Robotics and Automation: A Necessary Evil

1st Abdullah Hassan
Department of Data Science
Faculty of Computing and Information Technology
University of the Punjab
Lahore, Pakistan
bsdsf21a003@pucit.edu.pk

2nd Abdul Moeed
Department of Data Science
Faculty of Computing and Information Technology
University of the Punjab
Lahore, Pakistan
bsdsf21a004@pucit.edu.pk

3rd Muhammad Soban Anjum
Department of Data Science
Faculty of Computing and Information Technology
University of the Punjab
Lahore, Pakistan
bsdsf21a007@pucit.edu.pk

4th Muhammad Sohaib Gill
Department of Data Science
Faculty of Computing and Information Technology
University of the Punjab
Lahore, Pakistan
bsdsf21a041@pucit.edu.pk

5th Faisal Bukhari
Department of Data Science
Faculty of Computing and Information Technology
University of the Punjab
Lahore, Pakistan
faisal.bukhari@pucit.edu.pk

I. INTRODUCTION

Nowadays, it is the era of Artificial Intelligence, robotics, or automation. Even though there has been significant progress in this field, many people still don't understand it, and they associate it with various things. Our goal was to see how much progress has been made in this and how much potential is still untapped. People still don't know, but we undertook our project to familiarize them with what robotics and automation really entail. Then, we asked them questions according to their understanding.

In the contemporary landscape, we find ourselves immersed in the age of Artificial Intelligence (AI), robotics, and automation. Despite witnessing remarkable advancements in these fields, a substantial portion of the population remains unaware of the intricacies involved. The pervasive influence of these technologies, though trans-formative, often eludes the understanding of many.

The rapid pace of development in AI, robotics, and automation has reshaped industries, economies, and daily life. From machine learning algorithms that power recommendation systems to robotic arms automating manufacturing processes, the impact is undeniable. However, the disconnect between the rapid evolution of these technologies and public awareness persists.

Our initiative sought to bridge this knowledge gap and unveil the depth of progress achieved and the untapped potential that lies ahead. As we delved into our project, we aimed to showcase the multifaceted nature of robotics and automation, moving beyond common misconceptions. These technologies are not mere abstract concepts but tangible forces shaping the world around us.
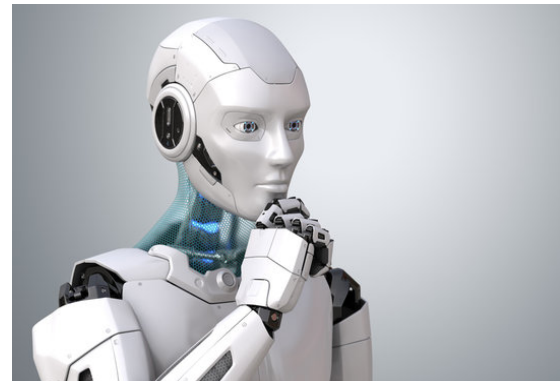

Fig. 1: Automated Robots

One of the challenges we encountered was the prevalent misconception that AI and robotics are confined to science fiction scenarios. Many individuals associate them with humanoid robots or futuristic dystopi-as, overlooking the subtle yet pervasive integration of these technologies into everyday life. Through our project, we aimed to dispel these myths and illustrate how AI and robotics manifest in various sectors, from healthcare and finance to transportation and beyond.

The lack of awareness is not solely attributed to disinterest; rather, it often stems from the complexity of these technological domains. Concepts like machine learning, neural networks, and autonomous systems can be daunting for those not directly involved in the field. Our efforts were geared towards simplifying these concepts and presenting them in a way that resonates with a broader audience.

Moreover, we addressed the prevailing concerns and apprehensions surrounding AI and automation. Questions about job displacement, ethical considerations, and the potential misuse of these technologies are common. By engaging with the public and initiating conversations, we aimed to demystify these concerns and foster a more informed and nuanced understanding.

In the pursuit of unraveling the mysteries of AI, robotics, and automation, we posed questions to individuals based on their existing knowledge and perceptions. This not only provided valuable insights into the prevailing misconceptions but also served as a platform for constructive dialogue. The diversity of responses underscored the need for continued education and awareness initiatives in these trans-formative fields.

As we navigate the ever-evolving landscape of technology, it becomes imperative to bridge the gap between innovation and public understanding. Our project, in its exploration of AI, robotics, and automation, aimed to be a catalyst for informed discussions, dispelling myths, and fostering a collective vision for a future where these technologies are harnessed responsibly for the betterment of society.

We have divided our survey into 3 perspectives, the reason being that we wanted to get the perspective of the industry experts, users/consumers and ultimately the developers.

II. METHODOLOGY

In this project, we have implemented a correlation analysis and applied the "Wilcoxon signed-rank test".
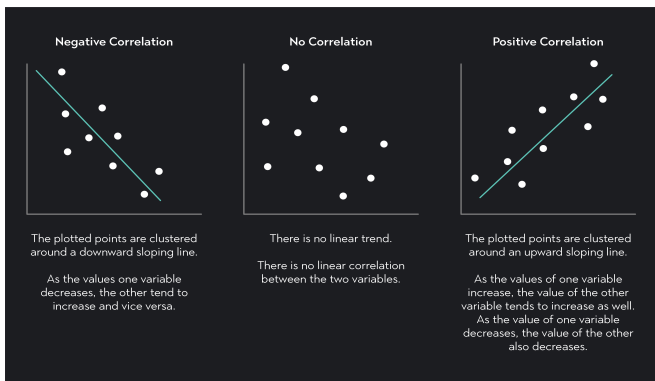

Fig. 2: Co-relation Test

Correlation analysis is a statistical method employed to assess the strength and direction of a linear relationship between two variables. By calculating the correlation coefficient, we gain insights into how changes in one variable correspond to changes in another. This technique allows us to identify patterns, dependencies, or trends within the data, providing a quantitative measure of the relationship's magnitude.
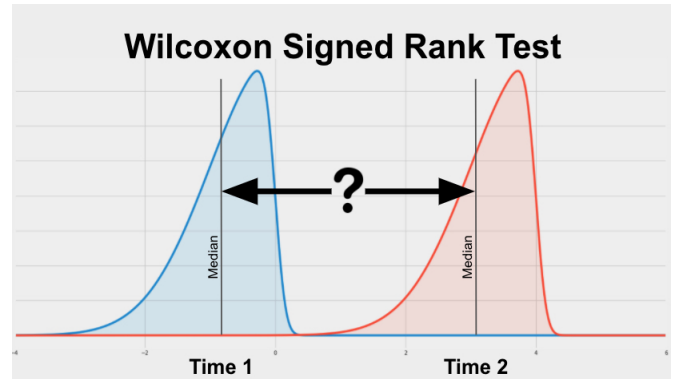

Fig. 3: Wilcoxon Signed Ranked Test

Simultaneously, the "Wilcoxon signed-rank test" is a non-parametric statistical test used to compare paired data points. Unlike traditional parametric tests, the "Wilcoxon test" does not assume a normal distribution of the data, making it robust and applicable to a wider range of scenarios. It evaluates whether there is a significant difference between two related groups, acknowledging the ordinal nature of the data and focusing on the direction of the differences rather than their specific values.

The decision to use these statistical methods in our project is rooted in their versatility and reliability. Correlation analysis enables us to uncover potential associations or dependencies between variables, offering valuable insights into the underlying dynamics of the studied phenomena. Meanwhile, the "Wilcoxon signed-rank test", with its non-parametric nature, is particularly suitable for scenarios where assumptions of normality might be violated or when dealing with ordinal data.

In the context of our project, these statistical tools serve a dual purpose. Firstly, they provide a rigorous and systematic approach to exploring relationships and differences within the data we have collected. This is crucial for drawing meaningful conclusions and making informed decisions based on the evidence derived from our study. Secondly, the application of these methods aligns with the project's commitment to employing robust statistical techniques that ensure the reliability and validity of our findings.

By incorporating correlation analysis and the "Wilcoxon signed-rank test", we aim to not only deepen our understanding of the intricate patterns within the data but also to uphold the highest standards of statistical rigor in our project, thereby enhancing the credibility and unreliability of our results. These tools serve as indispensable instruments in the arsenal of a data-driven approach, contributing to the project's overall objective of deriving meaningful insights and drawing well-founded conclusions.

III. Experiments and Results

As a traveler, how do automated systems in airports, hotels, and transportation services affect my overall experience, convenience, and safety? This question aims to gather insights into the real-world impact of automation on travelers' experiences, focusing on aspects such as convenience and safety. We seek to explore how automated systems, often deemed a necessary evil, influence the practical aspects of travel, shedding light on both positive and potentially negative consequences.
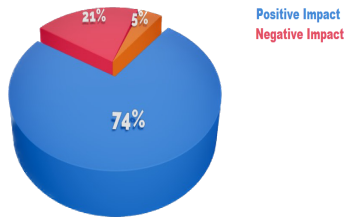

Fig. 4

The survey presented respondents with three options: Positive Impact, Neutral Impact, and Negative Impact. The results indicate that a substantial majority 74.2 percent of respondents perceive a Positive Impact, while 20.8 percent expressed a Neutral Impact. This overwhelming positivity towards automated systems suggests a general satisfaction among travelers regarding the integration of robotics and automation in the travel industry.

Positive Impact (74 percent): Respondents in this category highlighted the improved efficiency and convenience brought about by automated systems. The streamlined processes at airports, automated check-ins at hotels, and advanced transportation services were cited as factors contributing to an overall positive travel experience. Additionally, the perceived enhancement of safety measures, such as automated security checks, played a significant role in shaping this positive perspective.

Neutral Impact (21 percent): A notable proportion of respondents expressed a neutral stance, indicating a lack of strong positive or negative feelings towards automated systems in the travel domain. Further investigation into this group's comments and feedback could uncover nuanced aspects that contribute to this neutrality, potentially informing areas for improvement or optimization in automated systems

The statistical analysis of end-user perspectives on automated systems in the travel industry reveals a predominantly positive sentiment. Travelers appreciate the efficiency, convenience, and safety aspects that automation brings to airports, hotels, and transportation services. This research provides valuable insights for stakeholders in the travel industry to understand end-users' perspectives, fostering a more informed

approach to the integration and improvement of robotic and automated technologies.

Is there a significant correlation between the amount of training data for robotic systems and their overall performance?

This question addresses a fundamental aspect of the efficiency and effectiveness of robotic systems by examining the relationship between training data and performance. The provided options offer respondents a choice to express their views on the correlation strength, providing a quantitative aspect to your research. Ensure that respondents can select the option that best aligns with their perspective on the relationship between training data and the overall performance of robotic systems.
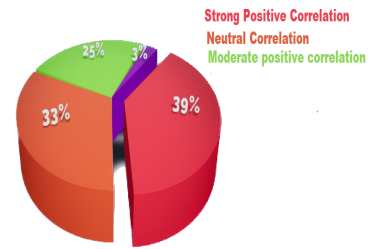

Fig. 5

Strong Positive Correlation (39 percent): A significant portion of respondents believes that there is a strong positive correlation between the amount of training data and the overall performance of robotic systems. This suggests that, in the view of these participants, increasing the volume of training data contributes substantially to enhancing the effectiveness and efficiency of robotic systems.

Neutral Correlation (33 percent): A substantial proportion of respondents adopted a neutral stance, indicating a lack of a clear correlation between the amount of training data and the overall performance of robotic systems. This suggests that, according to this group, other factors may play a role in determining the effectiveness of robotic systems, and the volume of training data alone may not be a decisive factor.

Moderate Positive Correlation (25 percent): A minority of respondents perceives a moderate positive correlation between the amount of training data and the overall performance of robotic systems. This viewpoint suggests that while training data volume is considered a factor, its influence may be moderate compared to other factors impacting performance.

The analysis of respondents' perspectives on the correlation between training data volume and the overall performance of robotic systems reveals a diverse range of opinions. This research provides valuable insights into the perceived impact of training data on robotic system effectiveness, informing

future strategies for training and optimizing robotic systems for various applications.

How much useful automation is in your life? This open-ended question allows participants to provide subjective insights into the extent to which automation positively impacts their daily routines. The responses can provide qualitative data that adds depth to your research on the topic of "Robotics and Automation: A Necessary Evil." This question captures the user perspective on the usefulness of automation and can help uncover specific areas where automation is seen as particularly beneficial or potentially challenging.
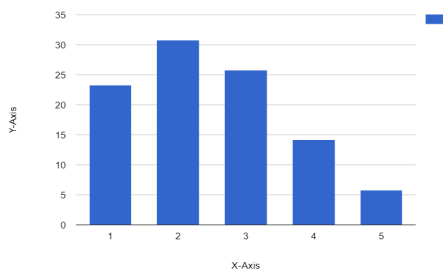

Fig. 6

Option B (30.8 percent): The highest percentage of respondents selected Option B, indicating that a significant portion considers automation to be quite useful in their daily lives. This suggests a positive outlook on the impact of automation, with a substantial number of individuals benefiting from automated processes.

Option C (25.8 percent): A notable percentage of respondents perceive automation as moderately useful in their daily lives. This suggests a balanced perspective, where automation plays a substantial but not overwhelming role in contributing to daily tasks and activities.

Option A (23.3 percent): A considerable portion of respondents believes that automation has a relatively lower level of usefulness in their daily lives. This viewpoint may reflect a certain degree of skepticism or limited exposure to automation in specific contexts.

Option D (14.2 percent): A smaller percentage of respondents expressed that automation has a limited usefulness in their daily lives. This suggests a more reserved attitude towards the integration of automated processes into various aspects of daily routines.

Option E (5.8 percent): The lowest percentage of respondents chose Option E, indicating that a small but distinct group perceives automation as minimally useful in their daily lives. This viewpoint may be associated with a preference for traditional, manual methods or a lack of exposure to automation.

The quantitative analysis of respondents' perceptions regarding the usefulness of automation in their daily lives reveals

a diverse range of opinions. This research contributes to the understanding of the prevalence and impact of automation on individuals' routines, offering valuable insights for industries and policymakers involved in the development and implementation of automated technologies.

What role do developers see AI playing in the future of automation? This question aligns with our research on "Robotics and Automation" as it seeks to understand the perspectives of developers who are at the forefront of shaping the future of automation. Their responses can provide valuable information on the envisioned roles, expectations, and potential concerns regarding AI in the context of automation. By focusing on developers, you gain insights from a key stakeholder group, shedding light on the trajectory and considerations in the ongoing development of automation technologies.
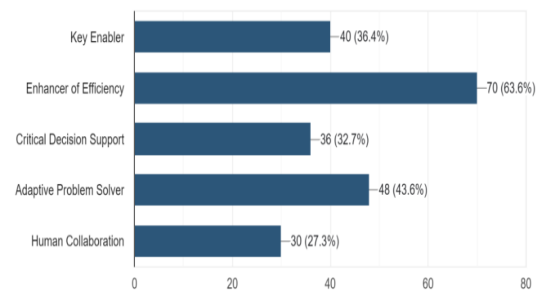

Fig. 7

Option B (63.6 percent): The majority of developers see AI as an enhancer of efficiency. This suggests a prevailing belief that AI technologies will primarily focus on optimizing processes and workflows to achieve higher levels of productivity and effectiveness.

Option D (43.6 percent): A significant portion of respondents views AI as having a role in adaptive problem-solving. This indicates a recognition of AI's potential to dynamically address complex challenges and find innovative solutions in various automated processes.

Option A (36.4 percent): A substantial percentage of developers considers AI as a key enabler in the future of automation. This perspective implies that AI will play a foundational role in empowering and facilitating various automated systems and processes.

Option C (32.7 percent): A notable portion of developers believes that AI will serve as critical decision support in the future of automation. This suggests a recognition of AI's ability to assist in making informed and strategic decisions within automated systems.

Option E (27.3 percent): A smaller percentage of developers sees AI's role in fostering human collaboration. This perspective suggests that while AI may enhance efficiency, there might be a belief that it will still require human collaboration for optimal performance.

The quantitative analysis of developers' perspectives on the future role of AI in automation highlights a diverse range of viewpoints. Understanding these perceptions is crucial for industry stakeholders, policymakers, and researchers to align development efforts with the anticipated roles of AI in shaping the future of automation.

If you are a developer of automation or robotics, have you ever encounter any difficulty in the development of the automation service?

This question aligns well with our research on "Robotics and Automation" as it delves into the challenges faced by those directly involved in creating these technologies.

Responses to this question can provide valuable qualitative data on the hurdles, complexities, or issues developers may encounter during the development process. Understanding these challenges contributes to a comprehensive view of the industry and can highlight areas for improvement or innovation.
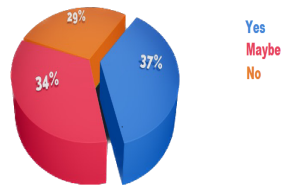

Fig. 8

Option A (Yes, 37 percent): A significant percentage of developers affirmatively reported encountering difficulties in the development of automation services. This suggests that a considerable portion of developers has faced challenges, which may include technical, logistical, or conceptual hurdles in their projects.

Option B (Maybe, 34 percent): A substantial number of developers expressed uncertainty or a nuanced view regarding difficulties in development, choosing the "Maybe" option. This indicates that some developers may have experienced challenges but are uncertain about categorizing them as significant difficulties.

Option C (No, 29 percent): A notable minority of developers asserted that they have not encountered any difficulties in the development of automation services. This suggests that a portion of developers has had relatively smooth experiences without significant hurdles.

The survey results provide valuable insights into the challenges faced by developers in the field of automation and robotics. Understanding the prevalence and nature of these difficulties is crucial for industry stakeholders, educational institutions, and researchers to address specific areas that may pose challenges and to provide adequate support and resources for developers in this dynamic field.

If all the automations vanishes from your life, will it effect you at all? The responses to this question can provide valuable insights into the extent to which people have integrated automation into their routines and the potential consequences they perceive if automation were suddenly removed. It helps you understand the dependency, convenience, and overall value that individuals associate with automation. Consider including a range of response options, such as "Yes, significantly," "Yes, to some extent," "No, not much," to allow for nuanced and varied perspectives.
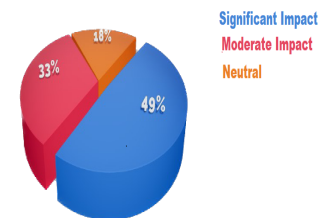

Fig. 9

Option A (Significant Impact, 45 percent): A significant percentage of respondents believe that the disappearance of automation would have a significant impact on their lives. This suggests that a substantial portion of individuals relies heavily on automated systems for various aspects of their daily routines.

Option B (Moderate Impact, 30 percent): A notable percentage of participants anticipate a moderate impact if all automations were to vanish. This indicates that, while not as heavily dependent as the first group, a significant portion of individuals acknowledges the role of automation in their daily lives and anticipates some level of impact if it were to be removed.

Option C (Neutral, 16 percent): A minority of respondents expressed a neutral stance, suggesting that the disappearance of automation may not have a noticeable impact on their lives. This group may have a lower reliance on automated systems or a preference for manual methods in various activities.

The quantitative analysis of participants' perspectives on the potential impact of automation withdrawal highlights a diverse range of viewpoints. Understanding the varying degrees of dependence on automation is essential for industries, policymakers, and researchers to develop strategies that align with individuals' expectations and needs in a world increasingly shaped by automated technologies.

What are the potential long-term consequences of automation on job markets?

This question explores respondents' perceptions of the potential long-term consequences of automation on job markets. The options cover a spectrum of outcomes, from positive aspects such as increased efficiency, higher productivity, and innovation to concerns about job displacement and a reduction in overall job opportunities.
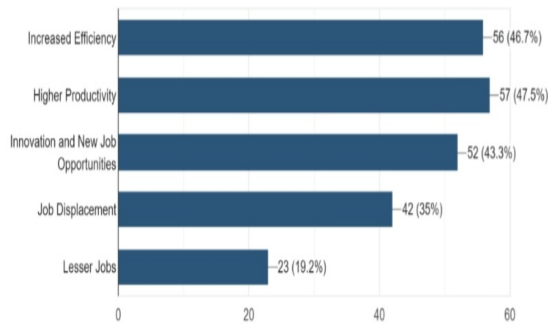

Fig. 10

Option A (Increased Efficiency 46.7 percent) - Respondents who believe that automation will lead to increased efficiency in job markets constitute 46.7 percent of the total. The graph visually represents the support for the idea that automation can enhance overall efficiency in the job market.

Option B (Higher Productivity 47.5 percent) - Those who anticipate higher productivity as a consequence of automation make up 47.5 percent of respondents. The graph illustrates the percentage of support for the idea that automation will contribute to elevated productivity levels.

Option C (Innovation and New Job Opportunities 43.3 percent) - A substantial 43.3 percent of respondents foresee innovation and the emergence of new job opportunities as a consequence of automation. The graph visually represents the optimism regarding the creation of novel job roles.

Option D (Job Displacement 35 percent) - Respondents expressing concern about job displacement due to automation constitute 35 percent of the total. The graph shows the percentage of those who believe that automation may lead to a reduction in existing job positions.

Option E (Lesser Jobs 19.2 percent) - Those who foresee a reduction in overall job opportunities due to automation make up 19.2 percent of respondents. The graph illustrates the percentage of those expressing a more pessimistic view on job availability.

In summary, respondents hold a mix of optimistic and cautious perspectives regarding the long-term consequences of automation on job markets. A significant proportion anticipates increased efficiency (46.7 percent) and higher productivity (47.5 percent), while a substantial 43.3 percent foresee innovation and the creation of new job opportunities. However, concerns exist, with 35 percent expressing worries about job displacement, and 19.2 percent foreseeing a reduction in overall job opportunities. This nuanced response highlights the complexity of assessing the impact of automation on job markets, incorporating both positive and potentially challenging outcomes.

What are the key performance metrics in the industry that can be improved through robotic automation?

This question seeks to identify the key performance metrics in the industry that respondents believe can be enhanced through robotic automation. The options cover various aspects, including production efficiency, quality control, waste reduction, flexibility, and the integration of data analytics.
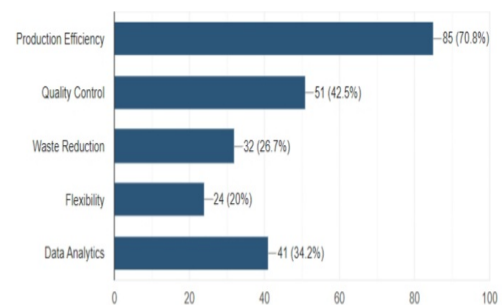

Fig. 11

Option A (Production Efficiency, 70.8 Percent) - Production efficiency is considered a crucial metric, and an overwhelming 70.8 percent of respondents believe that robotic automation can significantly improve it. The graph visually represents the high level of support for the idea that automation positively impacts production efficiency.

Option B (Quality Control, 42.5 Percent) - Quality control is another important aspect, and 42.5 percent of respondents believe that robotic automation can enhance this metric. The graph illustrates the level of support for the idea that automation contributes to improved quality control.

Option C (Waste Reduction, 26.7 Percent) - Waste reduction is identified as a key metric, with 26.7 percent of respondents expressing confidence in the ability of robotic automation to contribute to reducing waste in the manufacturing process. The graph shows the percentage of support for this aspect.

Option D (Flexibility, 20 percent) - Flexibility in handling different tasks or products is considered, and 20 percent of respondents believe that robotic automation can contribute to increased flexibility in manufacturing. The graph visually represents the level of support for the idea that automation enhances flexibility.

Option E (Data Analytics, 34.2 Percent) - The integration of data analytics with robotic automation is explored, with 34.2 percent of respondents recognizing its importance. The graph shows the percentage of support for the idea that data analytics plays a significant role in optimizing manufacturing processes through automation.

In summary, the industry's consensus is that robotic automation has the potential to significantly improve key performance

metrics. Production efficiency emerges as the most dominant metric, with an overwhelming 70.8 percent of support. Quality control, waste reduction, and the integration of data analytics also receive substantial percentages of 42.5 percent, 26.7 percent, and 34.2 percent, respectively. While flexibility is considered to a lesser extent at 20 percent, it is evident that respondents generally believe in the multifaceted potential of robotic automation to positively impact various performance metrics in the industry.

IV. CONCLUSION

At the end, its not about the necessity or not. It should be a perfect balance between both. One should not totally rely on automation and robotics and also one should not totally leave it. Because totally relying on it will cause the creativity will ultimately die and if we leave the robotics or automation then it will ultimately slow down the creativity. First, there should be a proper channel through where the students/industry can learn and get the information. Second, the industry and market should have the tendency to flex and then adopt it.

Fig. 12: Statistics of Automation

In conclusion, our exploration into the realm of AI, robotics, and automation aimed not only to demystify these technologies but also to foster a holistic understanding of their impact on society. By addressing misconceptions, ethical concerns, and societal implications, we sought to contribute to a more informed and engaged public discourse surrounding the on-going technological revolution. The journey continues as we navigate the evolving landscape of innovation, seeking to strike a balance between progress and responsible, inclusive deployment of these trans-formative technologies.