EU RIA Horizon Europe Proposal Template

Project IDIoHMA

Abstract

The interactions of humans and AI systems are becoming a cornerstone of research and digital innovation not only in ICT but also in any field that needs a digital interface to be used to its full potential. With the growing population of smart devices and the IoT, along with the interconnection of multiple devices in a network via the Continuum Cloud-to-edge, and the 6G wireless communication technologies, the world is evolving into a smart world fully connected and aimed toward the collaboration of humans and machines powered by AI, and where complexity rises along with the number of functionalities and interactions that humans have with their creations, as well as the techno-dependency for this products. All these phenomena lead to a greater quantity of consequences that need to be taken into account when designing the architecture and the interconnection substructure of the AI system in the context in which It operates and should be implemented. To address these consequences, we developed a consensus theory and an adaptable and flexible infrastructure as a distributed and decentralised framework(as an API?) that could be used in every situation to create a network of AI that is built and act based on human interactions with them, in a consensus environment, that is IDIoHMA(Infrastructure for Dynamic Interfaces of Humans-Machine AI). We measure the impact of our project directly in the context of smart cities, specifically in the city of Madrid where it will be deployed on some applications developed by the university and distributed to the public to measure the involvement and engagement of people with AI applications.

Project abstract. **Important:** limit to 2000 characters.

1 Excellence

1.1 Targeted breakthrough, Long term vision and Objectives

Our project aims to address most of the objectives of the call and also focuses on the topic at hand by interlacing the research with the whole work programme affiliated with the call. The main focus of the project is to provide a solid and flexible infrastructure to address the growing complexity of the interactions between humans and AI(robots, devices, decisional support systems, etc.) to improve the support and the capabilities that could be given by the technology at hand. With the growing support for fast internet(with 6G technologies) and the possibility of having a smart device always at hand(smartphones, smartwatches, smart glasses) that could be used as a part of an edge-AI system capable of getting very good results for a reduced cost of production, the opportunities to build something very useful for humans are innumerable.

The deployment of the final product will be on smart devices that need some type of information network to share collected data in a decentralized architecture. Our objective is also in line with most of the topics presented in Horizon Europe about digital innovation since we will be using new technologies and methods when needed, like the **Continuum Cloud-to-Edge** and **edge-AI**, fast networking(**6G**), mobility. The framework and methods could also be used to orchestrate the renewable energy capabilities and interactions since it will work as a network for all the smart devices to coordinate the grid of the same or different types of renewables.

The name of the project is also related to the objective of our focus, we aim at breaking the barriers created by the increasing complexity of the interactions between humans and machines. this is done with a flexible and adaptable infrastructure that will establish some guidelines and procedures to follow to make the interactions of humans of all genres, ages, disabilities and social classes more straightforward and simple, and also to provide a lot of functions and capabilities aimed toward the end-user.

Our project has as a primary objective to create a general framework and methods used in a distributed and decentralized system, but it also can be specialized for the requirements of the use case at hand.

Our focus is to build the framework and methodology that could be used to orchestrate a whole dynamic human-AI system capable of aiding humans in everyday activities, especially in smart cities. We also aim to build better AI with the help of the population by using engagement and involvement of people on our smart devices and collect both direct and indirect feedback in a **Human-in-the-loop** hybrid environment, where users can use the deployed product and also enhance it and improve it. The engagement process is also a concern most of the time when the application requirements to collect data are too tedious, so we also focus on the process of involving people with the system to get better performance for the app and satisfy the needs of the users.

1.2 Relation to the work programme

IDIoHMA answers to the topic AI for human empowerment(topic identifier: HORIZON-CL4-2022-HUMAN-02-01) that is part of the general work programme **Horizon Europe Framework Programme (HORIZON)** and also implements the co-programmed European Partnership on AI, Data and Robotics. In particular, it addresses most of the clusters in the pillar II of the work programme, and in particular, it focuses on **Culture, creativity and inclusive society**; **Digital, Industry and Space**; **Climate, energy and mobility**.

The outcome of the proposal(results and impact) is expected to contribute to at least one of the specific challenges seen in table 1.2.

Specific challenge	IDIoHMA answer
Truly mixed human-AI initiatives for human empowerment	1.1 Smart devices will aid end-users in everyday activities that include mobility, entertainment and support for decisions in specific environments. 1.2 The interaction between the AI systems and humans will be direct, not complex and easy to implement for localized topics. 1.3 Every day smart devices will be used to create the computation network that serves the purpose of providing end-users with useful functionalities and capabilities, along with the collection of useful data used to create better models and better interactions between the technology and the user, lightening the responsibility of the design of the developer, and obtaining better capabilities.
Trustworthy hybrid decision-support systems	1.1 Our framework is based on a consensus of decisions between end-users in a specific environment, so the final results should be trustworthy since the outcome is the one expected from a democratic decision system. 1.2 The project is completely hybrid since it uses the consensus environment to create decision aiding systems(along with other models for other use cases), the products alone will be useful to collect and provide information to the end-users to finalize the decisions with a solid base.

Scope	IDIoHMA answer
Build the next level of perception, visualisation, interaction and collaboration between humans and AI systems working together as partners to achieve common goals, sharing mutual understanding and learning of each other's abilities and respective roles.	Our framework clearly defines the relations between decentralized devices equipped with edge-AI. Every device is specialized for the activities of its users, and the whole system is linked to a network and some cloud system that is used to build and control the quality of the overall product.
Innovative and promising approaches, including human-in-the-loop approaches for truly mixed human-AI initiatives combining the best of human and machine knowledge and capabilities, tacit knowledge extraction (to design the next generation AI-driven co-creation and collaboration tools embodied e.g. in industrial/working spaces environments)	We also aim to build better AI with the help of the population by using engagement and involvement of people on our smart devices and collect both direct and indirect feedback in a **Human-in-the-loop** hybrid environment, where users can use the deployed product and also enhance it and improve it. This process of involvement is carried out by a hybrid strategy that uses some concepts of gamification, social sciences and human behaviour analysis to get the best engagement of people with the deployed system.

Reach truly mixed human-AI initiatives for human empowerment. The approaches should combine the best of human and machine knowledge and capabilities including shared and sliding autonomy in interaction, addressing reactivity, and fluidity of interaction and making systems transparent, fair and intuitive to use, which will play a key role.	The results that implement the framework will be completely flexible, especially for the end-users and the admins, since we will provide some mechanism to specialize the functionalities for the needs of the environment where the framework and methodologies of IDIoHMA are used. Reactivity of the system will be guaranteed by the high capabilities and computation network at hand, that uses the whole system of devices to build better and faster models. Intuitivity of use will be a concern of the methods and practices that we will explain along with the framework, to maximize both the flexibility of the end product and ease the interaction of humans with the interfaces to the system.
The systems should adapt to the user rather than the opposite, based on analysis, understanding and anticipation about human behaviour and expectations.	As already stated before, the whole system has the objective of easing the interaction of humans and AI devices, along with providing models that are based on consensus and democratic reason for the end-users. So the final product is dynamically changing for the population needs in the environment where it operates.
Trustworthy hybrid decision-support, including approaches for mixed and sliding decision-making, for context interpretation, for dealing with uncertainty, transparent anticipation, reliability, human-centric planning and decision-making, interdependencies, and augmented decision-making	As already stated in the specific objectives in table 1.2, the models that will be implemented are based upon a consensus and democratic learning, where the devices AI will be enhanced by the end-users. With the models that will be created over time, we will also be able to see the relations between groups and specific designs. For uncertainty, we address the issue by taking into account other environments other than the one where the framework is deployed, this ensures the possibility to get outlier data and treat it beforehand by predicting and handling the presence of uncertainty for similar contexts and environments. Augmented decision-making could be implemented easily in the model, as long as the base functionalities that the framework offers are implemented and tested on the devices for the decision making(also by providing continuous feedback since augmented decision making gives insight and aids the process of decision in every context, so it needs special attention from the users to get better results).
Transparency, fairness, technical accuracy and robustness will be the key, together with validation strategies assessing also the quality of the decision of the AI supported socio-technical system.	???
adopt a human-centred development of trustworthy AI and investigate and optimise ways of human-AI interaction, key for acceptance and democratisation of AI, to allow any user to take full advantage of the huge benefits such technology can offer, regardless of their age, race, gender or capabilities	Humans are at the centre of attention and the main objectives for IDIoHMA, the end-users of the AI systems developed will be the one that shapes the whole functions and how things should be decided, regardless of age, gender, or every type of classification of the end-users(as long as the end-users are the one who should be using the system, so additional considerations on security could be discussed). The decisions will be based especially on the consensus of the people that use the product (along with some fine-tuning with some established and clear rules) to create a dynamical decision system capable of adapting itself to the need of the users.

Development of methods to improve transparency, in particular for human users, in terms of explainability, expected levels of performance which are guaranteed/verifiable and corresponding confidence levels, accountability and responsibility, as well as perceived trust and fairness.	???
AI could also be used to empower humans in supporting them to improve responsible behaviours, where appropriate, but this should be done in full respect of the requirements ensuring trustworthy AI, including human autonomy.	IDIoHMA will be used as an aiding AI system that could be used in every situation where there is a decision to take and that decision has some type of consensus or democratic value to it. The product will be used by the people that need some kind of help with a decision, and the product itself should be never considered enough to decide since it needs a lot of feedback to work with non-trivial tasks.
multidisciplinary and transdisciplinary approaches paying particular attention to intersectional factors (gender, ethnicity, age, socioeconomic status, disability) as well as collaborative design and evaluation with users involvement	???

The scope of these challenges is aligned with the scope of the work programme for RIA(Research and Innovation Action) and specifically aimed toward the requirements of the partnership with **AI, Data and Robotics**.

Our pilot is deployed in the city of Madrid**(right now I do not know, but maybe if I work on those projects I can define more clearly the impact objectives and pilot, we also need to define the pilot clearly since most of the impact importance come from the pilots and the measures that we will be using)**.

We aim to address both of the objective specified in the call, that is

- **Truly mixed human-AI initiatives for human empowerment**
- **Trustworthy hybrid decision-support systems**

Our objective is more aimed toward the first objective since the core of our project is the engagement of people, the collection of useful feedback, and the creation of AI created by that feedback in a particular environment. That means that the focus of this project is the research objective of building and orchestrating a complex system (with **best practices** and methods to maintain the system always up to date and responsive to the needs of the end-users) that aids humans in the situation where it is thought for, but also can adapt itself dynamically when new and uncertain data rise from time to time. This is done with simplicity and particular attention to details regarding the interfaces between man and machine, thus facilitating interactions regardless of the category to which one belongs(elderly, disabled, gender identity).

IDIoHMA also has links with the value-chain methodology since it addresses the technological development and the production of the end products in a certain use case. In particular, our projects will facilitate the process of production and deployment of a decentralized system (with some form of centralised control and inference for the heavy computation of big data collected from the devices) with contained costs and better performance and reception to the end-users.

1.3 Novelty, level of ambition and foundational character

1.4 Research methods

1.5 Interdisciplinary nature

2 Impact

2.1 Expected impact

2.2 Measures to maximize impact

Dissemination and exploitation of results

Communication activities

3 Implementation

3.1 Project work plan

Work package description

Work package number	**WP1**		**Starting month**	1
Work package title	**MANAGEMENT WORK PACKAGE**			
Participant number	**1**	2	3	
Short name	**UoC**	UoP2	UoP3	
Person-months	**12**	3	2	

Objectives

This work package has the following objectives:

1. To develop ....
2. To apply this ....
3. etc.

Description of work

Description of work carried out in WP, broken down into tasks, and with role of partners list. Use the `\wptask` command.

Task T1.1: Test (M1-M12) *Leader:* **UoC**. *Contributors: UoC*
Here we will test the WP Task code.

Task T1.2: Integrate (M6-M9) *Leader:* **UoC**. *Contributors: UoC*
In this task UZH will integrate the work done in T1.1.

Task T1.3: Apply (M9-M12) *Leader:* **UoP3**. *Contributors: All other*
Here all the WP participants will apply the results to...

Role of partners
Participant short name will lead Task T1.2.
UoC will..

Deliverables

D1.1 Report on the definition of the model specifications. **(M36)**

D1.2 Report on Feasibility study for the model implementation. **(M12)**

D1.3 Prototype of model implementation. **(M24)**

Work package number	**WP2**		**Starting month**	1
Work package title	**DEVELOPMENT WORK PACKAGE**			
Participant number	1	**2**	3	
Short name	UoC	**UoP2**	UoP3	
Person-months	3	**12**	6	

Objectives

This work package has the following objectives:

1. To develop ....
2. To apply this ....
3. etc.

Description of work

Description of work carried out in WP, broken down into tasks, and with role of partners list. Use the `\wptask` command.

Task T2.1: Test (M1-M12) *Leader:* **UoC**. *Contributors: UoC*
Here we will test the WP Task code.

Task T2.2: Integrate (M6-M9) *Leader:* **UoC**. *Contributors: UoC*
In this task UZH will integrate the work done in T2.1.

Task T2.3: Apply (M9-M12) *Leader:* **UoP2**. *Contributors: All other*
Here all the WP participants will apply the results to...

Role of partners
Participant short name will lead Task T2.2.
UoC will..

Deliverables

D2.1 Report on the definition of the model specifications. **(M36)**

D2.2 Report on Feasibility study for the model implementation. **(M12)**

D2.3 Prototype of model implementation. **(M24)**

Work package number	**WP3**		**Starting month**	1
Work package title	**TEST WORK PACKAGE**			
Participant number	1	2	**3**	
Short name	UoC	UoP2	**UoP3**	
Person-months	3	8	**12**	

Objectives

This work package has the following objectives:

1. To develop ....
2. To apply this ....
3. etc.

Description of work

Description of work carried out in WP, broken down into tasks, and with role of partners list. Use the `\wptask` command.

Task T3.1: Test (M1-M12) *Leader:* **UoC**. *Contributors: UoC*
Here we will test the WP Task code.

Task T3.2: Integrate (M6-M9) *Leader:* **UoC**. *Contributors: UoC*
In this task UZH will integrate the work done in T3.1.

Task T3.3: Apply (M9-M12) *Leader:* **UoP3**. *Contributors: All other*
Here all the WP participants will apply the results to...

Role of partners
Participant short name will lead Task T3.2.
UoC will..

Deliverables

D3.1 Report on the definition of the model specifications. **(M36)**

D3.2 Report on Feasibility study for the model implementation. **(M12)**

D3.3 Prototype of model implementation. **(M24)**

List of work packages

Table 3.1b: List of work packages

Work package number	Work package title	Lead participant no.	Lead participant name	Person-months	Start month	End month
WP1	MANAGEMENT WORK PACKAGE	1	UoC	17	1	36
WP2	DEVELOPMENT WORK PACKAGE	2	UoP2	21	1	36
WP3	TEST WORK PACKAGE	3	UoP3	23	1	36
	TOTAL			61		

List of deliverables

[1]

Table 3.1c: Deliverable list

Deliverable number	Deliverable name	WP no.	Lead participant name	Nature	Dissemination Level	Delivery date (proj. month)
D1.2	Report on Feasibility study for the model implementation.	WP1	UoP3	R	PU	12
D2.2	Report on Feasibility study for the model implementation.	WP2	UoP3	R	PU	12
D3.2	Report on Feasibility study for the model implementation.	WP3	UoP3	R	PU	12
D1.3	Prototype of model implementation.	WP1	UoP2	R	PU	24
D2.3	Prototype of model implementation.	WP2	UoP2	R	PU	24
D3.3	Prototype of model implementation.	WP3	UoP2	R	PU	24
D1.1	Report on the definition of the model specifications.	WP1	UoC	R	PU	36
D2.1	Report on the definition of the model specifications.	WP2	UoC	R	PU	36

Continued on next page

[1] If your action taking part in the Pilot on Open Research Data, you must include a data management plan as a distinct deliverable within the first 6 months of the project. This deliverable will evolve during the lifetime of the project in order to present the status of the project's reflections on data management. A template for such a plan is available on the Participant Portal (Guide on Data Management).

Table 3.4a: Summary of staff effort

Partic. no.	Partic. short name	WP1	WP2	WP3	Total person months
1	UoC	**12**	3	3	18
2	UoP2	3	**12**	8	23
3	UoP3	2	6	**12**	20
Total		17	21	23	61

D3.1	Report on the definition of the model specifications.	WP3	UoC	R	PU	36

List of milestones

Table 3.1d: List of milestones

Milestone number	Milestone name	Related WPs	Estimated date	Means of verification
M1	Completed simulator development	1	24	Software released and validated
M2	Final demonstration	WP 3	36	Application of results

Critical risks for implementation

Table 3.1e: Critical risks for implementation

Description of Risk	WPs involved	Proposed risk-mitigation measures
The dedicated chip sent to fabrication is not functional.	WP 3	Resort to Software simulations

3.2 Management and risk assessment

3.3 Consortium as a whole

3.4 Resources to be committed

Summary of staff efforts

'Other direct cost' items (travel, equipment, other goods and services, large research infrastructure)

Participant no. 1 (UoC)	Cost (EUR)	Justification
Travel	2500	3 pairwise meetings for 2 people, 2 conferences for 3 people, 3 internal project meetings for 3 people
Equipment	3000	CAD workstation for chip design
Other goods and services	60000	Fabrication of 2 VLSI chips
Total	65500	

Participant no. 2 (UoP2)	Cost (EUR)	Justification
Other goods and services	40000	Fabrication of prototype PCBs
Total	40000	

Participant no. 1 (UoC)	Cost (EUR)	Justification
Large research infrastructure	400000	Synchrotron

Participant no. 3 (UoP3)	Cost (EUR)	Justification
Large research infrastructure	400000	Synchrotron

4 Members of the consortium

4.1 Participants (applicants)

4.2 Third parties involved in the project (third party resources)

UoC	
Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	**Y/N**
Does the participant envisage that part of its work is performed by linked third parties	**Y/N**
Does the participant envisage the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement)	**Y/N**

UoP1	
Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	**Y/N**
Does the participant envisage that part of its work is performed by linked third parties	**Y/N**
Does the participant envisage the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement)	**Y/N**

UoP2	
Does the participant plan to subcontract certain tasks (please note that core tasks of the project should not be sub-contracted)	**Y/N**
Does the participant envisage that part of its work is performed by linked third parties	**Y/N**
Does the participant envisage the use of contributions in kind provided by third parties (Articles 11 and 12 of the General Model Grant Agreement)	**Y/N**

5 Ethics and Security

5.1 Ethics

5.2 Security

[2]

[2]Article 37.1 of the Model Grant Agreement: Before disclosing results of activities raising security issues to a third party (including affiliated entities), a beneficiary must inform the coordinator – which must request written approval from the Commission/Agency. Article 37.2: Activities related to "classified deliverables" must comply with the "security requirements" until they are declassified. Action tasks related to classified deliverables may not be subcontracted without prior explicit written approval from the Commission/Agency. The beneficiaries must inform the coordinator – which must immediately inform the Commission/Agency – of any changes in the security context and –if necessary – request for Annex 1 to be amended (see Article 55).