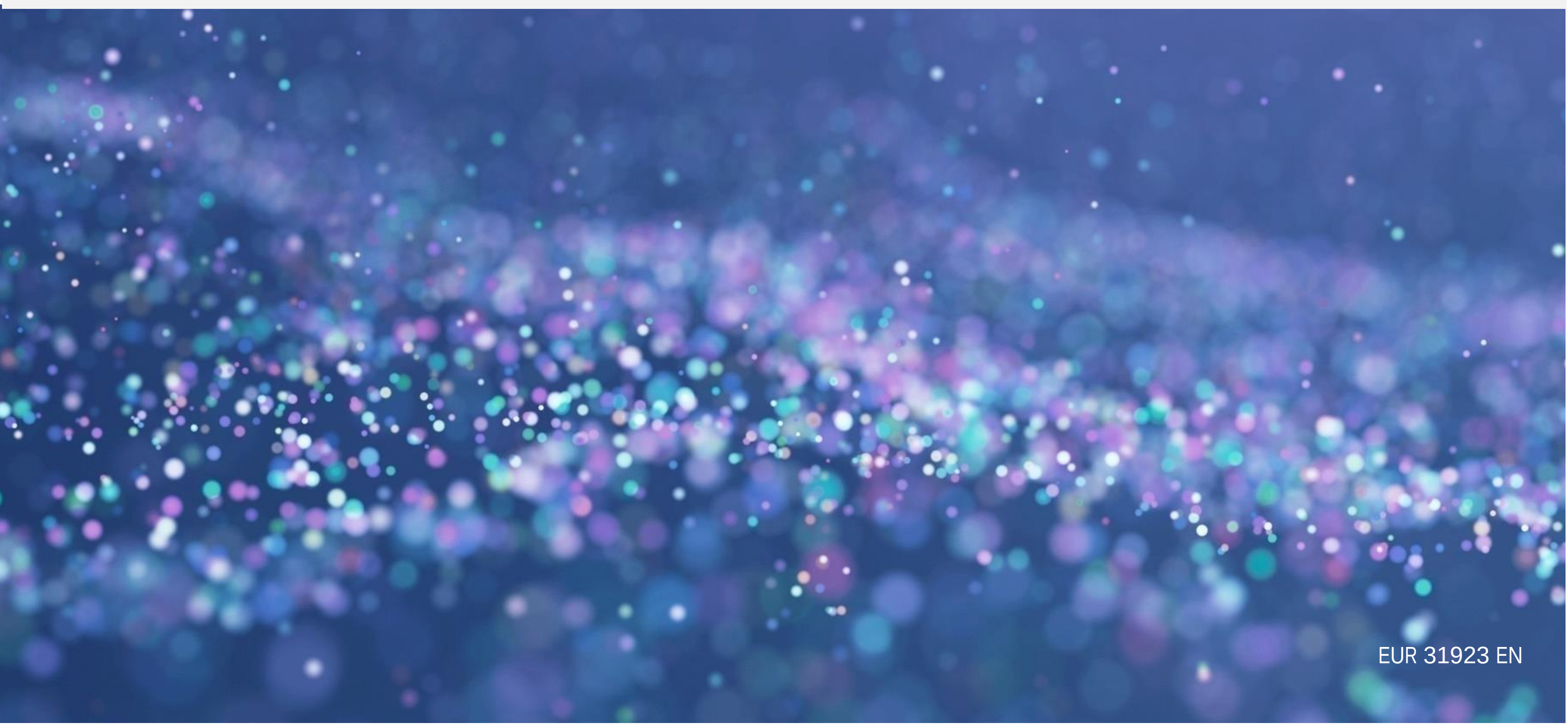
ISSN 1831-9424

Artificial Intelligence at the JRC: Survey Results 2023

Klinnert, A., Barbosa, A.L., Avgerou, A., Bernini, A., Caivano, A., Sgueo, G., Ugolotti, R.

2024



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JRC137445

EUR 31923 EN

PDF ISBN 978-92-68-15406-9 ISSN 1831-9424 doi:10.2760/793797 KJ-NA-31-923-EN-N

Luxembourg: Publications Office of the European Union, 2024

How to cite this report: European Commission, Joint Research Centre, Klinnert, A., Barbosa, A.L., Avgerou, A., Bernini, A., Caivano, A., Sgueo, G. and Ugolotti, R., Artificial Intelligence at the JRC: Survey Results 2023, Publications Office of the European Union, Luxembourg, 2024, https://data.europa.eu/doi/10.2760/793797, JRC137445.

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Abstract

The report presents the findings of a survey conducted by the JRC Community of Practitioners on Artificial Intelligence and Data Science (CoP on AI) at the Joint Research Centre (JRC). The survey aimed to update the understanding of AI at the JRC and define action points for the CoP on AI. Strong participation was noted, particularly from Directorates D, E, and T. Most respondents reported using AI in their projects, with climate change and sustainability identified as primary research areas. Machine learning, deep learning, and natural language processing emerged as prevalent AI techniques. Presentations and publications were the main dissemination methods. Despite recognizing AI's potential, participants were often unaware of JRC support services. Improvements in training opportunities and sharing best practices were highlighted. Desired training areas included machine learning, deep learning, and NLP. Main identified challenges included lack of experience, time constraints, and ethical concerns. Overall, the report underscores the need for comprehensive AI training, effective knowledge dissemination, and collaborative community efforts to address challenges and harness AI's potential.

Acknowledgements

We would like to thank the survey participants for taking the time to fill out the survey. We would also like to thank all those who helped us distribute the survey.

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Executive summary

This report presents the results of a survey on artificial intelligence (AI) at the Joint Research Centre (JRC), conducted by the JRC Community of Practitioners on Artificial Intelligence and Data Science (CoP on AI) from 15 September to 15 November 2023. This survey aimed to update the picture on AI at JRC depicted from an analogous survey conducted in 2018 (Nativi & Losada 2019) and to define concrete action points for the CoP on AI.

The number of participants who took part in the survey was 109. In order to facilitate the reading of the report and the results, we refer the reader to the Annex 1, which shows the organisation in Directorates and Units of the JRC.

Adoption and expertise on AI at the JRC

The survey revealed strong participation especially from Directorates D - Sustainable resources, E - Space, security & migration, and T - Digital transformation & data, with up to 22 respondents for each Directorate. On the other hand, Directorates A - Strategy & impact, G - Nuclear safety & security, and R - Support services showed limited or no participation. This can be attributed to the tailored survey distribution, which both prioritised directorates with a strong presence of activities related to AI and Data Science and focused on attracting individuals interested in joining a CoP.

Most survey participants were already using AI in their projects. Particularly high usage was observed in Directorates T and E, where up to 85% of participants have used AI, compared to 40% in Directorate B - Fair & sustainable economy and 0% in Directorate A. The average self-reported level of expertise of the participants is intermediate.

The survey identified climate change and sustainability as the primary research areas for AI applications, followed by agriculture and food security. A significant number of AI applications were also registered in other research domains, such as digital transformation, energy, environmental protection, biodiversity and space and security, reflecting the diverse nature of AI applications across different disciplines.

Machine learning and deep learning resulted the most common ways of applying AI in research projects, closely followed by natural language processing (NLP) and data mining. Notably, NLP emerged as the second most prevalent AI area at the JRC, reflecting advancements in technology and algorithms that have made NLP more accessible and effective.

The survey revealed that two-thirds of participants use personal or work laptops/computers for AI, while the percentage of those using the Big Data Analytics Platform (BDAP) and other cloud services were respectively equal to approximately 28% and 15%. The importance of cloud services has risen from 6% to 15% within the last five years, while the use of personal/work laptops/computers has slightly dropped from 66% to 60% compared to the previous survey.

In terms of sharing and dissemination of the results obtained with AI, presentations and talks were the most prevalent means, followed by publications in scientific journals and reports.

Benefit of AI services provided by the JRC and possible improvements

A significant majority (76%) of participants was convinced that their work could significantly benefit from AI, reflecting a widespread recognition of AI's potential impact. However, many participants were unaware of the JRC's support services for AI-related projects, highlighting the need to raise awareness of the JRC's expertise and support in this area.

Those aware of the JRC's support indicated that the computational resources and data storage provided by the JRC had been highly valuable for their AI-related tasks. This is consistent with the results of the 2018 survey, in which computing and storage infrastructures were identified as top beneficial services. Development environments, such as JEO-lab and JEO-desk offered by BDAP, received high regard. JRC-provided software tools, licenses and training courses were seen as moderately beneficial, while data access and sharing of AI results and best practices were only limitedly appreciated by the survey respondents.

When asked about improvements needed in JRC tools, survey participants indicated as priority enhancing both training opportunities and the sharing of AI results and best practices. They also highlighted the importance of improving computational resources, data storage capabilities and development environments. This result reinforces the community's decision to focus on training and sharing results, and it represents a shift compared to the survey conducted in 2018, where computational resources were identified as the top priority. This shift may be linked to infrastructure improvements, such as the introduction of BDAP.

AI areas of interest for potential training purposes

The survey findings indicate that a low proportion of participants (17%) had received training on AI, possibly suggesting that many had acquired AI expertise prior to joining the JRC or through external channels. Participants who had received AI training praised the trainers for their effective knowledge transfer and the relevance of the training topics. However, the survey also revealed that the training often lacked sufficient content and the desired level of challenge, with participants expressing a desire for more diversity in content. These findings highlight the need for comprehensive and engaging AI training programmes within the JRC.

The survey revealed that participants would like to receive AI training primarily in machine learning, deep learning, data mining and NLP. These areas are also those presently employed the most in ongoing work projects, indicating a keen interest in acquiring skills that directly align with professional applications.

To improve their AI knowledge and skills, 95% of survey participants expressed a strong preference for internal seminars or training courses, highlighting the value placed on hands-on training and the opportunity to network with JRC colleagues. There was also interest in external training options, while seeking guidance from internal and external specialists was less popular. Furthermore, 25% of the participants said they would be interested in a scientific journal club.

Many survey respondents expressed interest in contributing to the CoP on AI. This finding is consistent with the survey's focus on individuals interested in the activities of the CoP.

Challenges and concerns for a wider adoption AI at the JRC

Many survey participants reported challenges in applying AI to their projects, including lack of experience, time constraints, insufficient access to quality training data, and difficulty in selecting appropriate algorithms and models. This suggests a need for support, guidance and improved knowledge in these areas - particularly for those new to AI - and strategies to manage time effectively.

Most survey participants expressed concerns about privacy and ethical guidelines regarding AI. This indicates the need to prioritise discussions, training and resources within the CoP on privacy protection, ethical considerations and compliance with relevant regulations.

Conclusion

According to the survey, participants self-assessed their AI expertise as intermediate, with a majority already applying AI in their research projects, and many mentioning the potential for AI to benefit their work. In terms of field of work, respondents were mainly involved in environmental sciences, but a wide range of other research areas were also mentioned.

The survey revealed a strong interest in tailored AI training, particularly in machine learning, deep learning and NLP, with a preference for internal seminars and courses as a training modality. Many survey respondents expressed their willingness to contribute to the activities of the CoP on AI.

In response to the needs expressed by the participants, the CoP could better promote existing training and request new training as needed, for example to provide different levels of complexity. The CoP will also continue organising seminars, promote JRC AI expertise and facilitate the sharing of AI results and best practices. Discussions on privacy and ethical guidelines within the community would be beneficial.

1 Introduction

This report presents the results of a survey on artificial intelligence (AI) at the Joint Research Centre (JRC), conducted by the JRC Community of Practitioners on Artificial Intelligence and Data Science (CoP on AI) from 15 September to 15 November 2023. This survey laid the groundwork for the CoP on AI to develop a concrete action plan, as well as serving as a follow-up to another similar survey conducted in 2018 (Nativi & Losada, 2019).

1.1 Scope of the survey

The survey's objective was to gather insights into:

(1) the existing adoption and expertise on AI at the JRC;
(2) the perceived benefit of AI services provided by the JRC;
(3) the AI areas of interest for potential training purposes;
(4) the current challenges and concerns to further adopt AI at the JRC;

These insights are used to propose concrete action points and opportunities for the CoP on AI.

1.2 Survey and analysis methodology

The target population for this survey was JRC staff, with a particular focus on individuals interested in joining the CoP on AI or simply interested in AI. All JRC Directorates were invited to take part on a voluntary basis. The survey was distributed through several means, including newsletter post, emails distribution, reaching out to key experts within the JRC, and staff announcements through the official SharePoint page of the CoP on AI. Furthermore, participants were invited during the first seminar session of the CoP to participate in the survey.

The survey was streamlined through an online questionnaire hosted on the EU-Survey platform. Responses were collected from 15 September to 15 November 2023, while results were analysed in January 2024 by members of the CoP. It entailed over 30 questions, primarily closed-ended multiple-choice questions with predefined answer options. A few open-ended multiple-choice questions were also included, allowing respondents to provide answers not covered by the provided options.

A dashboard presenting the survey results was developed using Qlick and published via DataM. It is available at: https://datam.jrc.ec.europa.eu/datam/mashup/AI_COP_SURVEY/index.html

2 Results

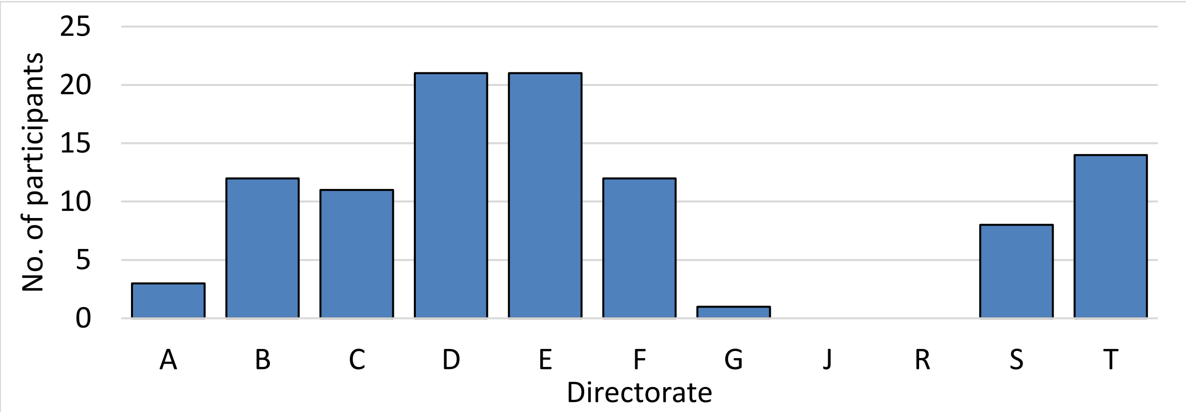
The number of participants who took part in the survey was 109. In order to facilitate the reading of the report and the results, we refer the reader to the Annex 1, which shows the organisation in Directorates and Units of the JRC.

2.1 Adoption and expertise on AI at the JRC

Question: Your Directorate at JRC?

The survey received strong participation from Directorates D, E and T, with up to 22 respondents each. Directorates B, C, F and S also showed a moderate level of participation, with 8 to 14 respondents. Directorates A, G and R, however, had limited or no participation. The uneven participation across Directorates may be explained by the fact that the survey distribution was prioritised in Directorates where activities on AI and Data Science have a strong presence, such as Directorates T and E. It is noteworthy that despite efforts to reach a broad audience, the survey was tailored to attract individuals interested in joining a CoP. Therefore, further enforcement of participation in other Directorates was not deemed necessary.

Figure 1. *Participation across Directorates*

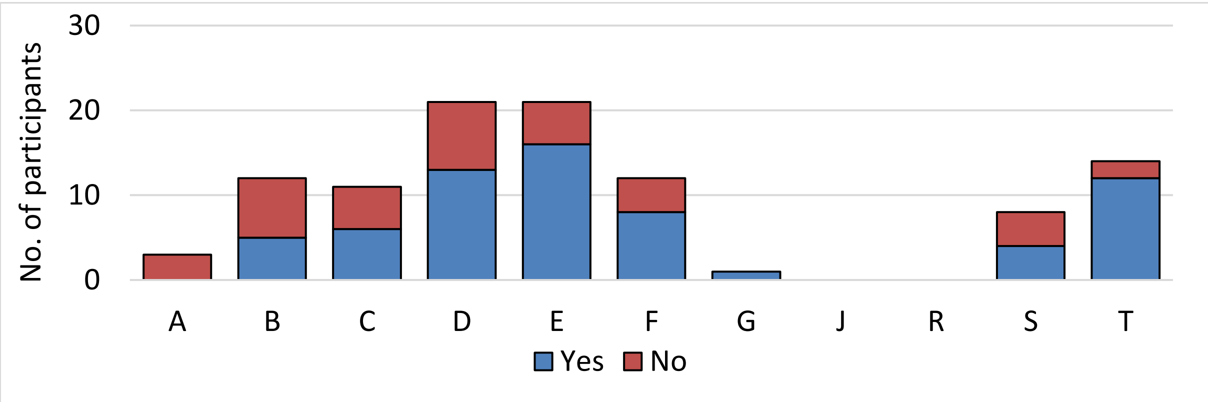


Source: own elaboration

Question: Have you personally used AI-powered tools or algorithms in your projects?

Most participants had already used AI in their projects at the time of the survey. The share of AI users was particularly high in Directorate T: 85% (12 out of 14) of the respondents had used AI. Over 60% of participants from Directorates E (16 out of 21), F (8 out of 12) and D (13 out of 21) declared to use AI in their projects. Lower values were reported from Directorates B (40% - 5 out of 12) and A (0% - 0 out of 3).

Figure 2. *Use of AI across Directorates*

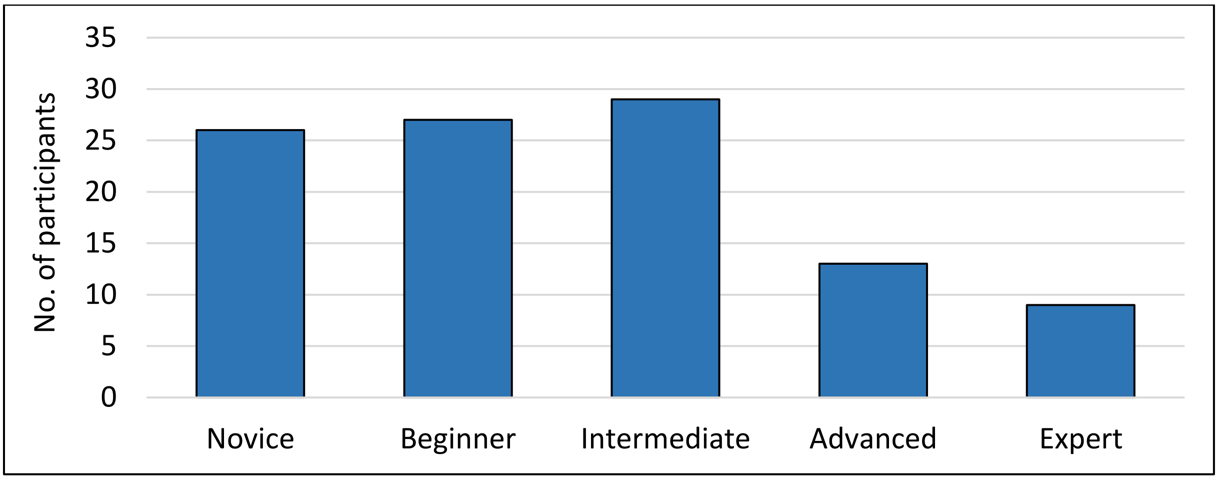


Source: own elaboration

Question: How would you rate your level of expertise in AI?

From a scale of 1 to 5, the level of expertise amongst the participants is about 2.5.

Figure 3. *Average level of expertise*

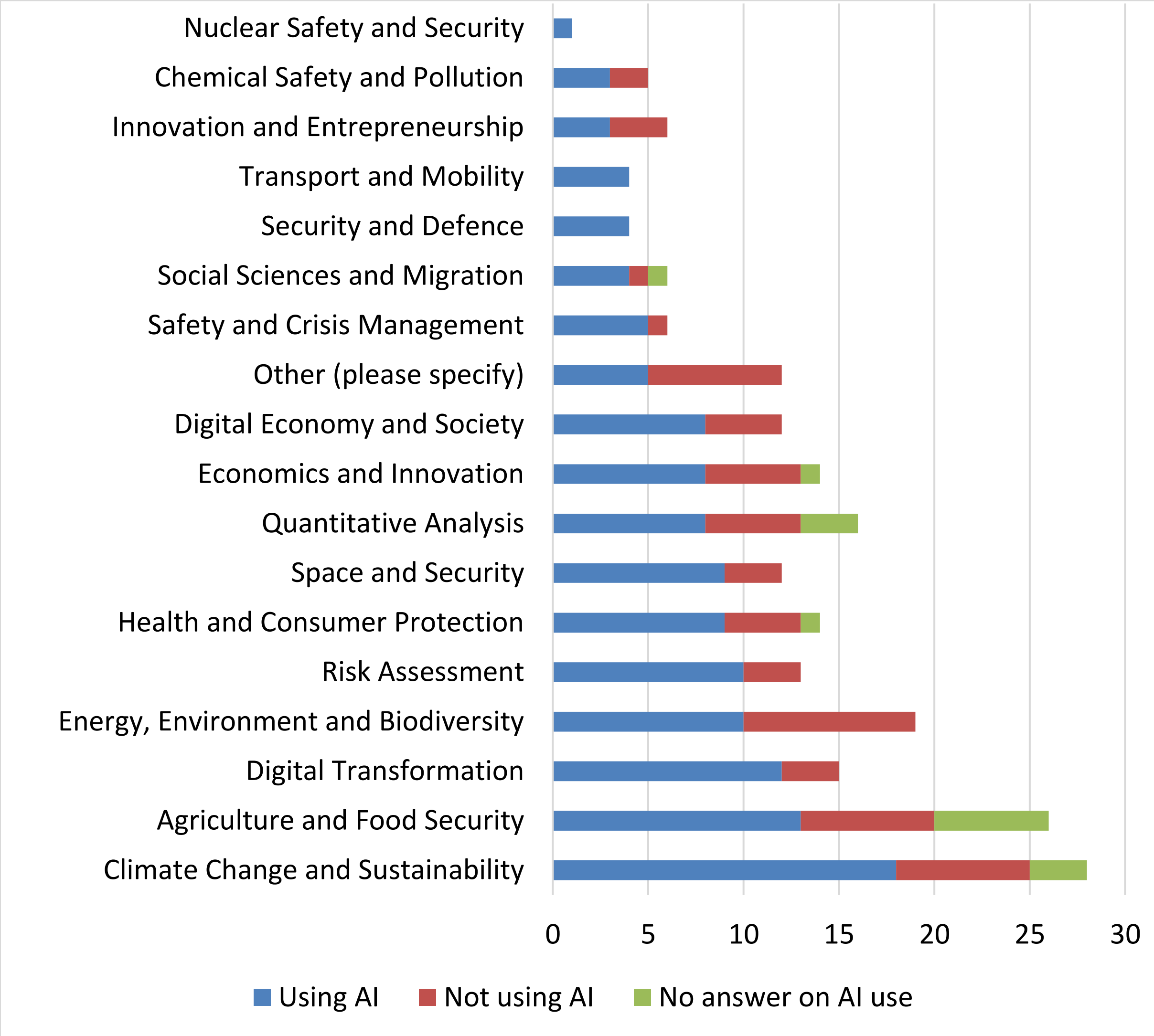


Source: own elaboration

Question: Please indicate your research area(s)

The research area with the highest number of AI applications were climate change and sustainability, followed by agriculture, food security and digital transformation. However, a substantial cluster of other research domains also demonstrated a high number of AI applications, including for example energy, environmental protection, biodiversity, as well as space and security. These findings underscore the diverse applications of AI across a broad spectrum of disciplines.

Figure 4. *Respondents' research areas further segmented by whether they used AI (blue), did not use AI (red) or did not answer whether they used or not AI (green). The bar chart is ordered by number of participants using AI (blue).*

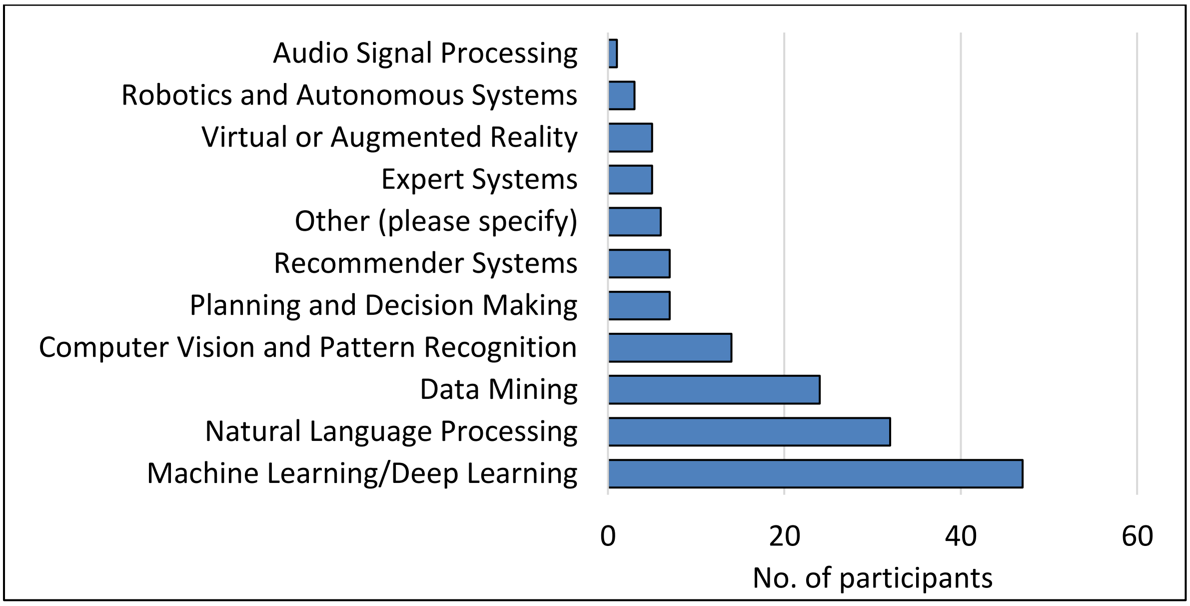


Source: own elaboration

Question: Please indicate which area(s) of AI your current work is related to?

Similar to the previous survey from 2018 (Nativi & Losada 2019), machine Learning and deep learning resulted the most common ways to apply AI in research projects, followed by NLP and data mining. These three categories received 25 to 50 votes each. Notably, NLP had many more use cases compared to the previous survey results. This fact is related to advances in technology and algorithms that have made NLP more accessible and effective. The success of tools like ChatGPT and the subsequent GPT@JRC have likely contributed to the growth of NLP use within the JRC by providing researchers and developers with accessible and powerful language processing tools.

Figure 5. *AI areas related to work activities*

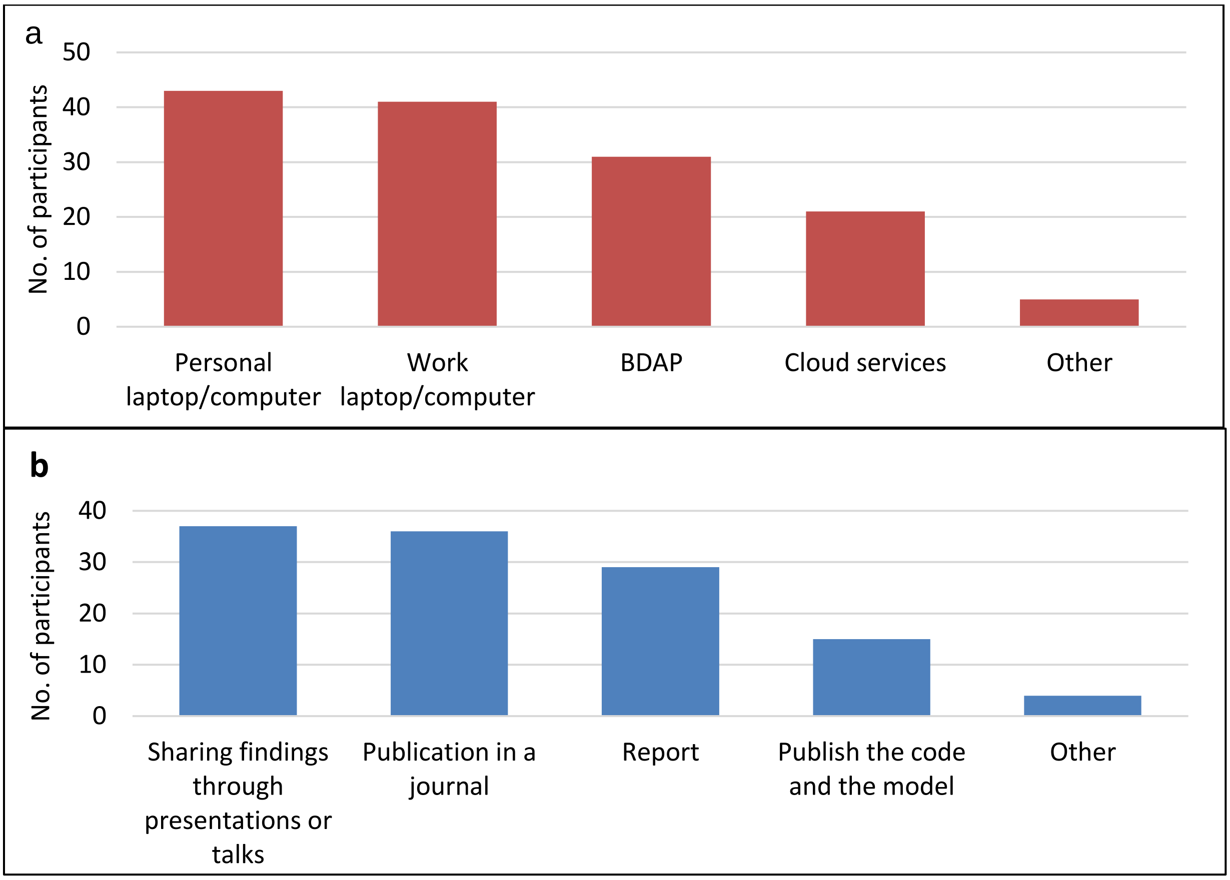


Source: own elaboration

Question: In which environment do you use AI and how do you share your results?

The majority of participants leverage either their personal or work laptops for AI-related projects. Additionally, BDAP and other cloud services received a significant portion of the vote (29% and 19% respectively), albeit slightly less than personal or work laptops. Regarding the dissemination of results, it's noteworthy that participants opt for both written forms (journal publications or reports) and more interactive modes such as talks and presentations. However, only approximately 14% share their results through code publication, suggesting an opportunity for improvement in promoting reproducibility and code sharing among colleagues.

Figure 6. *6a: Chosen environment to work on AI-related projects; 6b: Means of sharing results*



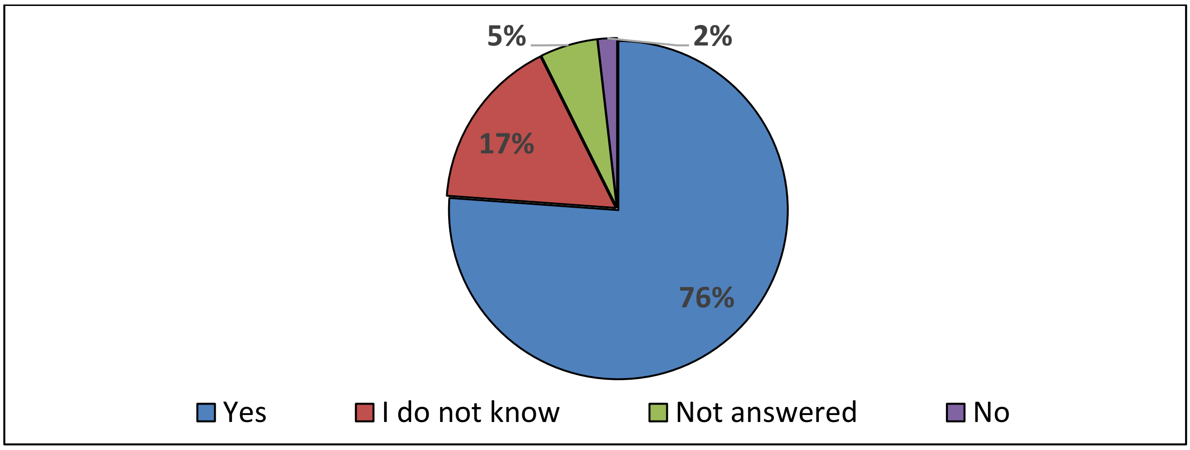
Source: own elaboration

2.2 Benefit of AI services provided by the JRC and possible improvements

Question: In your opinion, could your work significantly benefit from using AI?

A significant majority (76%) answered that their work could significant benefit from AI.

Figure 7. *AI benefit to work*

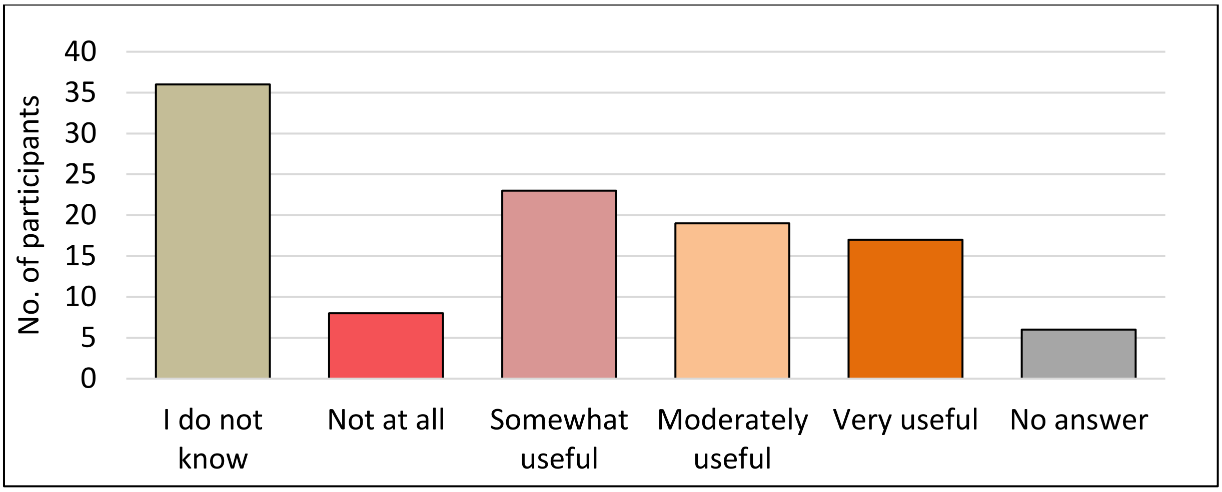


Source: own elaboration

Question: Do you find the JRC provides useful services to support the development of AI solutions in your work?

While a significant majority of survey participants acknowledged the potential benefits of AI for their work, many were unaware of the JRC's valuable services aimed at supporting AI adoption. Indeed, similarly to the previous survey published in 2019, more than 50% of the respondents did not know any useful services provided by the JRC. This highlights a crucial opportunity for the CoP to enhance awareness and promote the JRC's support and expertise in AI-related projects.

Figure 8. *Perceived benefit of JRC's support services for AI-related projects*

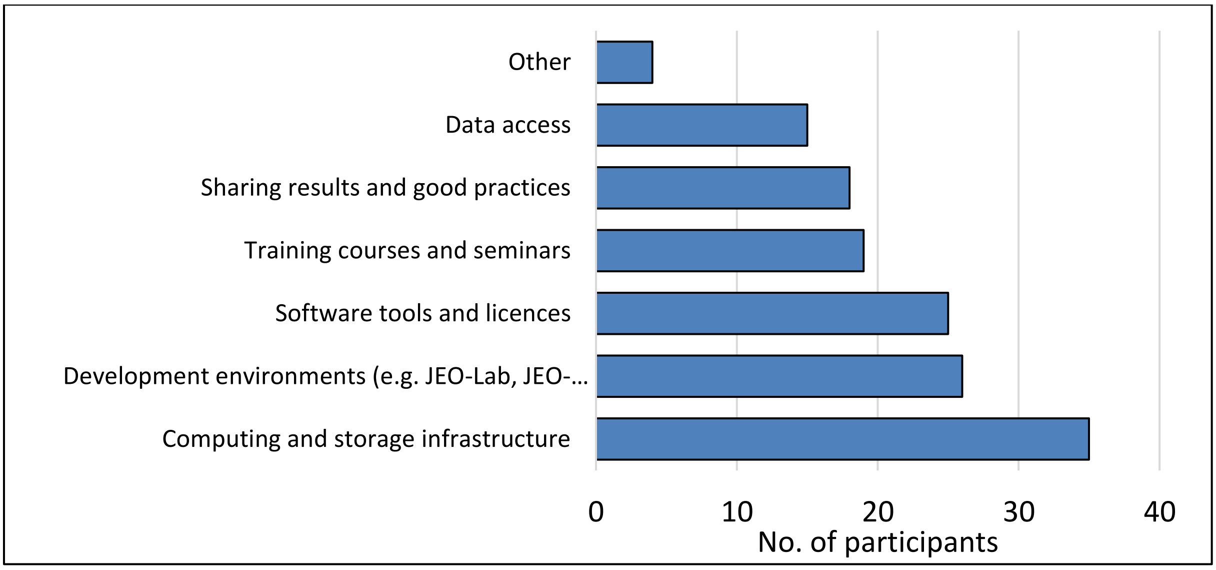


Source: own elaboration

Question: Since you find the JRC's services useful, please specify which areas have been particularly beneficial

The computational resources and data storage provided by the JRC were mentioned as particularly valuable assets for AI-related tasks. These findings are similar to the results published in 2019, where the top beneficial services at the JRC were related to computing and storage infrastructures, followed by software tools and licenses. Additionally, development environments like JEO-lab and JEO-desk were highly rated. Software tools and licenses, and training courses were seen as providing moderate benefits, while data access and sharing of AI results and best practices received limited support.

Figure 9. *Areas perceived as beneficial*

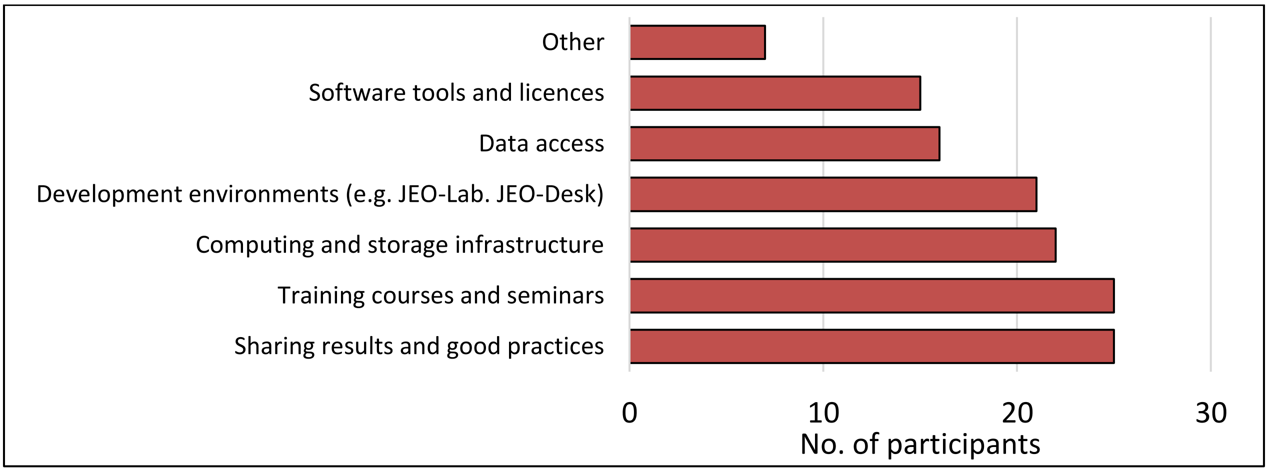


Source: own elaboration

Question: If you feel improvements are needed in JRC tools, please identify the areas where enhancements could be made

Survey participants identified enhancing the sharing of AI results, best practices and training opportunities and seminars as top priorities. The results of the survey conducted in 2018 highlighted High-Performance Computing (HPC) as the most important area for improvement in the JRC. This change in priorities could be attributed to the improvements made in infrastructure, such as the introduction of BDAP, within the JRC since 2018. As a result, the community's focus has shifted towards prioritising good practices, training and seminars. Nevertheless, there is also a strong interest in continuing to improve computational resources, data storage capabilities and provide further development environments.

Figure 10. *Areas to be improved*



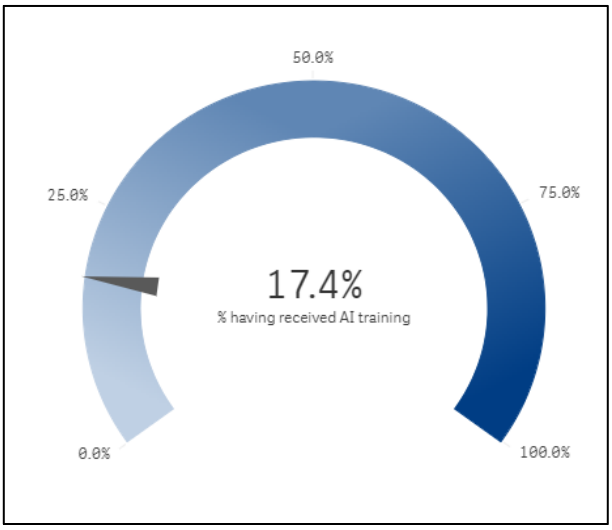
Source: own elaboration

2.3 AI areas of interest for potential training purposes

Question: Have you received any training or support related to using AI in research?

The relatively low proportion of survey participants (17%) who had received AI training, compared to the much higher share of AI applicants, suggests that many AI users likely acquired their AI expertise prior to joining the JRC or through external training and support channels. As highlighted in Figure 9, participants would be receptive to AI training offered by the JRC, as evidenced by their prioritisation of training options when asked what additional support the JRC could provide.

Figure 11. *Percentage of survey participants having received training*



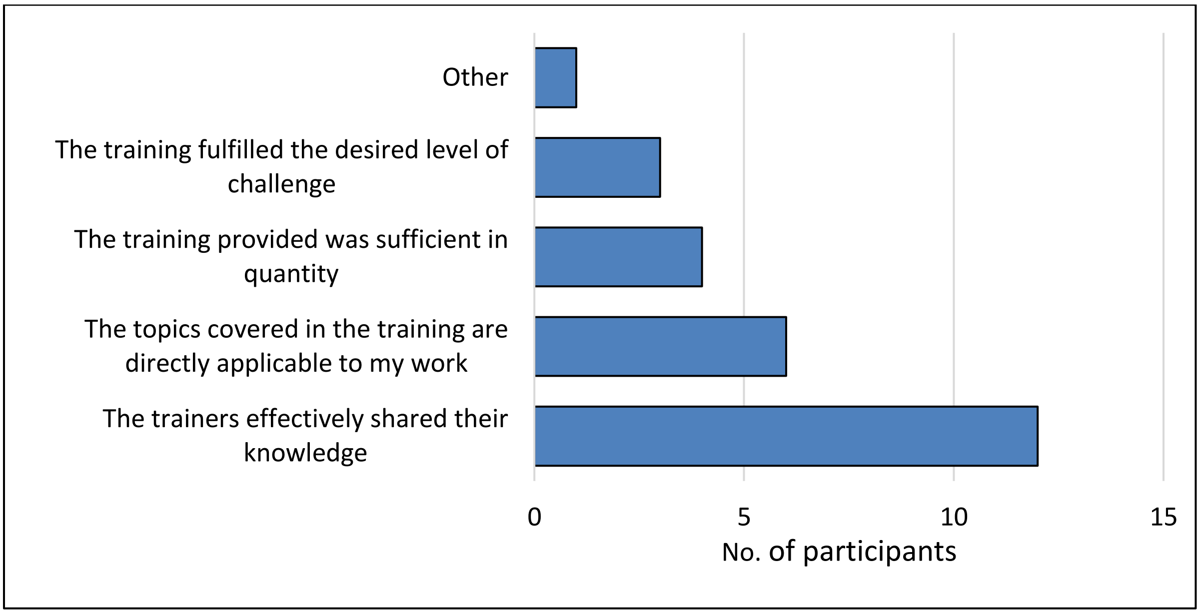
Source: own elaboration

Question: If you have been happy with the training received, please specify the reason(s)

Question: If you have NOT been happy with the training received, please specify the reason(s)

Participants who had received AI training praised the trainers, mentioning their effective knowledge sharing and the relevance of the training topics.

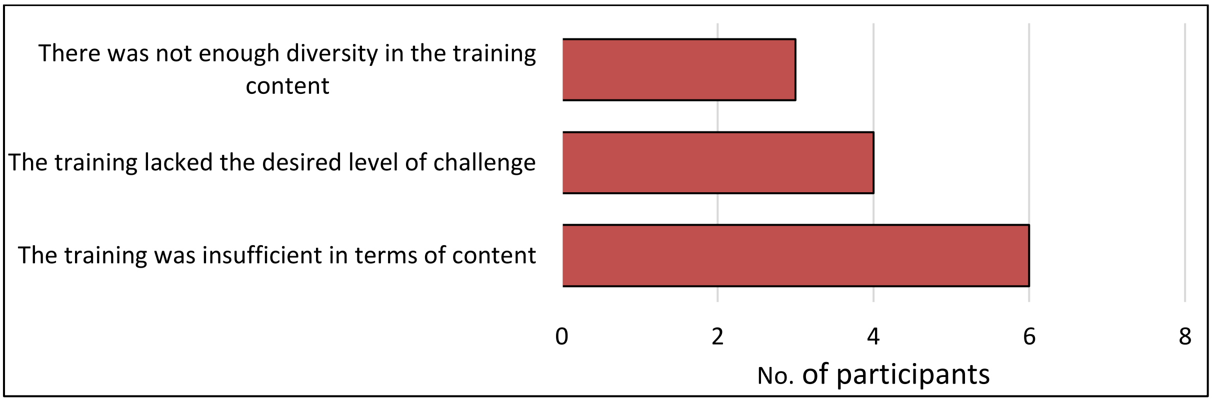
Figure 12. *Strong areas of training provided*



Source: own elaboration

In contrast, according to the survey results, the training was often insufficient in content and lacked the desired level of challenge. Furthermore, more diversity in the content would be welcomed.

Figure 13. *Areas for improvement of training provided*

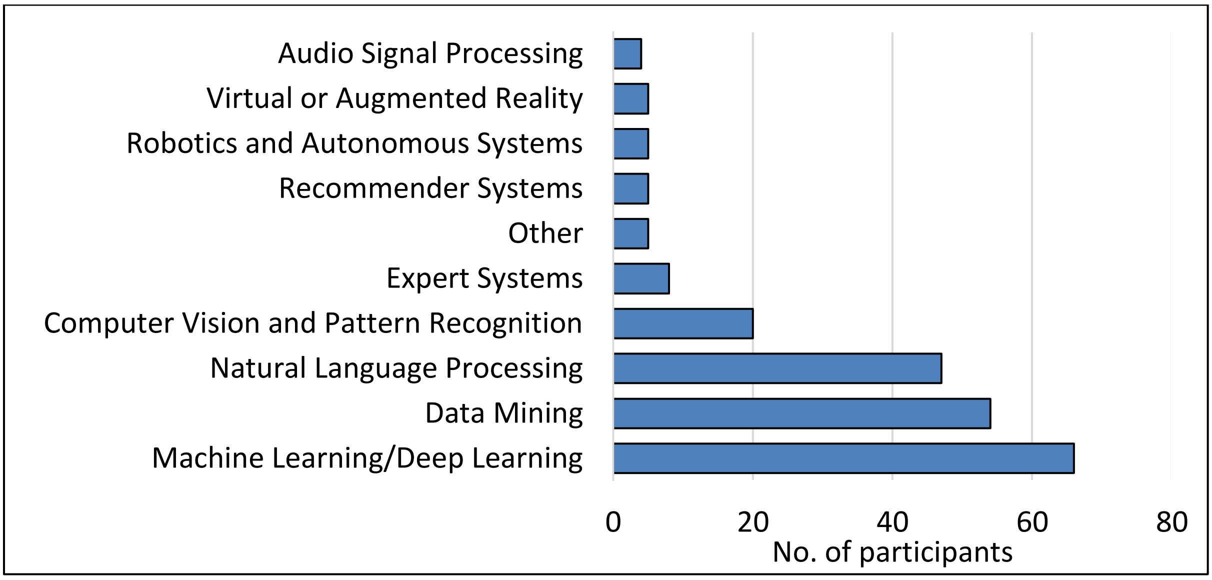


Source: own elaboration

Question: Which area(s) of AI do you believe is important to receive training for your current work?

Machine learning and deep learning, data mining and NLP emerged as the most popular areas of AI training that survey participants would like to receive. These same areas of expertise were also identified as the most relevant to participants' specific work applications (see question early on). This suggests that participants are keen to acquire skills that align directly with their professional requirements.

Figure 14. *Areas in which the participants would be interested in receiving training*

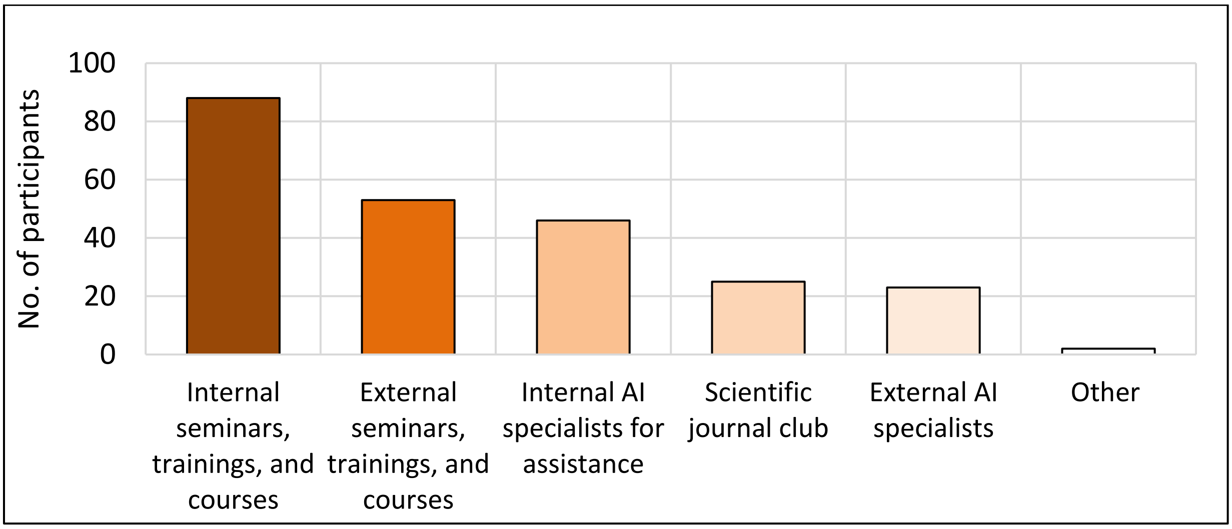


Source: own elaboration

Question: How would you prefer to receive additional training and support?

An overwhelming majority of survey participants (95%) indicated a strong preference for attending an internal seminar or training course to enhance their AI knowledge and skills. This preference reflects the value placed on hands-on training and the opportunity to network with colleagues within the JRC. Many participants also expressed interest in external training options. Less popular was seeking guidance from an internal and external specialist, while 25 people expressed interest in a scientific journal club.

Figure 15. *Modes of Training Delivery*

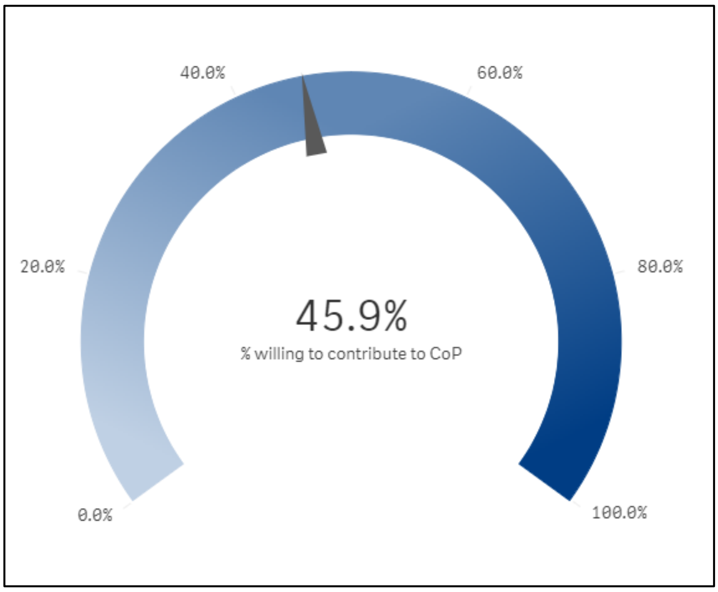


Source: own elaboration

Question: Would you like to actively contribute to a Community of Practice? And how would you like to participate?

A high proportion of the survey participants would like to contribute to the CoP. This is not too surprising, as the survey targeted people with potential interest in the CoP or at least in AI.

Figure 16. *Percentage of survey participants willing to contribute to CoP*



Source: own elaboration

Error! Reference source not found. shows a word cloud, where the size of each word indicates the f requency with which it was mentioned. According to the survey, the most common words used to describe the means of contributing to the CoP were: "use," "experience," "seminars," "sharing,", "cases" and "practices". The word "use" is to be read together with "cases". Furthermore, together with "experience" and "seminars" they underscore the strong participants' interest in sharing their experiences and practical use cases, suggesting the potentially inclusive nature of seminars that could be organised by the CoP. "Sharing" is also a key element, highlighting the collaborative nature of the community, where members openly exchange insights, best practices, and experiences. The focus on "practices" highlights the importance of sharing established methods and techniques.

Figure 17. *Means of contributing to CoP*

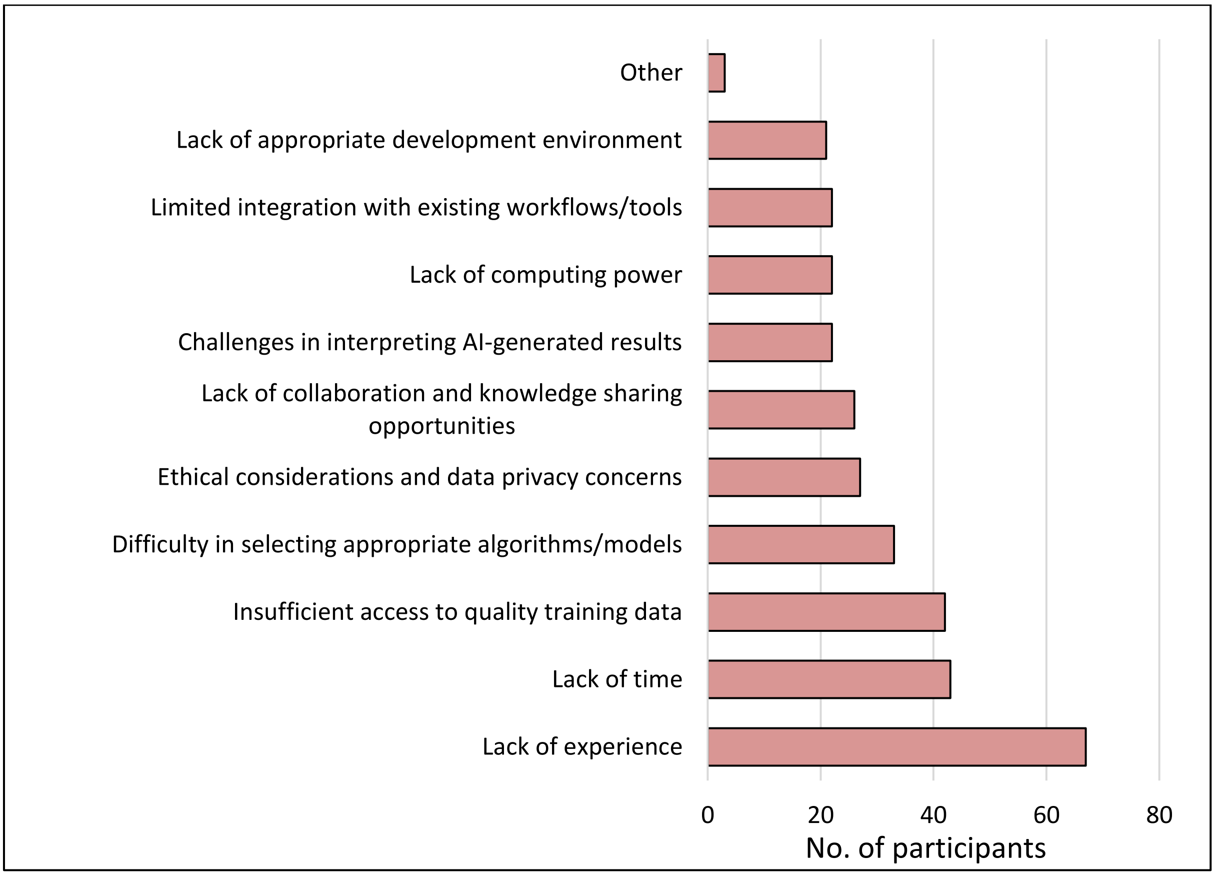
Source: own elaboration

2.4 Challenges and concerns for a wider adoption AI at the JRC

Question: Which challenges do you see for using AI applications in research?

A large number of the survey participants cited the lack of experience and the lack of time as the main challenges to using AI in their projects. This suggests that there is a need for support and guidance, as well as strategies to manage time effectively in the context of AI project implementation. Additionally, the survey highlights the issue of insufficient access to quality training data, which can significantly impact the development and success of AI projects. Furthermore, the difficulty in selecting appropriate algorithms and models emerged as another substantial challenge, indicating a need for improved knowledge in this area.

Figure 18. *Challenges to further apply AI*

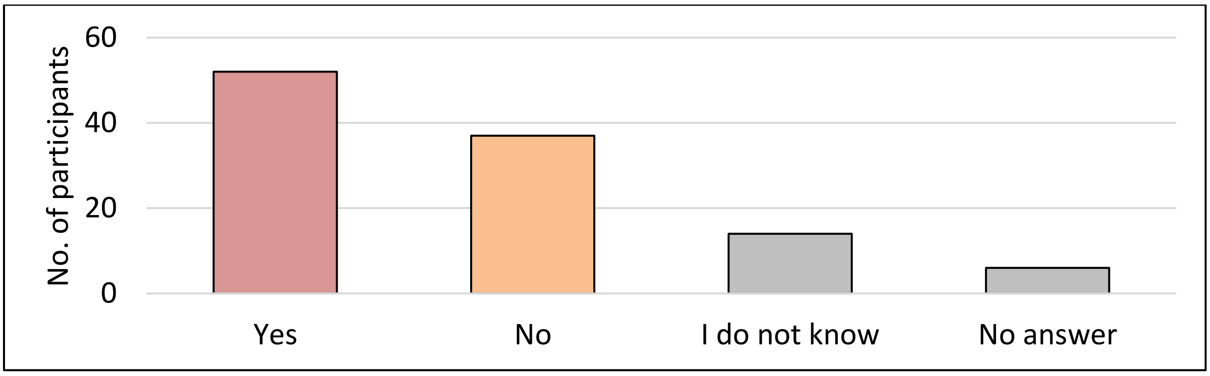


Source: own elaboration

Question: Are you concerned about privacy and ethical guidelines when using AI-related tools?

Most of the survey participants declared to be concerned about privacy and ethical guidelines. In response to these concerns, the CoP may need to prioritise discussions, training and resources focused on privacy protection, ethical considerations, and compliance with relevant regulations. This could involve organising workshops or seminars specifically addressing privacy and ethical guidelines in AI projects, facilitating knowledge sharing on best practices and providing guidance on ethical decision-making in AI applications.

Figure 19. *Privacy and ethical guideline concerns*



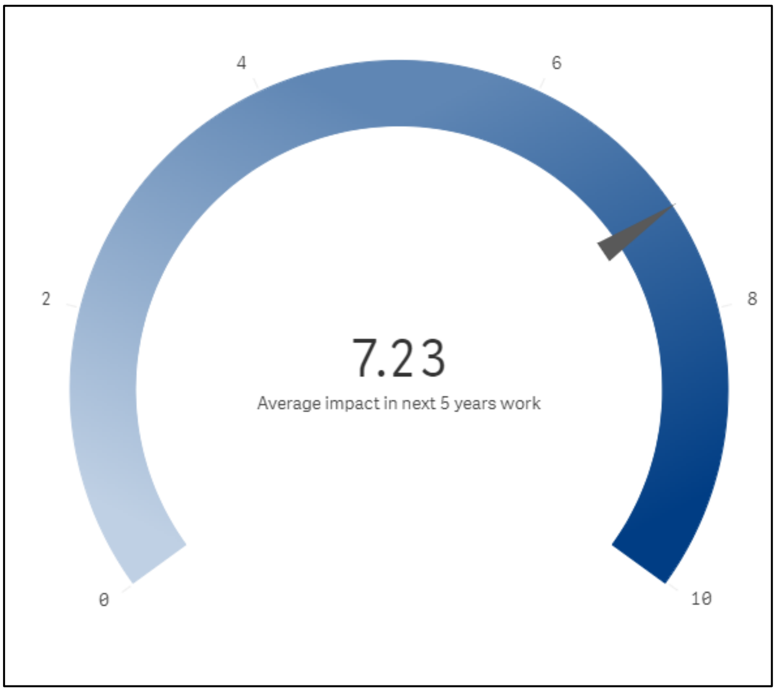
Source: own elaboration

2.5 Future Expectations

Question: How do you foresee the role of AI evolving in your current work tasks five years from now?

A significant majority of participants anticipated a substantial impact of AI on their work within the next five years. On average, the perceived impact was evaluated at 7.23 on a scale of 0 to 10. While the average impact remained consistent across different Directorates, the range of responses varied. Directorate T exhibited the least variability, with all participants predicting an impact between 6 and 10. In contrast, Directorate C participants' responses spanned the entire 0 to 10 range, with an average impact just below 8.

Figure 20. *Average AI impact within the next 5 years*



Source: own elaboration

3 Conclusion and concrete action points

While survey participants self-assessed their AI expertise as just below average, a majority had applied AI in their research projects and a significant portion (~75%) found that AI had the potential to benefit their work. Many of the participants worked in environmental sciences, such as climate change, agriculture, and biodiversity. However, a wider range of research areas beyond environmental sciences were also mentioned.

The survey revealed the respondents' strong interest in receiving further AI training tailored to their specific work applications, with machine learning, deep learning and NLP topping the list of preferred areas. From a practical perspective, participants indicated a preference for internal seminars/courses as a training modality, closely followed by external training courses. Additionally, participants expressed the willingness to contribute to the JRC CoP on AI through various means, such as preparing and presenting during seminars specific use-cases as well as their general experience when applying AI.

In light of these findings, the CoP on AI can:

a. Support training and seminars by organising them in an inclusive way, e.g. by announcing the topic and sending out a call for interest for presentations by colleagues. Furthermore, internal seminars, with presentations of results and best practices on a certain topic could be an especially good opportunity for the CoP, as sharing AI results and best practices emerged as the top priority for improvement, alongside the provision of training courses and seminars.

b. Similarly, the CoP should also advocate external seminars and training.

c. Additionally, the CoP can actively promote the JRC's AI expertise and support, particularly as many participants expressed limited awareness of these resources. This could be accomplished by highlighting the availability of JRC support during seminars, tailored to the specific seminar topics or even broader projects. Moreover, during these sessions, incorporating short discussions on privacy and ethical guidelines is encouraged when exploring specific AI applications.

d. Finally, to address different levels of expertise and challenge, the CoP should consider providing training modules with varying levels of complexity. Additionally, the CoP should not hesitate to delve into detailed explanations as some participants perceived training content as insufficient in depth. Establishing a journal club where meetings vary in terms of difficulty could be a possibility.

References

Nativi, S. and Gomez Losada, A. Artificial Intelligence at the JRC: Survey Results, EUR 29803 EN, Publications Office of the European Union, Luxembourg, 2019, ISBN 978-92-76-08847-9, doi:10.2760/54605, JRC117234.

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