

## **Recent CIAS publications**

### **2021 December**

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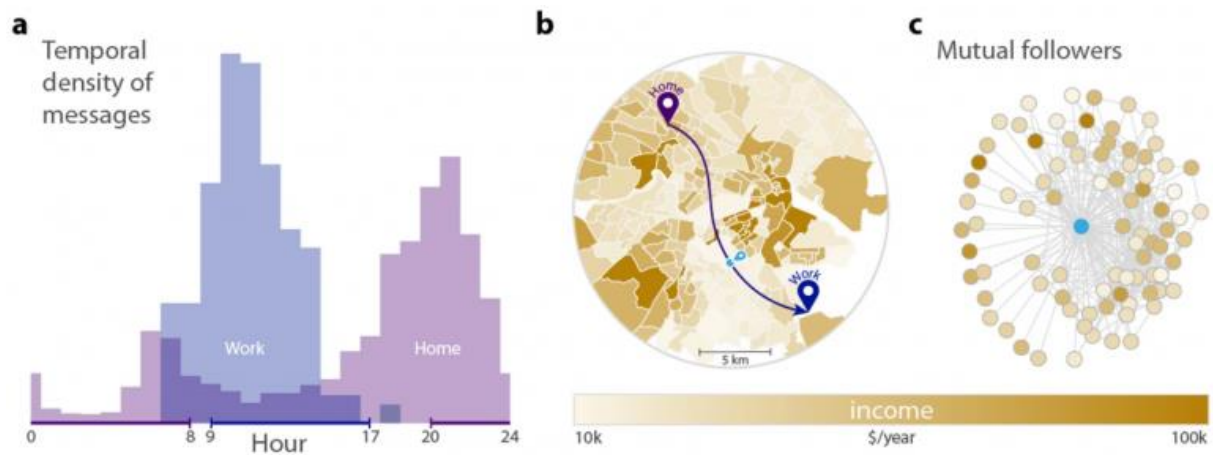
## Publications in Q1 journals

[Eszter Bokányi, Sándor Juhász and Balázs Lengyel's \(NeTI Lab\) paper in Scientific Reports](#)

**Eszter Bokányi – Sándor Juhász – M. Karsai – Balázs Lengyel** (2021) Universal patterns of long-distance commuting and social assortativity in cities. *Scientific Reports* 11, 20829 (2021). <https://doi.org/10.1038/s41598-021-00416-1>

New research article titled ‘Universal patterns of long-distance commuting and social assortativity in cities’ published in *Scientific Reports* by members of the NETI Lab, CIAS. The authors show that longer commuting rearranges the structure and composition of social connections inside cities.

Millions commute to work every day in cities and interact with colleagues, partners, friends, and strangers. Commuting facilitates the mixing of people from distant and diverse neighbourhoods, but whether this has an imprint on social inclusion or instead, connections remain homogeneous is less explored. The authors aim to better understand income sorting in social networks inside cities and investigate how commuting distance conditions the online social ties of Twitter users in the 50 largest metropolitan areas of the United States. An above-median commuting distance in cities is linked to more diverse individual networks, moreover, the article shows that longer commutes are associated with a nearly uniform, moderate reduction of overall social tie assortativity across all cities. This suggests a universal relation between long-distance commutes and the integration of social networks. The results inform policy that facilitating access across distant neighbourhoods can advance the social inclusion of low-income groups.



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Zsolt Darvay – **Tibor Illés** – **Petra Renáta Rigó** (2021) Predictor-corrector interior-point algorithm for  $P_*(\kappa)$ -linear complementarity problems based on a new type of algebraic equivalent transformation technique. *European Journal of Operational Research*

<https://doi.org/10.1016/j.ejor.2021.08.039>.

Abstract: We propose a new predictor-corrector (PC) interior-point algorithm (IPA) for solving linear complementarity problem (LCP) with  $P_*(\kappa)$ -matrices. The introduced IPA uses a new type of algebraic equivalent transformation (AET) on the centering equations of the system defining the central path. The new technique was introduced by Darvay and Takács (2018) for linear optimization. The search direction discussed in this paper can be derived from positive-asymptotic kernel function using the function  $\varphi(t) = t^2$  in the new type of AET. We prove that the IPA has

$O\left((1 + 4\kappa)\sqrt{n} \log \frac{3n\mu^0}{4\varepsilon}\right)$  iteration complexity, where  $\kappa$  is an upper bound of the

handicap of the input matrix. To the best of our knowledge, this is the first PC IPA for  $P_*(\kappa)$ -LCPs which is based on this search direction.

Péter Csóka – Ferenc Illés – **Tamás Solymosi** (2021) On the Shapley value of liability games. *European Journal of Operational Research*

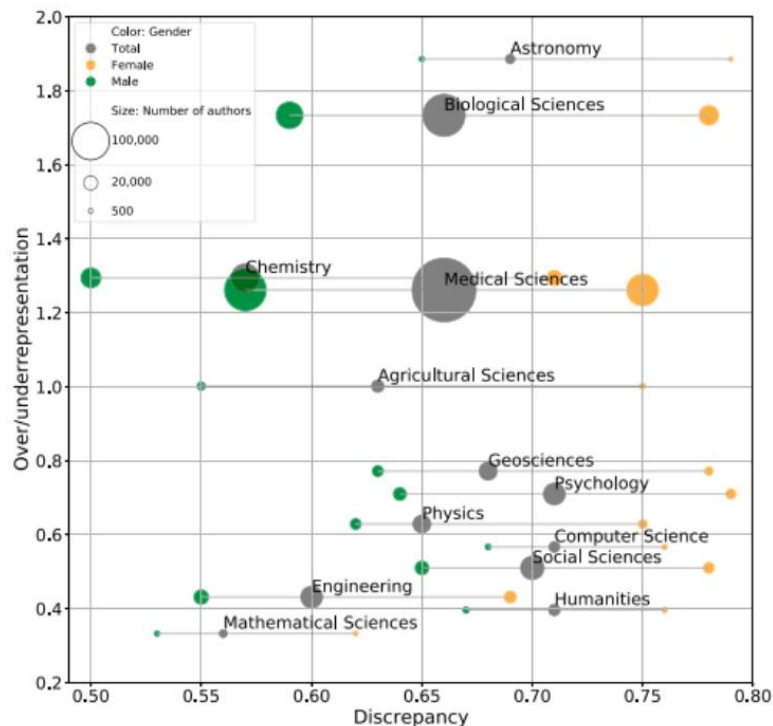
<https://doi.org/10.1016/j.ejor.2021.10.012>

Abstract: In a liability problem, the asset value of an insolvent firm must be distributed among the creditors and the firm itself, when the firm has some freedom in negotiating with the creditors. We model the negotiations using cooperative game theory and analyze the Shapley value to resolve such liability problems. We establish three main monotonicity properties of the Shapley value. First, creditors can only benefit from the increase in their claims or of the asset value. Second, the firm can only benefit from the increase of a claim but can end up with more or with less if the asset value increases, depending on the configuration of small and large liabilities. Third, creditors with larger claims benefit more from the increase of the asset value. Even though liability games are constant-sum games and we show that the Shapley value can be calculated directly from a liability problem, we prove that calculating the Shapley payoff to the firm is NP-hard.

**Orsolya Vásárhelyi** – Igor Zakhlebin – Staša Milojević – Emőke-Ágnes Horvát (2021) Gender inequities in the online dissemination of scholars' work. *Proceedings of the National Academy of Sciences (PNAS)* September 28, 2021 118 (39) e2102945118  
<https://doi.org/10.1073/pnas.2102945118>

New paper titled - Gender inequities in the online dissemination of scholars' work. got published at the prestigious Proceedings of the National Academy of Sciences (PNAS) by NETI Lab postdoctoral fellow Orsolya Vásárhelyi and co-authors. Vásárhelyi et al. showed that women are less successful than men in disseminating their research online, and demonstrate that scientific impact, social capital, and gendered tie formation in co-authorship networks are associated with the online success of men across research areas and levels of success, but not of women.

The massive data-driven study published by Orsolya Vásárhelyi and co-authors found evidence for gender inequality in the online dissemination of scholars' work. This large-scale work, based on half a million scholars' data, revealed that female scholars' work is mentioned less frequently than male scholars' work online in all research areas. They also found that the impact of prior work, social capital, and gendered tie formation in co-authorship networks are linked with online success for men, but not for women—even in the areas with the highest female representation. These results suggest that while men's scientific impact and collaboration networks are associated with higher visibility online, there are no universally identifiable facets associated with success for women.



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László Zsolnai and Gábor Kovács' (Economy & Religion program) paper in Journal of Management, Spirituality & Religion

**László Zsolnai – Gábor Kovács** (2021) Buddhist Values for Creating Mindful Markets. *Journal of Management, Spirituality & Religion* 18(1): 57-70.

<https://doi.org/10.51327/UGEH7597>

Abstract: The ultimate goal of Buddhist life is to reach enlightenment and put an end to suffering. From this perspective, the goal of human life can be defined as inner development – that is, ethical and spiritual growth that requires only a minimum level of material comfort (food, clothes, shelter, education, and medicine). This paper introduces principles and guidelines for individual behavior and business organizations derived from the Buddhist worldview. The paper argues that the realization of Buddhist values is needed for creating mindful markets in which mindful consumption and mindful entrepreneurship are mutually reinforcing. Mindful consumption can be defined as conscious consumption that is (i) wise (it supports the genuine well-being of individuals), (ii) non-violent (does not involve hurting other sentient beings), and (iii) compassionate (it helps others to satisfy their needs). Mindful entrepreneurship involves the application of Buddhist values and virtues in business activities, including production and trade.

## Publications in Q2 journals

László Lőrincz's (NeTI Lab) paper in Entropy

László Lőrincz (2021) Do Co-worker Networks Increase or Decrease Productivity Differences? *Entropy* 23(11), 1451

<https://doi.org/10.3390/e23111451>

The new publication in the special issue “Structures and Dynamics of Economic Complex Networks” of the *Entropy* journal seeks to answer the question about whether mobility of workers and networks between them contribute to decreasing or maintaining differences between regions.

Do labour mobility and co-worker networks contribute to convergence or divergence between regions? Based on the previous literature, labour mobility contributes to knowledge transfer between firms. Therefore, mobility may contribute to decreasing productivity differences, while limited mobility sustains higher differences. The effect of co-worker networks, however, can be two-fold in this process; they transmit information about potential jobs, which may enhance the mobility of workers—even between regions—and this enhanced mobility may contribute to levelling of differences. However, if mobility between regions involves movement costs, co-worker networks may concentrate locally—possibly contributing to the persistence of regional differences. In this paper, we build an agent-based model of labour mobility across firms and regions with knowledge spillovers that reflects key empirical observations on labour markets. We analyse the impact of network information provided about

potential employers in this model and find that it contributes to increasing inter-regional mobility, and subsequently, to decreasing regional differences.

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[Tamás Tóth's \(junior faculty research fellow\) paper in KOME](#)

Tamás Tóth (2021) Fractured implicitness. Why implicit populism matters? *KOME – An International Journal of Pure Communication Inquiry*

DOI: [10.17646/KOME.75672.68](https://doi.org/10.17646/KOME.75672.68)

Abstract: This paper aims to refine a theoretical and methodological approach in social sciences, namely implicit populism. To achieve this goal, the study aims to connect implicit populism and its counterpart, explicit populism to a specific research approach, namely the political communication style and introduce their contributions to the literature. Additionally, the paper introduces implicit populism's possible effects on content analyses to demonstrate its methodological potential. Finally, the study attempts to provide an aspect by which the antagonist part of implicit populism can be subcategorized. Therefore, new subdimension of antagonism might emerge in populism studies. The first focuses on the articulated enemy by employing, for instance, the signifier of 'dangerous people.' The second aims to explore the more sophisticated populist political style embedding the 'culprit others' in a concealed way. Consequently, expressions such as 'danger,' 'threat,' 'anger,' and 'hatred' are also parts of antagonism representing a universal and unarticulated problem that harmfully affects people.

### [Publications in other scientific journals](#)

[Marianna Eisenberg-Nagy's \(CCOR\) paper in SOR'21 Proceedings](#)

**Marianna E.-Nagy** – Anita Varga (2021) A numerical comparison of long-step interior point algorithms for linear optimization. In: Drobne – L. Zadnik Stirn – M. Kljajić Borštnar – J. Povh – J Žerovnik (eds.) *SOR '21 Proceedings - The 16th International Symposium on Operational Research in Slovenia*. Ljubljana: Slovenian Society INFORMATIKA - Section for Operational Research, 75-80. Available: <http://fgg-web.fgg.uni-lj.si/~/sdrobne/sor/SOR'21%20-%20Proceedings.pdf> Accessed: 10 November 2021

Abstract: Ai and Zhang (2005) closed the gap between the practice and theory of interior point methods (IPM) for LP. They proposed a large-update IPM with the same complexity as the best short-step methods. We combine their main ideas with the algebraic equivalent transformation technique introduced by Darvay (2003).

Using different transformation functions gives different search directions. Therefore we present sufficient properties of the function to keep the complexity of the proposed large-update algorithm  $O(\sqrt{n} L)$ .

[Marianna Eisenberg-Nagy's \(CCOR\) second paper in SOR'21 Proceedings](#)

Kolos Ágoston – **Marianna E.-Nagy** (2021) Mixed integer linear programming formulation for k-means cluster problem. In: Drobne – L. Zadnik Stirn – M. Kljajić Borštnar – J. Povh – J. Žerovnik (eds.) *SOR '21 Proceedings - The 16th International Symposium on Operational Research in Slovenia*. Ljubljana: Slovenian Society INFORMATIKA - Section for Operational Research, 49-60.

Available: <http://fgg-web.fgg.uni-lj.si/~sdrobne/sor/SOR'21%20-%20Proceedings.pdf> Accessed: 10 November 2021

Abstract: The minimum sum of clustering is the most used clustering method. The minimum sum of clustering is usually solved by the heuristic K-means algorithm which converges to a local optimum. Much effort was put into solving such kind of problem, but a mixed integer linear programming formulation (MILP) is still missing. In this paper, we formulate MILP models and solve them up to sample size 100. The advantage of MILP formulation is that users can extend the original problem with arbitrary linear constraints.

[Marianna Eisenberg-Nagy's \(CCOR\) paper in Corvinus Economics Working Papers](#)

Marianna E.-Nagy – Anita Varga (2021) A new long-step interior point algorithm for linear programming based on the algebraic equivalent transformation. Corvinus Economics Working Papers, CEWP

Available: <http://unipub.lib.uni-corvinus.hu/6771/>

Accessed: 10 November 2021

Abstract: In this paper, we investigate a new primal-dual long-step interior point algorithm for linear optimization. Based on the step-size, interior point algorithms can be divided into two main groups, short-step and long-step methods. In practice, long-step variants perform better, but usually, a better theoretical complexity can be achieved for the short-step methods. One of the exceptions is the largeupdate algorithm of Ai and Zhang. The new wide neighbourhood and the main characteristics of the presented algorithm are based on their approach. In addition, we use the algebraic equivalent transformation technique by Darvay to determine the search directions of the method.



Tibor Illés and Petra Renáta Rigó's (CCOR) paper in SOR'21 Proceedings

Roland Török – **Tibor Illés** – **Petra Renáta Rigó** (2021) Implementation of primal-dual interior-point algorithms for solving sufficient linear complementarity problems. In: Drobne – L. Zadnik Stirn – M. Kljajić Borštnar – J. Povh – J. Žerovnik (eds.) *SOR '21 Proceedings - The 16th International Symposium on Operational Research in Slovenia*. Ljubljana: Slovenian Society INFORMATIKA - Section for Operational Research, 86-91.

Available: <http://fgg-web.fgg.uni-lj.si/~sdrobne/sor/SOR'21%20-%20Proceedings.pdf>

Accessed: 10 November 2021

Abstract: A primal-dual interior-point algorithm (PD IPA) for solving  $P_*(\kappa)$ -linear complementarity problems (LCP) has been implemented and tested. The technique of algebraic equivalent transformation (AET) of the central path system allows us to incorporate into our implementation the most frequently used AET functions, namely  $\varphi(t) = t$ ,  $\varphi(t) = \sqrt{t}$  and  $\varphi(t) = t - \sqrt{t}$ .

László Zsolnai's (Economy & Religion program) paper in The Journal of the Macau Ricci Institute

László Zsolnai (2021) Frugality, Intrinsic Value of Nature, and Wellbeing Oriented Businesses. *The Journal of the Macau Ricci Institute* Issue 7, 2021 (May 12).

Available: <http://mrijournal.riccimac.org/index.php/en/issues/issue-7>

Accessed: November 10, 2021

I suggest three key ideas that are crucial to change the economic paradigm towards an economy oriented to the common good based on solidarity and fairness. These are frugality in consumption and production, acknowledging the intrinsic value of nature, and developing wellbeing oriented businesses.