Review id:197067

Confidential information!

Data of the Proposal

Proposal type and identifier:	K-146380	
Panel:	Mathematics and Computing Science	
Principal investigator:	Milán Mosonyi	
Title:	Mathematical problems in quantum information theory	
Duration:	48	months
Support (for the duration) (about 3 Euro/ kHUF):	32 870	thousand HUF
Research effort:	9,53	FTE in project

Scientometric rank in Hungary: D4

For scientometric details and for a link to MTMT database of publications, see **this page**

(Publication output was assessed by comparing the applicant's H-index, number of independent citations received in last complete year, and number of publications in the last five years to publication age-matched Hungarian researchers of the same scientific discipline. Data from MTMT; publications have 200% weight in the rank. For a complete description of the calculations, please refer to http://tudomanymetria.com.)

Review

1/A. Evaluation of the PI's scientific contributions in the last 5 active career years in the research field, considering the stage of his/her scientific career:

In the last five years, the PI has produced four papers in top journals (CMP and IEEE TIT, D1) and one paper in a high ranking journal (AHP, Q1). All the papers bring novel and outstanding quality results that are directly related to the project proposal. The number of papers is not so high, but quality and impact are more important.

Evaluation: ***Outstanding scientific contribution to the research field in the last 5 active career years, including quality and quantity of papers published as first/last/corresponding author. (10)***

1/B. Quality of the PI's professional achievements, competences, and skills:

The PI is a renowned expert in quantum information theory, with a number of outstanding publications having a strong impact to the field. He is the author of some of the fundamental results concerning asymptotic quantum hypothesis testing and quantum divergences. This is reflected in the high number of citations and h-index.

Evaluation: ***Internationally high achievements, competences and skills, strong publication profile and impact (considering the stage of scientific career), remarkable number of citations and/or registered patents. (9)***

1/C. Quality and appropriateness of the PI's scientific expertise in relation to the research proposal and the expected success of project implementation:

The PI is an internationally recognized expert in the field of the present research proposal. He is the author of some of the highly important results in the asymptotic quantum hypothesis testing (e.g. the error exponents) and quantum divergences, their properties and applications. The present proposal is based on recent papers of the PI and collaborators, extending the field in several highly promising directions. As far as I understand, these papers were the result of a previous project supervised by the PI. This shows that the expertise and experience of the PI is a guarantee of success of the present project. Profound new results and high quality publications are expected.

Evaluation: ***The PI is highly experienced and internationally acknowledged expert of the field of the research proposal, capable of coordinating and successfully implementing the proposed project. The project is expected to conclude with outstanding success. (10)***

2/A. Scientific importance of the project proposal:

The proposed project is focused on basic research in mathematically rigorous quantum information theory. This is one of the fast developing areas in recent years, with high potential of technological applications. However, the immediate impact of the present project is more on the theoretical level. The ambitious goals, if achieved, would have a profound influence in quantum information theory itself, since they are based on very recent works that seem to open quite new research directions. For example, the superexponential state discrimination or the new integral formula for the quantum relative entropy can be mentioned here. Furthermore, the proposed research has a potential impact also in other related fields of mathematics (e.g. operator theory, matrix means) or physics (quantum statistical physics, GPTs).

Evaluation: ***An original research concept with high scientific importance and very strong expected impact, even beyond the implementation of the project. (9)***

2/B. Quality and elaboration of the research plan:

The research objectives are very well described and the research plan is feasible. The aims are founded on previous profound works of the PI and senior group members, and on thorough analysis of the problems. Though some of the project objectives are quite ambitious, achieving a significant progress is well within the capability of the group and outstanding results can be expected.

Evaluation: ***The research objectives are well defined and are aimed at solving an outstanding scientific problem. The research plan is realistically feasible, the expected results are reproducible. The methods to be used are innovative, and the methodological challenges are clearly identified. (10)***

2/C. Quality and elaboration of the work plan:

The work plan is well designed and appropriate for the proposed research. The tasks in each of the three research directions are carefully assessed and distributed among the participants. The potential risks and challenging parts are pointed out. As in a strictly theoretical basic research, many of the outcomes and consequent changes in the research directions are quite unpredictable, so more detailed planning is not reasonable or necessary.

Evaluation: ***The work plan is efficient and elaborated in detail for each work phase, the planned tasks can be implemented within the given time and budget. Has an adequate risk management plan (if relevant). (9)***

2/D. Justification of the requested budget in terms of personal, material, and investment costs:

The requested budget is rather modest, planned mostly for small salary top-ups for students and young participants, travel costs and conference organization. This is fully justified for the proposed project.

3/A. Parallel research:

The senior group members are participating/leading several (6) other research projects. These projects are unrelated with the present proposal and some of them will end before the start of the proposed projects. As far as I understand, the present research group is funded mainly by a larger grant that will end before the start of the current proposal. A proposal for a similar grant is currently under evaluation, aimed mainly at the salaries for the members of the present research group.

3/B. Potential risks and ethical concerns:

There are no discernible risks or concerns, ethical or otherwise, connected with the project implementation.

3/C. Infrastructural and methodological conditions at the host institution:

The project is of theoretical nature and does not require any special resources or infrastructure. The Department of Analysis of BUTE is fully adequate for the proposed research.

Evaluation: ***The host institution has excellent equipment and resources in the given research field. (10)***

4/A. Credibility and consistency of the submitted research plan, work plan, budget plan, expected results, and time commitment:

The work plan is realistic and suitable for the present research project. Achievement of the project objectives within the planned time is realistic. The budget, planned mainly for dissemination of the project results through conferences and seminars and small renumerations for the participating students, is rather modest.

Evaluation: ***The research plan, the work plan and the budget plan are consistent with each other, the planned time commitment and requested support for the implementation of the project are realistic. (10)***

4/B. Give a list (maximum 5 items) of strengths of the proposal:

1. The competence of the PI, who is an internationally renowned expert in the area of the research project and an experienced leader of research groups.

2. The composition of the research group. The senior group members are experts in different fields: pure mathematics, operator theory, quantum information theory, matrix analysis, theoretical and mathematical

physics, which all have valuable contribution to the project. The three PhD students also seem promising.

3. Previous succesful projects of the group, which have produced profound results and show fruitful cooperation of the group members.

4. Well worked out research plan, based on novel and very promising results of the group members.
As in basic theoretical research, it may of course happen that some of the problems turn out to be too difficult or the solution does not work as expected, but the research plan is flexible enough and there is a wide range of alternative possibilities.

4/C. Give a list (maximum 5 items) of weaknesses of the proposal:

I do not see any real weakness of the project. The scientific part is very sound and promising and the research group works together very well. There are perhaps some questions that came to my mind reading the project:

1. Financial support. The research group is obviously not supported by the present project, a grant proposal that would provide such support is currently under evaluation. This can be seen as one of the dangers to the proposal.

2. Involvement of PhD students. There are currently three PhD students on the project, who will finish their PhD very soon. The project briefly mentions plans for new students, but no furher details are given.

Average score: 9.625

DECLARATION

I declare that I and the applicant have no conflict of interest other than what I will describe in the "Confidential remarks to the committee chair" section.

There is a conflict of interest with respect to the given proposal if the reviewer

- has an employment relation with the applicant;
- has an employment relation where he/she or the applicant is under direct supervision or control of the other; furthermore, he/she is a close colleague of the applicant in the same organizational unit (organizational units include a department of an institution of higher education, an organizational unit of a budgetary organization, a research group, or a supported research project; however, universities, their faculties, research institutes, museums, or other institutions are not included);
- is (was) a (co)advisor or student of the applicant in a procedure to obtain a scientific degree;
- works with the applicant on a common project or contributed to the preparation of the documents submitted in the given call for proposals;
- is a relative of the applicant according to Civil code 8:1. § (1) 2, or a close relative or spouse of the reviewer is an employer/employee of the applicant, or works with the applicant on a common project, or contributed to the preparation of the documents submitted in the given call for proposals;

- has a direct or indirect share of ownership in the organization involved in the proposal or is its member, executive, auditor, or a member of its supervisory board;
- is an executive in the company, foundation, association, ecclesiastical legal person involved in the proposal, or is a member or officer of the operative organization of a foundation or association, or a member of the operative or representative organization of the given ecclesiastical legal person involved in the proposal;
- is affected by other circumstances that interfere with the impartial evaluation of the proposal.

I accept that the proposal contains confidential professional information, it is an intellectual property of the applicant(s). It is forbidden to use the data in the proposal, to copy the proposal or a part of it, or to store it in any format – except for evaluation purposes.

I accept that I have to treat the proposal and my review confidentially and that the NKFI Office handles my data confidentially.

If you are a principal investigator or a participant researcher in a funded NKFI project and you would decide to decline to review the proposal for time constraints or other reasons, please consider that the system through which your funding has also been secured heavily relies on peer review to achieve the most efficient use of funding sources. 2023.06.28. 11:32:35