Explainable, Safe, Contact-Aware Planning and Control for Heavy Machinery Manipulation and Navigation

D 8.1

Initial Dissemination and Communication Plan and Activities

Project Name	Explainable, Safe, Contact-Aware Planning and Control for Heavy Machinery Manipulation and Navigation
Project acronym	XSCave
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Call	HORIZON-CL4-2024-DIGITAL-EMERGING-01-03
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XSCAVE Consortium

Participant organization name	Short name	Country
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Tampere University	TAU	Finland
Aalto Korkeakoulusaatio	Aalto	Finland
Toshiba Europe Limited	TEU	United Kingdom
FZI Forschungszentrum Informatik	FZI	Germany
CESKE Vysoke Uceni Technicke v Praze	CTU	Czech Republic
KOMATSU Forest AB	KM	Sweden
ALGORYX Simulation	ALRYX	Sweden
Umea University	UMU	Sweden
Novatron OY	NVTR	Finland
Clevon AS	CLV	Estonia

Abbreviations

AI - Artificial Intelligence
UTARTU – University of Tartu
XSCAVE - Explainable, Safe, Contact-Aware Planning and Control for Heavy Machinery Manipulation and Navigation

Target Audiences:

- Internal stakeholders (project team, partners)
- External stakeholders (policy makers, funders, media)
- End-users (community members, practitioners, clients)
- General public

Executive Summary

This document, "D8.1 Initial Dissemination and Communication Plan and Activities," outlines the strategy for publicizing the EU-funded **XSCAVE** project. The project aims to develop explainable, safe, and contact-aware AI for planning and control of heavy machinery in earth-moving, forestry, and logistics.

The core objective of the plan is to maximize the project's impact by raising awareness and sharing key findings with specific target audiences. The strategy is tailored to four distinct groups:

1. **The Academic and Research Community:** To be engaged through high-impact publications, conferences (e.g., ICRA, IROS), workshops, and open-access sharing of code and data.
2. **The European Robotics Industry:** To be reached via industry events, direct engagement, and technology demonstrations to foster business interest and exploitation.
3. **Policymakers:** To be informed through targeted publications and high-level forums to contribute to EU policy goals like the Green Deal and the AI Act.
4. **The General Public and Students:** To be engaged through popular science media, public outreach events, and educational activities to ensure societal acceptance and inspire future scientists.

Key communication channels include a central project website (**xscave.eu**), a **LinkedIn** page, newsletters, and press releases.

In its initial phase, the project has already accomplished several key activities:

- Launched the official project website and established a brand identity (logo and visuals).
- Created a LinkedIn page for ongoing updates.
- Issued press releases and articles through partners like the University of Tartu, Novatron, Algoryx, and Umea University.
- Published several initial academic journal papers, conference publications, and pre-prints, demonstrating early research progress.

Future plans include creating a YouTube channel, organizing four major workshops, and participating in invited talks at key industries and academic events.

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1. Introduction

The overall aim of the XSCAVE project is to push AI based approaches, specifically those built on Deep Neural Networks towards real-world deplorability in safety-critical applications such as earth-moving, forestry and self-driving vehicle based urban logistics. *The core results of the project take the form of proprietary as well as open-source software libraries for perception, control and physics-based simulation of off-road vehicles, excavators, earthmovers, forestry-forwarder machines etc, along with technical reports and publications.* To maximize the impact, XSCAVE will undertake extensive dissemination and communication activities aimed at different target groups.

This document provides an overview of the dissemination and communication activities conducted within the first eight months of the project. Specifically, it presents information regarding publications, workshops, partner meetings and press releases conducted during this period. Furthermore, it also summarizes the project website and social media channels that are developed for the project. The current document is only an initial version of the plan and activity summary that will be refined as the project progresses.

1.1. Dissemination and Communication Activities

A detailed description of the dissemination plan is presented in XSCAVE's Description of Action (DoA). Thus, we summarize only the main points here.

1.2. Short Description of Dissemination & Communication Plan

Dissemination plan

The dissemination and communication activities will be led by UTARTU in collaboration with all the project partners. The impact of the XSCAVE project will be amplified through a comprehensive Dissemination and Communication (D&C) plan, designed to effectively engage key stakeholders and the wider public. Our strategy is built on tailored messaging and targeted outreach, ensuring that the project's innovations in AI, robotics, physics, and human-robot interaction are shared with the communities that can best utilize, critique, and build upon them. *The plan focuses on four key target audiences, supported by a robust set of communication tools and a clear framework for measuring success.*

Tailored Audience Engagement Strategy for Focused Dissemination

The core of our D&C strategy involves customizing our communication to meet the specific needs and interests of different groups.

The Academic and Research Community
This audience includes researchers in AI, robotics, physics, and Social Sciences and Humanities (SSH).

- **Aims and Messaging:** Our goal is to position XSCAVE's results as significant contributions to the state-of-the-art, transforming them into advanced courses and new R&I pathways. We will highlight the scientific rigor and novelty of our work in areas like differentiable simulation, structured priors, end-to-end learning, off-road navigation, and trustworthy AI.
- **Key Channels:**
    - **High-Impact Publications:** Peer-reviewed articles in prestigious journals such as *IEEE Robotics and Automation Letters (RAL)*, *Science Robotics*, and the *Journal of Terramechanics, Transactions on Robotics, International Journal of Robotics Research etc.*

    - **Leading Conferences:** Presentations and posters at top-tier academic conferences, including ICRA, IROS, CORL, CVPR, Neurips, etc.
    - **Collaborative Workshops:** Organizing four workshops jointly with industry and academia to disseminate results and foster exploitation, alongside online workshops with other closely related EU projects.
    - **Open Access and Data Sharing:** All relevant results, code (via GitHub under CC BY license), and data will be made available on the AI-on-demand platform (AI4Europe) to encourage verification and reuse.
- **Measures of Success:** At least 2 articles submitted in Nature/Science-level journals, 24 total open-access publications (4 per academic partner), and active participation in at least 2 conferences per partner annually.

The European Robotics Industry

This group includes manufacturers of heavy equipment (e.g., Komatsu), last-mile delivery providers (e.g., Indigotech (earlier Clevon (CV)), and high-tech companies.

- **Aims and Messaging:** We aim to generate direct business interest by demonstrating how XSCAVE's technologies provide tangible benefits, such as increased efficiency, improved operational consistency, and enhanced safety for complex robotic tasks. The message will focus on technology transfer and the potential for industrialization.
- **Key Channels:**
    - **Direct Industry Engagement:** In-person and online workshops, and direct face-to-face meetings with industry stakeholders.
    - **Relevant Industry Events:** Participation in major forums like the European Robotics Forums, EIT Manufacturing Summit, and sTARTUp Day (annual event in Tartu).
    - **Network Leveraging:** Utilizing EU-wide networks such as ADRA and euRobotics to reach a broad industrial audience.
    - **Accessible Tech Demonstrations:** Making all relevant project results available via the AI-on-demand platform (AI4Europe).
- **Measures of Success:** Securing direct meetings with industry, attendance at relevant fairs, publishing business/tech articles, and generating the XSCAVE market analysis (D7.4) and exploitation plan (D7.6).

Public Organizations and Policymakers

This audience comprises national, regional, and European bodies responsible for delivering strategies and policies related to technology and industry.

- **Aims and Messaging:** The objective is to contribute to EU policy goals, particularly those related to the Green Deal, digital sovereignty, and the European Approach to AI. We will showcase how XSCAVE's focus on robustness, safety, and reliability can inform future policy and regulation for AI-driven autonomous systems.
- **Key Channels:**
    - **Direct Policy Engagement:** Cooperation with policymakers through partners' established networks and direct face-to-face interactions.
    - **High-Level Forums:** Participation in relevant policy-focused workshops and summits.
    - **Targeted Publications:** Publishing opinion pieces, perspectives, and success stories in outlets read by policymakers.
- **Measures of Success:** Attendance at relevant fairs/events, published articles in policy-oriented journals, and active participation in workshops with the policy domain.

The General Public, Youth, and Students

This group is crucial for ensuring societal acceptance and inspiring the next generation of scientists and engineers.

- **Aims and Messaging:** We will present XSCAVE's research in an exciting and accessible manner, demonstrating its societal benefits (e.g., addressing labor shortages, reducing environmental damage) and its commitment to trustworthy, ethical AI. For youth and female students, the goal is to spark interest in scientific careers.
- **Key Channels:**
  - **Popular Science Media:** Articles in national and EU media (e.g., Euronews) and educational videos for social media.
  - **Public Outreach Events:** Involvement in European Researchers' Night and the International Day of Women and Girls in Science.
  - **Educational Engagement:** Hosting open days and guest lectures for students.
- **Measures of Success:** The number of popular science articles and media appearances, engagement with social media posts, and materials produced for public/student events.

	Main Target Groups			
Dissemination tools and channels	**Academic community**	**European robotics industry**	**National, regional and European public organizations**	**General public, youth and (female) students**
Website	✓	✓		✓
Publications	✓			
Open software & data	✓			
Project public deliverables	✓			
Training activities	✓	✓	✓	
Workshops	✓	✓	✓	✓
Participation in exhibitions	✓	✓	✓	✓

Table 1. Target groups

Communication plan

To support our audience-specific strategies, XSCAVE will implement a range of traditional and digital communication measures.

- **Project Website:** A central hub for all project information, activities, results, and educational materials. Its performance will be tracked via quarterly monitoring of page visits, bounce rate, and average visit duration.

- **Social Media:** Dedicated Twitter, LinkedIn, and YouTube accounts will promote project events and results. Success will be measured quarterly by post numbers, engagement metrics (likes, shares, comments), and follower growth.
- **Dedicated Mailing List:** An opt-in mailing list will be used to distribute three project newsletters to all interested parties, including those beyond the primary target audiences.
- **Media Appearances and Articles:** The consortium will leverage existing connections with journalists to secure appearances on TV, radio, and podcasts, as well as articles in newspapers, to explain the project's benefits to the public.
- **Press Releases:** At least three coordinated press releases will be issued to announce major project events, milestones, and research outcomes on a national and EU scale.

1.3. Dissemination and Communication Activities

The progress of XSCave relies not only on its implementation but also on how effectively its outcomes and insights are shared with key stakeholders, partners, and the broader community. Our dissemination and communication plan is designed to ensure that the project's objectives, success, and results are communicated clearly, timely, and with the right level of engagement throughout its duration

The first activities took place already please during the first month (M1), when the project had its first kick-off meeting. Heretofore, some of the branding for the project was already done by the start of the project in January (i.e Website).

Current document will include an action plan on how to implement the activities listed in T8.2:

1. The XSCAVE **website** will be created and maintained as a main channel to shed light on outcomes and events happening within the whole project lifecycle – done in M1.

2. **Social media content** development from the beginning of the project will reinforce the capacity of networking and visibility of the project during the whole period amongst the different stakeholders. Consequently, the websites of project partners and blogs, social media such as Facebook, LinkedIn, and Twitter will be used – LinkedIn page done in M3, Facebook page will not be created, Twitter is used by key partners.

3. At least 3 **newsletters** will be launched and disseminated in compliance with GDPR. When possible, newsletters will be distributed through the partners' networks – in progress.

4. The consortium partners will publish three **press releases** to announce the XSCAVE, to present the intermediary results and final outcomes – done by M3.

5. At least four **open-access publications** per academic partner will be published during the project's lifetime – in progress.

6. Four workshops jointly with industry and academia as part of larger AI and robotics conferences will be organized to disseminate XSCAVE results and prepare for the exploitation – in progress.

7. Knowledge exchange online **workshops** with previously funded projects at the intersection of AI and robotics and at least one online session per year jointly with the other funded HORIZON-CL4-2024-DIGITAL-EMERGING-01-03 projects. If relevant, the 4 workshops mentioned above will be also organized jointly together with other projects or networks, to increase synergies and achieve maximum outreach – in progress.

Details are provided in the sections below.

1.4. Project website

The website of the XSCave project (available at https://www.xscave.eu/), was created by UTARTU before the start of the project and is the main tool for the project's dissemination activities.

The website was officially delivered in M1, as part of Deliverable D8.2. It was modified during month four and will be upgraded during the project's lifetime.

It provides information about XSCave's core ideas and partners involved. It will have bullets about work structure, results, news, publications, videos etc. Also, there will be links to other social media platforms, such as LinkedIn and Youtube channels. The website is maintained and kept up to date by UTARTU, with contributions from partners.

Figure 1. The header of the website

The footer of the website, available at the bottom of every page, provides general information about funding, coordination, as well as privacy policy and contact information (Fig. 2).

Figure 2. XSCave website footer

The partners are listed already up also in the project webpage. The logo will be embedded and directly addressed to each of the partners' webpages. There will be a description of each partner's information and responsibilities for this project.

Figure 3. The partners/consortium page of the website

As mentioned before, the website is progressing. There will be different bulletins, such as:

- Work packages and deliverables
- Results
- News
- Publications
- Social media
- Videos
- Events
- Contact information

1.5. Social media

XScave has been active in the most popular dissemination channels, namely LinkedIn, where UTARTU has created a project account since the third month of the project.

UTARTU is responsible for continuous and active social media content updates, while the other partners are supportive through the provision of information related to dissemination activities. Furthermore, XSCave partners that maintain social media accounts support the project's dissemination by releasing XSCave-related content in their corporate accounts.

The response of the audience until today could be considered low, as shown by the number of followers of LinkedIn account but as time passes and there will be great results, this number will rise.

LinkedIn

For further dissemination of the project activities and results, a LinkedIn group has been created under the name "XSCave" and is available at https://www.linkedin.com/showcase/xscave/ (Fig. 4).

The idea behind creating this page is the existence of an online team, whose members exchange ideas about the project and Deep Learning in general, thus maintaining their interest in the project. Anyone can become a group member, either by sending a "Request to join" or by receiving an invitation from another group member. The group has currently 41 members.

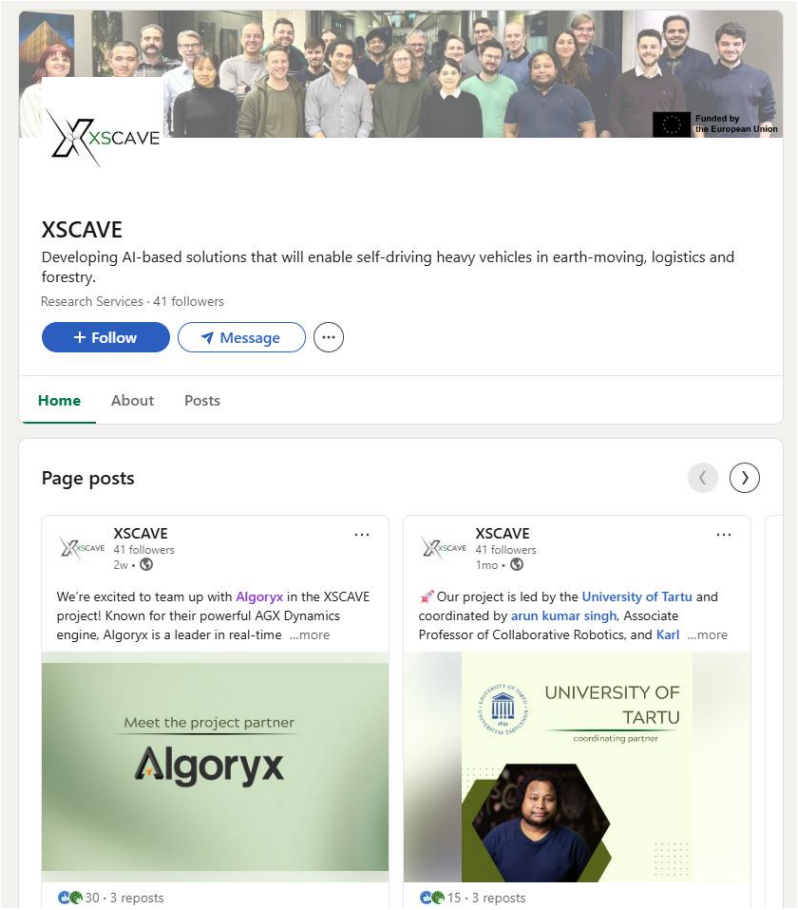

Figure 4. XSCave LinkedIn Group

Youtube channel

A Youtube channel for this project will be created in the future, since there will be different types of videos about various terrain vehicles, simulations, experiments, test drives etc. done by partners.

Partners social media activity

Apart from the activity in the official project channels mentioned above, XSCave partners are also actively publicizing the project as well as related events and achievements in the future.

For example, partner **UTARTU** has done different posts, for example:

- Kick-off meeting post on UT Institute of Tecnology Instagram (Figure 5) and Facebook post (Figure 6)

Figure 5. University of Tartu Institute of Technology Instagram post (https://www.instagram.com/p/DFUvgHvsjrh/?utm_source=ig_web_copy_link)

Figure 6. University of Tartu Institute of Technology Facebook post (https://www.instagram.com/p/DFUvgHvsjrh/?utm_source=ig_web_copy_link)

- Project introduction on LinkedIn (Figure 7)

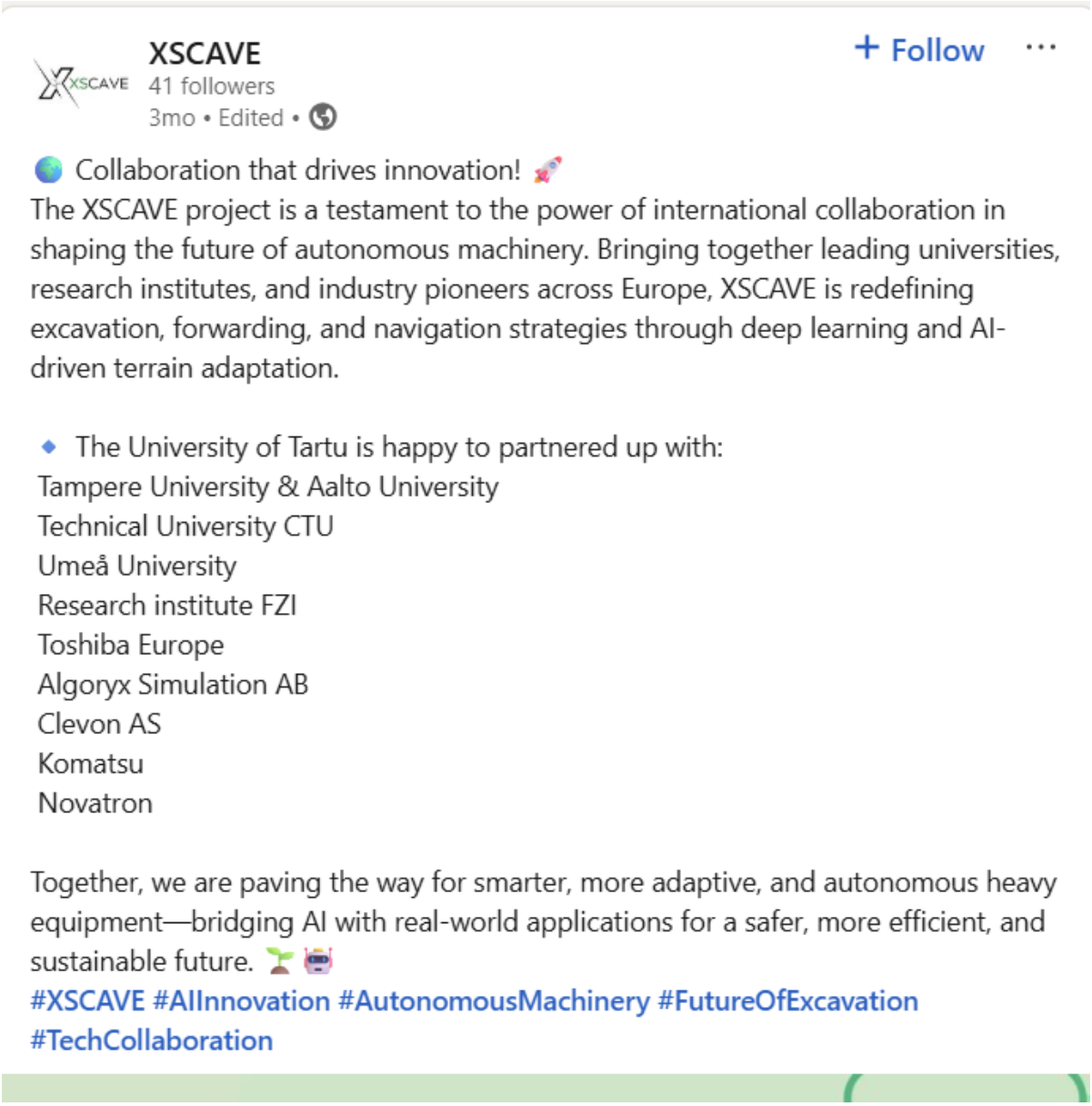

Figure 7. University of Tartu LinkedIn post (https://www.linkedin.com/feed/update/urn:li:activity:7308789856602656769/)

- Different posts about the project, partners etc. on LinkedIn (Figure 8)
  - Project introduction: why does it matter? (https://www.linkedin.com/feed/update/urn:li:activity:7314974577481203714)
  - Project meeting highlights (https://www.linkedin.com/feed/update/urn:li:activity:7318243400518926337)
  - Challenges in terrain adaption (https://www.linkedin.com/feed/update/urn:li:activity:7325113589705461761)
  - University of Tartu introduction (https://www.linkedin.com/feed/update/urn:li:activity:7330532105069789185)

- Algoryx introduction (https://www.linkedin.com/feed/update/urn:li:activity:7337822449088004096)

27.01.2025	Kickoff Meeting recap	UT Institute of Technology Instagram	https://www.instagram.com/p/DFUvgHvsjrh/
27.01.2026	Kickoff Meeting recap	UT Institute of Technology Facebook	https://www.facebook.com/unitartutech/post
12.03.2025	Kickoff Meeting recap	XSCAVE LinkedIN	https://www.linkedin.com/feed/update/urn:li:
21.03.2025	Project introduction	XSCAVE LinkedIN	https://www.linkedin.com/feed/update/urn:li:
07.04.2025	Project introduction: why does it matter?	XSCAVE LinkedIN	https://www.linkedin.com/feed/update/urn:li:
16.04.2025	Progress meeting highlights	XSCAVE LinkedIN	https://www.linkedin.com/feed/update/urn:li:
05.05.2025	Challenges in terrain adaption	XSCAVE LinkedIN	https://www.linkedin.com/feed/update/urn:li:
20.05.2025	University of Tartu introduction	XSCAVE LinkedIN	https://www.linkedin.com/feed/update/urn:li:
09.06.2025	Algoryx introduction	XSCAVE LinkedIN	https://www.linkedin.com/feed/update/urn:li:

Figure 8. UTARTU posts on Linkedin

Project partner **Algoryx** posted a newsletter at the beginning of the project to their website, where they mention a collaboration with various machine enterprises but also with academic experts to demonstrate autonomous control of different vehicles. The newsletter can be found here https://www.algoryx.se/robots-with-a-sense-for-physics-xscave-and-heavy-machine-autonomy/ (Figure 9)

Figure 9. Newsletter on Algoryx website

Project partner **Novatron** posted project launch news before the start of the project to their website, announcing a big collaboration with different partners leading to the development of AI-based machine

control solutions (https://novatron.fi/en/novatron-starts-to-develop-ai-based-machine-control-solutions-in-the-eu-funded-xscave-project-led-by-the-university-of-tartu/). (Figure 10)

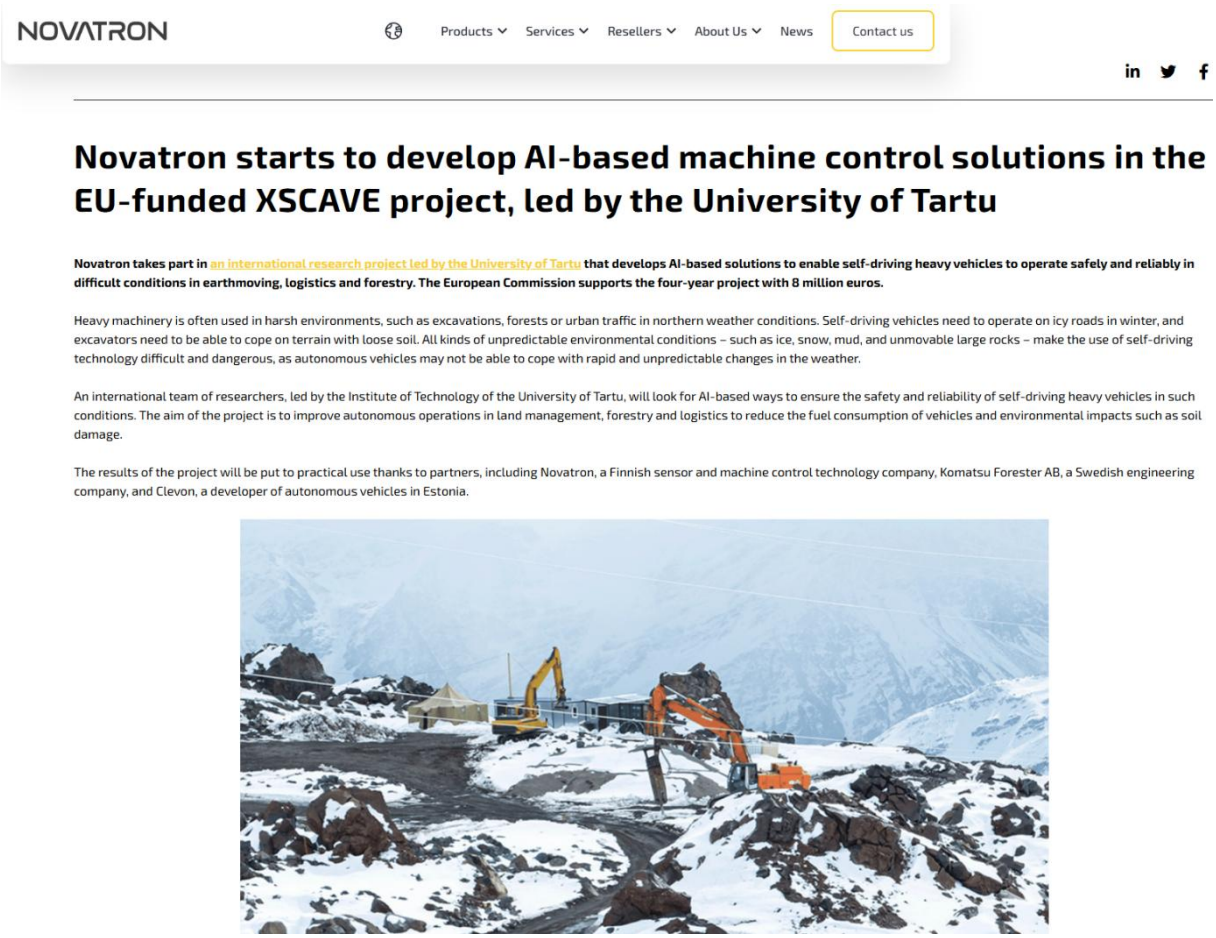

Figure 10. News on Novatron website

Umea University, who is an academic partner in this project, has also released two articles concerning this project. The first was done last year, before the project started, announcing the collaboration with ten different partners, where computational science meets AI technology. This article can be found here: https://www.umu.se/en/news/computational-physics-to-make-ai-controlled-heavy-machinery-safer_11997014 (Figure 11).
Umea University also posted a project overview on their page, introducing what this project is about, the research area and who is responsible for this project in their university. This can be found here: https://www.umu.se/en/research/projects/explainable-safe-contact-aware-planning-and-control-for-heavy-machinery-manipulation-and-navigation-xscave (Figure 12)

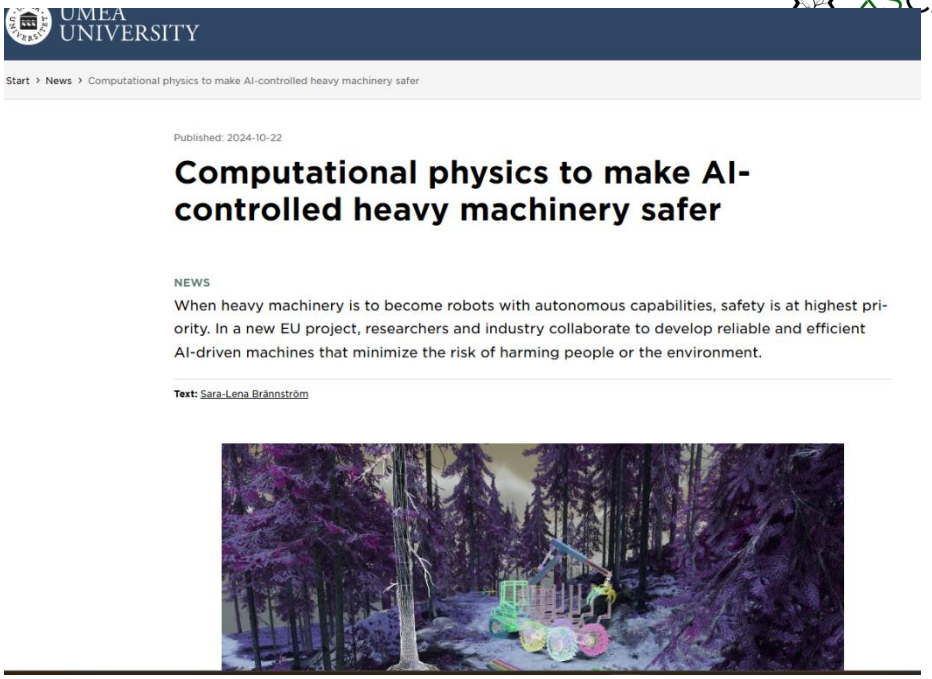

Figure 11. Umea University post on their website

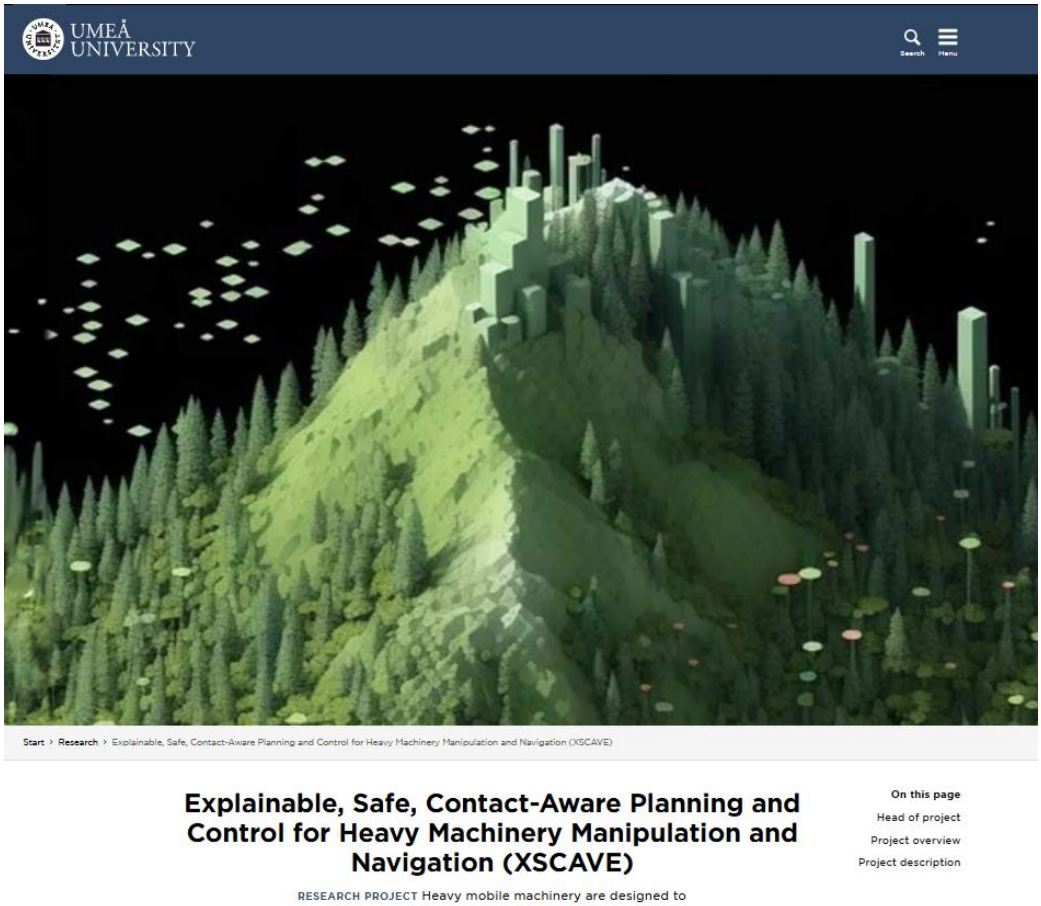

Figure 12. Umea University project indroduction post

2. Dissemination materials

For the first six months of the project, UTARTU has created some dissemination materials. There will be additional materials created during the rest of the project.

2.1. Project logo

XSCave logo is the centerpiece of the project visual creation and identity, which is used in project documents, travel documents, reporting documents, website, press releases, and social media. The logo was created as a part of deliverable 8.2 - branding.

2.2. Project visuals and branding

For the first six months of the project, UTARTU has created a logo and also a branding theme. For documents, XSCave will be using a template, with united colors (Figure 13).

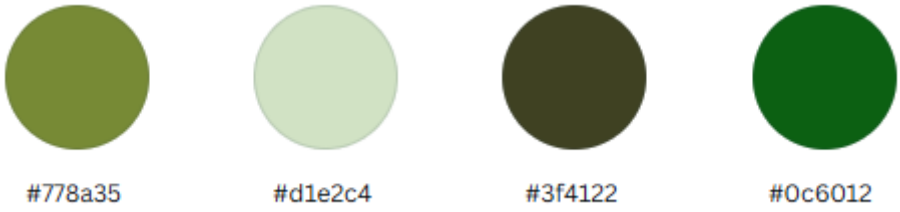

Figure 13. Branding colors for XSCave

The social media posts are done in a similar manner also, using similar outlining (Figure 14). Also, there will be a layout for the newsletter as well in the future.

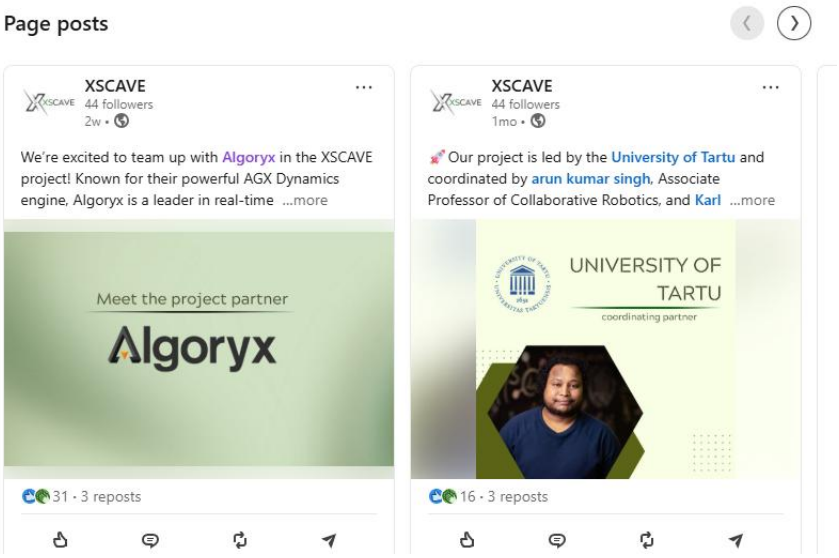

Figure 14. Branding visuals for XSCave

2.3. **Press releases**

University of Tartu made a press release in the beginning of the project to University of Tartu's main website (https://tuit.ut.ee/en/content/university-tartu-launches-initiative-improve-safety-autonomous-heavy-machinery) (Figure 15). Also, a press release was sent out to a website called "Trade with Estonia" (https://tradewithestonia.com/the-eu-supports-clevon-and-tartu-university-ai-project-with-e8-million/) (Figure 16)

Figure 15. Press release on UT website

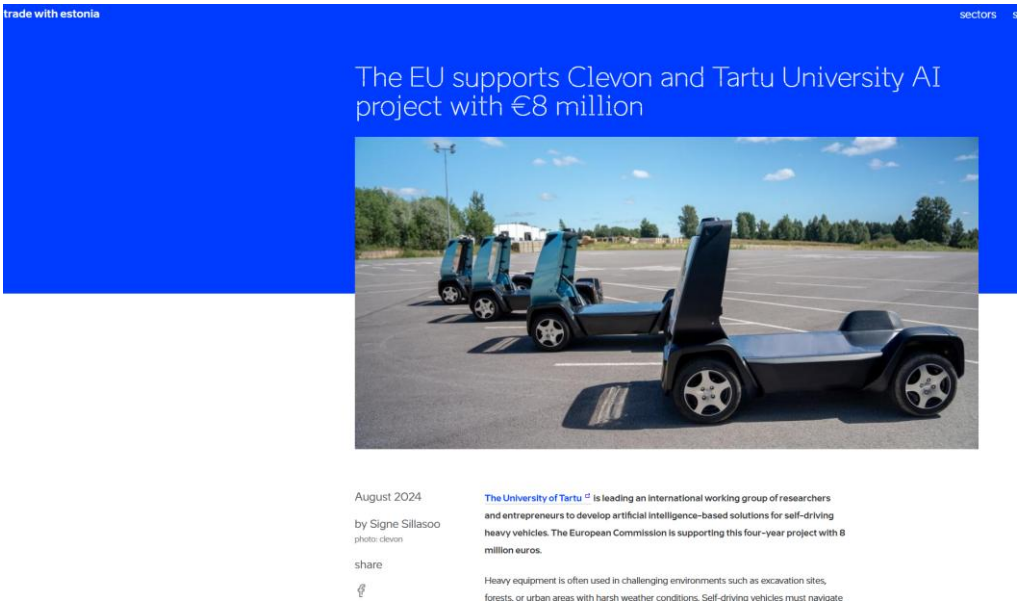

Figure 15. Press release on "Trade with Estonia" website

3. Publications

3.1. Journal Papers

The following journal paper was published by UTARTU in IEEE Robotics and Automation Letters.

Sharma B, Singh AK. Trajectory Optimization Under Stochastic Dynamics Leveraging Maximum Mean Discrepancy. IEEE Robotics and Automation Letters. 2025 Apr 29.

This paper is aligned with WP5 Task5.2. It proposes MPC based integrated planning and control for stochastic dynamics. The work will serve as the algorithmic foundation for all the use-cases considered in XSCAVE. For example, consider wheeled vehicles navigation on slippery roads. Due to unknow friction, the dynamics most appropriately represented as a stochastic system. Similarly, representation is also necessary for vehicles moving on uneven terrain. Furthermore, when learning dynamics purely from data, the stochastic representation allows us to capture the aleatoric and epistemic uncertainties of the learned model.

The approach presented in this journal paper can provide a risk-aware planning approach for any stochastic dynamics. The paper presented the use-case of urban driving of logistic vehicles. But in the future works, it will be extended to consider the use-cases as well.

3.2. Conference Publications

The following paper by TAU was accepted in IEEE Conference on Decision and Control which is the most prestigious conference in the control systems field.

Toulkani NE, Ghabcheloo R. Minimally Conservative Controlled-Invariant Set Synthesis Using Control Barrier Certificates. arXiv preprint arXiv:2411.07640. 2024 Nov 12.

Pre-print version (https://arxiv.org/pdf/2411.07640v4)

This paper is aligned with Task 4.3 which deals with automatically constructing control barrier functions (CBF)-based safety filter for dynamical systems. The core objective was to automatically construct constraint sets that enforce safety without being overly conservative. The developed CBF safety can also be used along with any neural planning and control policy to obtain flexibility of both data-driven along with control theoretical safety guarantees.

The following dataset paper was published by partners KM and UM.

Lundbäck M, Häggström C, Nyström M, Grönlund A, Fälldin A, Wallin E, and Servin M. FORWARD: Dataset of a forwarder operating in rough terrain. The 57th International Symposium on Forest Mechanization (FORMEC), Joensuu, Finland, June 9–13 (2025).

The paper presented a high-resolution multimodal dataset of a cut-to-length forwarder operating in rough terrain on two harvest sites in the middle part of Sweden. The dataset is intended for developing models and algorithms for trafficability, perception, and autonomous control of forest machines using artificial intelligence, simulation, and experiments on physical testbeds. In part we focus on forwarders traversing terrain, avoiding obstacles, and loading or unloading logs, with consideration for efficiency, safety, and environmental impact. Since this is a dataset paper, it will feed into almost all the WPs and tasks within XSCAVE, especially, T3.3, T 3.3 and T7.1.

The following paper was published by partner UM and ALRYX

Ahlman B, Berglund T, Lundbäck M, Marklund H, Nordin P, Persson P, Rydman J, Wiberg V, and Servin M. Constraint-based terramechanics simulation for realtime and faster simulation. ISTVS 2025, 55th Conference of the International Society for Terrain-Vehicle Systems in Lebanon, New Hampshire, USA, Oct. 6-9 (2025).

The paper deals with simulation of tracked and wheeled robots on uneven terrain considering the soil terrachmechanics. The results of the paper will serve as the foundation for many WPs and Tasks, especially T3.1, T4.2 and the excavation use-case of WP6.

The following paper was published by partner CTU

[CTU-CP-IROS-2025] Valentýn Číhala, Martin Pecka, Tomáš Svoboda, and Karel Zimmermann, Manual, Semi or Fully Autonomous Flipper Control? A Framework for Fair Comparison, in ***Proceedings of the IEEE International Conference on Robotics and Automation****, 2025.*

The result of the paper is aligned with Task 4.2, which deals with developing safe imitation and reinforcement learning algorithms considering machine terrain interaction. The paper evaluates several existing baselines for uneven terrain navigation tasks with a tracked machine. It also proposes a new SOTA policy with differentiable physics priorities for safe navigation.

3.3. Arxiv Pre-Prints and Under-Review Papers

In addition to published or accepeted papers, the results are also documented in several pre-prints uploaded to Arxiv and other open-access repositories and are currently under review in different journals and conferences.

The following pre-print is from partner CTU

End-to-End Differentiable Neural-Symbolic Layer for Trajectory Prediction, arXiv:2502.10156, 2025. Under review at ***The International Journal of Robotics Research (IJRR)****.*
https://arxiv.org/pdf/2502.10156

This paper presents one of the seminal results of XSCAVE and validates one of the foundational hypotheses that inclusion of different structured priors derived from physics, optimization and search improves the generalization and performance of end-to-end models. This paper integrates neural-odes into an end-to-end pipeline for predicting machine-terrain interaction and consequently traversability on uneven terrain. The work in this manuscript will feed into specifically to Task 3.4 but will act as a building block for all the other WPs and Tasks.

The following pre-print is from partner TAU

Heravi, M., Molaei, A., & Ghabcheloo, R. (2025). *Physics-informed data-driven modeling of rock motion dynamics in excavation using a high-fidelity simulator*. Manuscript submitted for publication to Simulation Modelling Practice and Theory (https://papers.ssrn.com/sol3/papers.cfm?abstract_id=5240192).

The paper deals with modeling machine-terrain interaction during excavation. The work aims to learn predictive dynamics of rocks, under forces applied from the excavator. To this end, the authors use the high-fidelity simulator provided by ALRYX and distill it into a neural network model. The results are mostly aligned with tasks T3.1 and T3.4 but it will act as the foundation for all the other WPs as well.

For example, the neural architecture and training methodology can be extended for other use-cases as well.

The following pre-print is from partner UM

[Marklund 2025] Marklund H, Larson MG, and Servin M. Joint parameter and state estimation for regularized time-discrete multibody dynamics. arxiv:2502.06599 (2025).

This work presents a framework for estimating dynamics parameters for high-fidelity simulation of machines on uneven terrains. The work is aligned with Task 2.5 which aims at minimizing the sim2real gap for effective transfer of simulation trained policies and dynamics models to real-world. The manuscript shows that learning only a few sets of parameters from the real data is enough to produce high-fidelity simulation in a computationally tractable manner.

4. Invited Talks

The consortium members are actively promoting the project's activities in several invited talks presented in conferences and workshops that align with the topic of the project. The following are some of the activities planned for the near future.

Invited Talk of Martin Servin from UM in IROS 2025 Workshop on Perception and Navigation of Autonomous Heavy Machines in Shared Environments (https://autonomous-heavy-vehicles.github.io/autonomous-heavy-vehicles/)

Martin Servin from UM will give a invited talk on physics-aware 3D scene understanding for planning and control. The topic is perfectly aligned with the aims and objectives of XSCAVE and some of the preliminary results of the project will be presented during the talk.

5. Organization of Workshops

- A workshop of autonomous navigation on challenging terrains is currently being planned for ICRA 2026. The workshop will cover simulation, planning and control for different kinds of vehicles on off-road conditions. The workshop is organized by members of CTU and UTARTU.
- A seminar is being planned for the end of this year or early 2026 between other projects funded within the same call (HORIZON-CL4-2024-DIGITAL-EMERGING-01-03) to initiate close collaboration, foster dissemination and evaluate possibility of leveraging results between different consortiums. To this end, preliminary discussion has been conducted with the project coordinator of PIPEON.