



# upscale

Upscaling **P**roduct development **S**imulation **C**apabilities exploiting **A**rtificial inte**L**ligence for  
Electrified vehicles

## D7.4 REPORT WITH THE COMPILED REQUESTS FOR PUBLICATIONS

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## Project Details

<b>PROJECT TITLE</b>	Upscaling product development simulation capabilities exploiting artificial intelligence for electrified vehicles
<b>PROJECT ACRONYM</b>	UPSCALE
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<b>PROJECT DURATION</b>	42 Months

### The UPSCALE Project

The UPSCALE (Upscaling Product development Simulation Capabilities exploiting Artificial intelligence for Electrified vehicles) goal is demonstrating the feasibility of using AI enhanced CAE methods in EV development processes, such as vehicle aerodynamics, battery thermal modelling and crash simulation and leading the deployment of AI tools for other CAE applications.

UPSCALE is the first EU-project that has the specific goal to integrate artificial intelligence (AI) methods directly into traditional physics-based Computer Aided Engineering (CAE)-software and –methods. These CAE-tools are currently being used to develop road transportation not only in Europe but worldwide. The current focus of the project is to apply AI-methods to reduce the development time and increase the performance of electric vehicles (EVs) which are required by the automotive industry to reduce global emission levels. High performance computing (HPC) and CAE software and methods play a decisive role in vehicle development process. In order to make a significant impact on the development process, the two most HPC intensive CAE applications have been chosen as use cases for the project: vehicle aero/thermal and crash modelling. When considering total automotive HPC usage, approximately 20% is used for aero/thermal simulations and up to 50% of HPC resources are utilized for crash simulations. By improving the effectiveness of these two areas, great increases in efficiency will lead to a 20% of reduction of product development time. Other novel modelling approaches such as reduced order modelling will be coupled to the AI improved CAE software and methods to further reduce simulation time and ease the application of optimization tools needed to improve product quality. Through the combined effort of universities, research laboratories, European automotive OEMs, software companies and an AI-SME specialized in machine learning (ML), the UPSCALE project will provide a unique and effective environment to produce novel AI-based CAE-software solutions to improve European automotive competitiveness.

**The UPSCALE Consortium**

<b>PARTICIPANT N°</b>	<b>PARTICIPANT ORGANISATION NAME</b>	<b>COUNTRY</b>
<b>1 (Coordinator)</b>	IDIADA AUTOMOTIVE TECHNOLOGY SA (IDIADA),	Spain
<b>2</b>	VOLVO PERSONVAGNAR AB (Volvo Cars)	Sweden
<b>3</b>	VOLKSWAGEN AG (VW)	Germany
<b>4</b>	CENTRO RICERCHЕ FIAT SCPA (CRF)	Italy
<b>5</b>	ESI GROUP (ESI GROUP)	France
<b>6</b>	ENGYS LTD (ENGYS LTD)	United Kingdom
<b>7</b>	KOMPETENZZENTRUM - DAS VIRTUELLE FAHRZEUG,Forschungsgesellschaft mbH (VIF)	Austria
<b>8</b>	VRIJE UNIVERSITEIT BRUSSEL (VUB)	Belgium
<b>9</b>	ECOLE NATIONALE SUPERIEURE D'ARTS ET METIERS (ENSAM PARISTECH)	France
<b>10</b>	ALGORITHMICA TECHNOLOGIES GMBH (ALGORITHMICA)	Germany
<b>11</b>	FI INICIATIVAS I MAS D MAS I SLU (FI GROUP)	Spain

**Document Details**

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**ABSTRACT**

This deliverable is the summary of requests for publications and conferences produced so far.

### Revision History

The following table describes the main changes done in the document since it was created

REVISION	DATE	DESCRIPTION	AUTHOR (ORGANIZATION)
0	23/05/2022	Deliverable draft	Enric Aramburu (IDIADA)
1	26/05/2022	Deliverable update	Cristina Nappi (FI GROUP)
2	30/05/2022	Deliverable update	Enric Aramburu (IDIADA)
3	02/06/2022	Deliverable update	Albert R. De Liebana (IDIADA)

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## Acronyms and Abbreviations

AI	Artificial Intelligence
CAE	Computer Aided Engineering
CMS	Content Management System
D&C	Dissemination and Communication
EC	European Commission
EU	European Union
EV	Electric Vehicle
FPEDR	Final Plan for Exploitation and Dissemination of Results
GA	Grant Agreement
KPI	Key Performance Indicators
PEDR	Plan for Exploitation and Dissemination of Results
R&D	Research and Development
TV	Television
WP	Work Package

*Table 1 Acronyms and Abbreviation*

## 1 Executive Summary

Deliverable 7.4 “Report with the compiled requests for publications”, belongs to Task 7.3, and aims at compiling and reporting all the events, conferences, and publications where the UPSCALE results have been published so far.

The objective of WP7 is to maximize the impact of the European Commission (EC) funded project and to raise awareness among the different target audiences (refer to point 2.2.1) which include diverse groups such as European citizens, policy makers and the scientific community that may make use of this project as a starting point for new developments leading to a virtuous circle of R&D.

Task 7.1 is based on designing and producing materials and content to promote the project and its results among a wide range of target groups, using both digital and physical materials, conferences, workshops, papers and any other mean that may be considered relevant for the deliverable’s purpose.

These results may be found as well in D7.6.

This deliverable doesn’t deviate from the grant agreement in terms of content. The delivery is delayed in more than one month to try to include as much information as possible in the lists.

### 1.1 Document’s Scope.

The present document will list all the dissemination events, where the UPSCALE partners have presented the main project results.

### 1.2 Document’s main sections.

Following what has been aforesaid, the present document has been split into two sections:

**A. Events:** First section is gathering information regarding the events and conferences where the UPSCALE project has been presented.

**B. Publications:** second part includes all the articles, papers, posters, etc. published so far by the UPSCALE partners.

### 1.3 Related Documents

These results may be found as well in D7.6.

## 2 Requests for publications

### 2.1 Events & conferences

WP7 Dissemination & Communication - List of events, conferences, etc.					
Partner	Level	Type	Event	Title of event	Comments
Applus IDIADA	I	C		<a href="#">Automotive CAE Grand Challenge</a>	2019 - April, 16th - 17th, Hanau, Germany;
Engys Ltd	I	OT		<a href="#">ENGYS USER GROUP MEETING</a>	2019 - September, 16th - 18th London, UK; The ENGYS User Group Meeting brings together the global community of users of open-source CFD software tools HELYX and ELEMENTS.
Applus IDIADA	I	OT		<a href="#">GHOST and iModBatt workshop</a>	2019 - October, 18th, San Sebastian, Spain; Participation in poster session organized within sister projects workshop
Applus IDIADA	E	C		<a href="#">(EUCAR) Reception &amp; Conference</a>	2019 - November, 6th - 7th, Brussels, Belgium; Conference
Volkswagen AG	I	C		<a href="#">VDI SIMVEC Artificial Intelligence and Reduced Order Modelling in Computer Aided Engineering Methods (AI and ROM in CAE-Methods)</a>	2019 - November, 19th - 20th, Baden, Germany; Conference participation of IDIADA, CRF, ENSAM, ESI Group, ViF, ALGORITHMICA, ENGYS, VW, VOLVO, VUB
ESI Group	E	C		<a href="#">ESI FORUM</a>	2019 - November, 6th - 7th, Berlin, Germany; Conference
Applus IDIADA	E	OT		<a href="#">Machine Learning for Fluid Mechanics: Analysis, Modelling, Control and Closures, von Karman Lecture Series</a> <a href="#">Machine Learning for Fluid Mechanics</a>	2020 - February, 24th - 28th, Brussels, Belgium; Event Poster presentation
Engys Ltd	E	OW		<a href="#">Machine Learning for Accelerated Aero-Thermal Design in The Age of Electromobility</a>	2020 - March, 10th; On-line Webinar
ESI Group	E	OW		<a href="#">How Virtual Prototyping is Key to Certify EVs with an embedded battery</a>	2020 - June, 10th ; On-line Webinar
Applus IDIADA	I	PW		<a href="#">IEEE VPPC2020</a> <a href="#">Part of the workshop on Virtual product development and production of all types of electrified vehicles and components</a>	2020 - November, 20th; On-line Workshop
Applus IDIADA	E	C		<a href="#">H2020 RTR20 European Conference: as part of the Green Vehicles panel</a>	2020 - November & December, 30th - 1st; On-line Conference
ESI Group	I	C		<a href="#">WCCM-ECCOMAS 2020: participated in a mini-symposium with other EU project</a>	2021- January, 11th - 15th; On-line Congress
Applus IDIADA	I	OT		<a href="#">HiFiLED Symposium - 2nd High-Fidelity Industrial LES/DNS Symposium</a>	2021 - September, 22nd - 24th; On-line Event
ESI Group	I	C		<a href="#">CAE Grand Challenge 2021</a>	2021 - October, 19th - 20 th; Hybrid (on-line/ Hanau, Germany); Topic on



				Application in UPSCALE H2020 project of AI enhanced methods for the prediction of battery short circuit in crash scenarios during the Session CRASH: Material models for battery packs of EVs
ESI Group	I	C	<a href="#">NAFEMS World Congress</a>	2021 - October, 25th - 27th; Hybrid (on-line/ Salzburg, Austria) Presented Abstracts: Combining reduced-order modeling and machine learning for local-global simulation: short circuit prediction in electric vehicle crash simulation
Applus IDIADA	I	C	<a href="#">VDI Conference - Automotive CAE</a>	2021 - November, 9th - 10th; Hybrid (on-line/ Dusseldorf, Germany); Conference participation of IDIADA, CRF, ESI Group, ENGYS, VW, VOLVO
ESI Group	I	C	<a href="#">WCCM-APCOM 2022: participated in a mini-symposium with other EU project</a>	2022 - July -August, 31st - 5th, Yokohama, Japan; Congress; Participation of ESI Group and IDIADA

Table 2. List of events, conferences, etc.

## 2.2 Publications

WP7 Dissemination & Communication - Peer articles and conferences proceedings					
Partner	DOI	Type of Publication	Repository Link	Title	Authors
ESI Group	<a href="https://doi.org/10.4271/2020-01-0950">https://doi.org/10.4271/2020-01-0950</a>	Conference Proceedings	<a href="https://www.researchgate.net/publication/340643536_AI_Enhanced_Methods_for_Virtual_Prediction_of_Short_Circuit_in_Full_Vehicle_Crash_Scenarios">https://www.researchgate.net/publication/340643536_AI_Enhanced_Methods_for_Virtual_Prediction_of_Short_Circuit_in_Full_Vehicle_Crash_Scenarios</a>	AI Enhanced Methods for Virtual Prediction of Short Circuit in Full Vehicle Crash Scenarios	Alexandre Dumon, Michael Andres, Stefano Menegazzi, Christoph Breitfuss, Cristian Jimenez, Francisco Chinesta, Fatima Daim, Alain Tramecon
Applus IDIADA		Conference Proceedings	<a href="https://www.upscaleproject.eu/wp-content/uploads/2019/09/poster-upsacle5.jpg">https://www.upscaleproject.eu/wp-content/uploads/2019/09/poster-upsacle5.jpg</a>	Application of Physics Informed Machine Learning model for correcting RANS modeled Reynolds Stress Anisotropy	Bhanu Prakash, Charalampos Tsimis, Enric Aramburu
Applus IDIADA	<a href="https://doi.org/10.1109/VPPC5392.3.2021.9699125">10.1109/VPPC5392.3.2021.9699125</a>	Conference Proceedings	<a href="https://ieeexplore.ieee.org/xpl/conhome/9698824/proceeding">https://ieeexplore.ieee.org/xpl/conhome/9698824/proceeding</a>	Advanced Digitalization for Development of All Types of Electrified Vehicles and Components	Alain Bouscayrol; Valentin Ivanov; Reinhard Tatschl; Enric Aramburu
ESI Group		Conference Proceedings	<a href="https://www.esi-group.com/sites/default/files/resource/other/2437/ESI_Daim_NAFEMS_Abstract.pdf">https://www.esi-group.com/sites/default/files/resource/other/2437/ESI_Daim_NAFEMS_Abstract.pdf</a>	Combining reduced-order modeling and machine learning for local-global simulation: Short circuit prediction in electric vehicle crash simulation	Fatima Daïm , Nicolas Hascoët , Michael Andres, Christoph Breitfuss, Eleonora Cortelletti, Cristian Jimenez, Alexandre Dumon, Francisco Chinesta, Fouad El Khaldi
Applus IDIADA	10.1109/VPPC4960.1.2020.9330980	Workshop	<a href="https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&amp;arnumber=9330980">https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&amp;arnumber=9330980</a>	2020 IEEE Vehicle Power and Propulsion Conference (VPPC)	Alain Bouscayrol, Valentin Ivanov, Reinhard Tatschl and Enric Aramburu
VW	<a href="https://doi.org/10.48">https://doi.org/10.48</a>	Paper	<a href="https://arxiv.org/abs/2110.14396">https://arxiv.org/abs/2110.14396</a>	Multi-fidelity data fusion through parameter space reduction with	Francesco Romor, Marco Tezzele, Markus Mrosek, Carsten Othmer, Gianluigi Rozza

	<a href="https://arxiv.org/abs/2110.14396">550/arXiv.2110.14396</a>			applications to automotive engineering	
VW	<a href="https://doi.org/10.3390/fluids6080296">https://doi.org/10.3390/fluids6080296</a>	Paper	<a href="https://www.mdpi.com/2311-5521/6/8/296/html">https://www.mdpi.com/2311-5521/6/8/296/html</a>	Hybrid Neural Network Reduced Order Modelling for Turbulent Flows with Geometric Parameters	Matteo Zancanaro Markus Mrosek Giovanni Stabile, Carsten Othmer and Gianluigi Rozza

Table 3. Peer articles and conferences proceedings

WP7 Dissemination & Communication – Professional Publications				
Partner	Type of Publication	Repository Link	Title	Authors
F-Iniciativas	Professional Publication	<a href="https://into.ai/blog/company-news/upscale-ai-to-speed-up-the-electric-car-production/">https://into.ai/blog/company-news/upscale-ai-to-speed-up-the-electric-car-production/</a>	UPSCALE, AI to speed up the electric car production	Angela Bada
ESI Group	Professional Publication	<a href="https://www.engineering.com/DesignSoftware/DesignSoftwareArticles/ArticleID/20185/How-to-Make-Electric-Vehicles-Safer-and-Cheaper-Start-by-Analyzing-the-Battery.aspx?utm_source=relat-etips&amp;_hstc=212727627.e4610ae93dceff7f3ba6dadee36535e1.1589320366885.1589320366885.1589320366885.1&amp;_hssc=212727627.1.1589320366887&amp;_hsfp=2471010493">https://www.engineering.com/DesignSoftware/DesignSoftwareArticles/ArticleID/20185/How-to-Make-Electric-Vehicles-Safer-and-Cheaper-Start-by-Analyzing-the-Battery.aspx?utm_source=relat-etips&amp;_hstc=212727627.e4610ae93dceff7f3ba6dadee36535e1.1589320366885.1589320366885.1589320366885.1&amp;_hssc=212727627.1.1589320366887&amp;_hsfp=2471010493</a>	How to Make Electric Vehicles Safer and Cheaper? Start by Analyzing the Battery	

Table 4. Professional publications