MINISTRY OF EDUCATION, RESEARCH, DEVELOPMENT AND YOUTH OF THE SLOVAK REPUBLIC

VER 2026

Periodic Assessment of Research, Development, Artistic and Other Creative Activities VER 2026

Final Report of the Computer and Information Sciences Sub-panel

In this season (2025-2026) 15 projects, 364 project outputs, 18 social impacts, and 15 creative environments in Computer and Information Sciences (CS/CIS) discipline were evaluated by 6 sub-panel members and 1 sub-panel chair. The strengths, weaknesses, opportunities, and recommendations are summarized next. In addition, a summary of the quality level characteristics that are considered important when assessing the outputs in the following categories are summarized at the end.

1st STRENGTHS:

Strengths of projects offered for this evaluation period are summarized next:

1) Obviously important areas are considered such as Natural Language Processing (NLP), with specific, state of the art models developed for the Slovak language, Computer Vision and Graphics, with applications to Heritage documentation, Health informatics, and AI for Health, Data Science with economic applications, Strong collaboration in astrophysics and large physics data processing, Telecommunications and networking, Theoretical computer science (Graph theory).
2) There exist many applications showing solid experimental work with clearly described methods, carefully tested results, and well-applied machine learning competence.
3) Several projects show clear practical relevance, especially in finance, education, language technologies, and infrastructure systems and several applications demonstrate strong real-world relevance.

4) In some cases, there is clear evidence of deployment beyond the academic setting, including collaboration with industry, public institutions, or regulatory bodies.
5) Applied outcomes are not only described in general terms but are supported by concrete examples, usage metrics, or institutional partnerships in several cases.
6) Extensive use of real-world, massive datasets for validation, a high percentage of research addresses immediate industrial bottlenecks, such as legacy equipment interoperability and "brownfield" factory digital transformation, successful bridging of discrete structural logic with probabilistic assessment and machine learning.
7) Many connections with local industries and deep competencies in selected areas of ICT.
8) International collaborations, including participation in European initiatives, strengthen visibility and sustainability.

2nd WEAKNESSES

Weaknesses of projects offered for this evaluation period are provided next:

1) There is a large amount of research of low caliber in computer science education, without ambition to contribute to knowledge in the European/global context. CS Education research is very important, and in a period of flux due to the advent of AI. These areas should be strengthened.
2) Extensive activity persists in traditional symbolic AI and expert systems - this seems to no longer be accepted as state of the art with exceptions. Consider whether activity in those systems is deliberate and well-motivated, or because of inertia.
3) Strong links to Electrical Engineering research in CS persist. It may be worth reconsidering the categorization of some of this research.
4) A large share of the work is incremental. Many papers apply existing methods or compare standard techniques rather than introduce new concepts or algorithms.

5) Some research is strongly context-bound, based on small or local datasets, with limited international visibility.
6) There are relatively few examples of public datasets or tools that could serve as reference points for the wider research community.
7) The overall portfolio leans heavily toward applied analytics. Stronger theoretical or foundational contributions would improve balance.
8) A significant number of studies significantly cross the border of traditional and applied Computer Science topics into Engineering and Materials Science topics to the point where the area of research is not recognizable as CS.
9) Some evaluations rely on limited data sources, such as using only teacher interviews to assess student learning.
10) There were a few outputs labeled as interdisciplinary that were clearly not. It should be clarified that, to be interdisciplinary with computer science, it is not enough that some Python/Matlab scripting is used.
11) There is also a structural risk that strong industrial integration may overshadow frontier academic leadership. To address this, it would be beneficial to create targeted initiatives that explicitly support foundational research, thereby promoting greater theoretical depth and conceptual ambition. Without such deliberate measures, the research ecosystem may remain internationally recognized but not internationally leading.

3rd OPPORTUNITIES

Opportunities of projects offered for this evaluation period are given next:

1) Localized needs for new-gen AI systems are increasing everywhere, this is an area of opportunity that needs to be harnessed, and for a country with specific linguistic needs and strength in NLP and CV, an opportunity to participate in fundamental and applied

research, including in areas of Computer Supported Computer Work, AI Ethics, Critical AI, and others.

2) Build on existing technical competence and aim for more ambitious theoretical and foundational contributions, not only applications.
3) Focus effort on a few areas where international leadership could realistically be achieved.
4) Increase presence in highly selective international venues.
5) Strengthen long-term international embedding through competitive European projects, stronger doctoral training structures such as The Marie Skłodowska-Curie Actions (MSCA), part of Horizon Europe.

Reflections on qualitative indicators — particularly in terms of originality, significance, and rigor:

World Leading

Typical outputs in this category demonstrated breakthrough originality, introducing new theoretical frameworks, algorithms, or paradigms with clear potential to shape international research agendas. They were published in highly selective venues, exhibited methodological excellence, and showed strong evidence of international collaboration with top institutions. The work was generalizable beyond local contexts and often set benchmarks for subsequent research. To qualify for this category, an output needed to combine conceptual innovation, technical depth, and demonstrable influence. Key differentiators included transformative theoretical contributions, large-scale validation, and clear evidence of shaping the field rather than following it. Both theoretical and experimental (computational ones included), rigor, highly original and comprehensive papers. They contribute novel theoretical frameworks and algorithms, with considerable potential to international society.

Internationally Excellent

Outputs in this category displayed high methodological quality and clear international relevance. They often extended existing frameworks in a meaningful way, proposed well-validated methodological refinements, or demonstrated sophisticated interdisciplinary integration. Publications were typically in respected international venues. The main differentiator from World Leading work was the level of originality and field-shaping impact. While rigorous and significant, these outputs generally advanced existing lines of inquiry rather than redefining them. Both theoretical and experimental (computational ones included), somehow rigor, somehow comprehensive papers. The principal difference from the World Leading one is relevant with quality of novelty and impact on relevant society.

Internationally Recognized

These outputs met high international quality standards and were technically sound. They frequently applied established methods competently, sometimes with moderate innovation or domain adaptation. International visibility was present but not necessarily at the highest level. The distinction from higher categories lay in the limited degree of conceptual novelty or broader theoretical contribution. Contributions were incremental but valid, and often context-specific. Any of theoretical or experimental (computational ones included), somehow rigor, somehow comprehensive papers. The principal difference from Internationally Excellent one is relevant with quality of contributions and presentation of methods.

Nationally Recognized

Work in this category demonstrated adequate technical competence and national relevance. Research questions were generally applied and locally grounded. The methodological design was acceptable but often lacked a strong theoretical framing or broad generalizability. Outputs typically had limited international dissemination and modest citation potential. Originality was present but narrow in scope. Any of theoretical or experimental (computational ones included), not fairly rigor and not comprehensive. The principal difference from Internationally Recognized one is relevant with too narrow contributions and limited international dissemination.

Below the Standard of Nationally Recognized Work

Outputs placed in this category showed insufficient methodological rigour, unclear research questions, weak theoretical grounding, or minimal contribution to new knowledge. Some were primarily descriptive, tool-based, or implementation reports that did not advance research. In other cases, the disciplinary relevance to computer science was not convincingly demonstrated. Not relevant with CS or just an abstract or very short papers.

Key Differentiators Across Levels

The primary differentiators across quality levels were:

- Degree of originality (incremental refinement vs conceptual innovation).
- Depth of theoretical contribution.
- Methodological sophistication and reproducibility.
- Strength and clarity of argumentation.
- Scale and robustness of empirical validation.
- Generalizability beyond local datasets or case studies.
- International collaboration and visibility.
- Demonstrable, evidenced impact within the evaluation period.

Overall, the highest-rated outputs combined rigorous research design, clear theoretical framing, strong empirical validation, and credible international positioning. Lower-rated outputs were typically limited by incremental scope, local orientation, weak theoretical anchoring, or insufficient methodological transparency.

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