

## **Anexa nr. 1 – Cerere de premiere\***

### **1. (Candidat) Candidate**

(Prenume) Name: *Szilárd-Csaba*

(Nume) Surname: *László*

(Doctor din anul, se prezintă copie a diplomei de doctor sau echivalent ) Ph.D. in Mathematics:  
*Faculty of Mathematics and Computer Science, Babeş-Bolyai University Cluj -Napoca,*  
*(23.09.2011 - public defense, 27.03.2012 - minister's order). Title of Ph.D. Thesis: The theory*  
*of monotone operators with applications*

(Poziția ocupată) Position: *Professor, Technical University of Cluj-Napoca, Department of*  
*Mathematics*

(Instituția) Affiliation: *Technical University of Cluj-Napoca*

(Telefon mobil) Mobile:

(Adresa de e-mail) e-mail:

### **2. Ediția „Gala Cercetării Românești”: 2024**

**3. Premiul și categoria pentru care aplică (individual sau echipă de cercetare):** *Matematică și*  
*informatică – Premiul “Grigore Constantin Moisil” (individual)*

**4. O descriere a celor mai importante realizări științifice din ultimii 5 ani (maximum 4 pagini,**  
**format A4, caractere Times New Roman, 12 puncte, spațiere între linii de 1,5 și margini de 2**  
**cm)\*\***

**\*\* Rezultatele activității de cercetare sunt evaluate conform anexei nr. 3 la Regulamentul de**  
**organizare și funcționare a programului „Gala Cercetării Românești”.**

#### **4. Important scientific achievements of the candidate in the last 5 years**

The applicant published 35 scientific papers (14 single authored, 23 as corresponding author and all as main author), among them 34 in ISI indexed journals, with a total article influence score (JCR 2023) of 30.557 consisting in 10 Q1 papers and 11 Q2 papers. In the last 5 years we made quality researches in the field of optimization (our accumulated AIS for the last 5 years is 9.30) and we preferred to submit our papers to high ranked and top journals. Though this choice increased significantly the period of publication process, our papers from the last years gained much visibility among top scientists in the optimization field but also from related areas as image processing or machine learning. Indeed, in the last years we published in Q1 ranked journals and also flagship journals (see Publications List) like Siam Journal on Optimization (3 papers), Journal of Differential Equations (2 papers), Analysis and Applications, Journal of Evolution Equations, Numerical Algorithms, Applied Mathematics and Optimization, Set-Valued and Variational Analysis (2 papers) or Mathematical Programming (2 papers). Note that we are single author/ corresponding author of several papers published in top journals. Our papers were cited by some excellent scientists, in the field of optimization but also in the related fields as machine learning, image processing, inverse problems or differential equations, we mention here S. Adly, M. Ahoosh, Q.H. Ansari, H. Attouch, J.F. Aujol, P. Bégout, J. Bolte, R.I. Boţ, S. Boyd, E.R. Csetnek, C. Dossal, N. Gillis, M.A. Jendoubi, M. Jordan, A. Jourani, C. Kanzow, G. Kassay, P.E. Maingé, B.S. Mordukhovich, P. Moulin, P. Ochs, G. Peyré, P. Patrinos, T. Pock, V.D. Rădulescu, H. Riahi, S. Sabach, J. Solomon, U. Stefanelli, L. Stella, J.C. Yao or G. Wanka, who cited our works in the top journals like Mathematical Programming, Siam J. Optimization, J. Differential Equations, J. Machine Learning Research, European J. Operational Research, Applied Math. Optim., Nonlinear Analysis: Real World Appl., J. Scientific Computing, Mathematics of Operations Research, Esaim: COCV, Optimization Methods and Software, ACM Transactions on Graphics, SIAM J. Imaging Sciences, Computational Optimization and Applications, Foundations of Computational Mathematics, Inverse Problems or Neural Networks. We have common researches with some internationally recognized scientists, like R.I. Boţ, E.R. Csetnek, G. Kassay and H. Attouch. Our Hirsch index is 11 on WoS and 17 on Google Scholar and our works received more than 350 citations in ISI journals. During the last 5 years our main research areas included subjects in convex and non-convex optimization, non-smooth optimization, approximation algorithms and dynamical systems in

connection to optimization problems and monotone inclusions, respectively. The most important achievements of the project leader in the last 5 years are synthesized as follows.

We already published 15 papers in the field of optimization, (and we have other 4 papers under review), in high ranked and top journals, with a cumulated number of citations 456 (cf. Google Scholar). We introduced and studied several (inertial) algorithms in (non)convex optimization (see [L12], [ALV], [BCL1], [L14], [L15], [L16], [KL], [AL1], [AL3] at the list of publications). Some of the obtained results were then applied to image processing in [BCL1] and [L14]. Further, we treated several continuous dynamical systems in connection to convex/non-convex (structured) optimization problems and monotone inclusion problems ([ALP], [BCL2], [BCL3], [BCL4], [BCL5], [ALa], [AL2], [L13], [BCL6], [BCL7]). A continuous version of the famous ADMM algorithm was introduced and studied in [BCL5]. We used the Yosida regularization for maximal monotone operators and Moreau regularization for non-smooth convex functions in order to obtain improved convergence rates both for the generated trajectories of a continuous dynamical system associated to the monotone inclusion/optimization problem and the sequences generated by the corresponding algorithms, obtained via discretization in [AL1, BCL7] and [AL2]. In order to obtain strong convergence, we introduced a Tikhonov regularization term in some dynamical systems and algorithms in [BCL6, BCL7, L13, L15, ALa, L16, AL3] and [KL]. We are the first ones in the literature who succeeded to obtain both fast convergence of the function values and strong convergence of the generated trajectories/sequences for the same continuous/discrete time dynamics [AL3, L13, L15, L16, BCL7, KL]. This is a very important feature, since by the Tikhonov regularized dynamical systems/algorithms not only the strong convergence of the trajectories/generated sequences to a minimizer of the objective function is obtained, but we also have a-priori the knowledge to which element from the solution set the trajectory/sequence converge. This solution is usually the minimum norm solution, (which is the projection of 0 to the solution set), however a slight modification of the Tikhonov regularization term allows us to obtain strong convergence of the generated trajectories/sequences to the projection of a given element on the solution set.

In [ALP] we introduced a second order dynamical system that can be seen as an intermediate system between the famous systems of Su-Boyd-Candes and the Hessian driven damping system of Attouch-Peypouquet-Rendont. Our system not only inherits (and even improve) all

the convergence properties of the latter systems but is the first system in the literature that fully models Nesterov's convex gradient method, that is, explicit discretization of our system leads to inertial gradient type algorithms, where also the gradient contains an extrapolation term in its argument. This feature was new in the literature, (note that in case of explicit discretization in order to obtain an extrapolation term in the gradient of the objective function one need to discretize a term of the dynamical system which contains the derivative of the trajectory in the argument of the gradient) and makes our system unique. Tikhonov regularized version of this system has been studied in [ALa] where we succeeded to obtain both strong convergence results for the generated trajectories and fast convergence of the potential energy. A further development of these results can be found in [L16], where we give a comprehensive study on the correlation between the damping parameter and the Tikhonov regularization parameter and we show that there is a constellation of these parameters when weak convergence of the generated trajectories to a minimizer of the objective function and very fast convergence of the potential energy and velocity to 0 can be obtained, meanwhile for another setting of these parameters strong convergence of the trajectories to the minimum norm minimizer and fast convergence of the potential energy and velocity to 0 are attained.

Concerning the strong convergence of inertial algorithms which can be obtained via explicit/implicit discretization of second order dynamical systems, in the pioneering work [L15] we introduced a proximal-inertial algorithm with a Tikhonov regularization term and variable step-size in connection to the minimization problem of a convex lower semi-continuous function. Also here, we show that the inertial parameter, the step-size and the Tikhonov regularization parameter are strongly correlated, there is a setting when weak convergence of the generated sequences to a minimizer of the objective function and very fast convergence (of arbitrary rates in concordance to the famous results of O. Güler) of the discrete potential energy and discrete velocity can be obtained. By developing some new techniques we also succeeded to show that for another setting of these parameters strong convergence of the generated sequences to the minimum norm minimizer and fast convergence of the discrete potential energy and discrete velocity can be obtained, which is the first result of this kind in the literature. A challenging problem was to obtain the strong convergence of the sequences of Tikhonov regularized inertial algorithms of gradient type without losing the consecrated Nesterov rate for the potential energy. In [KL] we introduced a Nesterov type algorithm with

two Tikhonov regularization terms and we have shown strong convergence of the generated sequences to the minimum norm minimizer of the smooth objective function and Nesterov type rates for the discrete potential energy but also for the discrete velocity.

Undoubtedly one of the greatest achievement of the last five years was that we had the opportunity to collaborate with Hedy Attouch, who is one of the creators of this field, namely solving optimization problems via dynamical systems and numerical algorithms obtained by implicit/explicit discretization from these dynamical systems. During our collaboration we finalized 3 papers ([AH1-AH3]) concerning Newton like inertial dynamics and the corresponding numerical algorithms and also we were the first in the literature who affirmative answered the widely open question: can strong convergence results for the generated trajectories and fast convergence results for the potential energy be obtained for the same dynamics? Further, we put the bases for several future researches, which hopefully we will have the power to finalize, taking into account that unfortunately professor Attouch passed away recently.

7. Curriculum vitae narativ al candidatului „individual“ sau al fiecărui membru al echipei de cercetare, în cazul candidatului „echipă de cercetare“, din care să reiasă rezultatele activității de cercetare din ultimii 5 ani, conform indicatorilor cantitativi din anexa nr. 2 la regulament și criteriilor de evaluare calitativă prevăzute în anexa nr. 3 la regulament.

## **7. Curriculum Vitae**

**General data:** Szilárd Csaba László, April 22, 1977 Zaláu, jud. Sălaj, România.

**Languages:** fluent in English, Romanian and Hungarian

**Computer Skills:** Microsoft Office • Maple • Matlab • Pascal • C/C++ • LaTeX

### **Education and training:**

*Habilitation* - Title of Habilitation Thesis: Topics in Variational Analysis via Monotonicity and Convexity, Public defense 19.07.2017, Technical University of Cluj-Napoca

*Ph.D. in Mathematics*, Faculty of Mathematics and Computer Science, Babeş-Bolyai University Cluj -Napoca, (23.09.2011 - public defense, 27.03.2012 - minister's order). Title of Ph.D. Thesis: The theory of monotone operators with applications

*M.Sc. in Applied Mathematics-Informatics*, Lucian Blaga University Sibiu, 2008.

*B.Sc. in Mathematics*, Babeş-Bolyai University Cluj-Napoca, 2001.

**Invited researcher.** We had several Invited Research Visits at **University of Vienna** as a guest of the Chair of Applied Mathematics and Optimization as follows:

1 December 2023 to 15 December 2023

7 November 2022 to 21 November 2022

5 November 2019 to 16 November 2019

13 November 2016 to 19 November 2016

8 June 2014 to 20 June 2014.

Research position at Chemnitz University of Technology as a guest of the Chair of Applied Mathematics, from 1 October 2010 to 31 May 2011.

**Professional experience:**

2021-present Professor (full), Technical University of Cluj-Napoca, Department of Mathematics.

2016-2021 Professor (associate), Technical University of Cluj-Napoca, Department of Mathematics.

2014- 2016 Lecturer, Technical University of Cluj-Napoca, Department of Mathematics.

2012-2014 Assistant professor, Technical University of Cluj-Napoca, Department of Mathematics. 2008-2011 Ph.D. student, Faculty of Mathematics, Babeş-Bolyai University Cluj-Napoca.

**Publications and research metrics:**

We have 34 papers published in ISI journals, 1 paper published in ESCI journal, 1 paper published in BDI journal, 3 books. Let us mention that we are single author or corresponding author of 23 of our papers and we have more 4 papers under review at top ISI journals, with a real chance to be accepted soon. 10 of our papers are in Q1 zone meanwhile 11 of our papers are in Q2 zone (after AIS, JCR 2023). We have 747 citations and h-index 17 cf. Google Scholar, (490 citations and h-index 11 for the last 5 years), 362 citations and h-index 11 cf. WoS. We have a cumulated Article Influence Score for the last 5 years of **9.30 (from the total**

of 30.557) and our works were cited by top scientists in flagship journals on optimization and related fields.

**We have the following Q1 Publications** (cf. Article Influence Score JCR 2023):

- [1] S. László, Minimax Results on Dense Sets and Dense Families of Functionals, *Siam Journal on Optimization*, 27(2), 661-685 (2017) [AIS: 2.421, **Q1**]
- [2] R.I. Boţ, E.R. Csetnek, S. László, Approaching nonsmooth nonconvex minimization through second order proximal-gradient dynamical systems, *Journal of Evolution Equations*, 18(3), 1291-1318 (2018) [AIS: 0.957, **Q1**]
- [3] R.I. Boţ, E.R. Csetnek, S. László, Second order dynamical systems with penalty terms associated to monotone inclusions, *Analysis and Applications*, 16(5), 601-622 (2018) [AIS: 0.985, **Q1**]
- [4] R.I. Boţ, E.R. Csetnek, S. László, A primal-dual dynamical approach to structured convex minimization problems, *Journal of Differential Equations*, 269(12), 10717-10757 (2020) [AIS: 1.416, **Q1**]
- [5] Hedy Attouch, S. László, Newton-like Inertial Dynamics and Proximal Algorithms Governed by Maximally Monotone Operators, *SIAM Journal on Optimization*, 30(4), 3252–3283 (2020) [AIS: 2.421, **Q1**]
- [6] S. László, Convergence rates for an inertial algorithm of gradient type associated to a smooth nonconvex minimization, *Mathematical Programming*, 190(1-2), 285-329 (2021) [AIS: 2.296, **Q1**]
- [7] C.D. Alecsa, S. László, T. Pinţa, An extension of the second order dynamical system that models Nesterov's convex gradient method, *Applied Mathematics and Optimization*, 84, 1687-1716 (2021) [AIS: 1.010, **Q1**]
- [8] R.I. Boţ, E.R. Csetnek, S. László, Tikhonov regularization of a second order dynamical system with Hessian driven damping, *Mathematical Programming*, 189, 151-186 (2021) [AIS: 2.296, **Q1**]
- [9] C. Alecsa, S. László, Tikhonov regularization of a perturbed heavy ball system with vanishing damping, *Siam Journal on Optimization* 31(4), 2921-2954 (2021) [AIS: 2.421, **Q1**]
- [10] S. László, On the strong convergence of the trajectories of a Tikhonov regularized second

order dynamical system with asymptotically vanishing damping, *Journal of Differential Equations*, 362, 355-381 (2023) [AIS: 1.416, Q1]

Other publications in the last 5 years:

[1] C. Alecsa, S. László, A. Viorel, A gradient type algorithm with backward inertial steps associated to a nonconvex minimization problem, *Numerical Algorithms*, 84, 485-512 (2020) [AIS: 0.748, Q2]

[2] R.I. Boţ, E.R. Csetnek, S. László, A second order dynamical approach with variable damping to nonconvex smooth minimization, *Applicable Analysis*, 9(3), 361-378 (2020) [AIS: 0.426, Q3]

[3] Hedy Attouch, S. László, Continuous Newton-like Inertial Dynamics for Monotone Inclusions, *Set-Valued and Variational Analysis*, 29, 555-581 (2021) [AIS: 0.939, Q2]

[4] S. László, A Forward–Backward Algorithm With Different Inertial Terms for Structured Non-Convex Minimization Problems, *Journal of Optimization Theory and Applications*, 198, 387–427 (2023) [AIS: 0.776, Q2]

[5] R.I. Boţ, E.R. Csetnek, S. László, On the strong convergence of continuous Newton-like inertial dynamics with Tikhonov regularization for monotone inclusions, *Journal of Mathematical Analysis and Applications*, 530(2), 127689 (2024) [AIS: 0.671, Q2]

As we mentioned before, our papers were cited by top scientists in optimization but also in related fields as machine learning or image processing. We mention here the researchers S. Adly, M. Ahookhosh, Q.H. Ansari, H. Attouch, J.F. Aujol, P. Bégout, J. Bolte, R.I. Boţ, S. Boyd, E.R. Csetnek, C. Dossal, N. Gillis, M.A. Jendoubi, M. Jordan, A. Jourani, C. Kanzow, G. Kassay, P.E. Maingé, B.S. Mordukhovich, P. Moulin, P. Ochs, G. Peyré, P. Patrinos, T. Pock, V.D. Rădulescu, H. Riahi, S. Sabach, J. Solomon, U. Stefanelli, L. Stella, J.C. Yao or G. Wanka to name just a few, who cited our works in the top journals like *Mathematical Programming*, *Siam J. Optimization*, *J. Differential Equations*, *J. Machine Learning Research*, *European J. Operational Research*, *Applied Math. Optim.*, *Nonlinear Analysis: Real World Appl.*, *J. Scientific Computing*, *Mathematics of Operations Research*, *Esaim: COCV*, *Optimization Methods and Software*, *ACM Transactions on Graphics*, *SIAM J. Imaging Sciences*, *Computational Optimization and Applications*, *Foundations of Computational Mathematics*, *Inverse Problems* or *Neural Networks*.



### **10 Relevant citations:**

- 1.A. Kratsios, C. Hyndman, NEU: A Meta-Algorithm for Universal UAP-Invariant Feature Representation, *Journal of Machine Learning Research*, 22(92), 1–51 (2021)[Q1].
- 2.T. Lin, M.I. Jordan, A control-theoretic perspective on optimal high-order optimization, *Math. Program.*, 195, 929–975 (2022) [Q1].
- 3.S. Adly, H. Attouch, First-order inertial algorithms involving dry friction damping, *Math. Program.*, 193, 405–445 (2022) [Q1].
- 4.S. Adly, H. Attouch, Finite convergence of proximal-gradient inertial algorithms combining dry friction with hessian-driven damping, *Siam Journal on Optimization*, 30(3), 2134-2162 (2020) [Q1].
- 5.S. Adly, H. Attouch, V.N. Vo, Newton-Type Inertial Algorithms for Solving Monotone Equations Governed by Sums of Potential and Nonpotential Operators, *Appl Math Optim* 85, 44 (2022) [Q1].
- 6.H. Attouch, J. Fadili, From the ravine method to the nesterov method and vice versa: a dynamical system perspective, *Siam Journal on Optimization*, 32(3), 2074-2101 (2022) [Q1].
- 7.H. Attouch, A.Balhag, Z. Chbani, H. Riahi, Damped inertial dynamics with vanishing Tikhonov regularization: Strong asymptotic convergence towards the minimum norm solution, *Journal of Differential Equations*, 311, 29-58 (2022) [Q1].
- 8.M. Chao, L. Liu, A dynamical alternating direction method of multipliers for two-block optimization problems, *Nonlinear Dyn*, 111, 6557–6583 (2023) [Q1].
- 9.T.Y. Lin, M.I. Jordan, Monotone Inclusions, Acceleration, and Closed-Loop Control, *Mathematics of Operations Research*, DOI: 10.1287/moor.2022.1343, 2023[Q1].
- 10.P.E. Maingé, Accelerated Proximal Algorithms with a Correction Term for Monotone Inclusions. *Appl Math Optim*, 84, 2027–2061 (2021) [Q1].

### **Presentations:**

We presented our results at 25 international conferences and we had 19 presentations in research seminars at several prestigious universities, we mention here University of Vienna, Chemnitz University of Technology or Corvinus University of Budapest . We emphasize here that we were invited speaker at the last 3 editions of the workshop “Games, Dynamics and

Optimization” held in Vienna (2018), Cluj-Napoca (2019) and Rome (2020), respectively, with the talks:

“Approaching nonsmooth nonconvex minimization through second order proximal-gradient dynamical systems”, „A primal-dual dynamical approach to a nonsmooth convex minimization” and „An extension of the second order dynamical system that models Nesterov’s convex gradient method”. We were also invited to the Thematic Program: Modern Maximal Monotone Operator Theory, January 28-March 1, 2019, Vienna, the talks given: „A second order dynamical approach with variable coefficients to nonconvex smooth minimization” and „A gradient type algorithm with backward inertial steps for a nonconvex minimization”. All the above mentioned talks are of a great relevance for the scientific achievements from the last 5 years. In addition, we gave a scientific presentation at “The 21-st International Symposium on Mathematical Programming”, which is one of the most important conferences in this field, the title of the talk „Regularity conditions for the maximal monotonicity of the generalized parallel sum”. Other notable presentations: 13-eme Colloque Franco-Roumain de Mathématiques Appliquées, 25-29 August 2016, Iasi, Romania, 7-th German-Polish Conference on Optimization, Będlewo, Poland, August 27 – September 1, 2017, Optimization Methods in Acoustics, Vienna, October 12-14, 2022 and EUROpt 2023 Conference, Budapest, 23-25 August 2023.

#### **Editorial activity:**

Reviewer for the journals European Journal of Operational Research, SIAM Journal on Optimization, Mathematical Programming, Set-Valued and Variational Analysis, Journal of Optimization Theory and Applications, Optimization Letters, Optimization, Novi Sad Journal of Mathematics, Abstract and Applied Analysis, Fixed Point Theory, Applied Mathematics and Optimization, Numerical Linear Algebra with Applications, Computational Optimization and Applications,... Reviewer for Zentralblatt Math and Mathematical Reviews.

#### **Research grants and Prizes**

2022(1 may)-2024 (30 april) Project Leader of the Research Projects for Young Independent Teams entitled "Optimization through Regularized Dynamical Systems", PN-III-P1-1.1-TE-2021-0138, Technical University of Cluj-Napoca, financed by the he Ministry of Research, Innovation and Digitization, CNCS - UEFIS (450000 lei $\approx$  100.000 euro, 4 members), [ProjectHomePage](#).

The members of the team are: prof.dr.habil S.C. László (team leader), prof.dr.habil R.I. Boț, dr.habil E.R. Csetnek, drd. C.D. Alecsa.

2018-2020 Project Leader of the Research Projects for Young Independent Teams entitled "Nonsmooth convex and nonconvex optimization, a dynamical system approach", PN-III-P1-1.1-TE-2016-0266, Technical University of Cluj-Napoca, financed by the Romanian Ministry of Education, CNCS – UEFISCDI (450000 lei≈ 100.000 euro, 4 members), [ProjectHomePage](#).  
The members of the team were: prof(asoc).dr.habil S.C. László (team leader), prof.dr.habil R.I. Boț, dr. A. Viorel, drd. C.D. Alecsa.

2013-2015 Project leader of the Postdoctoral Research Project entitled “Overcoming the failure of classical monotonicity in solving problems in nonlinear-, variational- and convex analysis”, PN-II-RU-PD-2012-3-0166, Technical University of Cluj-Napoca, financed by Romanian Ministry of Education, CNCS - UEFISCDI (299992lei≈68.000 euro, 1 member), [ProjectHomePage](#).

2017-2019 Researcher in the Exploratory Research Project PN-III-P4-ID-PCE-2016-0190, entitled “Equilibrium and optimization problems: theoretical and computational approaches”, Babeș-Bolyai University Cluj-Napoca, [ProjectHomePage](#)

2011-2016 Researcher in the Exploratory Research Project PN-II-ID-PCE-3-0024/2011, entitled „The structure and sensitivity of the solution sets of variational inequalities, optimization and equilibrium problems under generalized monotonicity”, Babeș-Bolyai University Cluj-Napoca, [ProjectHomePage](#)

Prize for the excellent results obtained in the period of doctoral studies in the project POS DRU 6/1.5/S/3 – ID 5216, 2011 (≈2260 euro). Awarding research results-Human Resources-UEFISCDI-article: 21 of our papers were prized, total amount ≈15.000 euro.

#### **Member in Mathematical Associations**

Societatea de Științe Matematice din România

Mathematical Optimization Society- 2013

Asociația Teodor Angheluță

## **Organized Conferences**

Organizer of the 17-th International Conference on Applied Mathematics and Computer Science, July 11-13, 2023 Cluj-Napoca.

## **Forming young researchers, consolidating research teams**

We helped some young researchers in developing their career by attracting them in top researches in optimization and publishing the obtained results in flagship and top journals in the field. Indeed, we have common research with Titus Pința, who was back then a master student at Babeș-Bolyai University and now its a doctoral student at University of Göttingen. Beside Titus another young doctoral candidate (Babeș-Bolyai University) Cristian Alecsa was member of the team (he is also a team member of our last 2 research grants, see the projects list). Our research was a pionering work consisting in the introduction of a second order dynamical system that models Nesterov's convex gradient method in such way that the latter can be obtained via explicit Euler discretization from this system. Despite of this new feature, the system preserves (even outperforms) the convergence properties of the famous systems of Su-Boyd-Candes or the system with Hessian driven damping of Attouch-Peypouquet-Rendont. Our results were published in the Q1 journal Applied Mathematics and Optimization in 2021 and the paper already gained 28 citations. We continued our collaboration with Cristian Alecsa, who continuous his second doctoral studies under our supervision, and we succeeded to obtain strong convergence results for the trajectories generated by a Tikhonov regularized version of the above mentioned system. This was a new and challenging result that time (2021) and we published our result in the flagship journal in the field Siam Journal on Optimization (Q1) and gained 10 citations. We also published some results concerning new numerical algorithms associated to nonconvex optimization problem in Numerical Algorithms (Q2, 12 citations). The young researcher Adrian Viorel (lecturer at Babeș-Bolyai University and team member in our research grant) was also member of the team. Recently we have as a guest at Technical University of Cluj-Napoca the doctoral student Mikhail Karapetyants from University of Vienna (3 months) and we succeeded to finalize a pionering work consisting in obtaining strong convergence of the sequences generated by a Nesterov type algorithm with a Tikhonov regularization term. This result in indeed challenging since for the Nesterov algorithm (in its original form) even the weak convergence is not known. In contrast in our algorithm not only

the strong convergence is achieved but we have a-priori the control to which minimizer our generated sequence converge (the minimum norm minimizer in our result). Beside, we also kept the famous Nesterov rate of order  $O(1/n^2)$  for the function values and these feature makes our algorithm unique in the literature. Our paper is at second round of reviews at the flagship journal Siam Journal on Optimization, hence is a real chance to be accepted soon.

**8.** Lista publicațiilor candidatului „individual“ sau ale fiecărui membru al echipei de cercetare, în cazul candidatului „echipă de cercetare“, cu evidențierea publicațiilor relevante ale candidatului în ultimii 5 ani și a publicațiilor comune ale membrilor unei echipe de cercetare, în cazul candidatului „echipă de cercetare“. Se menționează și un link al paginii web unde se regăsesc publicațiile candidatului.

**8. List of publications (see <https://www.researchgate.net/>):**

**The list of 10 most relevant papers from the last years:**

[1] S. László, Minimax Results on Dense Sets and Dense Families of Functionals, Siam Journal on Optimization 27(2), 661-685 (2017)

[2] R.I. Boț, E.R. Csetnek, S. László, Approaching nonsmooth nonconvex minimization through second order proximal-gradient dynamical systems, Journal of Evolution Equations 18(3), 1291- 1318 (2018)

[3] R.I. Boț, E.R. Csetnek, S. László, Second order dynamical systems with penalty terms associated to monotone inclusions, Analysis and Applications 16(5), 601-622 (2018)

[4] H. Attouch, S. László, Newton-like Inertial Dynamics and Proximal Algorithms Governed by Maximally Monotone Operators, SIAM Journal on Optimization 30(4), 3252–3283 (2020)

[5] R.I. Boț, E.R. Csetnek, S. László, A primal-dual dynamical approach to structured convex minimization problems, Journal of Differential Equations 269(12), 10717-10757 (2020)

[6] S. László, Convergence rates for an inertial algorithm of gradient type associated to a smooth nonconvex minimization, Mathematical Programming, 190(1-2), 285-329 (2021)

[7] C. Alecsa, S. László, T. Pința, An extension of the second order dynamical system that models Nesterov's convex gradient method, *Applied Mathematics and Optimization* 84, 1687-1716 (2021)

[8] R.I. Boț, E.R. Csetnek, S. László, Tikhonov regularization of a second order dynamical system with Hessian driven damping, *Mathematical Programming* 189, 151-186 (2021)

[9] C. Alecsa, S. László, Tikhonov regularization of a perturbed heavy ball system with vanishing damping, *Siam Journal on Optimization* 31(4), 2921-2954 (2021)

[10] S. László, On the strong convergence of the trajectories of a Tikhonov regularized second order dynamical system with asymptotically vanishing damping, *Journal of Differential Equations* 362, 355-381 (2023)

**PhD thesis:** The theory of monotone operators with applications, Babeş-Bolyai University, Cluj-Napoca, September 2011.

**Habilitation thesis:** Topics in Variational Analysis via Monotonicity and Convexity, Technical University of Cluj-Napoca, July 2017.

### **Monographs:**

[1] Szilárd László, *Monotone Operators: Theory and Applications* 300 pages, ISBN: 978-3659497636, LAP LAMBERT Academic Publishing (2013), <https://www.amazon.com/Monotone-Operators-Applications>

[2] Peter Ioan Radu, László Szilárd, Viorel Adrian, *Elements of Linear Algebra*, UTPRESS (2014), ISBN: 978-973-662-935-8, <http://algappl.utcluj.ro>

[3] László Szilárd, Peter Ioan Radu, Timboș Liana, Viorel Adrian, *Elemente de Algebră Liniară*, UTPRESS (2023), ISBN 978-606-737-642-5

### **ISI papers:**

[1][L1] S. László, Some Existence Results of Solutions for General Variational Inequalities, *Journal of Optimization Theory and Applications*, 150 (3), 425-443 (2011) [AIS: 0.776, Q2]

[2][KPL] G. Kassay, C. Pinteș, S. László, Monotone operators and closed countable sets, *Optimization*, 60 (89), 1059-1069 (2011) [AIS: 0.708, Q2]

- [3][L3] S. László, Generalized Monotone Operators, Generalized Convex Functions and Closed Countable Sets, *Journal of Convex Analysis*, 18(4), 1075-1091 (2011) [AIS: 0.423, Q3]
- [4][L4] S. László, Theta-monotone operators and theta-convex functions, *Taiwanese Journal of Mathematics*, 16(2), 733-759 (2012) [AIS: 0.299, Q4]
- [5][BL] R.I. Boţ, S. László, On the generalized parallel sum of two maximal monotone operators of Gossez type (D), *Journal of Mathematical Analysis and Applications*, 391(1), 82-98 (2012) [AIS: 0.671, Q2]
- [6][L5] S. László, Existence of solutions of inverted variational inequalities, *Carpathian J. Math.*, 28(2), 329-336 (2012) [AIS: 0.326, Q4]
- [7][LBM] S. László, B. Burján-Mosoni, About the Maximal Monotonicity of the Generalized Sum of Two Maximal Monotone Operators, *Set-Valued and Variational Analysis*, 20(3), 355-368 (2012) [AIS: 0.939, Q2]
- [8][KPL1] G. Kassay, C. Pinteá, S. László, Monotone operators and first Baire category sets, *Positivity*, 16(3), 565-577 (2012) [AIS: 0.433, Q3]
- [9][L6] S. László, Multivalued variational inequalities and coincidence point results, *Journal of Mathematical Analysis and Applications*, 404(1), 105-114 (2013) [AIS: 0.671, Q2]
- [10][AHL1] A. Amini-Harandi, S. László, A coincidence point result via variational inequalities, *Fixed Point Theory*, 15(1), 87-98 (2014) [AIS: 0.314, Q4]
- [11][AHL2] A. Amini-Harandi, S. László, Solution existence of general variational inequalities and coincidence points, *Carpathian Journal of Mathematics*, 30(1), 15-22 (2014) [AIS: 0.326, Q4]
- [12][L7] S. László, On the strong representability of the generalized parallel sum, *Bulletin of the Malaysian Mathematical Science Society*, 37(4), 1029-1046 (2014) [AIS: 0.432, Q3]
- [13][AHL3] A. Amini-Harandi, S. László, Applications of general variational inequalities to coincidence point results, *Publ. Math. Debrecen*, 85(1-2), 47-58 (2014) [AIS: 0.339, Q4]
- [14][LV1] S. László, A. Viorel, Densely defined equilibrium problems, *Journal of Optimization Theory and Applications*, 166(1), 52-75 (2015) [AIS: 0.776, Q2]

- [15][LV2] S. László, A. Viorel, Generalized monotone operators on dense sets, *Numerical Functional Analysis and Optimization*, 36, 901-929 (2015) [AIS: 0.371, Q4]
- [16][L8] S. László, On injectivity of a class of monotone operators with some univalency consequences, *Mediterranean Journal of Mathematics*, 13(2), 729-744 (2016) [AIS: 0.465, Q3]
- [17][L9] S. László, Vector equilibrium problems on dense sets, *Journal of Optimization Theory and Applications*, 170(2), 437-457 (2016) [AIS: 0.776, Q2]
- [18][L10] S. László, Minimax Results on Dense Sets and Dense Families of Functionals, *Siam Journal on Optimization*, 27(2), 661-685 (2017) [AIS: 2.421, Q1]
- [19][BCL2] R.I. Boţ, E.R. Csetnek, S. László, Approaching nonsmooth nonconvex minimization through second order proximal-gradient dynamical systems, *Journal of Evolution Equations*, 18(3), 1291-1318 (2018) [AIS: 0.957, Q1]
- [20][L11] S. László, A primal-dual approach of weak vector equilibrium problems, *Open Mathematics*, 16(1), 276–288 (2018) [AIS: 0.313, Q4]
- [21] [BCL3] R.I. Boţ, E.R. Csetnek, S. László, Second order dynamical systems with penalty terms associated to monotone inclusions, *Analysis and Applications*, 16(5), 601-622 (2018) [AIS: 0.985, Q1]
- [22] [BCL4] R.I. Boţ, E.R. Csetnek, S. László, A second order dynamical approach with variable damping to nonconvex smooth minimization, *Applicable Analysis*, 9(3), 361-378 (2020) [AIS: 0.426, Q3]
- [23][ALV] C. Alecsa, S. László, A. Viorel, A gradient type algorithm with backward inertial steps associated to a nonconvex minimization problem, *Numerical Algorithms*, 84, 485-512 (2020) [AIS: 0.748, Q2]
- [24] [BCL5] R.I. Boţ, E.R. Csetnek, S. László, A primal-dual dynamical approach to structured convex minimization problems, *Journal of Differential Equations*, 269(12), 10717-10757 (2020) [AIS: 1.416, Q1]



- [25][AL1] Hedy Attouch, S. László, Newton-like Inertial Dynamics and Proximal Algorithms Governed by Maximally Monotone Operators, *SIAM Journal on Optimization*, 30(4), 3252–3283 (2020) [AIS: 2.421, **Q1**]
- [26][L12] S. László, Convergence rates for an inertial algorithm of gradient type associated to a smooth nonconvex minimization, *Mathematical Programming*, 190(1-2), 285-329 (2021) [AIS: 2.296, **Q1**]
- [27][ALP] C.D. Alecsa, S. László, T. Pința, An extension of the second order dynamical system that models Nesterov's convex gradient method, *Applied Mathematics and Optimization*, 84, 1687-1716 (2021) [AIS: 1.010, **Q1**]
- [28] [BCL6] R.I. Boț, E.R. Csetnek, S. László, Tikhonov regularization of a second order dynamical system with Hessian driven damping, *Mathematical Programming*, 189, 151-186 (2021) ) [AIS: 2.296, **Q1**]
- [29][AL2] Hedy Attouch, S. László, Continuous Newton-like Inertial Dynamics for Monotone Inclusions, *Set-Valued and Variational Analysis*, 29, 555-581 (2021) [AIS: 0.939, **Q2**]
- [30][ALa] C. Alecsa, S. László, Tikhonov regularization of a perturbed heavy ball system with vanishing damping, *Siam Journal on Optimization* 31(4), 2921-2954 (2021) [AIS: 2.421, **Q1**]
- [31][L13] S. László, On the strong convergence of the trajectories of a Tikhonov regularized second order dynamical system with asymptotically vanishing damping, *Journal of Differential Equations*, 362, 355-381 (2023) [AIS: 1.416, **Q1**]
- [32][L14] S. László, A Forward–Backward Algorithm With Different Inertial Terms for Structured Non-Convex Minimization Problems, *Journal of Optimization Theory and Applications*, 198, 387–427 (2023) [AIS: 0.776, **Q2**]
- [33][BCL7] R. I. Boț, E. R. Csetnek, S. László, On the strong convergence of continuous Newton-like inertial dynamics with Tikhonov regularization for monotone inclusions, *Journal of Mathematical Analysis and Applications*, 530(2), 127689 (2024) [AIS: 0.671, **Q2**]

#### **ESCI papers (indexed in WoS):**

[34][BCL1] R. I. Boț, E. R. Csetnek, S. László, An inertial forward-backward algorithm for minimizing the sum of two non-convex functions, *Euro Journal on Computational Optimization* 4(1), 3- 25 (2016)

#### **BDI papers:**

[35] S. László, A bivariate infimal convolution formula and the maximal monotonicity of the parallel sum, *Annals of the Tiberiu Popoviciu Seminar of Functional Equations, Approximation and Convexity* 11, 59-85 (2013)

#### **Under review/arxiv:**

[36][AL3] Hedy Attouch, S. László, Convex optimization via inertial algorithms with vanishing Tikhonov regularization: fast convergence to the minimum norm solution, <https://arxiv.org/abs/2104.11987>, (2021)

[37][L15] S. László, On the convergence of an inertial proximal algorithm with a Tikhonov regularization term, <https://arxiv.org/abs/2302.02115>, (2023)

[38][KL] M. Karapetyants, S. László, A Nesterov type algorithm with double Tikhonov regularization: fast convergence of the function values and strong convergence to the minimal norm solution, <https://arxiv.org/pdf/2308.05056.pdf>, (2023)

[39][L16] S. László, Solving convex optimization problems via a second order dynamical system with implicit Hessian damping and Tikhonov regularization, <https://arxiv.org/abs/2401.02676>, (2023)

9. Lista proiectelor de cercetare câștigate de candidat și valoarea acestora

#### **9. Research Grants**

2022(1 may)-2024 (30 april) Project Leader of the Research Projects for Young Independent Teams entitled "Optimization through Regularized Dynamical Systems", *PN-III-P1-1.1-TE-2021-0138*, Technical University of Cluj-Napoca, financed by the he Ministry of Research, Innovation and Digitization, CNCS - UEFISCDI (450000 lei≈ 100.000 euro), [ProjectHomePage](#)

The members of the team are: prof.dr.habil S.C. László (team leader), prof.dr.habil R.I. Boț, dr.habil E.R. Csetnek, drd. C.D. Alecsa.

*2018-2020* Project Leader of the Research Projects for Young Independent Teams entitled "Nonsmooth convex and nonconvex optimization, a dynamical system approach", PN-III-P1-1.1-TE-2016-0266, Technical University of Cluj-Napoca, financed by the Romanian Ministry of Education, CNCS – UEFISCDI (450000 lei $\approx$  100.000 euro), [ProjectHomePage](#).

The members of the team were: prof(asoc).dr.habil S.C. László (team leader), prof.dr.habil R.I. Boț, dr. A. Viorel, drd. C.D. Alecsa.

*2013-2015* Project leader of the Postdoctoral Research Project entitled "Overcoming the failure of classical monotonicity in solving problems in nonlinear-, variational- and convex analysis", PN-II-RU-PD-2012-3-0166, Technical University of Cluj-Napoca, financed by Romanian Ministry of Education, CNCS - UEFISCDI (299992lei $\approx$ 68.000 euro), [ProjectHomePage](#).