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ARTIMATIION

TRANSPARENT ARTIFICIAL INTELLIGENCE AND AUTOMATION TO AIR TRAFFIC MANAGEMENT SYSTEMS'

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Abstract

Recently, Artificial intelligence (AI) algorithms have shown increasable interest in various application domains including in Air Transportation Management (ATM). Different AI in particular Machine Learning (ML) algorithms are used to provide decision support in autonomous decision-making tasks in the ATM domain (e.g., conflict detection and resolution (CD&R), and delay prediction and propagation.). However, most of the time these automated systems are not accepted or trusted by the intended users as the decisions provided by AI are often opaque, non-intuitive and not understandable by human operators. Safety is the major pillar to air traffic management, and no black box process can be inserted in a decision-making process when human life is involved. To address this challenge related to transparency of the automated system in the ATM domain, ARTIMATIION focuses on investigating AI methods in predicting conflict detection and resolution (CD&R), and delay prediction and propagation based on the domain of Explainable Artificial Intelligence (XAI). Here, AI models' explainability in terms of understanding a decision i.e., post hoc interpretability and understanding how the model works i.e., transparency can be provided in the air traffic management. ARTIMATIION will provide a proof-of-concept of transparent AI models that includes visualisation, explanation, generalisation with adaptability over time to ensure safe and reliable decision support.

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1.

Introduction

Dissemination represents one of the core activities of the ARTIMATION project. The Project's dissemination, communication and exploitation strategy is based on informing about and promoting the project and its results/success (Communication), describing, and ensuring results available for others to use (Dissemination), and making concrete use of research results (Exploitation).

The present document aims at reporting the different communication and dissemination actions carried out within the project lifetime, specifically for the period January 2021 – December 2022. To better understand the link between the activities carried out in the first 12 months and the communication strategy, the next sections will introduce the relationship between the WP8, the other Work Packages (WP) and the Communication, Dissemination and Exploitation Plan D8.1 detailed in the Project Management Plan. Since the document will be submitted at the end of month 23, it will be updated with the final Communication and Dissemination activities carried out during month 24 of the project, i.e., the last month of ARTIMATION.

1.1 Interconnections with other work packages

Since this deliverable is part of a work package (WP8) concerning communication, dissemination and exploitation activities, its contents are lined up with all the other technical WPs, such as WP1 "Project Management", by publishing the (Project Management Plan) on the website, WP3 "Definition of Specifications and SOA", by recruiting the participants for Workshop T3.2 on the website and social medias. WP4 "Multivariate data Analytics and AI Model Development", WP5 "Lifelong Machine Learning with Human-Centred AI", by the publication of scientific journals of the first outcomes, a survey in AI and XAI in ATM, current trend, and development with future Research Trajectory. WP6 "Test and Validation". WP8 and its deliverables are first and foremost linked with the validation activities carried out in the WP6 "Test and Validation". Being DBL also lead beneficiary for WP6 will make the process easier and more productive in disseminating the ARTIMATION project core related results.

The strategy applied in the communication of ARTIMATION to key stakeholders relies on the clarification of targets, audience, and message before deciding which media to use to convey the message. Therefore, in the Communication, Dissemination and Exploitation (CDE) Plan, ARTIMATION matches the messages to the target audience, or audience segments, and the means to reach them. This was fundamental to increase the possibility of increasing the message impact on the multi-layered community to which ARTIMATION refers. The main communication and dissemination actions carried out in the first period follow these objectives:

1. **Inform** about and **promote** the project and its results/success (Communication)
2. **Describe** and ensure results available for others to use (Dissemination)
3. **Make concrete use** of research results (Exploitation)

To ensure that the intended impact is achieved across the different stakeholder categories, the strategy creates strong links between dissemination goals and target audiences. This enabled us to select the appropriate type of information, tool, or activity to communicate the project and reach the

goals set in the CDE plan. Thus, the CDE objectives must be seen in relation to specific audience segments:

- **the general public:** people and groups interested in the general topics pertaining ARTIMATIION, such as citizens interested in the potential of ARTIMATIION, and the media;
- **the scientific community:** the broader European R&D community;
- **the policy makers and regulatory:** such as the Horizon 2020 (H2020), SESAR Joint Undertaking (SJU), and institutional decision-makers projects;
- **the aviation industry:** Air Traffic Controllers (ATCOs) and Air Navigation Service Providers (ANSPs)

Communication strategies for the ARTIMATIION project are developed based on the CDE objectives and target audiences. A strategy based on domain-centric communication, the continued involvement of the project stakeholders and a constant interaction with the SESAR brand. In setting up the pillars of communication, all projects' activities were aimed at achieving maximum outreach.

1.2 Structure

The rest of the document is structured as follows:

Chapter 2 reports all the communication of the project towards the public made through the social networks, website, press coverage and public materials.

Chapter 3 describes the liaison with relevant stakeholders such as the scientific community and the aviation industry.

Chapter 4 analyses the results of the communication and dissemination.

Chapter 5 details the next events, scientific publications, and activities.

Chapter 6 draws the conclusions.

1.3 List of Acronyms

Table 1. List of Acronyms

Acronym	Definition
AB	Advisory Board
AI	Artificial Intelligence
ATCO	Air Traffic Controller
ATM	Air Traffic Management
CDE	Communication, Dissemination, and Exploitation (Plan)
CD&R	Conflict Detection and Resolution

DBL	Deep Blue
Dx.x	Deliverable x.x (often used in referment of D6.1)
EAB	External Advisory Board
ENAC	Ecole National de l'Aviation Civile
GA	General Assembly
HMI	Human-Machine Interaction
H2020	Horizon 2020
MDU	Mälardalen University
ML	Machine Learning
PMP	Project Management Plan
R&D	Research and Development
SOA	State Of the Art
SJU	SESAR Joint Undertaking
UNISAP	Università degli Studi La Sapienza
WP	Work package
XAI	Explainable Artificial Intelligence

2 Introduction on Communication and Dissemination activities

2.1 Audience and objectives of the activities

The Communication, Dissemination and Exploitation plan defined a list of four main objectives for communication and dissemination in the ARTIMATIION project: (1) promoting the activities, (2) raising awareness about the ARTIMATIION objectives and goals, (3) fostering interaction and exchange among the target audience, and (4) getting key messages to decision-makers to ensure the impact.

ARTIMATIION focused its first reporting period on achieving the first two objectives and demonstrating the relevance of the project purposes and maximising its recognition among a general and specialized audience. The last months of dissemination and communication activities mostly focused on promoting the projects' methods and outcomes, to fully understand the inner process used during ARTIMATIION lifecycle and to effectively disseminate among the different audiences the final outcomes.

The goal of informing and raising awareness among the target audience on the ARTIMATIION project and objectives lasted for the project lifetime, and it has been integrated with the project outcomes during the last steps of the project activities. To reach our goal, ARTIMATIION increased the media visibility (YouTube, Twitter, website). The corrective actions taken during the project lifetime will be further detailed in the next sections. The results produced so far by the communication and dissemination activities show that the targeted audience has been reached and overcome through mostly all the dissemination channels considered: only the website KPIs have not been achieved.

2.2 Communication and dissemination tools

ARTIMATIION aimed to maximise communication effectiveness of the project results by the general audience and disseminate project results to other relevant stakeholders in the field of XAI design and human factor (HF) assessment and Aviation. A variety of methods have been used to communicate the key messages of the project to reach a multi-layered community, with the aim of achieving awareness. In this perspective project results have been communicated to multiple audiences: the public and stakeholders. The first group of audience includes people interested in the topic in general, such as policymakers, the usability community (UX designers, developers, etc.), industrial associations, industries, service providers and people interested in increasing the use of explainable AI (XAI) in the aviation domain, with a general idea of what XAI does and its usefulness. Therefore, this kind of audience looks for clear, useful information: the main source of information for this group are the website and the project's social networks. The second cluster of audience's communication channels involved more engaging the research community through publications in scientific journals and the participation in different conferences presenting the ARTIMATIION project. All the used channels and tools of communication and dissemination have been listed in the table below:

Table 2. Communication and Dissemination tools

Tool	Communication	Dissemination
Website	X	X
LinkedIn	X	X
Twitter	X	
YouTube		X
Press coverage	X	
Scientific Publications		X
Third parties' events and conferences		X

3 Communication

3.1 ARTIMATION Project website

The project website¹ has an essential role in the dissemination as the principal means of communication of ARTIMATION objectives, activities, and results. The website promotes communication and interaction within ARTIMATION by improving dissemination directed to specialists, stakeholders, potential users, public funding authorities, as well as the public.

Since the website was launched at month 4 of the project (April 2021), no major changes were made to the structure and graphical aspects of the website. Until now, the project uploaded on the website public outcomes as well as blog posts to update the public about news and events related to the ARTIMATION project.

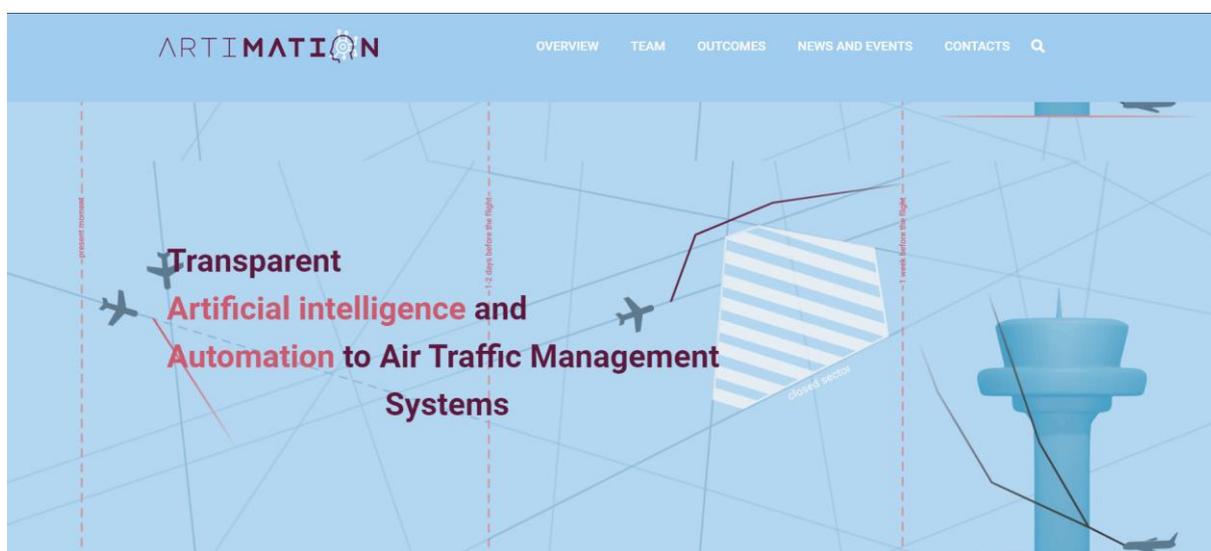


Figure 1. Website Home Page

3.1.1 Website analytics

Sometime after the website was launched, the analytics were linked to it to monitor the access and usage of the webpages, for providing different kinds of information regarding the number and behaviours of visitors, helping identify possible problems, and increase the website performance by evaluating the impact and effectiveness of its contents.

¹ <https://www.artimation.eu/>

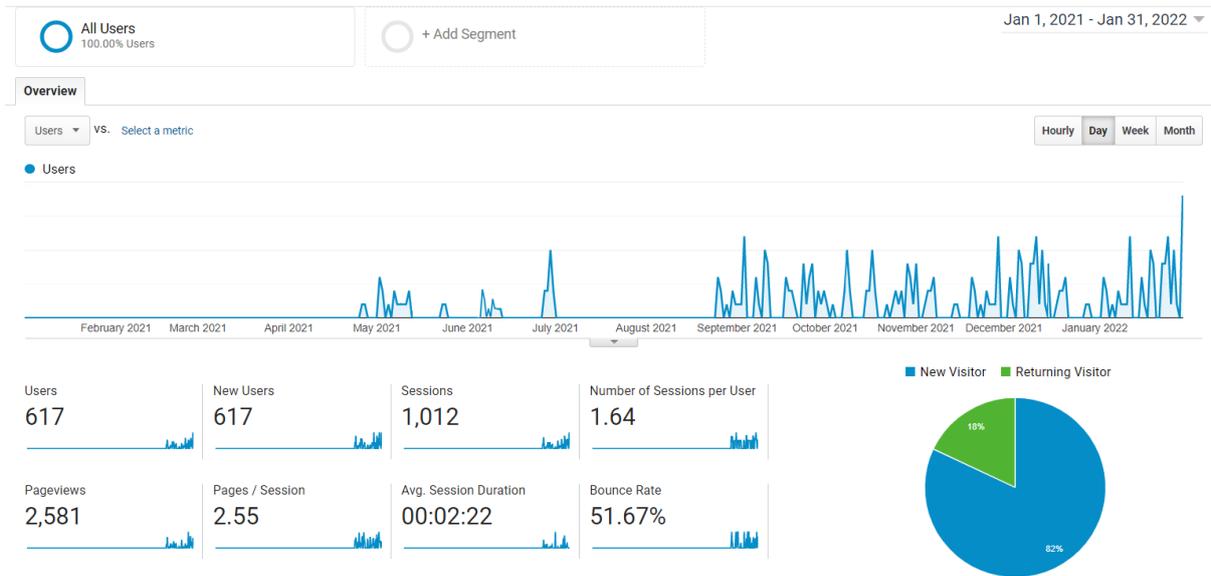


Figure 2. ARTIMATION Website Analytics Feb. 21- Jan. 22

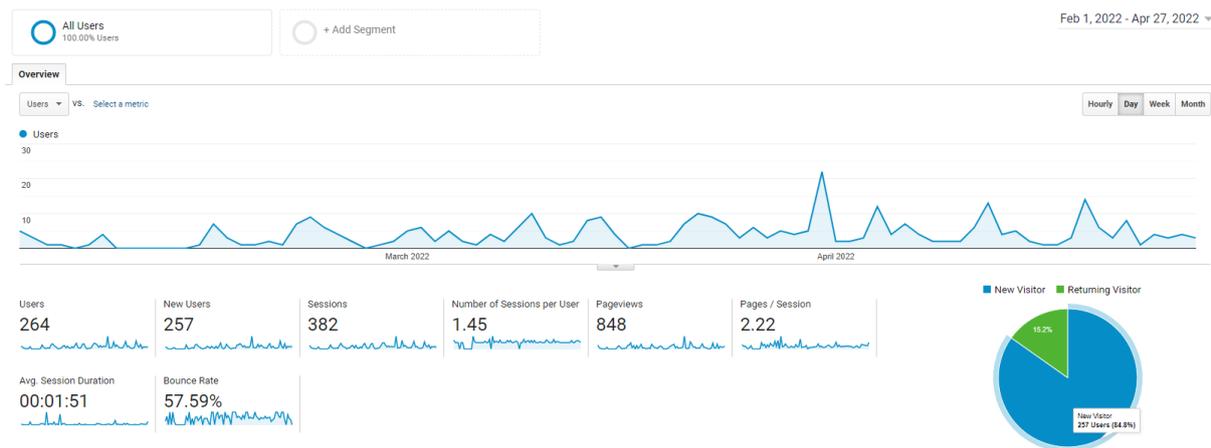


Figure 3. ARTIMATION Website Analytics Feb. 22- Apr. 22

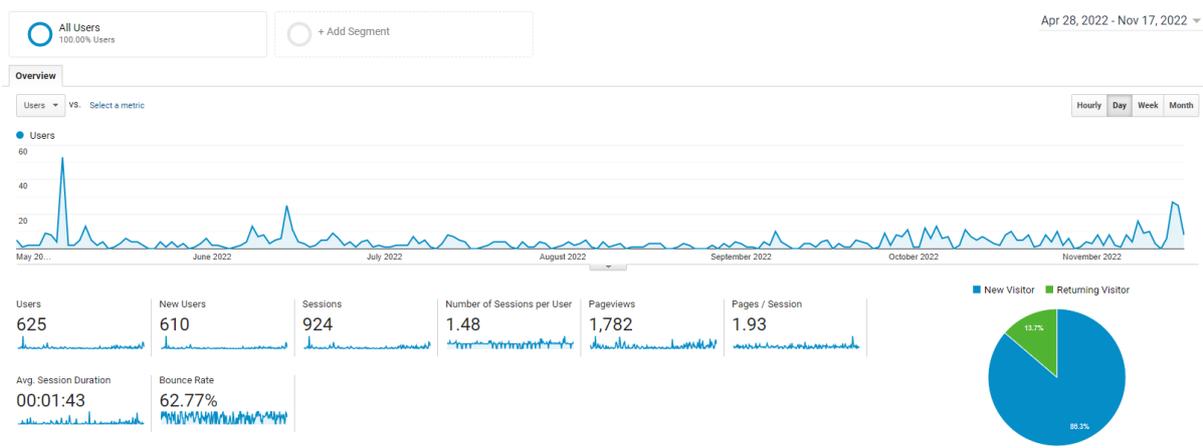


Figure 4. ARTIMATION Website Analytics May 22- Nov 22

As it can be seen from the three above figures, the website visitors increased during the time, showing a growing trend. In particular, the dissemination activities towards the scientific community could have helped this process: ARTIMATION took part in several events during the last 4 months of the project, both with the advisory board and generic conferences related to ATM and Artificial Intelligence. Nonetheless, ARTIMATION did not reach the target KPI of website visitors. This can be related to the delays had in the other work packages, that delayed the dissemination and communication of the results of the project. Moreover, at this stage of the project, we can point out that ARTIMATION could have introduced and disseminated better some ML methods used within the project, to try to increase the visibility of the project. These data are reporting the website visitors from January 1st, 2021, to November 17th, 2022, and will be updated at the end of month 24. Anyhow, the growing trend shows how the communication and dissemination activities carried out in the last quarter of the project helped increasing the visitors of the website, realising almost the same number of views in the timeframes January 2021-January 2022 and May 2022-November 2022.

3.1.2 Website Search Engine Optimization

The position of the ARTIMATION website in well-known search engines is one of the parameters to monitor to assess the success of the dissemination activities. The KPI keyword “ARTIMATION project” did not climb up to the first position until Month 14 of the project. This could have been partially due to the chosen name, as we have found out that many other popular websites have a similar spelling (e.g., Animation project). At the same time, we noticed the number of backlinks from project partners’ websites was low. We decided to tackle this issue, and act in changing the results implementing the corrective measures listed in the following paragraph. We have already started to adopt 8 key actions to improve the search engine position, that have already begun producing results in the last month.

We list all the corrective measures as follows:

- Improving SEO ranking via overhauling of the keywords
- As visuals and infographics are widely used and appear to be more appealing than words to a more general audience, we decided to add some pictures and graphics on ARTIMATION website pages.
- “Guest Post” posting articles on other websites that can link to the ARTIMATION website

- Implementing hyperlinks in the partners website to indirectly increase the SEO

Performing these actions allowed us to reach several results at the same time:

1. Increase number of visits
2. Increase credibility on Google
3. Increase visibility, creating content of value for a real niche of users' needs.

As a result, starting from month 16 of the project, "ARTIMATION project" climbed up to the first page in google research.

3.1.3 Website News

According to our objective of raising awareness, we set the KPI of 0.5 website news per month: after 23 months of project, we have reached the target with a ratio of 0.7, considering after the submission of the D8.3 the project will publish at least two more news about the final outcomes and description of the results, both for the use cases of conflict detection and resolution and delay prediction.

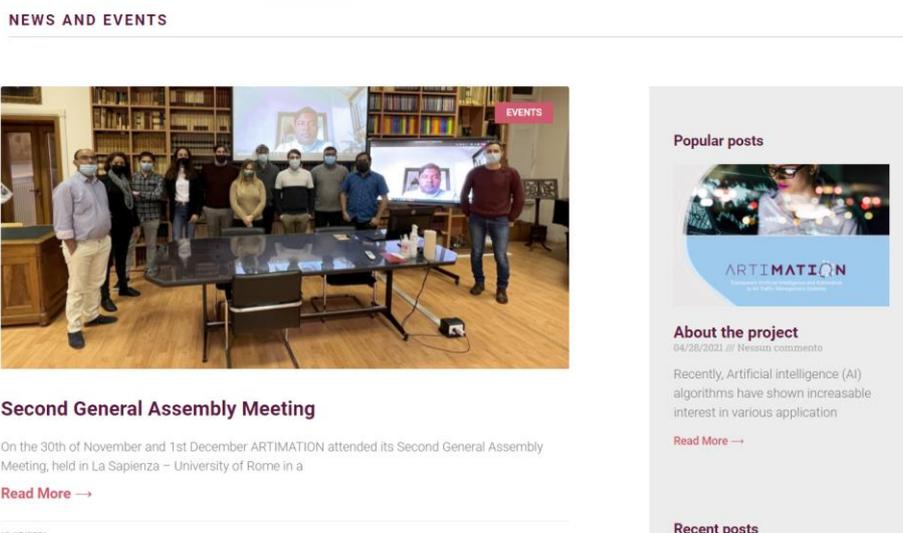


Figure 5. Website News page

3.1.4 Geo-Localization

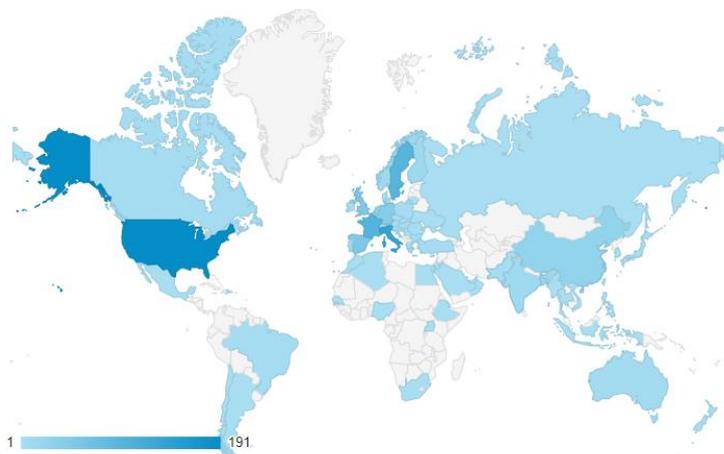


Figure 6. Active users’ geo-localization density of the ARTIMATION website visitors

Not surprisingly, most visitors come from Italy, France and Sweden, the same countries that compose the ARTIMATION Consortium. But most surprisingly, most of the website visitors come from the United States. The other most represented countries come from Spain, UK, Germany and from other countries worldwide as well. Overall, the website at half of its life cycle counted visitors from 71 countries, against the initial provision of 20.

3.1.5 Website KPIs and actual numbers

To conclude the website paragraph, in the following table the KPIs in relationship with the actual results at month 23 of the project are reported. The timeframe for the KPIs in the following table is then from January 2021 to November 2022:

Table 3. Communication KPIs and success criteria, and actual results

Website	Target	KPI	Actual number
artimation.eu	# of visitors to the website	2000	1506
	# of posts in website “News” section (per Month)	0.5/per month	0.7
	# of countries’ visitors	20	71
	# of website backlinks	8	59
	Search engine position (keyword: “ARTIMATION Project”)	First page	First page

As it can be seen from the table above, all the KPIs have been overreached during the first 23 months of the project, except for the number of visitors of the website. ARTIMATION, as reported in D8.2, identified this as the main issue for the communication activities, trying to tackle it starting from month 12 of the project. Unfortunately, the corrective measures adopted have not been enough to reach the target of 2000 visitors of the website. Nonetheless, the number of visitors from 71 different countries show how ARTIMATION gathered interest from all the continents, overreaching the target number of 20.

3.2 Social Media Networks

As part of the communication, dissemination, and exploitation activities, ARTIMATION uses three social media platforms: LinkedIn, Twitter, and YouTube. These channels have been selected due to their ability to target a diversified audience. Through LinkedIn, the Consortium aims at reaching a more professional and specialised audience, while Twitter has been preferred to reach the public. These channels help open discussion around the project and engage the target audience according to the communication goals described in Section 1.1.1.

Digital communication benefited from the support received by the SESAR Joint Undertaking. ARTIMATION project description is mentioned in SESAR website, and we started forwarding information regarding project activities and results to share through their social media profiles as well as periodically including ARTIMATION in their monthly e-news. Addressing the SJU wider community it is crucial so that the ARTIMATION findings and results will be taken into consideration by policymakers and implemented in future policies and practices. Long-term impact reflects on stakeholders' and regulators' research agendas and research programmes.

The dissemination team wanted to create a series of social media posts where some more general information about artificial intelligence can be shared, with the aim of making the project's domain more accessible to non-experts and thus fostering communication. This series was called #ArtificialIntelligenceFacts and it was characterised by the graphic below. The [first post](#) shared on LinkedIn and Twitter was in May 2022 and it has recorded a good response in the audience, a sign that information of this kind, such as tips and facts, is interesting to the project followers.



Figure 7. Graphic Communication AI Facts

In the following table the KPIs for the social media network are listed, considering as a time frame the beginning of the project until December 2022. Only the KPI “# of posts on social media platforms” is listed in a time frame “per-month” and the KPI “# of impressions on Twitter” is listed in a time frame of 90 days, from August 2022 to November 2022. As can be deduced from the table, all social media networks target has already been reached.

Table 4. Social media KPIs and actual results

Social media	Target	KPI	Actual number
Twitter; LinkedIn for ARTIMATION project	# of posts on social media platforms (per month)	15	15
	# of Followers (Twitter & LinkedIn)	200	291
	# of impressions on Twitter (last 90 days)	200	1900
	# of interactions on LinkedIn	200	363

3.2.1 Twitter

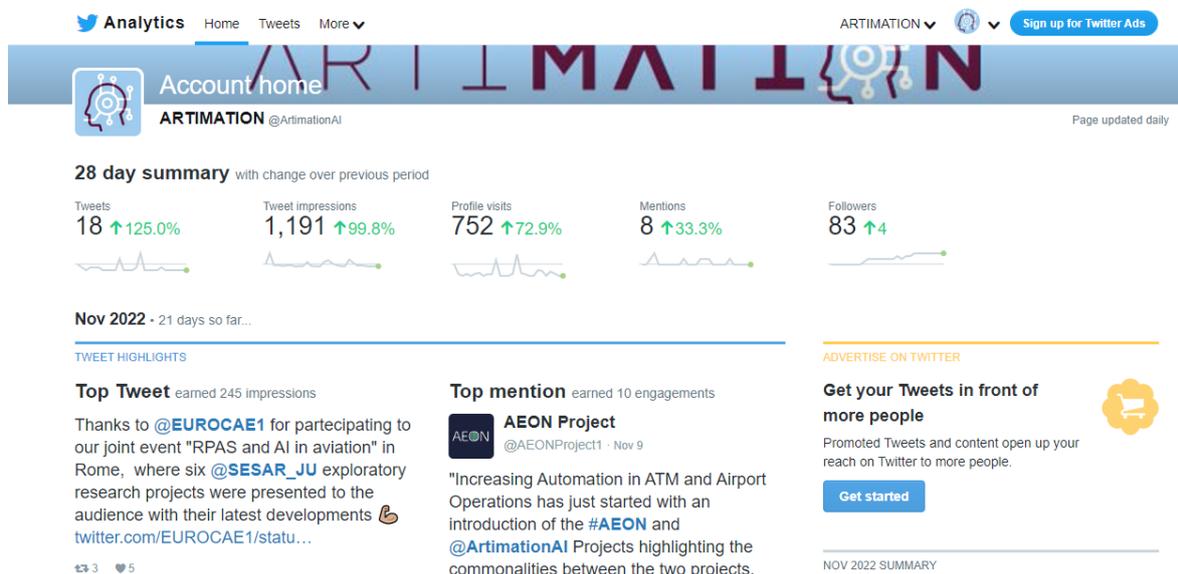


Figure 8. ARTIMATION Twitter account (timeframe: 26-Oct-22; 22-Nov-22)

The content shared through Twitter are mainly focused on the research, on innovative techniques, general updates from the ARTIMATION and its related projects. The goals of this activity were to inform and raise awareness about research in the field of XAI design and human factor (HF) assessment and Aviation to the general audience and other relevant stakeholders. Twitter supports short and focused

communication. It has been very useful to follow profiles relevant to the project, and when participating in external events it offers the possibility of live tweeting, interacting with people taking part in the same event, or entering in a previously started discussion.

The table below reports ARTIMATIION activities on Twitter in the period from January 2021 – November 2022. The first part of the project from January 2021 to October 2021 is summed up together, since it was the very first part of the project that only fewer results were available to share with the audience. During November, the project social networks saw a higher engagement due to the upcoming General Assembly Meeting: after Month 11, the engagement adjusted to the usual levels, in line with CDE plan KPIs.

Table 5. Twitter profile analytics

Month	Followers	Impressions	Visits	Mentioning
January-October 21	35	3594	2381	5
November 21	4	442	527	
December 21	9	189	287	
January 22	1	650	457	1
February 22	2	331	239	
March 22	8	463	187	5
April 22	9	796	697	4
May 22	2	623	461	
June 22	-1	721	328	
July 22	3	69	627	
August 22	4	33	0	
September 22	1	65	472	2
October 22	3	1039	515	9
November 22	4	745	572	5

3.2.2 LinkedIn

LinkedIn, as a professional social network, helps attract a specialised public that can exchange information and discuss the project and its findings (this may also involve the partners of the Consortium). Besides detailed project description and project updates, the main achievements we have shared through LinkedIn are deliverables, photographs taken at project meetings, consortium, and field related news.

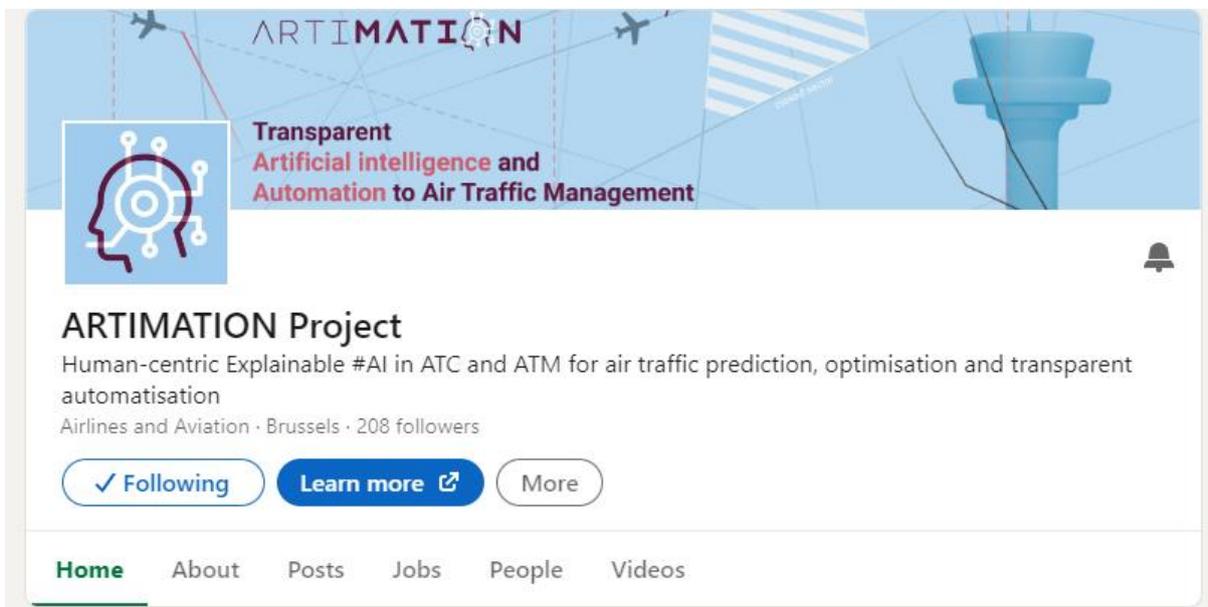


Figure 9. ARTIMATION LinkedIn page (timeframe: 22-Nov-22)

ARTIMATION LinkedIn page has reached 208 connections up to the Month 23 of the project, in November 2022.

These results were possible thanks to the publication of periodic updates about the project activities and news from projects focused on research results. This content was employed to inform and raise awareness about the ARTIMATION project towards a community largely composed of professionals operating in the aviation and AI and ML, the scientific community, and other industries.

Table 6. LinkedIn profile analytics

Month	Connections	Impressions
Jan 21-Sept 21	104	1229
November 21	8	1156
December 21	11	1196
January 22	4	1071

February 22	9	514
March 22	7	1132
April 22	9	606
May 22	12	1162
June 22	5	501
July 22	13	1744
August 22	2	73
September 22	5	120
October 22	13	1048
November 22	14	2562

Monitoring and studying the analytics of each social media channel over the lifetime of the project is useful to comprehend which are the interesting and engaging topics of the project audience and it also allows to pinpoint actual strengths and weaknesses of the strategy pursued, to identify and implement corrective actions, to measure the effectiveness, and to report results.

As the Table 5 and 6 show, the trend on both LinkedIn and Twitter social pages are fairly linear, a positive tendency of growth in followers and interest in the project’s publication and/or periodic updates has always been kept.

The moments of highest traffic and interactions on the social network pages can be traced back to the participation at live events in which the project was able to present the progress of the research, its developments, and future actions.

During the last quarter of the project's activities, from September to December, it is noticeable how the audience and the number of interactions rose. This is related to the fact that the project participated in numerous public events, which helped raise awareness of ARTIMATIION's work and attract the specific target audience.

The hottest months were October and November, the months in which ARTIMATIION held several dissemination events. It attended the 12th EASN International Conference on Innovation in Aviation & Space for opening New Horizons, with nearly 500 participants; in Rome it was presented along with six SESAR Joint Undertaking Exploratory Research project; and it had its final event in Toulouse, along with the AEON project. All public events that gave ARTIMATIION visibility and recognition. And this can be seen by the traffic on both social network pages, LinkedIn, and Twitter.

3.3 Press and public materials

ARTIMATIION communication activities included brochures, flyers, and factsheet with the main objective of informing and raising awareness, together with the publication of different press releases involving the project contents.

The initial plan was to print flyers to present projects goals, methods, and findings in connection to public events. Due to the pandemic situation, we were unable to predict with significant time our physical participation in the events in the first part of the project. Therefore, ARTIMATIION produced one factsheet and 2 brochures. The factsheet has been published on the project’s website to summarise the main concept of ARTIMATIION, while 2 brochures were sent out during 2 events:

- [the World ATM Congress 2022 in Madrid](#)
- [the RPAS and AI in Aviation event in Rome](#)

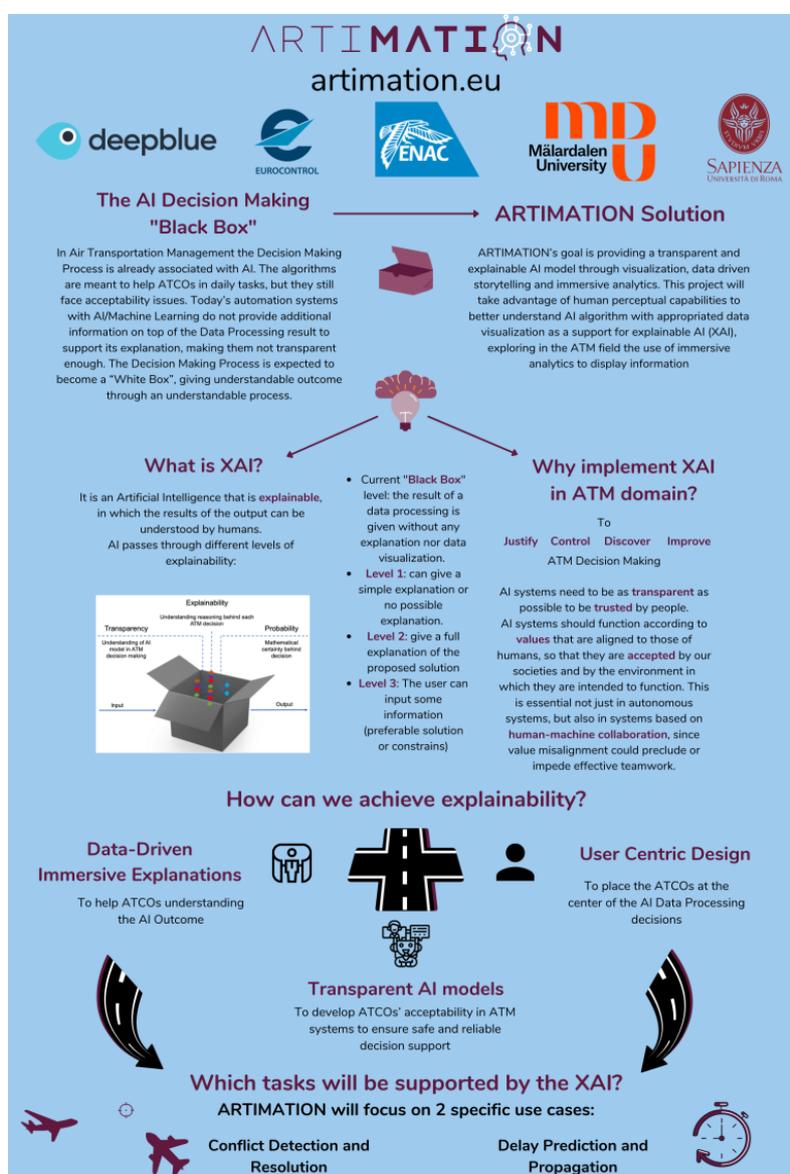


Figure 10. ARTIMATIION Factsheet

With the aim to announce newsworthy results to targeted members of the news media, ARTIMATION has been published on a book, “Neurometrics for Immersive data Visualisation”, produced by UNISAP soon to be presented in the World Congress "AVIATION IN THE XXI CENTURY - Safety in Aviation and Space technologies"

Deliverable extracts:

- Roadmap
- Project Management plan
- Report SOA.
- Development plan

All these documents have been shared through ARTIMATION social media profiles and are available on the project website. In this way, these materials will be easily accessible for any project stakeholders even beyond the ARTIMATION life span.

During the project lifetime, ARTIMATION communicated to the general audience through articles and participation in general events, introducing ARTIMATION, the methods of the project and the generalisation of the concept outside the ATM world. In particular,

- ENAC communicated ARTIMATION in a panel about the topic of collaborative visualization and new visualization techniques in the “[DataViz for society](#)” conference in Barcelona
- MDU communicated ARTIMATION in Open Public talk in the event “[Inauguration lectures of new professor](#)”, with a speech about multimodal machine learning in data science and the use of XAI towards trustworthy AI, having ARTIMATION as example of both the topics.
- MDU communicated ARTIMATION in an open public talk inside a knowledge fest called “[Kunskapsfesten 2022](#)”, with a speech about AI becoming integral part of everyday life
- ENAC communicated ARTIMATION in an AI panel, title: Unravelling/unwrapping the ATM AI black box in 12th SESAR Innovation Days in Budapest.



Figure 11. ARTIMATION in AI panel discussion

Moreover, ARTIMATION has achieved the KPI of 2 press releases, exceeding it. The 5 press releases involving ARTIMATION are:

- [“Explainable Artificial Intelligence to improve air traffic management”](#), held by MDU at the beginning of the project
- The interview to the project coordinator Mobyen Uddin Ahmed (MDU) for the SJU format [“Project of the Month”](#)
- Interview for the National Swedish newspaper “Dagens Industri” by MDU

DETTA ÄR EN ANNONS FRÅN MÅLARDALENS UNIVERSITET

Förklaring till pålitlig AI

För att kunna lita på AI-teknik fullt ut måste vi förstå hur den kommit fram till de svar den ger oss. Det menar åtminstone forskarna Shahina Begum och Mobyen Uddin Ahmed, professorer på Mälardalens universitet, som nu är i gång med en rad projekt inom XAI (explainable AI).

AI (artificiell intelligens) används ofta i svenskars vardag utan att det reflekteras över. Ber man en röststyrningstjänst att spela upp en låt man gillar, får man direkt ett förslag. Däremot är det sällan det ges en förklaring till varför just det låvalet föreslås. Att göra AI-algoritmerna mer transparenta är viktigt av flera skäl. Dels för att det gör tekniken mer trovärdig, dels för att den blir mer jämställd.

”XAI gör det enklare att lita på systemet.”

– Shahina Begum, professor på Mälardalens universitet.
– XAI gör det enklare att lita på systemet. Om vi ser hur algoritmen kommit fram



Shahina Begum och Mobyen Uddin Ahmed, professorer på Mälardalens universitet.

bättre kunna förstå hur flygtrafiken planeras med hjälp av AI.

– Idag är besluten som tas av AI fortfarande en ”black box”. Vi forskar på hur man ska kunna försäkra flygledare om att de val de gör utifrån data går att lita på och är säkra, säger Mobyen Uddin.

Utöver ovanstående projekt forskar de även på hur XAI och ökat förtroende för AI kan vara till nytta i andra områden, som till exempel trafiksäkerhet för att minska trafikanters riskbeteenden.

OM SHAHINA BEGUM OCH MOBYEN UDDIN AHMED:
Shahina Begum och Mobyen Uddin har en gedigen forskningserfarenhet inom AI, över sexton år. Tillsammans har de publicerat hundratals vetenskapliga rapporter och lett flera olika projekt inom området.
Kontakt: shahina.begum@mdu.se, mobyen.uddin.ahmed@mdu.se



Läs mer på: www.mdu.se/en/malardalen-university

Besök oss på Facebook: www.facebook.com/malardalenuniversity

Följ oss på LinkedIn: @Mälardalen University

Figure 12. ARTIMATION print press on Dagens Industri

- Interview for the National newspaper at “VLT_Framgång” by MDU



The image shows a newspaper page from 'FRAMGÅNG'. The main headline is 'Vill öka förtroendet för artificiell intelligens'. There is a sub-headline 'Artificiell intelligens i samhällets tjänst' with a photo of a woman in a blue headscarf. The article text is visible on the right side of the page.

Figure 13. ARTIMATION print press on VLT_Framgång

- “Building trust in air traffic management AI” article, translated in 5 different languages, published on [CORDIS](#)

4 Dissemination

4.1 YouTube

The main goal of creating a YouTube channel is to provide visual storytelling in making AI understandable to start to find a way to understand data. Engage the target audience in the use of the project's results and findings and in a further networking process between stakeholders, showing the relevance of the work in their own practices as well as collecting feedback.

As it can be seen from Table 2, ARTIMATION designated the YouTube channel for both dissemination and communication purposes. Therefore, produced both presentation at conferences about the concept and the results of the project, and a cross-cutting video comparing ARTIMATION with a few selected domain-specific projects.

This the link to ARTIMATION YouTube channel:

<https://www.youtube.com/channel/UCwpz7YmvamxgZrP0k0sofpg>

ARTIMATION YouTube channel, by now, has been used to disseminate several videos:

- The development and results of workshop T3.2,
- The 1st presentation at SJU Automation Workshop during 2021, held by MDU
- The presentation of ARTIMATION at the 2nd SJU ER4 Automation Workshop, held by MDU
- The video “AI Support in ATM”, coordinated by the ARTIMATION Project, involving the ER4 projects (MAHALO, AISA, TAPAS, ARTIMATION, SafeOPS), with the aim to disseminate the similarities and differences that the 5 Explainable AI related project have, as suggested by SJU during the Intermediate Review Meeting. The video is now offline to allow the editors to make some corrective actions and it will be reuploaded before the SESAR Innovation Days
- The preliminary results of the project at the 12th EASN conference presented by DBL, in the joint panel at the EASN Conference with the ER4 projects (MAHALO, AISA, TAPAS, SafeOPS), chaired by DBL representative from ARTIMATION, MAHALO and SafeOPS. The video is available [here](#)
- The video “Immersive Analytics for Conflict Detection and Resolution”, explaining the main concepts of using a VR headset to visualise conflict resolution strategies in 3 dimensions, realised by ENAC. The video is available [here](#)

4.2 Scientific Journals

The press coverage directly results from the work packages activities and indicates the new findings in AI, XAI and visualisation techniques in the ATM field. ARTIMATION has been published in more journals and newspapers as the project's results increased. In the first reporting period, the ARTIMATION project appeared three times in scientific journals, such as *Sensors*, *Brain Sciences* and *Applied Sciences*. Generally, the publication of ARTIMATION in third-party journals followed the objectives set in the first period of communication activities, namely, to generate understanding, engage, and ensure impact. As the project began to produce its first results, the materials published on digital magazines were used also to engage the ARTIMATION target audiences with the project results. Below the table of magazine and scientific publications where the ARTIMATION project has been published.

Table 7. ARTIMATIION publications on scientific journals

Title	Date	Journals	Objective	Audience
Joint Analysis of Eye Blinks and Brain Activity to Investigate Attentional Demand during a Visual Search Task	April 2021	Brain Sciences	Engage Ensure Impact	Scientific community
The Sample Size Matters: To What Extent the Participant Reduction Affects the Outcomes of a Neuroscientific Research. A Case-Study in Neuromarketing Field	September 2021	Sensors	Engage Ensure Impact	Scientific community
A Survey on Artificial Intelligence (AI) and eXplainable AI in Air Traffic Management: Current Trends and Development with Future Research Trajectory	February 2022	Applied Sciences	Engage Ensure Impact	Scientific community
A Systematic Review of Explainable Artificial Intelligence in terms of Different Application Domains and Tasks	February 2022	Applied Sciences	Engage Ensure Impact	Scientific Community
A Video-Based Technique for Heart Rate and Eye Blinks Rate Estimation: A Potential Solution for Telemonitoring and Remote Healthcare.	February 2021	Sensors (Basel, Switzerland)	Engage Ensure Impact	Scientific Community
Air Force Pilot Expertise Assessment during Unusual Attitude Recovery Flight	May 2022	Safety; Volume 8; Issue 2; Pages: 38	Engage Ensure Impact	Scientific Community

Moreover, ARTIMATION is currently writing a white paper together with the other ER4 Projects (MAHALO, TAPAS, AISA, SafeOPS), to gather in a single paper all the results obtained in the last two years of EU funded research on Explainable AI in support to ATM tasks.

4.3 Public Events

To disseminate the projects' results, the WP8 leaders will employ channels such as peer-reviewed papers, presentations at scientific conferences and social events.

The main dissemination objectives are to raise awareness, engage, and ensure impact. During the first year of the project, the following events were attended by the consortium:

- **T3.2 Workshop**

On Tuesday the 6th of July, the ARTIMATION project held its first Workshop: AI support to ATM tasks. The interactive exercise and related discussion focused on the levels of explainability of the AI outcomes required to let the AI perform some tasks in the future. These includes, for example, Issuing Instructions, clearance delivery, optimizing utilization of available capacity, take-off time prediction. Members of ANACNA, TAPAS, EGIS, and DFS, representatives from ENAC, La Sapienza University and Mälardalen University also took part in the workshop, together with members of the Advisory Board (EUROCONTROL) and of other relevant SESAR projects (MAHALO, AISA, SAFELAND, HARVIS).

The participation of all these members allowed the ARTIMATION project to have a prioritised list of tasks to be supported by XAI algorithms. Two tasks were finally selected: AI optimises utilisation capacity and AI issues instructions. Thanks to these results, after T3.3 workshop (internal workshop), the Consortium was able to start developing the XAI algorithms to support two tools: a delay prediction and propagation tool, sub-task for AI optimises utilisation capacity, and a conflict detection and resolution tool, hybrid sub-task between AI optimises utilisation capacity and AI issues instructions.

More information on the objectives, partners and AB members contributions and results are available in D3.2 Report on the development plan based on ATM tasks with supporting AI.

- **The 11th EASN International Conference**

On the 3rd of September 2021, the ARTIMATION Project attended the [11th EASN International Conference on Innovation in Aviation & Space to the Satisfaction of the European Citizens](#), hosted online.

ARTIMATION performed its State of the Art by reviewing several papers from different conferences and journals, mostly from the ICRAAT conference, ATM seminar events, and the Transportation part C journal. The results of this review led ARTIMATION to identify the main categories of ATM that could best connect to AI in general. After presenting the state of the art of AI support in ATM, ARTIMATION presented the first outcomes of the project: the prioritised tasks to be supported by XAI algorithms, because of T3.2 workshop (see above).

The presentation is available here: <https://www.artimation.eu/the-artimation-project-presented-at-the-11th-easn-international-conference/>.

- **2021 43rd Annual International Conference of the IEEE Engineering in Medicine & Biology Society (EMBC)**

The 43rd Annual International Conference of the IEEE Engineering in Medicine & Biology Society conference was attended by the consortium partner Sapienza University with a conference paper on Mental Effort Estimation by Passive BCI: A Cross-Subject Analysis.

(<https://ieeexplore.ieee.org/document/9630613>)

EMBC is the most important conference for bioengineering. ARTIMATION submitted a study in which proposed an algorithm for the implementation of passive BCI system without the necessity of calibration procedures tuned on the specific subject to evaluate mental states, such as mental effort or workload. The ARTIMATION project will use this advancement in processing during the analysis of data that will be recorded during the validation activities in ARTIMATION.

- **1st half year consortium meeting**

On the 23rd of June ARTIMATION attended its first half-year Consortium meeting. The meeting took place on Microsoft Teams and involved all ARTIMATION Consortium: Mälardalen University (MDU) as project coordinator, ENAC – École National de l’Aviation Civile, Deep Blue, Sapienza University and members from EUROCONTROL as external advisory board.

- **2nd GA meeting**

- On the 30th of November and 1st December ARTIMATION attended its Second General Assembly Meeting, held in La Sapienza – University of Rome in a mixed modality of presence and remotely. All the Consortium partners were able to participate physically: representatives from Mälardalen University (MDH), Deep Blue, La Sapienza and ENAC joined the meeting in Rome, whereas members from EUROCONTROL participated as an external Advisory Board.

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- **[30th International Conference on Case-Based Reasoning](#)**

In September 2022 ARTIMATION partner MDU took part at the fourth workshop on case-based reasoning for the explanation of intelligent systems with a conference paper named “When a CBR in Hand is Better than Twins in the Bush”, available [here](#).

- **Workshop “The control room of the future: AI empowered dashboards”**

Attended by ENAC partners during October 2022 in Ghent, the workshop focuses on bringing academics and professionals together, with a focus on real-world cases of AI implementation.

- **[34th European Association for Aviation Psychology \(EAAP\) Conference](#)**

Held from the 26th to the 30th of September 2022, ARTIMATION attended the European Association for Aviation Psychology Conference in Gibraltar with a conference paper, that can be found [here](#). Here,

ARTIMATION presented the preliminary results for the expert experimental group of Use Case 1 – Conflict Detection and Resolution

- [International Conference on Cognitive Aircraft Systems](#)

In the 1st and 2nd of June 2022, ARTIMATION attended the International Conference on Cognitive Aircraft Systems in Toulouse with a poster, presenting the main concepts of the project and information about Explainable AI Support in ATM. The poster can be found [here](#)

- [12th EASN conference](#)

In October 2022, ARTIMATION attended the 12th EASN Conference in Barcelona, taking part to SAFELAND final event and to the common panel with the other ER4 Explainable AI Projects (AISA, MAHALO, TAPAS, SafeOPS), to present the preliminary results for Use Case 1 – Conflict Detection and resolution, both from the self-report questionnaires and neurophysiological measures point of view, gaining the attention of the audience for the innovative neurophysiological data gathering and the innovation proposed with the new visualisation. The conference was attended by DBL

- **RPAS and AI in Aviation**

On the 4th of November ARTIMATION attended the “RPAS and AI in aviation”, held in Rome. In this event, a partner from ENAC presented the preliminary results for the analysis of Use Case 1 - Conflict Detection and Resolution. The “RPAS and AI in aviation” Event hosted the final dissemination event of MAHALO Project, to whom ARTIMATION attended as a sign of close collaboration with a project mutually involved in the Advisory Board. During the demo session, ARTIMATION presented the concept and realisation of the innovative Immersive Data Visualisation, gathering feedback about the future use of Virtual Reality in ATM

- **XII SIE Congress**

Between the 2nd and the 4th of May 2022, ARTIMATION attended the XII Società Italiana di Ergonomia (Italian Society of Ergonomics - SIE) congress, held in Lucca. The project joined the conference with a joint Explainable AI paper with other related projects, such as HARVIS, MAHALO, SafeOPS, XMANAI. A representative from the consortium partner Deep Blue introduced the concept and latest developments of ARTIMATION in relationship with the other projects’ findings. The proceedings of the conference can be downloaded [here](#)

5 Liaison with relevant stakeholders

The following sections describe the communication and dissemination activities targeting stakeholders relevant for the ARTIMATION project. The activities performed towards this audiences aimed to share the ARTIMATION lessons-learned and findings and achieve different goals. In this reporting period, the objectives for most of the activities carried out were to inform relevant stakeholders about the project progress, findings, and results; and to foster the exploitation of the ARTIMATION results, as well as gather feedback from the interested parties. The main activities in which the ARTIMATION project coordinated with the stakeholders are described in section 3.2.1

5.1 Links with other EU funded research projects

ARTIMATION established a collaborative network with a group of 9 projects selected by the Consortium due to their point of contacts or continuity with the topic covered by the project. The projects that are still ongoing are:

- **AISA:** Exploring intelligent situational awareness systems for air traffic control operations
- **MAHALO:** Modern ATM via Human/Automation Learning Optimisation
- **TAPAS:** Towards an Automated and exPlainable ATM System
- **SAFELAND:** SAFE LANDing through enhanced ground support
- **4D SKYWAYS:** 4D Skyways (ATM 4D trajectory management)

Coordination and networking with other projects ensured the collaboration with other similar initiatives/research projects modelling and designing XAI, using neurometric indexes and UX-UI interfaces and user acceptance. These networking activities seek to create real synergies, exploring the possibility of coordinating the communication and dissemination activity or better organising the research. As proof of this, the Project Coordinator Mobyen Uddin Ahmed is member of the EAB for the AISA, TAPAS, SafeOPS and MAHALO projects, with an active participation in several of those “sister” projects. Furthermore, ARTIMATION will use these events also to disclose the project results to the research community, whenever the firsts will be ready.

Together with MAHALO, AISA, and TAPAS, ARTIMATION participated to the Automation workshop promoted by SJU (see below).

Especially, a close collaboration with MAHALO, SafeOPS, TAPAS and AISA projects has been established. During the planning of the validation activities, ARTIMATION and MAHALO shared ideas, methods, and brainstorming sessions to generate useful questions and questionnaires to ask the ATCOs during the validation exercises. This collaboration led to the use of similar questions during the validation activities enabling a comparison of results between the two projects. Then, ARTIMATION coordinated the “AI support in ATM video”, presented during a joint ER4 projects panel at the 12th EASN conference. Moreover, a white paper is being developed during the last months of the projects to promote the results of the 5 ER4 projects and try to contribute shaping the future of AI support in ATM. In fact, as stated in the “Final Safety and Security integrated recommendations” report published

in 2021, “Finding the right Human-AI partnerships will be key to future aviation safety. The Intelligent Assistant (IA) in the cockpit and on the ground will be the crucial stepping stone toward fuller Artificial Intelligence (AI) by 2050. Research is urgently needed to determine how humans and AIs can work together productively and safely, including human supervision and recovery in case of ‘aberrant behaviour’ by AI systems”. The White Paper describes and highlights research progress on using Artificial Intelligence in Air Traffic Management, with a specific focus on Explainability, from the ER4 Projects AISA, TAPAS, MAHALO, SafeOPS and ARTIMATION. The white paper can be retrieved [here](#).

Moreover, ARTIMATION is present in the Advisory Board of all the other 4 projects and has in its Advisory Board at least a member from one of each project. ARTIMATION attended the final events of MAHALO and SAFELAND, to prove the close collaboration between the projects and contribute by sharing their results with the community ARTIMATION reached. Finally, a joint Final Event with the AEON project was organised to disseminate the results of the projects towards the advisory board and reaching other relevant stakeholders.

The project also got in contact with the following concluded projects:

- **HARVIS:** Human Aircraft Roadmap for Virtual Intelligent System
- **NINA:** adaptive automation solutions that it designed to ease Air Traffic Controller's workload
- **STRESS:** Provide effective measurement of stress scenario on ATCO performance
- **MOTO:** Provide effective measurement of workload to be associated with ATCO performance during remote tower operations

Thanks to the participation in these projects by some members of the Consortium, a close relationship with HARVIS, NINA, STRESS, and MOTO was established. ARTIMATION got several inputs from these projects. First, some of the results of these projects have been used to have a complete overview in D3.1: State of the Art of AI support in ATM. Then, the neurometric evaluation followed some of the criteria used to assess the human performance in STRESS, MOTO, and NINA. Finally, ARTIMATION considered these projects’ methods to further develop the self-report ad-hoc questionnaires to assess the acceptance and the human performance for the CD&R use case.

5.2 Dissemination towards the Advisory Board

Active contribution and participation from a large set of stakeholders are pivotal for the development projects objectives and its validation. Nevertheless, the communication and dissemination activities towards the industry is also vital to ensure the deployment of the project results.

To this end, at the beginning of the project the Consortium instituted an Advisory Board (AB) to support the methodological work of the project, provide reviews, recommendations and feedback on project activities and findings; and bring an external view into the project.

Nevertheless, the Consortium carried out several activities to establish connections with aviation industry members even beyond the AB, preparing the ground for the dissemination of the project results.

After the Intermediate Review Meeting, the Consortium decided to expand the actual Advisory Board to collect useful insights for the next workshop that the ARTIMATIION project will hold, the validation workshop and a final joint workshop to present the outcomes for different AI-related SESAR projects.

5.2.1 Liaison activities with Advisory Board members

Together, the consortium and SJU sought to broaden the impact of the project by bringing in additional stakeholders, such as National Service Providers, Policy Makers and Regulatory Bodies, and other Safety domain experts. System engineering success depends on obtaining input from multiple stakeholders. The collaboration with the Advisory Board members takes the form of 'ad-hoc' meeting reviews where they provide feedback to project results, steering the overall work of the project. The Advisory Board shall meet in connection to the General Assembly meetings, and other formal events, thus, ARTIMATIION project carried out several activities involving the AB:

- 1st half year consortium meeting
- T3.2 Workshop
- 2nd GA meeting
- Automation Workshop
- Validation Workshop
- 3rd GA meeting
- 4th GA meeting
- Final Dissemination Event with AEON

The ARTIMATION Advisory Board reunites the following members:

Advisory Board members

ANSPs	DFS
	SKYGUIDE
	ENAV
	MUAC
RESEARCH PROJECTS	MAHALO
	AISA
	TAPAS
EUROPEAN AGENCIES	EUROCONTROL
	EUROCAE
RESEARCH CENTERS	CRIDA
INDUSTRY	SAAB

ARTIMATION

SESAR-ER4-01-2019

Figure 14. Advisory Board members

In the first year of activities, the Consortium had a series of meetings with representatives of the industry, internal and external to the AB. After a first contact, SAAB accepted to join the Advisory Board. Then, the project contacted the European Standardisation Body EUROCAE, including a member on the AB.

Generally, the Advisory Board contributed to ARTIMATION in different times within the project life cycle. By now, the main feedbacks have been gathered during the validation workshop with the Advisory Board (paragraph 5.2.1.5). The contribution for every event is detailed in the following list of events where the Advisory Board was involved.

5.2.2 First Half Year Consortium Meeting with Advisory Board

On the 23rd of June ARTIMATION attended its first half-year Consortium meeting. The meeting took place on Zoom and involved all ARTIMATION Consortium: Mälardalens University (MDU) as project coordinator, ENAC – École National de l’Aviation Civile, Deep Blue, Sapienza University and members from EUROCONTROL as external advisory board.

All the teams presented the main results of the first months of work, to have a general overview of the project and to adjust this first half-year's progress.

The meeting has been productive, having important feedbacks from EUROCONTROL experts in dialogue with the ARTIMATION Consortium about the transparent AI models with explainability, the data visualization with immersive technology, the neurophysiological measures related to specific mental and emotional states and the lifelong machine learning with Human-Centered AI. These last feedbacks have been helpful also in finalising the preparation of T3.2 workshop.

5.2.2.1 T3.2 Workshop

Held on the 6th of July, ATM experts, representatives from other relevant AI-related projects and members from the Advisory Board participated. Important contents and feedbacks have been gathered: first, the Advisory Board helped the Consortium defining the need of AI and XAI for the different ATM tasks. Then, different human performance parameters were assessed in relation with the XAI support. Finally, the Advisory Board helped in defining the so-called “Stories from the future”, to generate use cases situated in the future to guide the development of the concepts. Generally, the contribution for this workshop can be summarised in the main outcome of the workshop: a prioritised list of ATM tasks to be supported by the XAI.



Figure 15. T3.2 Workshop

5.2.2.2 Second General Assembly Meeting



Figure 16. 2nd GA Meeting

Held both on the 30th of November and the 1st of December and hosted by Sapienza University, members of the Advisory Board and of the Consortium took part in the 2nd General Assembly of the project. Representatives from all the Consortium were able to join the event physically, whereas some members from the Advisory Board joined the event on Microsoft Teams. After a detailed overview of the project, important contents were gathered about the next steps of the project, especially about

the validation plan and the validation activities both for the tool of delay prediction and propagation and the tool of conflict detection and resolution.

5.2.2.3 SJU Automation Workshops

On the 8th of March and the 5th of October 2022 ARTIMATION attended the SJU ER4 Automation Workshops. During the first workshop, ARTIMATION presented the objectives, the expected impact, and the methodology of the project. During the 2nd workshop, the project presented the first outcomes and the development of the XAI algorithms to support the prioritised Air Traffic Controllers’ tasks. Sharing outcomes, issues and lessons learned with other AI-related SJU projects was helpful in identifying barriers and enablers in improving automation within the ATM system, to improve the quality of the future work of the project.

During both workshops, the project collected useful insights regarding explainability and visualisation techniques from SJU and representatives from other relevant SESAR projects like TAPAS, SAFEOPs and MAHALO.

5.2.2.4 Validation workshop with the Advisory Board

On the 13th of April, the Consortium met the members of the Advisory Board to validate the concepts of the two use cases: conflict detection and resolution; delay prediction and propagation. Important feedback was gathered on both the concepts. Different kinds of visualisation techniques of a conflict between 3 or more aircrafts were presented to the AB, who contributed with their feedback on every kind of visualisation. Important feedback was also gathered about the 3D visualisation involving the use of a VR helmet. The members of the AB gave also important feedback about the Human-Machine Interaction (HMI) of the low-fidelity use case of delay prediction and propagation, helping the Consortium understand the precise end-users of the tool, the main parameters to be shown to the users, and how the tool would integrate within the ATM system.

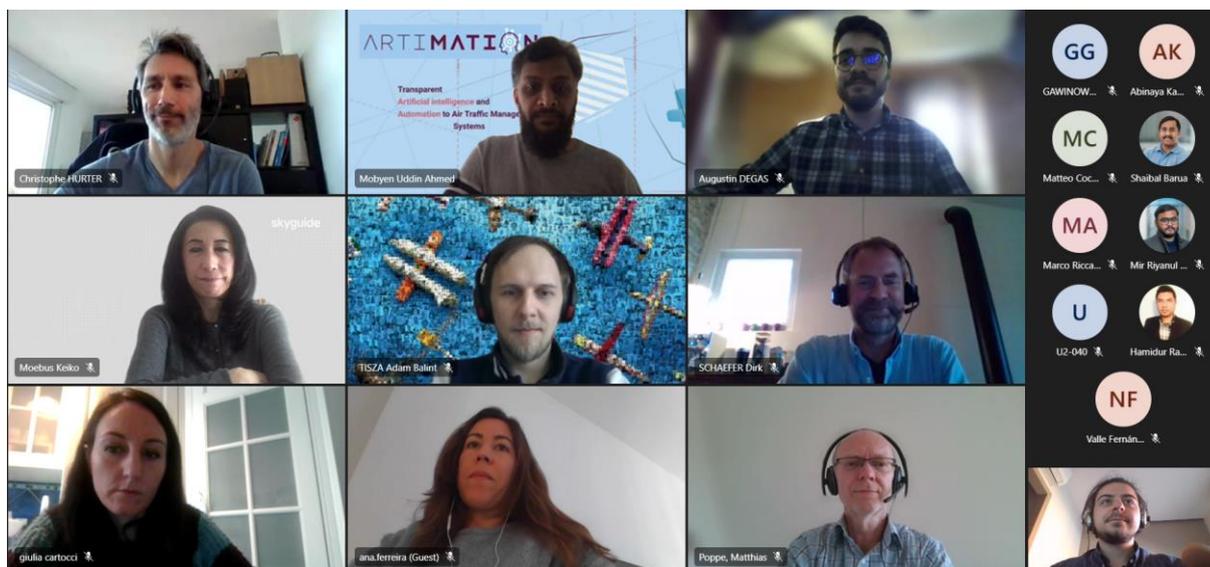


Figure 17. Validation workshop with the Advisory Board

5.2.2.5 3rd GA Meeting

Held on the 9th of June 2022, the Third General Assembly Meeting of the ARTIMATION project took place in Västerås, Sweden, at MDU facilities. All the members of the consortium took part in presence, while members from the Advisory Board joined the meeting virtually. During the meeting important discussions and decisions about the development of the 2 use cases were faced. In particular, a great focus of the discussion involved the finalisation of the methods to be used for the validation activities: in particular, the main decision taken by the Consortium involved delaying the validation activities for Use Case 2 - Delay Prediction to September 2022, to be performed with an online workshop. More information about this can be retrieved from Deliverable 6.2 - Validation Report.

5.2.2.6 Final Dissemination Event

The final event of the ARTIMATION project took place in Toulouse, at ENAC facilities, jointly with the AEON project, on the 9th of November 2022. This allowed both the projects to enlarge the catchment area of both the project and communicate the results to a broader audience. During the first part of the event, the meeting discussed all the use cases from both the projects, engaging a discussion with all the external participants and stakeholders. In particular, the main interaction has been exploited during the second part of the event, involving the presentation of the demos of both ARTIMATION and AEON for all the use cases.

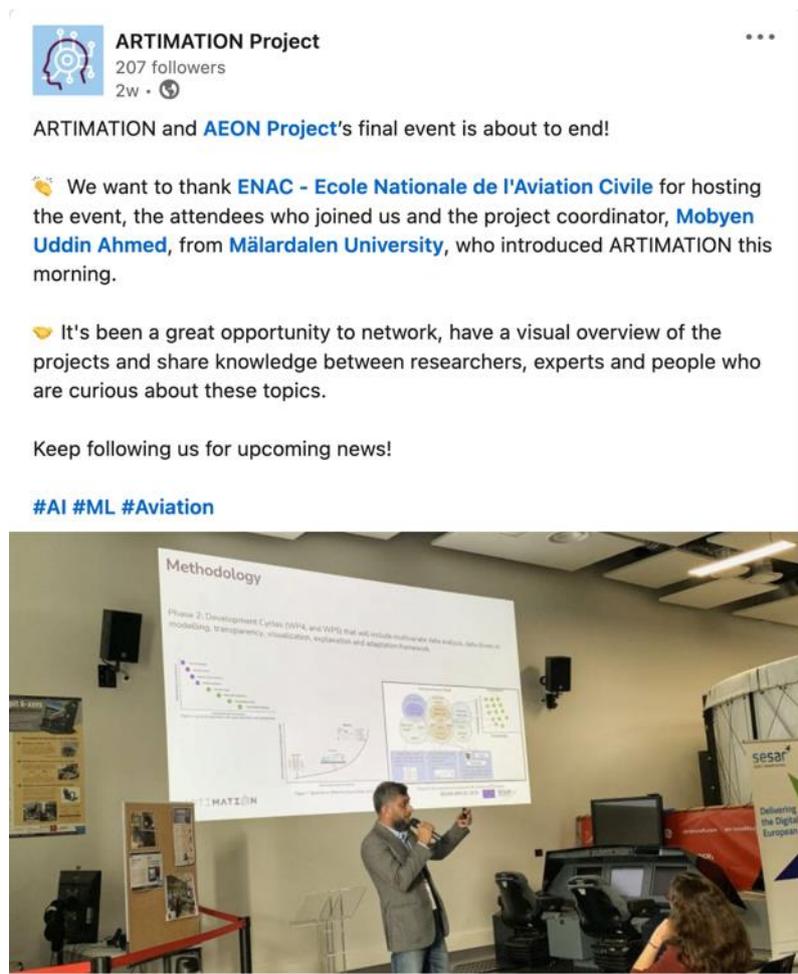


Figure 18. ARTIMATION project is presented at the final event



Figure 19. Final AEON-ARTIMATIION dissemination joint event group photo

5.2.2.7 4th GA Meeting

The fourth and last General Assembly of the project took part on the 10th of November 2022 at ENAC facilities in Toulouse. The members of the consortium took part in the meeting in presence. This way, all the partners were able to discuss every outcome of the project from both use cases, finalising the remaining doubts and uncertainties related to the last 2 months of project.



Figure 20. Final ARTIMATION GA meeting

6 Future communication, dissemination, and exploitation initiatives

6.1 Next planned communication activities

Communication towards the public will go on until the end of the project to share the results of ARTIMATION.

6.2 Next planned workshops and events

ARTIMATION will probably not take part to any workshop or event during month 24.

6.3 Next scientific publications and conferences

In the first year of project activities, the ARTIMATION Consortium, because of the project work plan, conveys the production of the most meaningful results in the second year of activity. Nevertheless, the Consortium managed to present a paper to several conferences which will describe the initial concept of operations including the inputs received in the first Advisory Board meeting.

ARTIMATION will attend during month 24 further conferences. Even if the ARTIMATION paper for the SESAR Innovation Days was not accepted, the project will attend a common panel with the other ER4 projects in Budapest, December 2022. Moreover, ARTIMATION is planning to attend the 15th International Conference on Agents and Artificial Intelligence (ICRAAT) to present its results.

7 Analyses of the overall activities, conclusions and lessons learned

The present deliverable discussed all the communication and dissemination activities done towards the public by using the website, social networks, press coverage and public materials. Then, the discussion moved on to liaison with relevant stakeholders such as the scientific community and the aviation industry. After presenting all the activities carried out to communicate and disseminate the project to the public, the scientific community, and the aviation industry, we went to the analysis of the produced results to highlight the status of WP8 as well as its deviations from the workplan and the CDE plan.

As we are now in Month 23 out of 24 of the projects, some conclusions about the dissemination and communication activities of the project can be drawn. Overall, all the KPIs stated in the CDE plan have been achieved, except for the number of visitors in the project website. But dissemination and communication need to be considered without focusing only on the stated KPIs. After the Intermediate Review Meeting, the project increased the effort on the dissemination and communication activities, as consequence of the comments and corrective actions from the SESAR Joint Undertaking. If by the time of the Intermediate Review Meeting the dissemination and communication activities of the project were underperforming, after presenting the first concepts of both the use cases the engagement with the public and the scientific community increased. In a later stage of the project, the first preliminary results and the validation activities for both Conflict Resolution and Delay Prediction were presented to several conferences and events, increasing even more the engagement with the audience.

Therefore, from a present perspective, we can say that the dissemination and communication activities could have been performed better in the first half of the project, but at the same during the second half of the project ARTIMATION has been able to cope with the limits presented before. The high engagement and interest received in the last events the project attended show how overall we can be satisfied by the project dissemination and communication activities. Therefore, we can retrieve some relevant lessons learned from the Communication and Dissemination activities of the project. First of all, Artificial Intelligence as human support is both a complex and delicate subject, and must be communicated carefully. In the first steps of the project, the explanation of how the project aims to support humans with AI can be helpful, as well as a brief explanation of the models involved. Then, a strict collaboration with similar project to create synergies can be considered a basic action to have a broader audience to communicate the project concept and results. This way, projects can contribute to each other as well, improving the quality of the performed work, gathering different points of view. Finally, the organisation of common events (e.g., the common panel at the 12th EASN conference, at the SESAR Innovation Days 2022, and the RPAS and AI in Aviation event) is a great opportunity to catch not only in the final steps of the project, but also at the beginning of development in the first months. This way, a continuous feedback from a specialised audience, a general public and the R&D Community can be achieved, improving the project's quality.

8 References

- [1] D8.1 Communication, Dissemination and Exploitation Plan
- [2] Grant Agreement Number: 894238 – ARTIMATION - H2020-SESAR-2019-1

Appendix A Graphical Materials

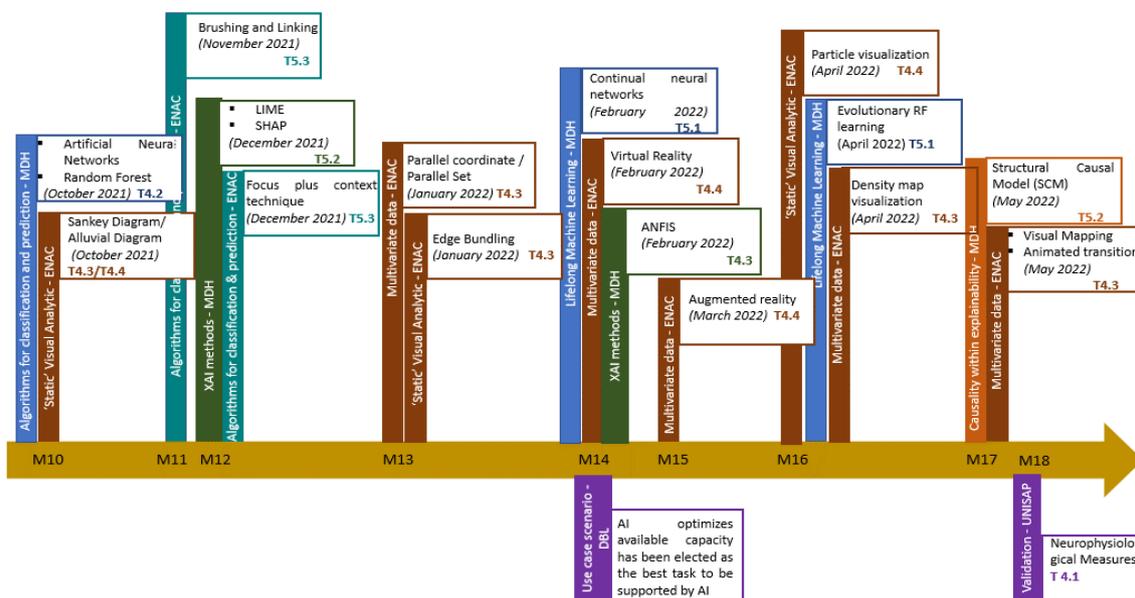


Figure 21. Roadmap

ARTIMATION SAPIENZA UNIVERSITÀ DI ROMA ENAC MÅLARDALENS HÖGSKOLA ESKILSTUNA VÄSTERÅS EUROCONTROL

The AI Decision Making "Black Box"

In Air Transportation Management the Decision Making Process is already associated with AI. The algorithms are meant to help ATCOs in daily tasks, but they still face acceptability issues. Today's automation systems with AI/Machine Learning do not provide additional information on top of the Data Processing result to support its explanation, making them not transparent enough. The Decision Making Process is expected to become a "White Box", giving understandable outcome through an understandable process.

Transparency and Explainability

ARTIMATION's goal is providing a transparent and explainable AI model through visualization, data driven storytelling and immersive analytics. This project will take advantage of human perceptual capabilities to better understand AI algorithm with appropriated data visualization as a support for explainable AI (XAI), exploring in the ATM field the use of immersive analytics to display information

Data-Driven Immersive Explanations

To help ATCOs understanding the AI Outcome

Transparent AI models

To develop ATCOs' acceptability in ATM systems to ensure safe and reliable decision support

User Centric Design

To place the ATCOs at the center of the AI Data Processing decisions

Figure 22. ARTIMATION Explanatory Image

ARTIMATION

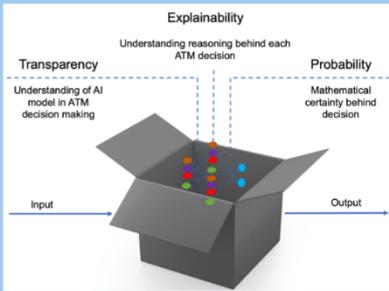
What is XAI?

It is an Artificial Intelligence that is **explainable**, in which the results of the output can be understood by humans. AI passes through different levels of explainability:

Why implement XAI in ATM domain?

To **Justify Control Discover Improve** ATM Decision Making

AI systems need to be as **transparent** as possible to be **trusted** by people. AI systems should function according to **values** that are aligned to those of humans, so that they are **accepted** by our societies and by the environment in which they are intended to function. This is essential not just in autonomous systems, but also in systems based on **human-machine collaboration**, since value misalignment could preclude or impede effective teamwork.



- Current "**Black Box**" level: the result of a data processing is given without any explanation nor data visualization.
- **Level 1:** can give a simple explanation or no possible explanation.
- **Level 2:** give a full explanation of the proposed solution
- **Level 3:** The user can input some information (preferable solution or constrains)

Figure 23. ARTIMATION Explanatory Image