

TEACHING NEWSLETTER

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TEACHING is an EU-funded project that designs a computing platform and the associated software toolkit supporting the development and deployment of autonomous, adaptive, and dependable CPSoS applications, allowing them to exploit sustainable human feedback to drive, optimize and personalize the provisioning of their services.



This issue provides a grasp of the main project developments during March 2022 – Aug 2022. It also provides facts on the results achieved, as well as links to the latest dissemination activities.

During the reference project period TEACHING has progressed considerably by releasing a new version of the TEACHING platform with new functionalities and features. We are very pleased to register this progress which gives credit to hard work of the TEACHING partners and provides motivation for reaching the next milestones. We are going to demonstrate these results in European Commission during the upcoming Interim Technical Review Meeting to be held online in 5th of October 2022.

TEACHING
HIGHLIGHTS
M27 – M32

WHAT HAS BEEN DONE?

Humans, as the users of AI are directly affected by the actions and decisions made from such intelligent systems. TEACHING extends this single direction operation ("AI affects humans") by implementing a platform that "mediates" between humans and AI systems in order to close the feedback loop. The TEACHING platform enables the "passing" of human feedback on the AI system decisions, back to the AI system, in the form of control operations that do not affect the AI system's dependability. To achieve that, the TEACHING platform enables the following features:

- allows the developer to dynamically define and deploy data workflows at the cloud-edge continuum, called TEACHING Applications;
- supports a wide range of underlying resources, including ARM-based, resource-constrained devices;
- supports the integration of AI/ML tools in the workflows, for both inference and training.

The Platform follows a microservices architecture and relies on the Docker engine. The testbed is an iMX8 board, courtesy of our partner [Ideas and Motion](#). The platform is available on [github](#).



WP2

WP2 contains several activities due to the platform implementation of TEACHING along with the research tasks. The main activities during the reporting period concur in realizing the HPC2I platform, which supports all previously specified objectives and formalizes the Cloud-Edge Continuum ecosystem as the composition of three functional layers, stacked one on top of the other. Specifically, the topmost one is the layer of Cloud resources, the middle one is that of the so-called Near-Edge, where a plethora of devices exist that are geographically scattered, possibly resource constrained, but not onboard any vehicle or carried by a single user. The Far-Edge is the lowest level of the platform, where vehicle-based devices, mobile devices and the likes are found.

The work on the HPC2I platform in WP2 aims as much as possible at extending abstractions and tools used in one layer to the other ones, in order to achieve higher generality, higher performance and easier application development over complex CPSoS. Continuous evaluation of the state of the art for universal deployment of services in distributed platforms has been done due to the T2.6, implementation of the deployment mechanisms for the TEACHING platform. Lastly, within the Task 2.5 we addressed different aspects of managing and optimizing communication and decentralized information exchange within the HPC2I platform, in the context of the TEACHING Use Cases. Research activities addressed features selection efficiency within a fleet of Autonomous Vehicles (AVs) that collect multi-modal raw measurements through their sensors. Collected data must be pre-processed and delivered to feed a remote edge server for inference tasks.

During this reporting period, WP3 continued to work on dependability engineering approaches for AI-based and mission critical systems. Multiple domains are moving towards connected and automated vehicles (drones, cars, robots, etc.) with a high degree of dynamic and adaptive behavior, driven by software. Due to this connectivity and interaction, dependability engineering is an increasingly important topic. Recent topics of automotive cybersecurity and safety-critical AI-based systems play an important role, to be able to support the type of approval of such novel systems. Due to this challenge, it is necessary to develop the necessary expertise. To this aim, WP3 has started different activities related to the development of training materials and engineering approaches, also for automotive cybersecurity engineering and manager job roles. The recent approaches are not only presented at prestigious conferences (e.g., EuroSPI, SafeComp), but will also be subject of next week's initial TEACHING onsite training workshop for broader knowledge distribution at our industrial project partner Marelli. Also, partners engaged in the activities of other WPs and cross-fertilized the activities of the related tasks.

WP3

WP4

The main effort in WP4 has been directed towards the finalization and integration of the core components of the AI toolkit in the TEACHING use cases setup. This process involved the activities of all the tasks in the work package (i.e., T4.1-4.4), and was conducted by means of online meetings (on a weekly basis), as well as by 3 in-person integration meetings held in partners' facilities in Graz, Athens, and Pisa. As a result, the core AI learning modules and components were successfully integrated, showing

Federated and Distributed learning on the iMX8 hardware support, hence contributing to the demonstration of

milestone MS4 (at M28). Besides integration, the work on the AI toolkit continued with a focus on the advanced learning functionalities, including out-of-distribution learning in human state monitoring for automotive applications and Federated Learning-related cybersecurity functionalities, that will be delivered in the final TEACHING platform.

Furthermore, the scientific work in WP4 continued with the progress on AI-related research topics of interest for the TEACHING project, including Federated and Continual Learning, Reservoir Computing, Pervasive and Safe AI. Several research papers on these topics were submitted and accepted for presentation in prestigious international conferences including CVPR, PERCOM, and WCCI/IJCNN. Moreover, the dissemination of the AI concepts developed in TEACHING contributed to the organization of the 1st International Workshop on Pervasive Artificial Intelligence (hosted by WCCI/IJCNN), of the 3rd CLVision workshop (hosted by CVPR), and of 2 special sessions at WCCI/IJCNN (on "Safe AI", and on "Reservoir Computing: algorithms, implementations and applications").

WP5 has moved from the design and specification of its use cases towards integration and implementation of tailored technologies that are originally developed in lower-numbered WPs. The focus of UNIPI and HUA is on the integration of secure methodologies for continual federated learning on streams of non-stationary physiological data for human state monitoring. The



advances are supporting the creation of live AlaaS demonstrations in the context of autonomous driving. TUG has in cooperation with MM and AVL continued reshaping the WP5 activities in the context of cyber-security that stems from the WP3 activities. These are of particular importance for the integration of the TEACHING HW platform from I&M in the driving simulator studies. The methods are also adapted to nest within the boundaries dictated by the standards ISO 26262 and ISO 21488. ITML has been improving and preparing the Anomaly Detection Learning Module for the handling of a wider range of datasets and application scenarios. I&M has continued integration of its HW platform in the automotive use case, as well as testing of the SW concepts in a realistic environment in cooperation with AVL and TUG. I&M and MM have also carried out the integration of the HW and SW platform into the avionics use case, which is yet to be demonstrated. On the other hand, AVL has, with the support of all the project partners conducted the first TEACHING-specific driving simulation study using a SotA driving simulator for quantification of human states when facing different driving scenarios. Future activities are looking into the exploitation of the generated data for the creation of appropriate human state prediction models.

TEACHING Dissemination and Communication

Within the reference period, the TEACHING partners have effectively disseminated the project results by participating in online events, creating further networking opportunities, and continuously raising awareness. One of the main scopes of the TEACHING partners is to contribute and support communication activities of the project in order to achieve all the dissemination goals. TEACHING partners have expanded the project visibility via submitting the 5th TEACHING broadcast, a live interview session of Claudio Gallicchio (UNIPI). In addition, TEACHING consortium meetings have been organized aiming at monitoring the technical achievements during the reporting period, and also technical workshop with students of Technische Universität Graz (TUG) to present TEACHING computing platform and discuss further on technical modules. This reporting period, despite the COVID

considerations and restrictions, TEACHING partners have managed to organized hybrid integration meetings (M27 & M29& M30) with physically and remotely participation for demonstrating the TEACHING toolkit. Partners seek to organize the next consortium and integration meetings in physically nature in order to achieve an in-person integration meeting and boost our discussion culture!

TEACHING 2nd Stakeholder Engagement Questionnaire has been released within M27 in order to improve project's business plan and share its offerings and vision. Furthermore, on M28 TEACHING has released another scientific article in the context of Continual Learning methods. The TEACHING project had an active performance in many interesting events and webinars. In this regard, TEACHING participated in Silkroad 4.0 Istanbul to Tel Aviv 2022 Event, where TUG Graz circle's pre-event & post-event, which was led by our TEACHING's Pilot Manager and drew in the project's local external stakeholders focused on the future of the automotive industry. Moreover, TEACHING's Coordinator, UNIPI participated in the HiPEAC22 conference and presented a talk about TEACHING, "A Safe AI-as-a-Service Toolkit" in one of the 45 sessions (10th International Workshop on Mixed Critical Systems). Visibility of the project and transferability of the project outcomes has been promoted through the generation of [promotional material](#) (Project poster, 2nd version of project flyer & the project roll up banner) and by regular dissemination to the public through social media channels.

Although the outreach activities continue with weekly posts on social media platforms (LinkedIn and Twitter), ITML structured the 2nd stakeholder's questionnaire in order to help TEACHING consortium to set up project's business plan. The results will be collected and analyzed and will be available through our TEACHING website.

In result of the above actions, TEACHING will organizing the 1st Online Stakeholders Engagement Workshop on October for all the survey participants and more, in order to present the project offerings and sharing the TEACHING vision. We are wishing for a brainstorming workshop with fruitful and constructive discussions from all the participants!

Special Workshop
**Coming
Soon!**

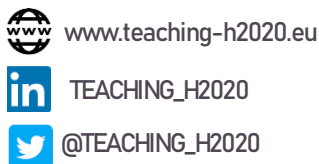
TEACHING Consortium



Key Facts

Project Coordinator: Dr. Davide Bacciu
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Start: 1-1-2020
Duration: 36 months
Participating organisations: 10
Number of countries: 5

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Fundings

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