Proposal Evaluation Form

EUROPEAN COMMISSION

Horizon Europe Framework Programme (HORIZON)

Evaluation Summary Report - Postdoctoral Fellowships

Call:	HORIZON-MSCA-2021-PF-01
Type of action:	HORIZON-TMA-MSCA-PF-EF
Proposal number:	101064105
Proposal acronym:	CYDER
Duration (months):	24
Proposal title:	CYclic DErivations for Recursive operators
Activity:	EF-ENG

N.	Proposer name	Country	Total Cost	%	Grant Requested	%
1	UNIVERSITEIT VAN AMSTERDAM	NL	187,624.32	100.00%	187,624.32	100.00%
	Total:		187,624.32		187,624.32	

Abstract:
Modal fixpoint logics, which express recursive notions, find several fundamental applications in computer science. As a key example, in formal verification recursively defined notions are needed to reason about iterations of programs. A second prominent example comes from knowledge representation, where common knowledge of groups of agents is formalised through recursion. Much as in basic modal logics, the semantics of modal fixpoint logics can be enriched with additional properties, called frame conditions, to capture specific attitudes. Frame conditions give rise to rich and expressive families of modal fixpoint logics.

Proof theory is the discipline that studies proof systems, which are sets of axioms and rules used to check validity of a formula. Proof systems play a central role in the analysis of logical systems. Despite their wide range of applications, the proof theory of modal fixpoint logics is currently underdeveloped. More specifically, the proof theory of modal fixpoint logics with frame conditions is much less advanced than the proof theory of modal or intuitionistic logics.

The key objective of CYDER is to define proof systems for modal fixpoint logics with frame conditions, providing a general proof-theoretical framework for these logics. Towards this challenging aim, CYDER will define two new kinds of proof systems: labelled and nested cyclic proofs. CYDER proof-theoretical methodology is inspired by labelled and nested sequents, which capture modal logics with frame conditions, and cyclic proofs, which are a powerful formalism to treat recursion. The project will define cyclic proof systems for several systems of modal fixpoint logics: epistemic logics with common knowledge, the alternation-free modal mu-calculus with frame conditions, intuitionistic modal logics with recursive modalities and dynamic epistemic logics.

Evaluation Summary Report

Evaluation Result

Total score: 95.80% (Threshold: 70/100.00)

Criterion 1 - Excellence

Score: **4.70** (Threshold: 0/5.00 , Weight: 50.00%)

• Quality and pertinence of the project's research and innovation objectives (and the extent to which they are ambitious, and go beyond the state of the art).
• Soundness of the proposed methodology (including interdisciplinary approaches, consideration of the gender dimension and other diversity aspects if relevant for the research project, and the quality and appropriateness of open science practices).
• Quality of the supervision, training and of the two-way transfer of knowledge between the researcher and the host
• Quality and appropriateness of the researcher's professional experience, competences and skills.

Strengths:
- The state of the art is well presented, and the proposal's position in the field is well explained.
- The approach is very promising, and has the potential to go beyond the state of the art with respect to the theoretical study of modal fixpoint logics with frame conditions. Especially interesting is the suggestion of a modular definition of labelled and nested cyclic proofs for families of these logics.
- The research objectives are pertinent and realistically achievable.
- The methodology is described in detail and suits the proposal's aims very well. It is very sound to consider first the study of mono-modal logics and frame conditions from the S5-cube, and simple non-indexed recursive modalities.
- Even though the areas have some overlap, the interdisciplinary aspects among mathematics, informatics, and philosophy are credibly described. The proof theoretic techniques will be concisely used to define analytic proof systems, and they will be well integrated with the study of recursion from a computer science point of view, and the use of philosophical theories for the agents' knowledge representation.
- The transfer of knowledge from the host to the researcher is very well explained.
- The described approach to open science is credible.
- The supervisor is very qualified for the proposed research, being a recognised expert in the field of modal logics, with well demonstrated success in mentoring PhD students and post-docs.
- The planned training activities are effective and will allow the researcher to develop transferable skills in areas such as mentoring, grant writing or management. The plan to attend diversity training initiatives are of special interest and well thought.
- The researcher's scientific achievement is excellent relative to the career length, and the researcher's profile is very well suited to the

proposal field.

Weakness:
- The transfer of knowledge from the researcher to the host is limited, since competences in structural proof theory are well represented in the host institution.

Criterion 2 - Impact

Score: **4.80** (Threshold: 0/5.00 , Weight: 30.00%)

• Credibility of the measures to enhance the career perspectives and employability of researchers and contribution to their skills development.
• Suitability and quality of the measures to maximise expected outcomes and impacts, as set out in the dissemination and exploitation plan, including communication activities.
• The magnitude and importance of the project's contribution to the expected scientific, societal and economic impacts.

Strengths
- The intended training is very well suited to enhance the researcher's career, including the qualification to obtain a tenured position at Dutch universities.
- As a consequence of the training courses and joint research with the supervisors, the researcher will acquire new skills in areas of knowledge related to proof-theory. The publication of the results will increase the visibility of the researcher in the proof-theoretical community. The proposed measures to enhance the researcher's expected skills development are credible.
- The proposal addresses very well dissemination and communication to the academic community, such as publications, seminars and introductory courses on cyclic proofs addressed to PhD and Master students. These measures guarantee very well the academic exploitation of the expected results.
- The measures to communicate the proposal's topic to high school students, teachers, and other general audiences are highly credible.
- The scale and the importance of the expected scientific impact as outlined in the proposal is very good and going beyond logic. With applications to other disciplines such as computer science, mathematics and philosophy, the results will allow the researcher a deeper understanding of cyclic proofs in these areas.
- The proposal has a good potential to go beyond the immediate scope and the duration of the proposal when applied to computer science such as in formal verification and knowledge representation.

Weakness
- The claims regarding the project's societal impact are not sufficiently demonstrated.

Criterion 3 - implementation

Score: **5.00** (Threshold: 0/5.00 , Weight: 20.00%)

• Quality and effectiveness of the work plan, assessment of risks and appropriateness of the effort assigned to work packages.
• Quality and capacity of the host institutions and participating organisations, including hosting arrangements.

Strengths:
- The work plan is well structured and consistent with the objectives of the proposal.
- The milestones and deliverables are credibly placed.
- The Gantt chart is consistent and complete with respect to the objectives.
- The effort assigned to the work packages regarding the different objectives is very appropriate.
- Scientific risks are well identified and well described, and suitable mitigation measures are very clearly defined.
- The host institution, awarded the highest score of research quality in its most recent institutional evaluation, is scientifically and optimally placed to host the researcher.
- Administrative and support services offered to the researcher are very good.
- The researcher's integration into the host team is very well documented, involving frequent interaction with renowned experts in the field.

Weaknesses:
No weakness identified

Scope of the application

Status: **Yes**

Comments (in case the proposal is out of scope)

Not provided

Exceptional funding

A third country participant/international organisation not listed in the General Annex to the Main Work Programme may exceptionally receive funding if their participation is essential for carrying out the project (for instance due to outstanding expertise, access to unique know-how, access to research infrastructure, access to particular geographical environments, possibility to involve key partners in emerging markets, access to data, etc.). (For more information, see the HE programme guide)

Please list the concerned applicants and requested grant amount and explain the reasons why.

Based on the information provided, the following participants should receive exceptional funding:

Not provided

Based on the information provided, the following participants should NOT receive exceptional funding:

Not provided

Use of human embryonic stem cells (hESC)

Status: **No**

If YES, please state whether the use of hESC is, or is not, in your opinion, necessary to achieve the scientific objectives of the proposal and the reasons why. Alternatively, please state if it cannot be assessed whether the use of hESC is necessary or not, because of a lack of information.

Not provided

Use of human embryos

Status: **No**

If YES, please explain how the human embryos will be used in the project.

Not provided

Activities excluded from funding

Status: **No**

If YES, please explain.

Not provided

Do no significant harm principle

Status: **Not applicable**

If Partially/No/Cannot be assessed please explain

Not provided

Exclusive focus on civil applications

Status: **Yes**

If NO, please explain.

Not provided

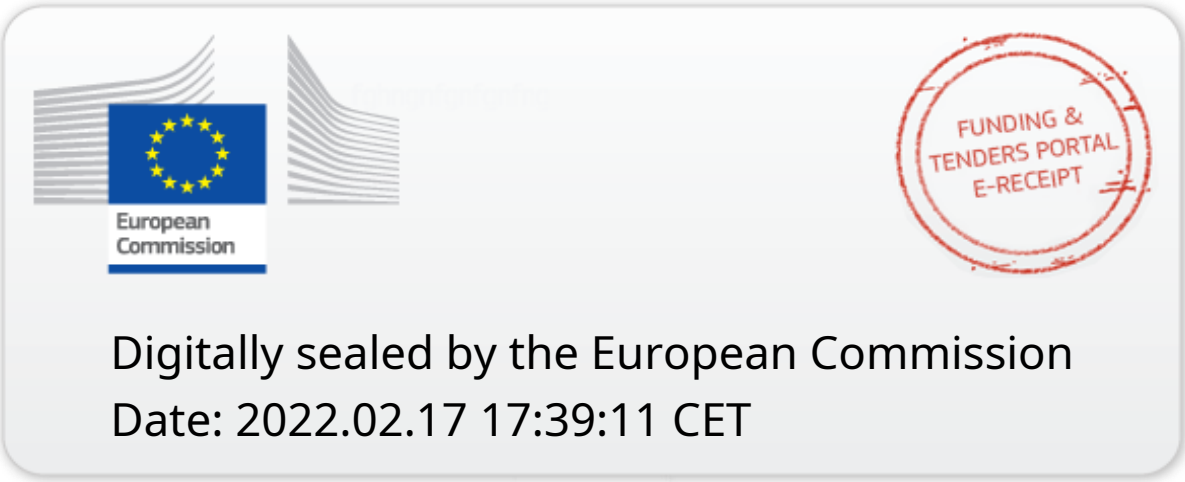
Artificial Intelligence

Status: **No**

If YES, the technical robustness of the proposed system must be evaluated under the appropriate criterion.

Overall comments

Not provided



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