



Dissemination and Outreach Plan

Project Number: 101066739

Project Acronym: DTADD

Project Title: Digital Twin Anomaly Detection Decision-Making for Bridge Management

Experienced Researcher: Dr. Alejandro Jiménez Ríos

Main Supervisor: Prof. Vagelis Plevris

Secondment Supervisor: Prof. Maria Nogal

OSLOMET



Funded by
the European Union

 **TU Delft**

Table of Contents

Table of Contents	I
List of tables	II
List of figures	III
1 Policy Context	1
2 Exploitation and Dissemination Plan.....	1
2.1 Expected impact.....	1
2.2 Results usefulness	2
3 Potential End-Users and Stakeholders	3
4 Outputs	4
5 Open Access Implementation and Data Management.....	4
6 Barriers for Results Application	5
7 Further Steps for Application in Actual Practice	5
References.....	7
Annex A	8

List of tables

Table 1. DTADD continuous communication tools.....	3
Table 2. DTADD fellowship outputs.	4
Table 4. History of changes.	8

List of figures

No table of figures entries found.

1 Policy Context

According to the Horizon Europe Work Programme 2021-2022¹:

The European Union needs a strong, resilient, flexible, and creative human resource base, with the right combination of skills to match the future needs of the labour market, to innovate and to convert knowledge and ideas into products and services for economic and social benefit. The Covid-19 crisis has highlighted once more the importance of the Union's reliance on a highly skilled research-based human capital that is able to detect and tackle upcoming challenges, to communicate scientific evidence to policymakers and the public at large, and to work across disciplines.

In this context, the Union must reinforce its efforts to encourage more young women and men to make a career in research, promote its attractiveness for top talents from around the world, retain its own researchers and reintegrate those working elsewhere.

The DTADD project will allow the experienced researcher (ER) to establish a solid foundation for future interdisciplinary research across the fields of structural and bridge engineering, artificial intelligence, asset management and cultural heritage conservation. Therefore, his employability and academic profile will be enhanced, in accordance with the objectives described by the Horizon Europe Work Programme 2021-2022, thus allowing him to pursue a career in research and academia.

2 Exploitation and Dissemination Plan

2.1 Expected impact

The expected impact areas of the DTADD fellowship are artificial intelligence and assets management. These areas of expertise have been identified by the European Union (EU) in the Strategic Transport Research and Innovation Agenda² (STRIA) package as priority areas of the agenda for research and innovation in transport. Structural and bridge engineering, as well as cultural heritage conservation are other research areas where this fellowship will have an impact too.

The expected scientific impact of the DTADD fellowship will be reflected in the creation of high-quality new knowledge in the disciplines of bridge and structural engineering, artificial intelligence, reliability analysis, and asset management and cultural heritage conservation through the publication of peer-reviewed scientific publications, the creation of databases and the development of state-of-the-art digital twin bridge models. Furthermore, through the participation of the ER on research, academic, dissemination and communication activities envisaged during the fellowship, his professional profile and employability will be greatly enhanced, contributing to the strengthening of human capital in research and innovation in accordance with Horizon Europe Work Programme 2021-2022 objectives.

This fellowship will also lead to enhanced cooperation and knowledge transfer between researchers from the main hosting institution and the secondment organisation. Through the mobility associated with the fellowship, the ER will expand his research network and will boost

¹https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/wp-call/2021-2022/wp-4-health_horizon-2021-2022_en.pdf

² https://research-and-innovation.ec.europa.eu/research-area/transport/stria_en

the research and innovation capacity, and output of participating organisations. Finally, as all the outputs of the project will be made publicly available, it would lead to an impact on the increment of the diffusion of knowledge and open-source philosophy among the ER and the hosting institutions.

The expected economic/technological impact of the DTADD fellowship addresses EU policy priorities and global challenges through research and innovation. In particular, the research and innovation objectives (R&IO) of the DTADD fellowship are aligned with the Transport action of the European Green Deal³ as well as with the United Nations Sustainable Development Goals (SDG)⁴, particularly with SDG 9: Industry, Innovation, and Infrastructure, and with SDG 11: Sustainable cities and communities. More specifically, this interdisciplinary fellowship will aim at influencing the inclusion of cultural heritage aspects in the development of a more holistic research approach at both participating research groups.

The EU has recognised the economic and social benefits of cultural heritage and the need to preserve it if sustainability is to be achieved and has pledged to work towards its preservation by adopting the Rome Declaration⁵. Therefore, if cultural heritage is adopted in the development of future research projects among the hosting institution and the participating organization, their research and innovation output, and capacity would be increased. The knowledge developed during this fellowship will help address the pressing issue of the old and poorly maintained existing European bridge infrastructure. As part of the delivering benefits and impact through research and innovation, the proposed deliverables will help improve the decision-making process of the maintenance and operation of bridges in Europe, thus increasing their lifetime, durability, resilience, and sustainability.

Regarding the expected societal impact, this fellowship will contribute to the knowledge-based economy and society through the strengthening of human capital base in research and innovation (as the ER will become a better trained researcher), implement better communication of research and innovation results to society (through the dissemination activities of the fellowship discussed in this plan), involve end users in co-design and co-creation processes, and increase Europe's attractiveness as a leading destination for research and innovation. Finally, the awareness increases towards cultural heritage assets and their societal value promoted during the fellowship will result in a better cultural heritage conservation culture among bridge management and operation practitioners.

2.2 Results usefulness

This interdisciplinary project will go beyond the state of the art by improving bridge damage detection with the application of a high-performance anomaly detection algorithms to the post-processing of the data collected from bridge monitoring. The DTADD is a very ambitious, yet achievable project since for the first time, an automatic algorithm will be implemented with the cultural heritage value of bridges explicitly in mind. The selected anomaly detection algorithm will be fine-tuned to provide an acceptable number of false positives to ensure the adequate and timely detection of damages in cultural heritage bridges, thus preventing their irreplaceable loss.

Furthermore, a specialised open-source decision-making plug-in with a reliability-based bridge management approach that explicitly considers the cultural heritage of bridges will be developed. This plug-in could be directly integrated within any of the currently implemented

³ https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal/transport-and-green-deal_en

⁴ <https://sdgs.un.org/goals>

⁵ <https://www.ecco-eu.org/tag/rome-declaration/>

bridge maintenance systems in Europe, thus bringing the outcomes of this research directly to the reach of bridge management practitioners and stakeholders. This plug-in will foster the preventive conservation of existing bridges in Europe leading to an improved cultural heritage conservation and to more sustainable management and operation of bridge networks.

3 Potential End-Users and Stakeholders

The dissemination and exploitation activities of the DTADD fellowship will be focused on the following target audiences:

- Academic/scientific community.
- Bridge operation and management practitioners.
- The public at large.

The best way to address the academic/scientific community will be through the publication of journal papers and two-way exchanges in connection with presentation of the project advances/results during international conferences. All fellowship results (databases, papers, software, digital twin models) will be made open source as to foster their exploitation by the academic/scientific community.

Relevant knowledge actors (the DTADD end-users Statens Vegvesen⁶, the Norwegian Public Roads Administration, and Rijkswaterstaat⁷, the Dutch Ministry of Infrastructure and Water Management) will be involved in the research project at an early stage during a co-design workshop to discuss the benefits and the challenges of the R&IO of the fellowship, at an intermediate stage during a second co-creation workshop to participate in the developing of an adequate and effective implementation of the proposed tools and finally, at the end of the project during a co-assessment activities workshop in order to test the implemented tool and provide feedback with regards to further improvement steps of the DTADD developed tools.

The public at large will be engaged through participation in the European Researchers' Night Event⁸ and the Pint of Science Global Festival⁹. Furthermore, general communication of the fellowship progress and findings will be delivered through the creation and continuous updating of a project website and through regular posting on social media and specialised communication websites such as ResearchGate and LinkedIn. Access to this mass communication tools is presented in Table 1.

Table 1. DTADD continuous communication tools.

Communication tool	Link
Website	https://alejandroslomet.github.io/
OSF	https://osf.io/wfqrg/
ResearchGate	https://www.researchgate.net/project/Digital-Twin-Anomaly-Detection-Decision-Making-DTADD-for-Bridge-Management
LinkedIn	https://www.linkedin.com/company/msca-dtadd/
Facebook	https://www.facebook.com/MSCA.DTADD
Twitter	https://twitter.com/MSCA_DTADD
Instagram	https://www.instagram.com/msca_dtadd/
YouTube	https://www.youtube.com/@MSCA_DTADD

⁶ <https://www.vegvesen.no/>

⁷ <https://www.rijkswaterstaat.nl/>

⁸ <https://marie-sklodowska-curie-actions.ec.europa.eu/event/2022-european-researchers-night>

⁹ <https://pintofscience.com/>

4 Outputs

All dissemination, exploitation and communication activities of this fellowship will be based on relevant EU policies/guidelines. The details of these outputs are presented in Table 2.

Table 2. DTADD fellowship outputs.

Activity		Target Audience	When	Where	Metrics
Publication of databases	2	Scientific community	On completion of WP1	Online open access repository such as Zenodo	-# of downloads -# of citations
Publication of peer-reviewed journal papers	2	Scientific community	After 12 and 24 months	Open access peer-reviewed journals	-Journal Impact Factor and Quartile -# of citations
Publication of peer-reviewed conference papers	2	Scientific community/ bridge management and operation practitioners	After 12 and 24 months	Presenting scientific dissemination papers at the IABSE and IABMAS annual conferences	-# of participants -# direct conference feedback and participants engagement
Publication of DTs and software		Scientific community/ bridge management and operation practitioners	On completion of WP2	Online open access repository such as GitHub	-# of downloads -# of citations
Workshops		Bridge management and operation practitioners	3rd, 9th, and 15th months	OsloMet facilities	-# of participants -# of stakeholders that decide to implement the tools
Fellowship website and communication websites		Public at large	Continuously	Online	# of website visits -# likes/shares/views
European Researchers' Night Event and Pint of Science Global Festival		Public at large	Once a year when the events take place	At the event's venues	-# of participants

This plan will be revised during project implementation and may include dissemination and exploitation activities even after the fellowship has ended.

5 Open Access Implementation and Data Management

The DTADD fellowship fully complies with the mandatory open science practices and would apply as often as possible the recommended practices, established in the Horizon Europe Programme Guide¹⁰ and in Article 17 of the Model Grant Agreement¹¹. The fellowship outputs will be early and openly shared by pre-registering at an early stage of the project a detailed description of the hypothesis, study design and planned analysis at the OSF website¹² and by sharing the preprints of all scientific publications generated at the Preprints platform¹³.

¹⁰https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/guidance/programme-guide_horizon_en.pdf

¹¹https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/common/guidance/aga_en.pdf

¹² <https://osf.io/>

¹³ <https://www.preprints.org/>

The immediate open access to the scientific publications produced will be guaranteed by selecting relevant journals compatible with Horizon Europe open access policies (such as The Baltic Journal of Road and Bridge Engineering¹⁴ and Engineering Structures and Technologies¹⁵) and by using CC BY¹⁶ right of reuse. Alternatively, if a particular article does not fit into the scope of any relevant open access journal, it will be published at the Open Research Europe¹⁷ website under an open peer-review scheme. Moreover, digital access will be granted, and persistent identifiers will be generated, to all software and digital twin models developed as they will be hosted at GitHub and databases created will be published and shared at Zenodo. Finally, the final fellowship report will contain complementary information about the research outputs/tools needed to validate the conclusions of scientific publications created during the fellowship.

6 Barriers for Results Application

Risks of both research and administrative nature may arise during the DTADD fellowship. The mechanisms in place to assess and mitigate risks will consist in fortnightly meetings and formal progress reviews every six months where progress and potential risks will be assessed and addressed by the ER and both supervisors. The hosting faculty at OsloMet will manage the administration of the award, including support of all aspects of contract compliance, financial claim, and audit. A dedicated budget account will be established with monthly reporting. All project-related expense claims will be authorised by the supervisor in accordance with good auditing practice to ensure best-value purchasing principles and manage the risk of overspending. Monthly financial reports will be available to the supervisor and ER.

Collaboration conflicts are unlikely to arise because an internal review process at OsloMet was used to select best matches among interested candidates and because the ER has already worked together with both supervisors. Expectations and practical concerns have been discussed between all project members and with members of OsloMet EU team via Skype, email, and during an online workshop. Should any issues arise, OsloMet has a conflict resolution system in place to solve them.

7 Further Steps for Application in Actual Practice

No further steps for application have been considered at this stage of the fellowship. This point could be amended in future revisions of this plan. Other tools that could be used to communicate the activities of the fellowship include those official EU communication channels such as:

- CORDIS: [CORDIS | European Commission \(europa.eu\)](https://cordis.europa.eu/)
- Research and innovation success stories: [Success stories | Research and Innovation \(europa.eu\)](https://cordis.europa.eu/success-stories/)
- Horizon Magazine: [Horizon Magazine | Research and Innovation \(europa.eu\)](https://cordis.europa.eu/horizon-magazine/)

¹⁴ <https://bjrbe-journals.rtu.lv/>

¹⁵

<https://www.tandfonline.com/journals/tesn20#:~:text=Engineering%20Structures%20and%20Technologies%20is,order%20to%20improve%20sustainable%20building.>

¹⁶

<https://creativecommons.org/about/cclicenses/#:~:text=CC%20BY%3A%20This%20license%20allows,is%20given%20to%20the%20creator.>

¹⁷ <https://open-research-europe.ec.europa.eu/>

- Research and Innovation Days: [European Research and Innovation Days | Research and Innovation \(europa.eu\)](#)
- Horizon Results Platform TV: [Horizon Results Platform \(europa.eu\)](#)

References

Annex A

Table 3. History of changes.

Version	Publication date	Change
1.0	29/08/2023	Initial version.

*This project has received funding from the European Union's Horizon
2020 research and innovation programme under the Marie Skłodowska-
Curie grant agreement No 101066739.*