AI4media

ARTIFICIAL INTELLIGENCE FOR THE MEDIA AND SOCIETY

D7.1

Integration plan and initial version of the integration result with the AI-on-demand platform

Project Title	AI4Media - A European Excellence Centre for Media, Society and Democracy
Contract No.	951911
Instrument	Research and Innovation Action
Thematic Priority	H2020-EU.2.1.1. - INDUSTRIAL LEADERSHIP - Leadership in enabling and industrial technologies - Information and Communication Technologies (ICT) / ICT-48-2020 - Towards a vibrant European network of AI excellence centres
Start of Project	1 September 2020
Duration	48 months

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 951911

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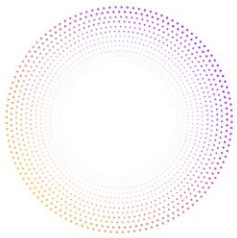

Deliverable title	Integration plan and initial version of the integration result with the AI on Demand Platform
Deliverable number	D7.1
Deliverable version	1.0
Previous version(s)	-
Contractual date of delivery	31 December 2021
Actual date of delivery	22 December 2021
Deliverable filename	AI4Media_D7.1_final
Nature of deliverable	Demonstrator
Dissemination level	Public
Number of pages	24
Work Package	WP7
Task(s)	T7.1, T7.2, T7.3, T7.4
Partner responsible	FhG-IAIS
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Abstract	This deliverable is the initial version of AI4Media's integration with the European AI on Demand Platform. Being of type demonstrator, it essentially consists of the AI4Media assets in the AI Catalogue, the Web Cafés lectures given by AI4Media members, the AI4Media models in the AI4EU Experiments marketplace, a public demonstrator of an AI pipeline, and a concept for interoperability with the Fraunhofer Mining Platform. Altogether, these items show that the integration is working as intended.

Keywords	AI on Demand Platform, integration, AI Catalogue, community building, AI4EU Experiments, interoperability, AI Café

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 951911

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Revision History

VERSION	DATE	REVIEWER	MODIFICATIONS
0.1	10/12/2021	Sven Becker and Andreas Steenpaß (FhG-IAIS)	Initial version
0.2	13/12/2021	Andreas Steenpaß (FhG-IAIS)	Minor improvements
0.3	17/12/2021	Sven Becker and Andreas Steenpaß (FhG-IAIS)	Merging of reviewer's suggestions, completion of chapter 5
1.0	22/12/2021	Sven Becker and Andreas Steenpaß (FhG-IAIS)	Merging of reviewer's and quality manager's suggestions

The information and views set out in this report are those of the author(s) and do not necessarily reflect the official opinion of the European Union. Neither the European Union institutions and bodies nor any person acting on their behalf.

Table of Abbreviations and Acronyms

Abbreviation	Meaning
AI	Artificial Intelligence
AI4EU	Project “A European AI On Demand Platform and Ecosystem”
AI4Media	Project “A European Excellence Centre for Media, Society and Democracy”
API	Application Programming Interface
ARD	Working group of public broadcasters of the Federal Republic of Germany (Arbeitsgemeinschaft der öffentlich-rechtlichen Rundfunkanstalten der Bundesrepublik Deutschland)
ATC	Athens Technology Center
AUTH	Aristotle University of Thessaloniki
CERTH	Centre for Research and Technology Hellas
D	Deliverable
DW	Deutsche Welle
EC	European Commission
EU	European Union
FhG-IAIS	Fraunhofer Institute for Intelligent Analysis and Information Systems IAIS
GAN	Generative Adversarial Network
GAR	Grassroots Arts and Research
GDPR	General Data Protection Regulation
gRPC	gRPC Remote Procedure Calls
GUI	Graphical User Interface
H2020	Horizon 2020
HTTP	Hypertext Transfer Protocol
IBM	International Business Machines Corporation
ICT	Information and Communication Technologies
Joanneum	JOANNEUM RESEARCH Forschungsgesellschaft
JSON	JavaScript Object Notation
M3L	Memory-based Multi-Source Meta-Learning
No.	Number
OCR	Optical Character Recognition
RAI	Rai – Radiotelevisione italiana
REST	Representational State Transfer
T	Task
TGB	Technical Governance Board
UNITN	Università degli Studi di Trento
vs.	versus
WP	Work Package

Index of Contents

1 Executive Summary 8

2 Introduction 9

2.1 AI4Media's integration with the European AI on Demand Platform 9

2.2 Further activities of WP7 10

2.3 Acknowledgements 10

3 Assets in the AI Catalogue 11

4 Web Cafés 13

5 Contributions to AI4EU Experiments 14

5.1 Models in the AI4EU Experiments marketplace 14

5.2 Public demonstrator of an AI4EU Experiments pipeline 14

6 Interoperability with other platforms 17

6.1 Survey results 17

6.2 Concept for interoperability with the Fraunhofer Mining Platform 18

7 Conclusions 19

7.1 Status of AI4Media's integration with the European AI on Demand Platform 19

7.2 Identified needs for improvement 19

7.3 Future plans 20

Appendix 1: Online questionnaire of Task 7.4 22

Index of Tables

Table 1: AI4Media assets in the AI Catalogue 11
Table 2: Web Cafés with contributions from AI4Media members 13
Table 3: AI4Media models in the AI4EU Experiments marketplace 14

Index of Figures

Figure 1: Web Café on the AI4Media project with speaker Dr Yiannis Kompatsiaris. 13
Figure 2: The user interface of the public demonstrator 15
Figure 3: The AI4EU Experiments pipeline in the Acu-Compose Design Studio 16
Figure 4: Surveyed platforms providing an API for their modules 18
Figure 5: Online questionnaire of Task 7.4 22
Figure 6: Online questionnaire of Task 7.4 (continued) 23

1 Executive Summary

The deliverable D7.1 is the first out of three iterations (initial/extended/final version) to present the outcomes of the tasks T7.1 to T7.4 from work package 7 (WP7) of AI4Media. As the purpose of WP7 is the integration of AI4Media with the European AI on Demand Platform, this deliverable proves that the integration as a whole as well as all of its parts are progressing and working as intended.

In contrast to the deliverables which have been successfully delivered by AI4Media so far, the type of this deliverable is "demonstrator". This means that it consists of publicly available content, which represents the achievements of tasks T7.1 to T7.4 up to the date of submission. In particular, it should be noted that the essence of this deliverable is not this document. It serves as an entry point/index for the related sub-deliverables, providing links pointing to these publicly available components.

Section 2 provides an introduction to the context of AI4EU and AI4Media projects as well as to AI4Media's integration with the European AI on Demand Platform. A detailed description of the outcomes of tasks T7.1 to T7.4 is given in Sections 3 to 6.

The publicly available components of this deliverable are the following:

- Assets in the AI Catalogue which are linked to AI4Media (see weblink)
- Web Cafés (lectures) with contributions from AI4Media members (see weblinks in Section 4)
- AI4Media models in the AI4EU Experiments marketplace (see weblinks in Section 5.1)
- Public demonstrator of a working AI pipeline (see weblink)
- Concept for interoperability with the Fraunhofer Mining Platform
    - Slides of the presentation (see weblink)
    - Recording of the presentation (see weblink)

Apart from these publicly available items, a summary of the results from a survey regarding candidate platforms for achieving interoperability with AI4EU Experiments is also presented (see Section 6.1).

Altogether, these components constitute the initial version of AI4Media's integration with the European AI on Demand Platform.

2 Introduction

As it is stated on its own website, the European AI on Demand Platform is a one-stop-shop for anyone looking for Artificial Intelligence (AI) knowledge, technology, tools, services and experts. The aim of this platform, which has been initiated by the AI4EU project, is to bring together the AI community while promoting European values, and to facilitate technology transfer from research to industry. As a follow-up project of AI4EU, AI4Media is collaborating closely with AI4EU by integrating the project's outputs such as modules, services and algorithms into the European AI on Demand Platform as well as by organizing Web Cafés for community building. Due to these activities, AI4Media is one of the pillars for ensuring the sustainability of the AI on Demand Platform over years to come.

2.1 AI4Media's integration with the European AI on Demand Platform

In January 2019, the AI4EU consortium was established to build the first European AI on Demand Platform and ecosystem with the support of the European Commission under the H2020 programme. As more and more features are integrated, the AI4EU platform serves as a catalyst to aid AI-based innovation, resulting in new products, services and solutions to benefit European industry, commerce and society. By bringing people together, the platform counterbalances the fragmentation of the European AI landscape.

Since the end of the year 2021 also marks the official end of the AI4EU project, it is now the task and the responsibility of the follow-up projects within the funding H2020 initiatives ICT-48 and ICT-49 to continuously animate the AI on Demand Platform by integrating new assets and features. Within AI4Media, WP7 has been established for exactly this purpose. In fact, the integration of AI4Media with the platform covers a wide spectrum of aspects, which are reflected by the different sub-tasks of this work package:

- T7.1 Publication of AI resources to the AI on Demand Platform
- T7.2 Community building using the AI on Demand Platform
- T7.3 Using and supporting the experimentation services of the AI on Demand Platform
- T7.4 Achieving interoperability between the AI on Demand Platform and media platforms
- T7.5 Platform liability vs. platform responsibility for third party content.

The task T7.5 will have its own deliverable (D7.3) and is thus not represented in this document. The initial outcomes of the tasks T7.1 to T7.4 are described, in this order, in the following sections.

2.2 Further activities of WP7

WP7 has organized a public AI4Media workshop on the European AI on Demand Platform, which took place on 11 November 2021. The goals of this workshop were

- to create a better understanding of the technical and non-technical facets of the AI on Demand Platform,
- to highlight the role of the platform as the central link between the European AI networks, and
- to encourage everyone interested in AI to join it.

A recording of the workshop is available in AI4Media's Youtube channel.

2.3 Acknowledgements

The core part of this deliverable are the contributions from AI4Media to the European AI on Demand Platform. Therefore, we would like to thank all contributors for their input and all AI4Media partners for their support.

3 Assets in the AI Catalogue

AI4Media ensures that the AI resources developed within the AI4Media project are published to the AI on Demand Platform.

There is a variety of types which these resources can have, such as service, dataset, docker container, library or tutorial. All of them are published online in the AI4EU AI Catalogue. The high quality of the uploaded assets is guaranteed by the publication process established by the platform. Each entry contains detailed information about the respective resource including a textual description, relevant documents, the license and the GDPR requirements.

At the time of submission of this deliverable, there are ten assets in the catalogue which are linked to AI4Media:

Title	Partner	Type	Description
AI for Visual Vehicles Counting	CNR	Docker container	Monitoring vehicle flows in cities by counting cars from images acquired from smart cameras
Entity Recognizer	FhG	Docker container	Deep learning-based extraction of named entities from text documents
Face Detection	FhG	Docker container	Detection of faces in still images or videos
Fraunhofer OCR Engine	FhG	Docker container	Fraunhofer OCR software that performs layout analysis and extracts textual content from documents
Fraunhofer Table Extraction	FhG	Docker container	Fraunhofer Table Extraction software to extract table information from documents
Live Speech Recognition	FhG	Docker container	Speech recognition translates spoken information into digital text in real time
Memory-based Multi-Source Meta-Learning (M3L)	UNITN	ML Model	A framework to train a generalizable model for unseen domains
Object Detection	FhG	Docker container	Detection of physical objects in still images or videos
Text-to-Visual Search Engine	CNR	Docker container	A Text-to-Visual Search Engine which enables to search images given natural language sentences as a query
The Devil is in the GAN: Defending Deep Generative Models Against Backdoor Attacks	IBM	Jupyter Notebook	Training time procedures to produce secret adversarial backdoors in Deep Generative Models

Table 1: AI4Media assets in the AI Catalogue

This overview, including any updates which meanwhile might have been applied, can also be accessed on the AI4Media project page on the AI on Demand Platform. The publication of further AI assets is an ongoing process that will continue for the remaining duration of the project. At the time of the preparation of this deliverable already more AI assets have been uploaded and staged for review by the AI4EU CMS team. For an up-to-date list of published AI assets please always visit the AI4Media project page online.

4 Web Cafés

AI4Media supports the community building activities of the AI on Demand Platform by offering a series of live Web Cafés on AI. The goal of these sessions is to gain insights into the international AI scene, to share knowledge and experiences, and to meet stakeholders from various areas of AI research and application. The live Web Cafés regularly reach a wide audience and recordings of past Web Cafés are available on GoToStage, if the speaker has agreed to it. So far, there have been six sessions with contributions from AI4Media members:

Speaker	Institution	Title & link to video
Nicu Sebe	UNITN	Image and Video Generation: A deep Learning Approach
Roberto Iacoviello	RAI	Video Compression turns to Artificial Intelligence
Hannes Fassold	JR	Employing AI for the semantic analysis of conventional and immersive video
Symeon Papadopoulos	CERTH	Deepfakes: An Emerging Internet Threat and their Detection
Yiannis Kompatsiaris	CERTH	A European Excellence Centre for Media, Society and Democracy
Ioannis Pitas	AUTH	Face de-identification for privacy protection

Table 2: Web Cafés with contributions from AI4Media members

This highly successful format, which has started in the AI4EU project under the label AI4EU Café in 2019, will be continued under the umbrella of AI4Media and specifically in the context of T7.2 "*Community building using the AI on Demand Platform*" with its new name AI-Café.

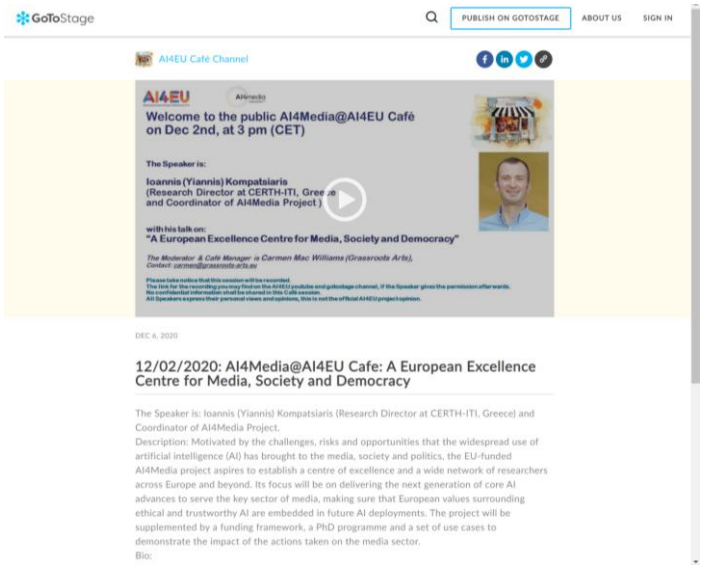


Figure 1: Web Café on the AI4Media project with speaker Dr Yiannis Kompatsiaris.

5 Contributions to AI4EU Experiments

A selection of the resources published in the AI Catalogue is also technically integrated into AI4EU Experiments, an open-source platform for the development, training, sharing and deployment of AI models that constitutes the technical part of the AI on Demand Platform. This only applies to those types of resources where a technical integration is reasonable such as datasets and docker containers, but not tutorials. The selection is made based on the requirements of AI4Media's use cases and on the impact of the relevant research.

5.1 Models in the AI4EU Experiments marketplace

At the time of submission of this deliverable, there are three models coming from AI4Media published in the AI4EU Experiments marketplace:

Name	Description (by the authors)
EntityRecognizer	The entity recognizer is a deep learning-based solution that takes a text document as input and returns a list of instances of pre-defined entities (Person, Location, Organization, Miscellaneous).
SpeechRecognition	Speech recognition reliably translates spoken information into digital text.
SpeechRecognitionWebUI	This is a web UI which can be used with the SpeechRecognition model. It serves as both the data source (audio stream) and the consumer of the results (transcribed text).
Text2ImageSearch	This model implements a text-to-image search engine: it searches images in a publicly available database (MIRFlickr100K) using natural language sentences as a query.

Table 3: AI4Media models in the AI4EU Experiments marketplace

5.2 Public demonstrator of an AI4EU Experiments pipeline

The provision of a publicly accessible demonstrator proves the technical feasibility of creating AI demo systems built with AI4EU Experiments. For the creation of the demonstrator, all necessary work steps have been carried out:

- Defining AI assets and their publication to the AI assets catalogue of the AI on Demand Platform,
- Publishing AI assets packaged as Docker containers to a suitable container registry,
- Defining an AI4EU Experiments model for each AI asset and publishing the model on the AI4EU Experiments marketplace,
- Building a pipeline from these AI models using the Acu-Compose Design Studio of AI4EU Experiments,
- Deploying the pipeline to a publicly accessible runtime environment.

The demonstrator provided with this deliverable contains a pipeline that uses functionality of two different technologies. First, a speech recognition system translates spoken information into digital text in real time. Second, a named entity recognizer identifies persons, locations, organizations and other entities ("miscellaneous") in the digital text and enriches the text with

markups of identified entities. A web user interface is provided to control input (spoken words using a microphone) and display the output (enriched transcription).

The demonstrator can be used with a web browser using the following URL:

https://dev01.ki-lab.nrw/ai4media/d7_1/demo.html

As a prerequisite, the web browser requires access to a connected microphone. The result of the enriched transcription is displayed in the web browser. A screenshot of the user interface at the time of preparing this document is shown in Figure 2.

The following aspects are to be considered when using the public demonstrator:

- At the bottom right corner of the website, a tiny number indicating the number of available live speech recognition workers is shown. At the time of submission of this document, only one worker is deployed. If there is no worker available, then please try again later.
- The demonstrator works best if used with a laptop or PC and a proper microphone. The user interface webpage is not optimized for mobile devices.
- The user interface and the functionality of the demonstrator may change in the future.
- The demonstrator will be kept online until at least 31 December 2022.
- Please contact andreas.steenpass@iais.fraunhofer.de, if any problems occur while using the demonstrator.

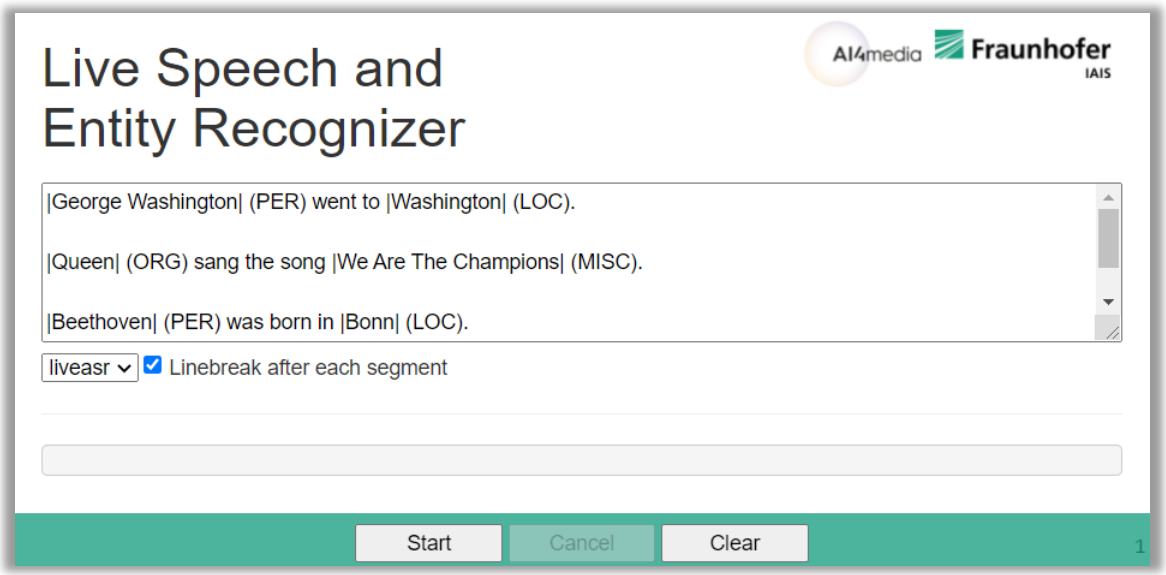


Figure 2: The user interface of the public demonstrator

The following are links to resources relevant to the demonstrator.

Link to publicly accessible user interface of the demonstrator:

- Demonstrator Web Interface: weblink

Links to the relevant AI assets in the AI Catalogue of the AI on Demand Platform:

- AI asset Live Speech Recognition: weblink
- AI asset Entity Recognizer: weblink

Links to the relevant AI models in the AI4EU Experiments marketplace:

- AI4EU Experiments model SpeechRecognition: weblink
- AI4EU Experiments model EntityRecognizer: weblink
- AI4EU Experiments model SpeechRecognitionWebUI: weblink

Pipeline composed of the above mentioned AI models using the Acu-Compose Design Studio of AI4EU Experiments (illustrated by Figure 3):

- AI4EU Experiments pipeline: weblink

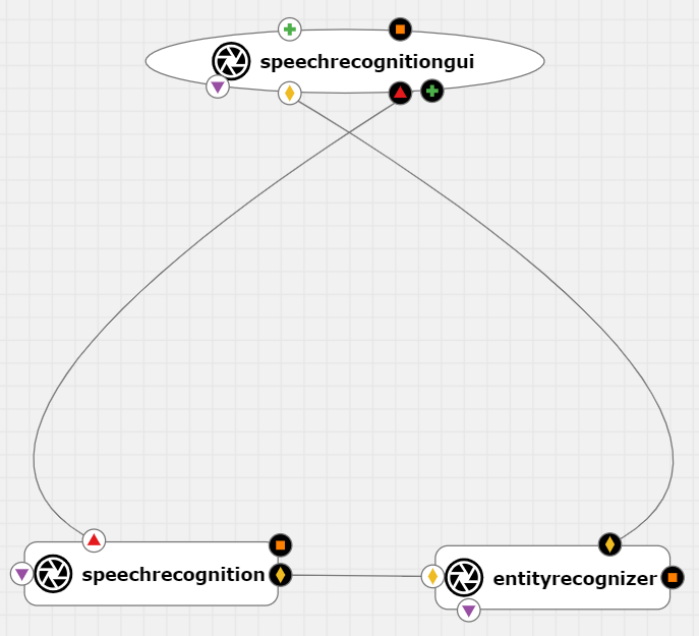


Figure 3: The AI4EU Experiments pipeline in the Acu-Compose Design Studio

6 Interoperability with other platforms

Going beyond the publication and technical integration of AI resources, AI4Media will also provide showcases for the interoperability of AI4EU Experiments with other media platforms, which is a key success factor for wider dissemination on both sides. For example, it is foreseen to provide adapters for making modules from other platforms available in AI4EU Experiments.

While the mentioned showcases will be implemented at a later stage of the project, there are two main outcomes (Survey results; Concept for interoperability with the Fraunhofer Mining Platform) of these efforts which have so far been undertaken in this direction. These are described in the following subsections.

6.1 Survey results

AI4Media aims at demonstrating that other media platforms can be connected to AI4EU Experiments, for example, showing that the latter can use modules from these media platforms. In order to examine the requirements of this interoperability framework and to decide upon the best way to design and implement the interoperability mechanisms, an online questionnaire was developed and shared with AI4Media's use case partners in the project. The goal of this questionnaire was to map the initial interoperability requirements and to collect necessary information from the partners that own a media platform. The questionnaire can be found in Appendix 1: Online questionnaire of Task 7.4 (Figure 5 and Figure 6).

In total, five AI4Media consortium partners have answered the questionnaire. From an initial analysis of the survey responses, the following observations can be made:

- Interoperability feasibility and requirements differ substantially among these different media platforms.
- 2 out of 3 surveyed media platforms provide an API that can connect their independent platform modules, while one surveyed platform does not provide any standalone modules and is therefore out of scope for the purposes of this task.
- The surveyed platforms employ a variety of different protocols, such as HTTP, REST, JSON, file access or GUI.
- There is a variety of different module types employed by the surveyed platforms.
- Some of the mentioned main functionalities would be valuable for AI4EU Experiments, examples including:
    - auto-tagging, categorization, visual search, facial recognition, content moderation, cropping, colour extraction, object detection
    - analysis of media files such as audio-to-text transcription, recognition of speakers, faces and entities, categorization of news articles
    - music composition
- The majority of the surveyed platforms have a proprietary licensing scheme.

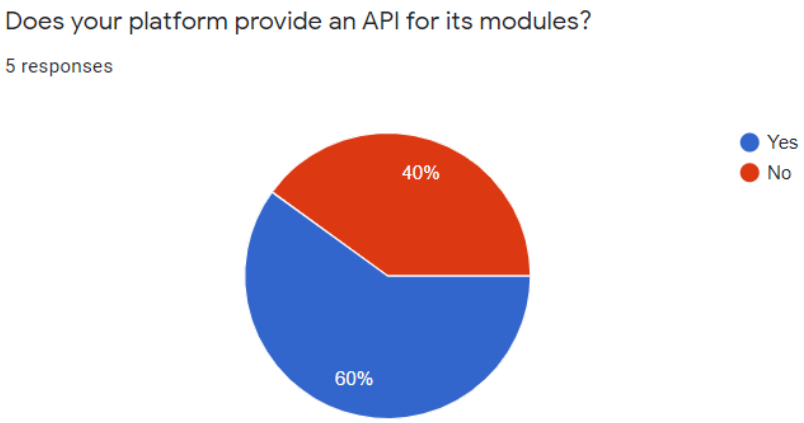


Figure 4: Surveyed platforms providing an API for their modules

The next steps towards designing the interoperability mechanisms are to finalise the survey analysis and then to contact the respective platform owners in order to further discuss the technical details and the required mechanisms as to ensure that their platforms are made interoperable with AI4EU Experiments.

6.2 Concept for interoperability with the Fraunhofer Mining Platform

One candidate for showcasing the interoperability of AI4EU Experiments is the Fraunhofer Mining Platform. This platform has been developed in a strategic partnership with the German broadcaster ARD, to fully automatically exploit text, audio and video information, generating valuable metadata. The generated metadata can then help to find relevant content such as files or documents faster, for example in archives, or can be used in combination and linkage with other information in order to realize new products and services.

A concept for achieving interoperability between AI4EU Experiments and the Fraunhofer Mining Platform has been developed by Jens Fisseler, the software architect of the Mining Platform. To summarize, this concept pursues two alternative approaches:

The first approach is to adapt AI4EU Experiments pipelines to the Mining Platform und to use them as mining services within mining workflows. This allows to quickly integrate new mining services coming from AI4EU Experiments. The challenge here is to convert the input and output data between the AI4EU Experiments pipeline and the mining workflow within the Mining Platform.

The second approach is to adapt mining services from the Mining Platform to AI4EU Experiments and to use them in pipelines on that platform. Since mining services implement a REST API whereas models in AI4EU Experiments use gRPC, the challenge with this approach is to write suitable adapters for these protocols.

This concept has been presented by Jens Fisseler at the public AI4Media Workshop on the European AI on Demand Platform which took place online on Thursday, 11 November 2021. Both the slides as well as a recording of this presentation are available online.

7 Conclusions

7.1 Status of AI4Media's integration with the European AI on Demand Platform

This deliverable, with the publicly available components listed in this document, prove that AI4Media's integration with the European AI on Demand Platform is progressing and working as intended in all aspects:

- There are already ten (10) assets published in the AI Catalogue which are linked to AI4Media, see Section 3. This represents one third of the target number of 30 AI resources which is to be reached by the end of the project (KPI 5.1). AI4Media members can upload their assets themselves. They are supported by WP7 for this task, and WP7 ensures close collaboration with the content management team of the AI on Demand Platform.
- AI4Media members contributed to six (6) Web Cafés and some other Web Cafés featured speakers who are closely involved in AI4Media such as Joachim Köhler or Martin Welß (the latter talks were not given in the scope of AI4Media). As the Web Cafés will continue in the context of T7.2 on a monthly basis from 2022 onward, the target number of 24 live recorded webinars (KPI 5.4) will easily be reached.
- There are already three (3) AI4Media models in the AI4EU Experiments marketplace, see Section 5.1, and also a public demonstrator for an AI4EU Experiments pipeline, see Section 5.2. This shows that the technical integration of AI4Media outcomes into AI4EU Experiments is working. These efforts will be continued based on the requests from AI4Media partners, on the requirements of AI4Media's use cases and on the impact of the relevant research.
- A concept for interoperability between AI4EU Experiments and the Fraunhofer Mining Platform as an example media platform has been presented at the AI4Media Workshop on the European AI on Demand Platform and is publicly available in form of the slides and the recording of the talk. A short summary of this concept is also included in this document, see Section 6.2. The concept shows that achieving interoperability between these two platforms is technically feasible. The portfolio of available services also shows that this will be very beneficial for both sides.

7.2 Identified needs for improvement

During the first project phase up to submission of this deliverable, several needs for improvement regarding AI4Media's integration with the AI on Demand Platform have been identified:

- The user interfaces for uploading content to the AI Catalogue and to the AI4EU Experiments marketplace are generally well working, but they could be improved in several aspects to achieve a better user experience. This might strengthen the motivation of project partners to contribute assets. For example, some fields which must be completed are lacking suitable choices for content from AI4Media, are not self-explanatory or are technically hard to handle. Some text editors in these interfaces do not work correctly.

- The definition of APIs for models in the AI4EU Experiments marketplace turns out to be a difficult task in some cases. On the one hand, these APIs should be general enough to ensure the versatility of the uploaded models. In principle, it should be possible to use those models in more than one pipeline. On the other hand, the APIs must be specific enough to cover the full functionality of the models. For example, a given model for speech-to-text transcription produces both the text and a confidence value for each transcribed word. Another model only needs the transcribed text for recognizing the named entities in it. What would be an appropriate common API between these two models in this example?
- In the AI Catalogue, it is easy to display a list of those assets which are linked to AI4Media. The same functionality would be needed for the models coming from AI4Media in the AI4EU Experiments marketplace and for the Web Cafés with contributions from AI4Media members in order to increase the visibility of AI4Media.
- AI4EU Experiments is not a physical execution environment and therefore it does not offer any computational resources to execute the designed pipelines. Instead, the pipelines must be deployed in an environment which the user has available. This can be, for example, a Kubernetes cluster or an installation of minikube on a local machine. It would therefore be desirable to have some execution environment where AI4Media partners can deploy their pipelines for testing.

7.3 Future plans

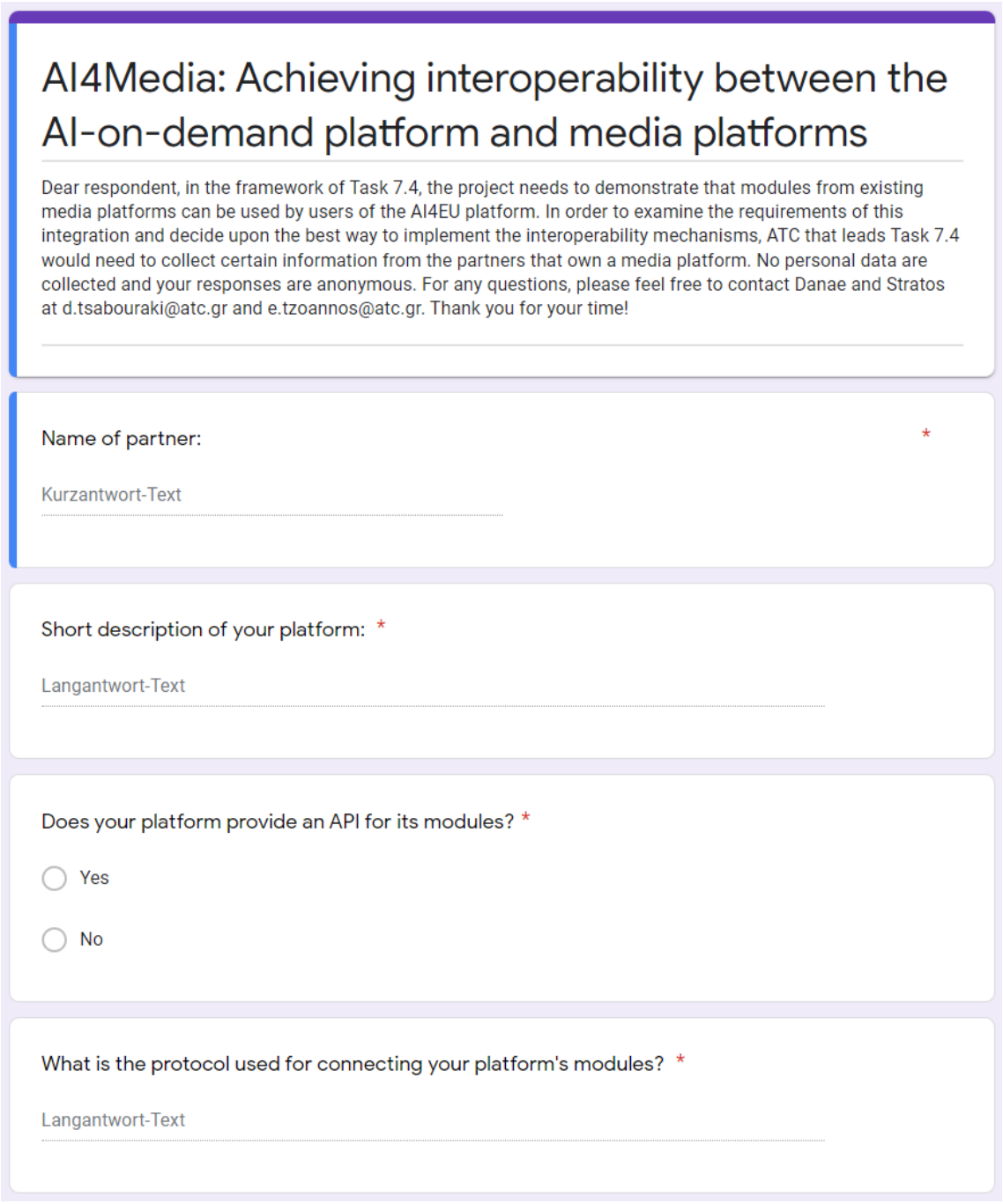
Based on the integration experiences up to now and on the identified needs for improvement listed above, the next phase of AI4Media's integration with the AI on Demand Platform will take into account the following proposals:

- The user interfaces for uploading content to the AI Catalogue and to the AI4EU Experiments marketplace will be improved in close collaboration with the content management team of the AI on Demand Platform and with the developers of AI4EU Experiments. This will be based on the valuable feedback of the AI4Media contributors.
- For dealing with the model APIs in AI4EU Experiments, it will be considered to generalize these APIs in a way so that subsequent models in the pipeline can choose which data from their predecessors they want to use as input. Continuing the example on the common API of two models mentioned in the previous subsection, if a model produces both text and confidence values as output, another model may only use the text as input. This would make the definition of pipelines more flexible, even for models with very specific APIs.
- The visibility of AI4Media in the AI4EU Experiments marketplace will be increased. A simple solution for listing all models coming from AI4Media would be to introduce a suitable tag. The Web Cafés with contributions from AI4Media members will be listed on the AI4Media homepage.
- A playground will be set up where AI4Media partners can deploy their AI4EU Experiments pipelines for testing. The launch of this playground is planned for the first half of 2022.

- Further AI pipelines will be designed and implemented based on the requests from AI4Media partners. A few initial ideas for pipelines have already been developed at the fourth plenary meeting of the project which took place in November 2021. These ideas concern the analysis of videos with different AI technologies. They will be further elaborated in future workshops and additional pipelines will be designed according to the needs of the project and the availability of AI modules in the AI4EU Experiments marketplace.

Finally, it is worth emphasizing that some activities of the AI4EU project will continue under the umbrella of AI4Media, such as the very successful Web Cafés, the further development of AI4EU Experiments and the management of the AI4EU Technical Governance Board (TGB). An even closer collaboration with the TGB will also contribute to the success of the proposals listed above.

Appendix 1: Online questionnaire of Task 7.4



AI4Media: Achieving interoperability between the AI-on-demand platform and media platforms

Dear respondent, in the framework of Task 7.4, the project needs to demonstrate that modules from existing media platforms can be used by users of the AI4EU platform. In order to examine the requirements of this integration and decide upon the best way to implement the interoperability mechanisms, ATC that leads Task 7.4 would need to collect certain information from the partners that own a media platform. No personal data are collected and your responses are anonymous. For any questions, please feel free to contact Danae and Stratos at d.tsabouraki@atc.gr and e.tzoannos@atc.gr. Thank you for your time!

Name of partner: *

Kurzantwort-Text

Short description of your platform: *

Langantwort-Text

Does your platform provide an API for its modules? *

- Yes
- No

What is the protocol used for connecting your platform's modules? *

Langantwort-Text

Figure 5: Online questionnaire of Task 7.4

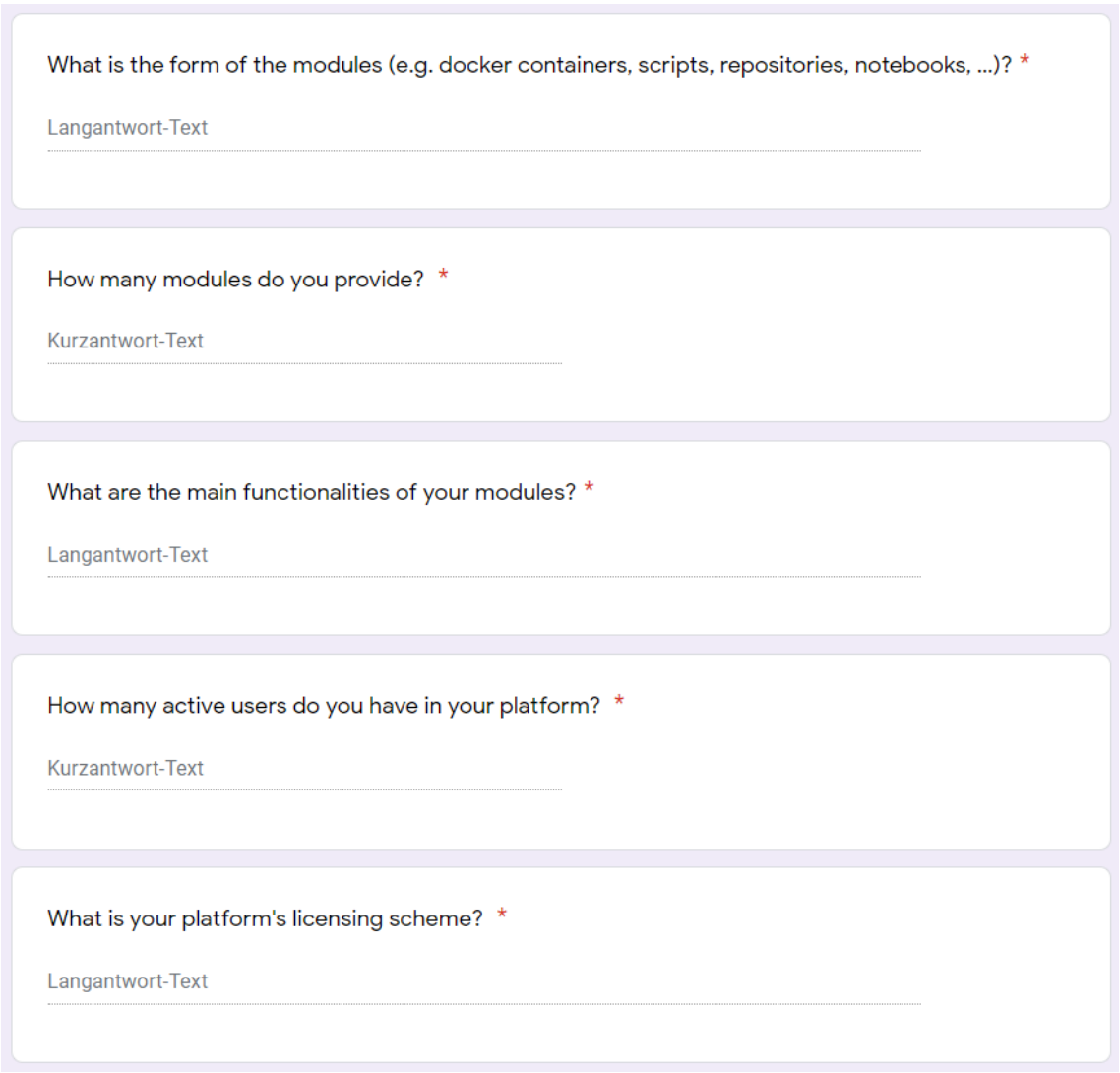


Figure 6: Online questionnaire of Task 7.4 (continued)

AI4media

ARTIFICIAL INTELLIGENCE FOR THE MEDIA AND SOCIETY

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 951911

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