Award Application

1. Candidate:
Name: Treanță
Surname: Savin
Doctor in Mathematics: 2014
Academic position: Full Professor, Department of Applied Mathematics, National University of Science and Technology Bucharest, Bucharest, Romania
Institution: National University of Science and Technology Bucharest, Bucharest, Romania
Mobile telephone: .
Email address

2. Edition: "Gala Cercetării Românești"

3. Award and category for which you apply (individual or research team): Mathematics and Informatics, “Grigore Constantin Moisil” Award; Category: individual

4. Team leader, if applicable: not applicable

5. Composition of the research team, if applicable (names of team members, position held, year of last degree awarded): not applicable

6. A description of the most important scientific achievements of the last 5 years (maximum 4 pages, A4 format, Times New Roman characters, 12 points, 1.5 line spacing and 2 cm margins)
The most five important scientific achievements of the last 5 years are related to the following publications:


More precisely, in the paper [1] entitled *On well-posed isoperimetric-type constrained variational control problems*, published in the prestigious international *Journal of Differential Equations*, the author investigates well-posedness and well-posedness in the generalized sense for a new class of isoperimetric-type constrained variational control problems. For this purpose, in the first part of the paper, we introduce new versions for the concepts of monotonicity, pseudomonotonicity and hemicontinuity associated with the considered curvilinear integral functional. Thereafter, we define the approximating solution set of the considered class of isoperimetric-type constrained variational control problems. By using these completely new elements, we formulate and prove several characterization results on well-posedness and well-posedness in the generalized sense for the problem under study. Also, in order to highlight the theoretical results and tools derived in the paper, some illustrative examples are provided. Analyzing this paper, it can be concluded that the topic is so important that it deserves to be mentioned and presented in synthesis materials that aim to analyze some classic topics left unresolved for a long time. The isoperimetric-type constrained variational control problems are governed by the following basic tools: (a) the functional to be extremized, called the objective functional or the cost functional, depending on the control variable and the state variable, (b) the control variable, arising in the objective functional and isoperimetric constraints, so that any change in the control variable implies a change in the state variable, and (c) the state (in)equation (that is, the isoperimetric-type constraints) provides the dependence between the control variable and the state variable. The main goal is to find an admissible control variable (called optimal control) which generates a satisfactory state variable and which, together, extremize the objective functional. In most previous research papers, the study is conducted in classical finite dimensional spaces (such as Euclidean spaces, Hilbert spaces, or Banach spaces). The current paper has several fundamental merits. We mention the most important: (i) defining, by means of variational/functional derivatives, of the notions of monotonicity, pseudomonotonicity and hemicontinuity for the case of curvilinear integral functionals and (ii) providing a mathematical framework governed by infinite dimensional normed function spaces.
and curvilinear integral functionals. These are completely new elements in the field of well-posed optimization problems.

In the second above-mentioned paper [2], motivated and inspired by ongoing research works, and based on a class of constrained robust optimization problems, we introduce and investigate a new class of auxiliary (modified) control problems by using the robust saddle-point criteria. More specifically, by considering multiple integral cost functionals and mixed (equality and inequality) constraints involving second-order partial derivatives and data uncertainty, we introduce the associated concept of convexity and establish some characterization results for the two considered classes of control problems. In comparison with other research papers in this field, the novelty elements contained in the paper are represented by the presence of second-order partial derivatives and also by the presence of uncertain data both in the objective functional and in the restrictions. Moreover, the proofs associated with the main results of the paper are presented in an innovative way. Also, since the mathematics developed here is suitable for various scientific approaches and viewpoints on complex spatial and temporal behaviors, this work could be seen as the definitive work for a large community of researchers in science and engineering. The results of this paper encompass, as special cases, some programming problems considered in the recent literature.

In paper [3], published in a very famous journal *IEEE Transactions on Neural Networks and Learning Systems*, the author introduces interval-valued KT-pseudoinvex optimization problems governed by interval-valued path-independent curvilinear integral objective functionals. Concretely, it is proven that an interval-valued KT-pseudoinvex variational control problem is described such that every Kuhn-Tucker point is an LU-optimal solution. Also, the main results are highlighted by two illustrative applications describing the controlled behavior of an artificial neural system. The original results include: the concepts of invexity and pseudoinvexity associated with an interval-valued curvilinear integral functional, the notion of interval-valued KT-pseudoinvexity for a new class of optimization problems, establishing the equivalence between the class of interval-valued invex functionals and the class of interval-valued pseudoinvex functionals. These outlines are new in the related literature and the main motivation comes from the multidimensional optimization problems arising in various fields, such as neural computation, artificial intelligence, genetic algorithms, fuzzy logic, or learning systems. The most important idea and the superiority of the proposed methods in this paper are to use an interval-valued
curvilinear integral functional. The interval-valued objective functional represents the mechanical work performed by an interval-valued variable force to move its point of application along a piecewise smooth curve joining two fixed points. Since the path-independent curvilinear integrals have physical meaning (mechanical work), the techniques presented in this paper may inspire the readers toward new directions of research and general interest to the applied physics community. Moreover, the present paper can be seen as a fundamental basis for some technical articles that deal with the theory, design, and applications of neural networks and related learning systems.

The interest in formulating the necessary and sufficient conditions so that a local extreme is a global extreme for a real-valued continuous function has been considered, with remarkable results, by several researchers. In [4], we establish a minimal criterion of efficiency for a class of multiobjective variational control problems. Thus, under only continuity hypotheses of the functionals involved in the considered class of variational control problems, some minimal conditions are formulated so that a local efficient solution to be a global efficient solution. These outlines are new in the related literature and the main motivation comes from the multidimensional optimization problems arising in various fields, such as artificial intelligence, genetic algorithms, fuzzy logic, or learning systems. Also, as is shown in the illustrative example, the impact of this paper on the design and/or analysis of algorithms for solving multidimensional multiobjective variational control problems is significant.

Variational inequalities have been introduced to model and study concrete problems in mechanics, physics, natural phenomena, engineering, or traffic analysis. In paper [5], by using some generalized convexity and differentiability (of Frechet type) hypotheses of the involved functionals, we establish several connections amongst the solutions of some new (weak) vector controlled variational-type inequalities and (weak, proper) efficient solutions associated with certain multi-objective controlled variational problems. Also, the notion of invex set with respect to some given functions has an important role for proving the main results derived in the paper. The illustrative application, given in the end of the paper, provides the physical motivation of the problem under study. The main novelty element in our mathematical framework is the presence of the control function and of multiple integrals as functionals in vector inequality and optimization problems.
The scientific visibility (impact on the state of the art of the results in the field), and quality of the above-mentioned research articles are determined by the increasing number of citations from the last time (according to WoS and Google Scholar).

7. Narrative curriculum vitae of the "individual" candidate or of each member of the research team, in the case of the "research team" candidate, showing the results of the research activity of the last 5 years, according to the quantitative indicators in Annex no. 2 to the regulation and qualitative assessment criteria provided in Annex no. 3 to the regulation.

_Curriculum Vitae – Savin Treanță_

**Personal Info:** Date and place of birth: 03 March 1986, Bechet, Dolj, Romania; Phone Number:

**Education:** 2021: Habilitation in Mathematics, National University of Science and Technology Politehnica Bucharest, Romania [4 Ph.D. students (from 2022), 4 Ph.D. students (from 2023)]

2010-2013: Ph.D. University Politehnica of Bucharest, Faculty of Applied Sciences, Romania

2009-2011: M.Sc. “Simion Stoilow” Institute of Mathematics of the Romanian Academy, Scoala Normala Superioara-Bucharest (SNS-B), Department of Mathematics, Romania

2008-2010: M.Sc. University of Bucharest, Faculty of Mathematics and Informatics, Romania

2005-2008: B.Sc. University of Bucharest, Faculty of Mathematics and Informatics, Romania

**Academic Experience:** 2023-present: Full Professor, Faculty of Applied Sciences, National University of Science and Technology Politehnica Bucharest

2020-2023: Associate Professor, Faculty of Applied Sciences, University Politehnica of Bucharest

2017-2020: Lecturer, Faculty of Applied Sciences, University Politehnica of Bucharest

2011-2017: Assistant Professor, Faculty of Applied Sciences, University Politehnica of Bucharest

2011-2012: BITDEFENDER fellowship - Junior Research Position (obtained by international competition), “Simion Stoilow” Institute of Mathematics of the Romanian Academy

**Research Fields:** Differential Equations, Calculus of Variations, Optimization and Control Theory, Variational and Nonlinear Analysis, Geometric PDEs, Convex Analysis

**Research Projects, Fellowships, Memberships:** see Section 9 of the present document.

**International/National Conferences:** - The Scientific Session of Young Researchers, AOSR TEAMS 2022-2023 competition (July 18, 2022; December 8, 2022; July 7, 2023; November 27, 2023)
- The 5-Day International Workshop on Optimization Techniques in Industrial and Engineering Applications, January 06-10, online, India, 2023 (invited speaker)
- The Third International Conference on Mathematical Techniques and Applications (cICMTA- 2022), March 23-25, online, India, 2022 (invited speaker)
- The Third Romanian Itinerant Seminar on Mathematical Analysis and its Applications, September 10-12, Alba Iulia, Romania, 2021
- The 13th International Conference on Multiple Objective Programming and Goal Programming, October 28-31, Marrakech, Morocco, 2019
- The 6th World Congress on Global Optimization, July 8-10, Metz, France, 2019
- The I Conference on Minimax Inequalities and Equilibrium Problems, May 6-7, Granada, Spain, 2019
- The 7th Workshop for Young Researchers in Mathematics (WYRM), May 17 - 20, Bucharest, Romania, 2017
- The 5th Workshop for Young Researchers in Mathematics (WYRM), May 21 - 24, Constanta, Romania, 2015
- Real and Complex Differential Geometry, September 8 - 12, Bucharest, Romania, 2014
- The 8th International Conference of Differential Geometry and Dynamical Systems, (DGDS - 2014), September 1 - 4, Mangalia, Romania, 2014
- The 7th International Conference of Differential Geometry and Dynamical Systems, (DGDS - 2013), October 10 - 13, Bucharest, Romania, 2013
- The 17th International Conference on Systems, Control, Signal Processing and Informatics (SCSI’13), July 16 - 19, Rhodes, Greece, 2013
- The 15th International Conference on Automatic Control, Modelling & Simulation (ACMOS’13), June 1 - 3, Brasov, Romania, 2013
- The 6th International Conference of Differential Geometry and Dynamical Systems, (DGDS - 2012), August 29 - September 2, Mangalia, Romania, 2012
- The 5th International Conference of Differential Geometry and Dynamical Systems, (DGDS - 2011), October 6 - 9, Bucharest, Romania, 2011


Guest Editor for the following Special Issues: “Advances in Partial Differential Equations: Theory and Applications” in the AIMS Mathematics journal (ISSN: 2473-6988); “Variational Problems and Applications - Volumes I, II” in the Mathematics journal (ISSN: 2227-7390); “Advances in Optimization and Nonlinear Analysis - Volumes I, II” in the Fractal and Fractional journal (ISSN: 2504-3110); “Symmetry in Mathematical Analysis and Functional Analysis - Volumes I, II, III” in the Symmetry journal (ISSN: 2073-8994); “Calculus of Variations and Nonlinear Partial Differential Equations” in the Axioms journal (ISSN: 2075-1680); “New Developments in Analysis of Variational Inequalities and Related Fields” in the Axioms journal (ISSN: 2075-1680).

Author (or co-author) of 3 (three) specialized books in international publishing houses (Springer, Cambridge Scholars Publishing, LAP Lambert Academic Publishing):

3) A. Jayswal, Preeti, S. Treanţă, Multi-dimensional Control Problems: Robust Approach; Series ISSN: 2364-6837; Series E-ISSN: 2364-6845; Springer Singapore, 2022.


Author (or co-author) of 8 (eight) book chapters published in edited books published by Springer, World Scientific, Chapman and Hall/CRC, and Cambridge Scholars Publishing:


**Total number of citations, according to Web of Science Core Collection:** 1055

**Hirsch index, according to Web of Science Core Collection:** 17

**Total number of citations, according to Google Scholar:** 1110

**The Google Scholar profile:** https://scholar.google.ro/citations?user=RjZrdA8AAAAJ&hl=en

**131 visible WoS articles (at the time of writing this document).**

**Expert examiner on the panel for several PhD theses from abroad (India, Pakistan).**

**Rewarding of scientific results - CNCS/UEFISCDI (2014, 2017-present) for publication of articles in prestigious international journals.**

**December 2023 - Rewarding of scientific results for the special quality of the results obtained within the research project “Well-posedness, existence and characterization results of solutions for certain variational problems”, Academy of Romanian Scientists, “AOSR-TEAMS” 2022-2023 https://www.aosr.ro/competitia-aosr-teams-2022-2023/**

**2023 - Participation in the training program Internal Managerial Control System, 6-8 June 2023.**

**2023 - Member of The International Society of Global Optimization.**

**Expert evaluator within the Call “Equipping pre-university education units and related units with furniture, teaching materials and digital equipment”, PNRR, 2023.**

**Expert evaluator within the Call “Scheme of Grants for the Digitization of Universities”, financed by the National Plan for Recovery and Resilience (PNRR), Iunie 2022.**
"Red" articles according to AIS (see JCR2022 – 28 June 2023), published in the last 5 years (2019-2023):


2) S. Treanţă, LU-optimality conditions in optimization problems with mechanical work objective functionals, IEEE Transactions on Neural Networks and Learning Systems, Vol. 33, No. 9, pp. 4971-4978, 2022; DOI: 10.1109/TNNLS.2021.3066196; WOS: 000733293400001; ISSN: 2162-237X.


"Yellow" articles according to AIS (see JCR2022 – 28 June 2023), published in the last 5 years (2019-2023):


2) S. Treanţă, On a global efficiency criterion in multiobjective variational control problems with path-independent curvilinear integral cost functionals, Annals of Operations Research, Vol. 311,


Highly cited papers published in the last 5 years (2019-2023), according to Web of Science: 9 articles, as follows:


8) M.B. Khan, S. Treanță, M.S. Soliman, K. Nonlaopon, H.G. Zaini, Some Hadamard-Fejér type Inequalities for LR-Convex Interval-Valued Functions, Fractal and Fractional, Vol. 6, No. 1, 6, 2022; DOI: 10.3390/fractalfract6010006; WOS: 000747879100001; ISSN: 2504-3110. [31 citations]

**Articles published in the last 5 years, with Relative Influence Score greater than or equal to 0.5**

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<td>1</td>
<td>S. Tremain, <em>Noether-type first integrals associated with autonomous second-order Lagrangians</em>, Symmetry, 11(9), 1088, 2019; WOS: 000489177900024, ISSN: 2073-8994.</td>
<td>Yes</td>
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<td>S. Tremain, <em>On locally and globally optimal solutions in scalar variational control problems</em>, Mathematics, 7, 9, 829, 2019; WOS: 000487953700058, ISSN: 2227-7390.</td>
<td>Yes</td>
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<td>S. Tremain, <em>On weak sharp solutions in (∪rho, b, d)-variational inequalities</em>, Journal of Inequalities and Applications, 2020, 1, 54, 2020; WOS: 000519076700002, ISSN: 1029-242X.</td>
<td>Yes</td>
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<td>6</td>
<td>S. Tremain, Şt. Mititelu, <em>Efficiency for variational control problems on Riemann manifolds with geodesic quasiinvex curvilinear integral functionals</em>, Revista de la Real Academia de Ciencias Exactas Fisicas y Naturales Seric A-Mateomaticas, 114(3), 113, 2020; WOS: 000529292100002, ISSN: 1578-7303.</td>
<td>Yes</td>
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<td>Efficiency in generalised V-KT-pseudoinverse control problems</td>
<td>International Journal of Control</td>
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<td>On Modified Interval-Valued Variational Control Problems with First-Order PDE Constraints</td>
<td>Symmetry</td>
<td>12(3)</td>
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<td>Saddle-point optimality criteria in modified variational control problems with PDE constraints</td>
<td>Optimal Control, Applications and Methods</td>
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<td>On the kernel of a polynomial of scalar derivations</td>
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<td>Constrained variational problems governed by second-order Lagrangians</td>
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<td>A necessary and sufficient condition of optimality for a class of multidimensional control problems</td>
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<td>17</td>
<td>S. Treanță, <em>Some results on ((\rho, b, d,)</em>)-variational inequalities*, Journal of Mathematical Inequalities, 14, 3, 805-818, 2020; WOS: 0005714917000013, ISSN: 1846-579X.</td>
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<td>S. Treanță, <em>On a class of differential variational inequalities in infinite-dimensional spaces</em>, Mathematics, 9, 3, 266, 2021; WOS: 000615394500001, eISSN: 2227-7390.</td>
<td>Yes</td>
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<td>S. Treanță, <em>Duality theorems for ((\rho, \psi, d,)</em>)-quasidiniex multiobjective optimization problems with interval-valued components*, Mathematics, 9, 8, 894, 2021; WOS: 0006445227900001, eISSN: 2227-7390.</td>
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<td>S. Treanță, <em>On a dual pair of multiobjective interval-valued variational control problems</em>, Mathematics, 9, 8, 893, 2021; WOS: 000644514500001, eISSN: 2227-7390.</td>
<td>Yes</td>
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<td>23</td>
<td>S. Treanță, <em>On a class of second-order PDE&amp;PDI constrained robust modified optimization problems</em>, Mathematics, 9, 13, 1473, 2021; WOS: 000671371400001, eISSN: 2227-7390.</td>
<td>Yes</td>
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<td>24</td>
<td>S. Treanță, <em>Second-order PDE constrained controlled optimization problems with application in mechanics</em>, Mathematics, 9, 13, 1472, 2021; WOS: 000670909700001, eISSN: 2227-7390.</td>
<td>Yes</td>
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<td>28</td>
<td>S. Treanță, <em>Well-posedness of new optimization problems with variational inequality constraints</em>, Fractal and Fractional, 5, 3, 123, 2021; WOS: 000699746700001, ISSN: 2504-3110.</td>
<td>Yes</td>
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<td>29</td>
<td>S. Treanță, S. Jha, <em>On well-posedness associated with a class of controlled variational inequalities</em>, Mathematical Modelling of Natural Phenomena, 16, 52, 2021; WOS: 000696631000002, ISSN: 0973-5348.</td>
<td>Yes</td>
<td>0,908 (2022)</td>
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<td>30</td>
<td>S. Treanță, <em>On well-posedness of some constrained variational problems</em>, Mathematics, 9, 19, 2478, 2021; WOS: 000708205200001, eISSN: 2227-7390.</td>
<td>Yes</td>
<td>0,634 (2022)</td>
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<td>33</td>
<td>S. Treanță, <em>On a class of isoperimetric constrained controlled optimization problems</em>, Axioms, 10, 2, 112, 2021; DOI: 10.3390/axioms10020112; WOS: 000665136300001; ISSN: 2075-1680.</td>
<td>Yes</td>
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<tr>
<td>37</td>
<td>S. Treanță, <em>On a class of controlled differential variational inequalities</em>, Applicable Analysis, 101, 17, 6191-6211, 2022; DOI: 10.1080/00036811.2021.1919646; WOS: 000643848800001; ISSN: 0003-6811; eISSN: 1563-504X.</td>
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<td>39</td>
<td>S. Treanță, <em>Saddle-point optimality criteria involving (rho, b, d)-invexity and (rho, b, d)-pseudoinvexity in interval-valued optimization problems</em>, International Journal of Control, 95, 4, 1042-1050, 2022; DOI: 10.1080/00207179.2020.1837960; WOS: 000582933000001; ISSN: 0020-7179; eISSN: 1366-5820.</td>
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<td>43</td>
<td>M.B. Khan, S. Treanţă, M.S. Soliman, <em>Generalized Preinvex Interval-Valued Functions and Related Hermite-Hadamard Type Inequalities</em>, Symmetry-Basel, 14, 9, 1901, 2022; DOI: 10.3390/sym14091901; WOS: 000856722300001; eISSN: 2073-8994.</td>
<td>Yes</td>
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<td>44</td>
<td>M.B. Khan, G. Santos-Garcia, S. Treanţă, M.A. Noor, M.S. Soliman, <em>Perturbed Mixed Variational-Like Inequalities and Auxiliary Principle Pertaining to a Fuzzy Environment</em>, Symmetry-Basel, 14, 12, 2503, 2022; DOI: doi.org/10.3390/sym14122503; WOS: 000904557800001; eISSN: 2073-8994.</td>
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<td>M.B. Khan, S. Treanţă, M.S. Soliman, K. Nonlaophon, H.G. Zaini, <em>Some Hadamard-Fejer type Inequalities for LR-Convex Interval-Valued Functions</em>, Fractal and Fractional, 6, 1, 6, 2022; DOI: 10.3390/fractalfract6010006; WOS: 000747879100001; ISSN: 2504-3110.</td>
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<td>46</td>
<td>M.B. Khan, S. Treanţă, H. Budak, <em>Generalized p-Convex Fuzzy-Interval-Valued Functions and Inequalities Based Upon the Fuzzy-Order Relation</em>, Fractal and Fractional, 6, 2, 63,</td>
<td>Yes</td>
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<td>49</td>
<td>S. Treanță</td>
<td>Advances in Optimization and Nonlinear Analysis</td>
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<td>S. Treanță</td>
<td>Results on the Existence of Solutions Associated with Some Weak Vector Variational Inequalities</td>
<td>2022</td>
<td>6, 8, 431</td>
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8. List of publications of the "individual" candidate or of each member of the research team, in the case of the "research team" candidate, highlighting the relevant publications of the candidate in the last 5 years and the joint publications of the members of a research team, in the case of the candidate "research team". A link to the web page where the candidate's publications can be found is also mentioned.

The most relevant publications (articles, books, edited books, book chapters) of the candidate in the last 5 years have been mentioned in the previous section (see Section 7). However, for a complete list of publications, the reader can consult the following links:

Google Scholar: [https://scholar.google.ro/citations?user=RjZrdA8AAAAAJ&hl=en](https://scholar.google.ro/citations?user=RjZrdA8AAAAAJ&hl=en)

Research Gate: [https://www.researchgate.net/profile/Savin-Treanta-2](https://www.researchgate.net/profile/Savin-Treanta-2)

Web of Science:


9. List of research projects won by the candidate and their value.
In the following, I will mention the research fellowships and membership in research teams (as a member or director):

2022 - 2023: project leader/director of the research project “Well-posedness, existence and characterization results of solutions for certain variational problems”, Academy of Romanian Scientists, “AOSR-TEAMS” 2022-2023 National Competition (Budget: 10.000 euro)

2022 - Present: founder member of “Fundamental Sciences Applied in Engineering” Research Center, National University of Science and Technology Politehnica Bucharest, 060042 Bucharest, Romania

2021 - 2026: Degree of Merit from the University “Politehnica” of Bucharest

2019 - 2024: member of research team for the project “AG 148 / SGU / NC / I / 10.09.2019 - Opportunities for professional development within the educational process of the Faculty of Applied Chemistry and Materials Science”, project leader Cristina Orbeci

2018 - 2019: project leader/director of the research grant “Nonlinear Analysis with Applications in Optimization and Control”, National University of Science and Technology Bucharest, National Competition (Budget: 10.000 euro)

2016 - 2017: member of research team for the project “Applied Mathematics in Urbanism”, project leader Corina Cipu

2011 - 2014: member of research team for the project “Qualitative study of delay differential equations with applications to modeling and simulation of leukemia therapy”, project leader Andrei Halanay

2011 - 2012: BITDEFENDER fellowship (Junior Research Position) at “Simion Stoilow” Institute of Mathematics of the Romanian Academy

10. List of patents filed and accepted, if applicable: not applicable