

Value and Impact through Synergy, Interaction and coOperation of Networks of AI Excellence Centres

GRANT AGREEMENT NUMBER: 952070

Deliverable D2.3

Al-on-demand (AloD) Platform Ecosystem Services Plan



Project title	Value and Impact through Synergy, Interaction and coOperation of Networks of AI Excellence Centres
Grant Agreement number	952070
Funding scheme	H2020-ICT-48: Towards a vibrant European network of AI excellence centres, CSA
Start date of the project and duration	09/2020 - 08/2024 (48 months)
Project coordinator name	University of Leiden
Deliverable number	D2.3
Title of the deliverable	AI-on-demand (AIoD) Platform Ecosystem Services Plan
WP contributing to the deliverable	WP2-Mobilizing the European AI community
Deliverable type	Report
Dissemination level	Public
Due submission date	31 August 2022
Actual submission date	October 2023
Partner(s)/Author(s)	Gabriel Gonzales-Castane (UCC), Barry O'Sullivan (UCC), Long Pham (UCC) and Luis Quesada (UCC)
Internal reviewers	Executive Board
Final approval (Executive Board)	Executive Board

Disclaimer

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 952070. This document has been prepared for the European Commission, however, it reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein



	Histo	ory of changes
When	Who	Comments
V0.1	Gabriel Gonzales-Castane, Barry O'Sullivan, Long Pham and Luis Quesada	Initial draft
V0.2	Gabriel Gonzales-Castane, Barry O'Sullivan, Long Pham and Luis Quesada	Version considering comments of the EC

	Confidentiality
Does this report contain confidential information?	Yes 🗆 No X
Is the report restricted to a specific group?	Yes \Box No X If yes, please precise the list of authorised recipients:



		I Table of Contents	
1	Tabl	e of Contents	4
2	Alo) Platform	5
	2.1	What is it?	5
	2.2	AIOD MISSION	5
	2.3	Why use AloD?	5
3	Pror	notional Campaign to the NoEs	5
	3.1	Introduction	5
	3.2	Campaign Objectives	6
	3.3	Target Audience	6
	3.4	Key Messages and Value Proposition	8
	3.5	Campaign Activities, Resources and Collaterals	9
	3.6	Evaluation and Metrics	10
	3.7	Conclusion	10
4	Alol	D Ecosystem Service	11
	4.1	Metadata retrieval based on the metadata available in DBLP and Scopus	11
	4.2	Measuring Collaboration	12
	4.3	Text Analysis	19
	4.4	Concluding remarks	21
5	Refe	erences	22

Table of Contents 1



2 AloD Platform

2.1 What is it?

The AI-on-Demand Platform (AloD) is a community-driven channel designed to empower European research and innovation in Artificial Intelligence (AI), while ensuring the European seal of quality, trustworthiness and explainability.

Openly and easily accessible, AloD facilitates knowledge sharing, research experimentation and development of state-of-the art solutions and technologies related with artificial intelligence. The AloD Platform can be used by the Al community to:

- share AI-related knowledge, assets, services or tools.
- make use of the numerous available resources.
- learn about the potential and opportunities of ai applications.
- engage with other peers and experts.

2.2 AIOD MISSION

To create a thriving European AI research ecosystem driven by AI excellence, through a channel that fosters collaboration, reproducibility and experimentation, while maximising academic, social and industrial impact.

2.3 Why use AloD?

Scientists, researchers, and innovators often invest a lot of effort and time in identifying trustworthy, high-quality datasets, algorithms, or even in finding efficient mechanisms to communicate, cooperate, and engage with other peers in an open and transparent manner.

AloD responds to these needs by:

- facilitating openness and transparent access to ai, providing tools that ease its understanding and research.
- fostering an ecosystem of excellence and accelerating the adoption of solutions based on ai.
- empowering its users to be part of the platform, allowing them to contribute to its growth and evolution by incorporating their needs into new developments.
- offering an environment for upskilling, knowledge transfer, experimentation and innovation.

AloD contributes to the success of the European Al strategy, providing a mechanism that unites the paradigm of Al research application and data, while ensuring the European seal of quality, trustworthiness and explainability.

The interested reader is referred to (J. Vanschoren, 2022), which presents the initial technical architecture of the AI-on-Demand Platform.

3 Promotional Campaign to the NoEs

3.1 Introduction

The AI-on-Demand (AIoD) Platform is a pivotal resource for European AI research and innovation. To maximize its impact and foster collaboration, synergy, and interaction, the Networks of Excellence (NoEs) will embark on a comprehensive promotional campaign, initiated by UCC in collaboration with the WP6 leaders, NOEs dissemination and communication partners and the AloD. This campaign, scheduled to start in January 2024, aims to engage and mobilize among the NoEs



members first, and then the wider European AI community, reinforcing its strategic autonomy in AI and solidifying Europe's position as a world leader in AI research, development, and deployment.

Due to the time and resource constraints, this plan is primarily leveraging all available/planned activities of VISION, NoEs, AIDA and the AIoD Platform. The promotional materials and content can be reused and adapted to address the target audiences.

3.2 Campaign Objectives

The promotional campaign for the AloD Platform within the NoEs is designed to achieve the following objectives:

- Increase awareness of the AIoD Platform among researchers, scientists, innovators, and professionals in the NoEs and potentially also their stakeholders in the European AI community.
- Foster active engagement and participation on the AloD Platform, encouraging knowledge sharing, collaboration, and experimentation among projects and people in the NoEs and beyond.
- Showcase the value proposition of the AIoD Platform in terms of open access to AI-related resources, tools, and opportunities within the NoEs and their extended partners.
- Highlight the role of the AIoD Platform in enabling and functioning as the platform for NoEs' positive contribution to the European AI strategy and its commitment to quality, trustworthiness, and explainability.

3.3 Target Audience

The campaign primarily targets researchers, scientists, academics, innovators, and professionals within the NoEs and potentially the wider European AI community (see Figure 1). These stakeholders are keen on advancing their AI research and innovation endeavours while adhering to ethical and trustworthy principles.

The target audience for the promotional campaign of the AloD Platform within the Networks of Excellence (NoEs) comprises a diverse group of professionals, scientists, researchers, and innovators within the European AI community. This audience is driven by a shared need for high-quality resources, collaboration, and transparency in their pursuit of AI research and innovation. The campaign will focus on engaging and catering to the specific needs and aspirations of this audience based on their characteristics and motivations.





Figure 1 Target Audience of the campaign

a. Scientists, Researchers, and Innovators:

This group forms the core of the target audience within the NoEs. Scientists, researchers, and innovators actively engage in AI research, development, and experimentation. They are often at the forefront of AI innovations, constantly seeking access to trustworthy and high-quality datasets, algorithms, and tools. These professionals invest significant time and effort in identifying resources that will enhance the rigour and depth of their work. The AIoD Platform offers them a comprehensive repository of AI-related knowledge, tools, and collaboration opportunities, streamlining their research process and enhancing their ability to contribute to cutting-edge advancements in AI.

These individuals and institutions are already invested in the advancement of AI research and innovation. The AIoD Platform offers a natural extension of their existing efforts, providing them with a platform to collaborate, share resources, and contribute to the growth and evolution of the European AI ecosystem.

b. Academics and Educators:

There are many academic institutions in the NoEs and they play a crucial role in shaping the future of AI research and education. Educators who teach AI-related courses and programs can benefit from the AIoD Platform as a valuable resource for curriculum development, access to real-world examples, and collaborative opportunities. By incorporating AIoD resources into their teaching methodologies, educators can provide students with hands-on experience and exposure to practical AI applications, fostering the next generation of AI researchers and practitioners.

c. AI Enthusiasts and Startups:



Beyond established researchers, the campaign will also target AI enthusiasts, startups, and emerging players in the AI landscape. These individuals and organisations are seeking opportunities to learn, experiment, and establish their presence with members of the NoEs and their projects, initiatives and activities in the European AI community. The AIoD Platform offers a level playing field for these entities to access cutting-edge resources, connect with established experts, especially those from the NoEs, and showcase their innovations, thus fostering a more vibrant and inclusive AI ecosystem.

d. Policymakers and other Stakeholders:

Policymakers, government officials, and other stakeholders interested in the development of AI within Europe are also stakeholders and partners of the NoEs, some, at national levels, thus they also become the target audience of this campaign. The campaign will highlight how the NoEs use and could use the AIoD Platform in aligning with the European AI strategy, contributing to ethical, trustworthy, and transparent AI development. By engaging this group, the campaign aims to garner support and recognition for the value of the NoEs and the AIoD Platform in driving European AI research and innovation.

In summary, the target audience, as classified in *a*, *b*, *c*, *d*, for the promotional campaign is to address a dynamic group of individuals and organisations who are passionate about advancing AI research, innovation, and collaboration. The NoEs can use the AloD Platform to address their specific needs by providing open access to resources, fostering transparency, and facilitating meaningful interactions within the European AI community.

3.4 Key Messages and Value Proposition

The AloD Platform empowers the European Al community with open access to Al-related knowledge, resources, and collaboration opportunities and NoEs are the major contributors and their members are key drivers in Al research, education and training activities.

NoEs use the platform to collaborate with peers, experts, and professionals to accelerate AI research and innovation, fostering a thriving European AI ecosystem.

NoEs contribute to the European AI strategy by aligning with ethical, trustworthy, and transparent AI principles.

NoEs educational members and institutions maximize academic, social, and industrial impact through collaboration, reproducibility, and experimentation.

NoEs see the AloD as a dynamic and inclusive hub that resonates at the heart of European research and innovation in the realm of Al. Distinctively designed to uphold the European seal of quality, trustworthiness, and explainability, the AloD Platform stands as a beacon of opportunity and collaboration for the entire European Al community. With its open and easily accessible framework, AloD seamlessly paves the way for a collective journey towards Al excellence.

Key Messages:

Empowering European AI Excellence: The AIoD Platform stands as a testament to Europe's commitment to AI excellence. By providing a community-driven channel, it empowers researchers, innovators, and practitioners to explore the full spectrum of AI advancements while adhering to the highest standards of quality, trust, and transparency.



Facilitating Knowledge Elevation: AIoD goes beyond being a repository of information; it fosters an environment where knowledge flows seamlessly. Researchers can effortlessly share their AI-related expertise, assets, services, and tools, thereby contributing to the enrichment of the entire community's intellectual wealth.

Unveiling AI's Potential: In the vast expanse of AI, AIoD is a guiding light that illuminates the boundless potential and opportunities that AI applications hold. By opening doors to unparalleled insights, it aids in expanding horizons and propelling innovation to new frontiers.

Cultivating Peer Engagement: AloD is not merely a platform; it's a thriving ecosystem where peers and experts converge to ignite conversations, spark collaborations, and forge connections that transcend geographical boundaries. By facilitating engagement, AloD lays the foundation for a harmonious exchange of ideas and experiences.

Transparent Access and Understanding: The AloD Platform champions the cause of openness and transparency by providing tools that bridge the gap between complex Al concepts and comprehensible knowledge. It's a conduit that demystifies Al, making it accessible to a wider audience.

Value Proposition:

Fostering Excellence: AloD serves as a fertile ground for cultivating an ecosystem of excellence. By enabling researchers to experiment, innovate, and refine their ideas, it acts as a catalyst for the rapid adoption of AI solutions grounded in quality and ingenuity.

Empowering Contributors: In the heart of AloD lies the power of contribution. Users become active participants, shaping the platform's evolution and growth by incorporating their unique needs and insights. This empowerment is the cornerstone of AloD's collaborative spirit.

Knowledge Hub for Upskilling: As an environment tailored for upskilling, AloD is a treasure trove of resources that foster continuous learning. It provides a safe haven for those looking to delve into Al, equipping them with the knowledge and tools needed to navigate this evolving landscape.

European AI Strategy Enabler: AloD takes centre stage in driving the success of the European AI strategy. It serves as a mechanism that harmoniously unites AI research, application, and data, all while upholding the European values of quality, trustworthiness, and explainability.

Unveiling Innovation: AloD thrives on the premise of innovation. By serving as a playground for experimentation, it fuels the development of state-of-the-art solutions and technologies. It's a platform where ideas metamorphose into groundbreaking realities, shaping the future of AI.

In a summary, NoEs need to leverage the AloD for their collaboration, expertise, and innovation. Using the AloD Platform, NoEs focus on and deliver knowledge sharing, empower contributors, and embody the essence of the European AI strategy. NoEs are utilizing and enriching Europe's journey towards AI excellence via the AloD Platform.

3.5 Campaign Activities, Resources and Collaterals

Timeline and Schedule: the campaign will be executed over a span of six months with the plan to be shared with Communication Club meetings among NoEs in November and December for embedded activities from Jan 2024. The activities are practical, and realistic and must leverage all the available resources, outlets and networks.



The plan is initiated by UCC and will collaborate with by VISION's communication and dissemination leaders, the NoEs dissemination and communication partners, AIDA, and the AIoD Platform.

This plan will be shared at the Communication Club meetings that have been scheduled till the end of this year on 17 November and 15 December 2023. UCC will discuss the synergies with NoEs for realistic outlets and activities.

Resources can be jointly developed for use and reuse by all relevant partners in NoEs, AIDA and the AIoD. The resources may include:

Engaging already planned promotional videos by VISION and templates highlighting how NoEs have been and are using the AloD Platform's features and benefits; content input for the regular VISION Newsletter (now monthly). Following the VISION Communication lead by joining regular meetings with other comms with contributions of the AloD Platform's functions, benefits, and resources in the facilitation of their works including involving the new NoEs. Contributions with the roles and possible outcomes in engaging with the AloD Platform can also contribute to the continuity of the most relevant activities of the NoEs.

Relevant content from NoEs and the AloD Platform can be shared or reused on the VISION website and leverage the communication across the social media profiles of NoEs, CLAIRE and other entities involved. This task will be supported by UCC on regular basis for VISION's communication lead.

The final conference(s) of NoEs is another venue in which the campaign can be embedded. The key messages and value propositions will be incorporated into the promotional materials together with the presentation(s) of/by the AloD Platform.

3.6 Evaluation and Metrics

The campaign is planned with limited resources and in the very last stage of the project. Thus, measurements such as an increase in user registrations, engagement, and active participation on the AloD Platform may be worth seeing the outcomes of the effort.

Increased outcomes from social media metrics, including likes, shares, comments, and hashtag usage related to the campaign can be counted and bring some insights.

Report the number of content submissions and contributions from the campaign to relevant outlets and channels of VISION and other NoEs will be generated.

3.7 Conclusion

The promotional campaign for the AI-on-Demand (AIoD) Platform within the Networks of Excellence (NoEs) is designed to create a synergy of excellence, collaboration, and innovation in the European AI community. By increasing awareness, fostering engagement, and encouraging active participation, the campaign aims to empower researchers, scientists, and professionals to leverage the AIoD Platform's resources and opportunities, contributing to Europe's leading position in AI research and innovation. Together, VISION partners, the NoEs, AIDA and the AIoD Platform will drive the European AI ecosystem towards a future of excellence and global competitiveness.



4 AloD Ecosystem Service

We present preliminary results of the implementation of a service aiming at encouraging countries to increase the level of collaboration. As the focus is on AI in EU, the implementation of the service is based on the publications of the biennial European Conference on Artificial Intelligence (ECAI).

ECAI is the leading conference in the field of Artificial Intelligence in Europe and one of the top general AI conferences worldwide. The conference series has been held without interruption since 1974, initially under the name of Summer Conference on Artificial Intelligence and Simulation of Behaviour (AISBO).

4.1 Metadata retrieval based on the metadata available in DBLP and Scopus

DBLP (Ley, 2009) is a computer science bibliography website started in 1993 at Universität Trier in Germany. Initially it was a small collection of HTML. Today it has become an organization hosting a database and logic programming bibliography site. Since November 2018, DBLP is a branch of Schloss Dagstuhl – Leibniz-Zentrum für Informatik (LZI). DBLP listed more than 5.4 million journal articles, conference papers, and other publications on computer science in December 2020, up from about 14,000 in 1995 and 3.66 million in July 2016. The most important journals on computer science are tracked. Proceedings papers of many conferences are also tracked. It is mirrored at three sites across the Internet (DBLP, 2023).

Scopus is Elsevier's abstract and citation database launched in 2004. Scopus covers nearly 36,377 titles (22,794 active titles and 13,583 inactive titles) from approximately 11,678 publishers, of which 34,346 are peer-reviewed journals in top-level subject fields: life sciences, social sciences, physical sciences, and health sciences. It covers three types of sources: book series, journals, and trade journals (Scopus, 2023).

In this section we focus on the ECAI publications that are found in both DBLP and Scopus. In Table 1 we summarise the publications that are found in both databases. The first column (References) refers to the total number of publications in based on DBLP. The number in column DOIs refer to those publications in the first column that have a DOI in DBLP. The number in the third column (Valid DOIs in Scopus) refers to those DOIs that are recognised by Scopus. In what follows we only consider the papers from years 2008 to 2020 given the availability of the metadata. However, we do plan to consider all the papers in the future, and consider additional mainstream AI conferences.

Year	References	DOIs	Valid DOIs
			in Scopus
1976	36	35	0
1978	51	0	0
1982	61	0	0
1984	43	0	0
1986	58	0	0
1988	146	0	0

Table 1 Summary of papers published in ECAI from 1976, with its corresponding DOIs and DOIs recognised by Scopus



1990	147	0	0
1992	200	0	0
1994	160	0	0
1996	138	0	0
1998	165	0	0
2000	143	0	0
2002	141	0	0
2004	274	0	0
2006	211	0	0
2008	238	237	233
2010	239	180	180
2012	196	193	191
2014	276	275	275
2016	296	295	295
2018	871	870	826
2020	409	408	408
2022	864	863	3

4.2 Measuring Collaboration

We associate each paper with the list of countries involved in it considering the country of the institution (or institutions in case of multiple affiliations) each author is affiliated to. We construct a collaboration a graph where the nodes correspond to the countries and each (undirected) edge represents that there is at least a paper with authors from the corresponding countries.

Figure 2 shows the collaboration graph of the ECAI papers in 2008. In this graph we observe, for example that Austria is the only country that collaborated with Japan. In Figure 3 we show the collaboration graph of the papers in 2020. We can see that both graphs are very sparse, thus showing that there is a lot of room for collaboration since most countries have not collaborated between them. This situation becomes clearer when we consider Figure 4. We remind the reader that each box plot (Robert Mcgill, 1978) shows median, inter-quartile range (IQR), bounds of +/- 1.5*IQR beyond the box, and outliers. As we can see, the media for several years is zero (e.g., 2008). That is, in those years, at least 50% of the countries have no collaborators. We do see outliers with more than 30 collaborators, but these outliers are far from the median value.





Figure 2 Collaboration graph for ECAI 2008. Countries with a link between them have at least one paper involving authors from both countries. The width of the edge is proportional to the number of publications involved in the collaboration.

In Table 2 we show the 20 countries with the highest number of collaborators. We show both the collaborators for each year and the number of collaborators in total. Notice that the total number of collaborators is not equal to the sum of the collaborators obtained in each year. This is because a country can collaborate with another country more than once, but the collaborator is only counted once. For instance, in country A has only collaborates with countries B and C every year, the total number of collaborators is 2.

Table 4 shows the ranking of the 20 countries with the highest number of publications. In this table we also show both publications per year and the total number of publications. Contrary to the situation of Table 2, in Table 4 the total corresponds to the sum of the publications for every year since a publication is only associated with one year. While the relative ranking of the countries changes a bit from Table 2 to Table 4, we observe that the set of countries is mostly the same, as observed in Figure 5. Indeed, 17 out 20 countries are the same in both sets.

Table 2 and Table 4 are ignoring the populations of the countries, which may be unfair since you would expect that the population play a role in the possibilities of collaborations and the production of the country in term of publications. Table 3 and Table 5 show the corresponding rankings if the population is considered.

We focus on the countries with the smallest numbers of collaborators in Table 6. In the table, the name of the country is complemented with the number of publications of the country. In Figure 6 we plot the average number of publications for each category of publication. We clearly observe the trend: the higher the number of collaborators the higher the number of publications. This shows that there is strong correlation between the number of collaborators and the number of publications. This should encourage countries that are not collaborating much to seek more international collaboration.





Figure 3 Collaboration graph for ECAI 2020. Countries with a link between them have at least one paper involving authors from both countries. The width of the edge is proportional to the number of publications involved in the collaboration.



Figure 4 Number of collaborators per year. Each box represents the collaborators that the countries have in the corresponding year.



Country	2008	2010	2012	2014	2016	2018	2020	Total
United Kingdom	10	11	12	17	17	28	8	40
France	11	11	10	18	17	12	12	37
United States	7	7	11	17	12	32	14	37
Germany	12	8	9	12	15	14	7	32
Australia	9	5	5	12	9	13	6	26
China	2	2	3	6	11	20	10	25
Spain	7	6	4	6	8	6	8	25
Italy	8	6	9	7	7	12	9	24
Canada	5	0	2	2	6	14	4	21
Japan	1	1	1	2	2	17	1	19
Netherlands	2	3	2	8	4	5	3	18
Austria	3	1	2	4	1	12	4	17
Poland	0	2	3	3	4	10	7	17
Israel	3	0	2	3	3	11	6	16
Czech Republic	4	1	3	4	2	3	2	14
Finland	4	1	0	2	0	7	2	14
Portugal	3	3	2	7	2	4	2	14
Belgium	3	1	2	2	4	8	3	13
Ireland	6	1	1	8	2	2	1	13
Brazil	3	4	2	6	3	3	3	12

Table 2 Ranking of countries with respect to their number of collaborations.



Country	2008	2010	2012	2014	2016	2018	2020	Total
Ireland	1.17E-06	1.95E-07	1.95E-07	1.56E-06	3.90E-07	3.90E-07	1.95E-07	2.54E-06
Finland	7.12E-07	1.78E-07	0.00E+00	3.56E-07	0.00E+00	1.25E-06	3.56E-07	2.49E-06
Austria	3.32E-07	1.11E-07	2.22E-07	4.43E-07	1.11E-07	1.33E-06	4.43E-07	1.88E-06
Israel	3.07E-07	0.00E+00	2.04E-07	3.07E-07	3.07E-07	1.12E-06	6.13E-07	1.64E-06
Portugal	2.87E-07	2.87E-07	1.91E-07	6.69E-07	1.91E-07	3.82E-07	1.91E-07	1.34E-06
Czech Republic	3.69E-07	9.24E-08	2.77E-07	3.69E-07	1.85E-07	2.77E-07	1.85E-07	1.29E-06
Belgium	2.56E-07	8.55E-08	1.71E-07	1.71E-07	3.42E-07	6.84E-07	2.56E-07	1.11E-06
Netherlands	1.12E-07	1.67E-07	1.12E-07	4.46E-07	2.23E-07	2.79E-07	1.67E-07	1.00E-06
Australia	3.36E-07	1.87E-07	1.87E-07	4.48E-07	3.36E-07	4.86E-07	2.24E-07	9.72E-07
United Kingdom	1.49E-07	1.64E-07	1.79E-07	2.54E-07	2.54E-07	4.18E-07	1.19E-07	5.97E-07
France	1.62E-07	1.62E-07	1.47E-07	2.65E-07	2.50E-07	1.76E-07	1.76E-07	5.44E-07
Canada	1.25E-07	0.00E+00	5.02E-08	5.02E-08	1.51E-07	3.51E-07	1.00E-07	5.27E-07
Spain	1.45E-07	1.24E-07	8.27E-08	1.24E-07	1.65E-07	1.24E-07	1.65E-07	5.17E-07
Poland	0.00E+00	5.26E-08	7.89E-08	7.89E-08	1.05E-07	2.63E-07	1.84E-07	4.47E-07
Italy	1.36E-07	1.02E-07	1.53E-07	1.19E-07	1.19E-07	2.04E-07	1.53E-07	4.08E-07
Germany	1.42E-07	9.48E-08	1.07E-07	1.42E-07	1.78E-07	1.66E-07	8.29E-08	3.79E-07
Japan	7.97E-09	7.97E-09	7.97E-09	1.59E-08	1.59E-08	1.36E-07	7.97E-09	1.51E-07
United States	2.10E-08	2.10E-08	3.30E-08	5.10E-08	3.60E-08	9.60E-08	4.20E-08	1.11E-07
Brazil	1.48E-08	1.97E-08	9.85E-09	2.95E-08	1.48E-08	1.48E-08	1.48E-08	5.91E-08
China	1.42E-09	1.42E-09	2.13E-09	4.25E-09	7.79E-09	1.42E-08	7.08E-09	1.77E-08

Table 3 Ranking of countries with respect to their number of collaborations normalised by population.



Country	2008	2010	2012	2014	2016	2018	2020	Total
China	5	2	3	12	32	366	97	517
United States	10	14	23	28	43	233	53	404
United Kingdom	33	30	30	43	50	112	33	331
France	48	36	38	54	44	40	42	302
Germany	31	21	33	44	35	36	34	234
Italy	24	18	21	19	22	38	36	178
Australia	15	10	14	23	21	56	18	157
Spain	15	24	11	12	14	10	26	112
Netherlands	13	9	7	26	20	7	9	91
Japan	5	5	2	6	5	48	9	80
Austria	6	5	7	11	7	16	14	66
Singapore	0	2	1	4	8	47	3	65
Israel	4	0	8	12	8	23	8	63
Canada	7	2	3	5	7	25	8	57
Portugal	8	9	5	8	7	8	3	48
Greece	15	4	7	3	6	5	4	44
Hong Kong	0	1	0	3	2	31	7	44
Belgium	4	3	3	5	8	7	6	36
Ireland	8	4	2	9	5	4	4	36
Brazil	4	6	2	6	6	6	5	35

Table 4 Ranking of countries with respect to the number of ECAI papers.



Country	2008	2010	2012	2014	2016	2018	2020	Total
Singapore	0.00E+00	3.55E-07	1.77E-07	7.10E-07	1.42E-06	8.34E-06	5.32E-07	1.15E-05
Austria	6.65E-07	5.54E-07	7.75E-07	1.22E-06	7.75E-07	1.77E-06	1.55E-06	7.31E-06
Ireland	1.56E-06	7.81E-07	3.90E-07	1.76E-06	9.76E-07	7.81E-07	7.81E-07	7.03E-06
Israel	4.09E-07	0.00E+00	8.18E-07	1.23E-06	8.18E-07	2.35E-06	8.18E-07	6.44E-06
Hong Kong	0.00E+00	1.36E-07	0.00E+00	4.09E-07	2.73E-07	4.23E-06	9.55E-07	6.00E-06
Australia	5.61E-07	3.74E-07	5.23E-07	8.60E-07	7.85E-07	2.09E-06	6.73E-07	5.87E-06
Netherlands	7.25E-07	5.02E-07	3.91E-07	1.45E-06	1.12E-06	3.91E-07	5.02E-07	5.08E-06
United Kingdom	4.93E-07	4.48E-07	4.48E-07	6.42E-07	7.47E-07	1.67E-06	4.93E-07	4.94E-06
Portugal	7.64E-07	8.60E-07	4.78E-07	7.64E-07	6.69E-07	7.64E-07	2.87E-07	4.59E-06
France	7.05E-07	5.29E-07	5.58E-07	7.94E-07	6.47E-07	5.88E-07	6.17E-07	4.44E-06
Greece	1.43E-06	3.82E-07	6.68E-07	2.86E-07	5.72E-07	4.77E-07	3.82E-07	4.20E-06
Belgium	3.42E-07	2.56E-07	2.56E-07	4.27E-07	6.84E-07	5.98E-07	5.13E-07	3.08E-06
Italy	4.08E-07	3.06E-07	3.57E-07	3.23E-07	3.74E-07	6.46E-07	6.12E-07	3.02E-06
Germany	3.67E-07	2.49E-07	3.91E-07	5.21E-07	4.15E-07	4.26E-07	4.03E-07	2.77E-06
Spain	3.10E-07	4.96E-07	2.28E-07	2.48E-07	2.90E-07	2.07E-07	5.38E-07	2.32E-06
Canada	1.76E-07	5.02E-08	7.53E-08	1.25E-07	1.76E-07	6.27E-07	2.01E-07	1.43E-06
United States	3.00E-08	4.20E-08	6.90E-08	8.40E-08	1.29E-07	6.99E-07	1.59E-07	1.21E-06
Japan	3.99E-08	3.99E-08	1.59E-08	4.78E-08	3.99E-08	3.83E-07	7.18E-08	6.38E-07
China	3.54E-09	1.42E-09	2.13E-09	8.50E-09	2.27E-08	2.59E-07	6.87E-08	3.66E-07
Brazil	1.97E-08	2.95E-08	9.85E-09	2.95E-08	2.95E-08	2.95E-08	2.46E-08	1.72E-07

Table 5 Ranking of countries with respect to the number of ECAI papers normalised by population.



Figure 5 Intersection between top collaborators and top producers



Table 6 Number of collaborators vs Number of publications for countries with the smallest number of collaborators

Collaborators	Countries
0	Malta(1) Egypt(1) Thailand(2) Malaysia(1)
1	Bangladesh(2) Bulgaria(1) Morocco(3) New Caledonia(1) Croatia(1) Ukraine(1) Macedonia(1) Algeria(1)
2	Hungary(3) Cambodia(1) Estonia(1) Qatar(1) Slovakia(2) Macao(3) Iceland(2)
3	Lebanon(2) Viet Nam(2) Argentina(4) Taiwan(13)
4	Iran(6) Venezuela(4) Tunisia(7)
5	Cyprus(7) Saudi Arabia(7) Denmark(6) South Korea(12)



Figure 6 Average number of publications for the countries with the smallest number of collaborators

4.3 Text Analysis

In the previous section we saw that there is a lot of potential for collaboration. We now turn our attention to the text in the abstracts to elicit topics that could be used to discover areas of common interest between countries that are not currently collaborating.

Figure 7 and Figure 8 show the word clouds of the abstracts of the ECAI papers published in 2008 and 2020 respectively. This word clouds were computed using wordcloud (Layla Oesper, 2011). We can observe, for instance, that the word 'system', which was very popular in 2008 is not that so in 2020. Instead, we observe words like 'data', 'network', 'feature', 'learning' and 'method' gaining importance.

Table 7 presents the topics computed using the Latent Dirichlet Allocation implementation provided by sklearn (F. Pedregosa, 2011). For every year three topics where computed. Each topic is described in terms of the tokens obtained from the conversion of the abstracts into a matrix of token counts using CountVectorizer from sklearn (F. Pedregosa, 2011).





Figure 7 Word cloud of the abstracts of the ECAI paper in 2008



Figure 8 Word cloud of the abstracts of the ECAI paper in 2020

What we aim to do as part of our future work is to define the potential of collaboration between two given countries based on the computed topics. The topics in Table 1 were computed using the abstracts of the papers. We could alternatively have used the keywords provided by the authors. However, this information was not available in the metadata retrieved from Scopus.



Table 7 Topics computed based on the abstracts of the papers.

Year	Topics
2008	use-approach-model-propos-base-algorithm-set-problem-differ-present
	use-propos-algorithm-constraint-problem-agent-approach-model-plan-result
	use-model-agent-propos-learn-present-approach-base-problem-rule
2010	problem-use-approach-propos-method-model-set-data-agent-base
	agent-use-model-approach-problem-result-base-logic-inform-propos
	use-problem-propos-method-approach-set-learn-result-new-agent
2012	problem-use-algorithm-approach-propos-result-agent-paper-new-plan
	problem-use-model-paper-approach-set-algorithm-propos-semant-base
	plan-algorithm-use-problem-base-agent-approach-knowledg-game-propos
2014	use-model-paper-approach-problem-agent-propos-data-result-algorithm
	agent-problem-model-use-propos-approach-paper-plan-algorithm-base
	approach-propos-set-use-algorithm-base-paper-method-logic-comput
2016	agent-model-propos-use-paper-approach-base-learn-problem-label
	model-use-problem-propos-approach-method-paper-result-learn-data
	problem-use-method-algorithm-data-paper-approach-comput-propos-agent
2018	model-learn-method-network-use-algorithm-problem-result-data-generat
	model-problem-learn-use-network-method-paper-agent-result-algorithm
	learn-model-method-data-problem-paper-network-featur-use-task
2020	model-learn-problem-use-approach-network-result-data-algorithm-method
	model-learn-network-method-use-data-perform-problem-approach-algorithm
	model-use-learn-method-data-paper-approach-base-train-problem

4.4 Concluding remarks

In this section we have a presented a preliminary version of a service that should encourage countries to increase their level of international collaborations. Based on the metadata considered, we see that there is a lot of potential for international collaboration.

The observations presented in this section are based on a metadata that still needs to be completed. As explained before, we have only focused on the publications between years 2008 and 2020. In the future we hope to complete our metadata, which will enable us to implement better approaches to suggest potential opportunities of collaborations based on the research topics that countries have in common.

As mentioned before, this preliminary results are based on the metada of the ECAI publications available in DBLP and Scopus. We have only considered IJCAI in those cases where IJCAI has taken place jointly with ECAI. However, the plan is to use metadata from other mainstream AI conferences (including IJCAI). The service is meant to be automatic. The user will be provided with means to personalise the source of the metadata and the format of the plots generated. The service will be implemented using the AI on-demand Application Programming Interface as specified in (J. Vanschoren, 2022), and the service is expected to be available by the end of the project.



5 References

- DBLP. (2023, August 21). Retrieved from Wikipedia: https://en.wikipedia.org/w/index.php?title=DBLP&oldid=1146558200
- F. Pedregosa, G. V. (2011). Scikit-learn: Machine Learning in Python. *Journal of Machine Learning Research*, 2825-2830.

J. Vanschoren, J. v. (2022). *Platform Architecture Report and User Guide (v1)*. AI4Europe.

Layla Oesper, D. M. (2011). WordCloud: a Cytoscape plugin to create a visual semantic summary of networks. *Source code for biology and medicine*, 7.

Ley, M. (2009). DBLP - Some Lessons Learned. Proc. {VLDB} Endow., 1493--1500.

Robert Mcgill, J. W. (1978). Variations of box plots. *The American Statistician*, 12–16.

Scopus. (2023, 09 31). Retrieved from Wikipedia: https://en.wikipedia.org/wiki/Scopus