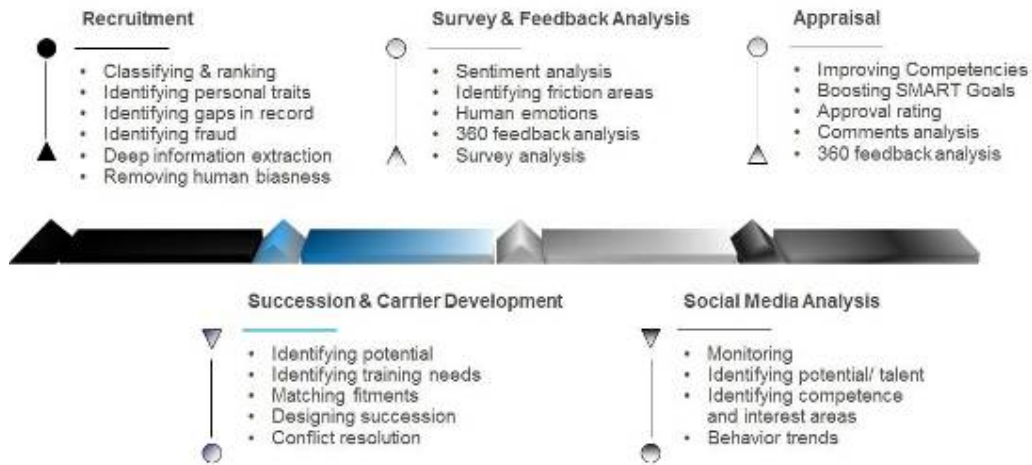


Figure 6 Key applications of NLP in HR [9].

Use Case of NLP in Hiring

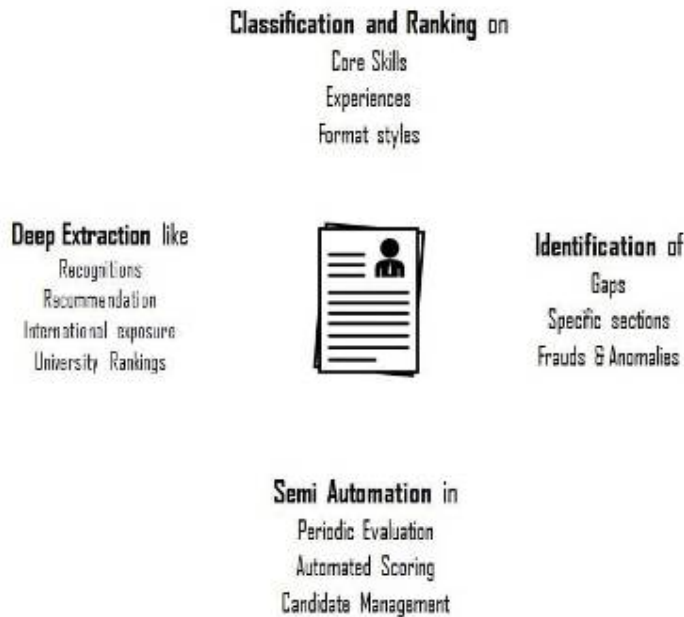


Figure 7 NLP in hiring [9].