Záznamy vložené do ASEP za UI (1. 12. – 31. 12. 2024)

New ICS records in ASEP (1. 12. – 31. 12. 2024)

0602775 - ÚI 2025 NL eng J - Journal Article
Fussner, Daniel Wesley - Galatos, N.
Semiconic idempotent logic II: Beth definability and deductive interpolation.
Annals of Pure and Applied Logic. Roč. 176, č. 3 (2025), č. článku 103528. ISSN 0168-0072. E-ISSN 1873-2461

Semiconic idempotent logic sCI is a common generalization of intuitionistic logic, semilinear idempotent logic sLI, and in particular relevance logic with mingle. We establish the projective Beth definability property and the deductive interpolation property for many extensions of sCI, and identify extensions where these properties fail. We achieve these results by studying the (strong) amalgamation property and the epimorphism-surjectivity property for the corresponding algebraic semantics, viz. semiconic idempotent residuated lattices. Our study is made possible by the structural decomposition of conic idempotent models achieved in the prequel, as well as a detailed analysis of the structure of idempotent residuated chains serving as index sets in this decomposition. Here we study the latter on two levels: as certain enriched Galois connections and as enhanced monoidal preorders. Using this, we show that although conic idempotent residuated lattices do not have the amalgamation property, the natural class of stratified and conjunctive conic idempotent residuated lattices has the strong amalgamation property, and thus has surjective epimorphisms. This extends to the variety generated by stratified and conjunctive conic idempotent residuated lattices, and we establish the (strong) amalgamation and epimorphism-surjectivity properties for several important subvarieties. Using the algebraizability of sCI, this yields the deductive interpolation property and the projective Beth definability property for the corresponding substructural logics extending sCI.
Permanent Link: https://hdl.handle.net/11104/0360077

0603164 - ÚI 2025 RIV DE eng J - Journal Article
Juškevičius, Tomas - Kurauskas, V.
Anticoncentration of Random Vectors via the Strong Perfect Graph Theorem.
Combinatorica. Roč. 45, č. 1 (2025), č. článku 1. ISSN 0209-9683. E-ISSN 1439-6912

In this paper we give anticoncentration bounds for sums of independent random vectors in finite-dimensional vector spaces. In particular, we asymptotically establish a conjecture of Leader and Radcliffe (SIAM J Discrete Math 7:90–101, 1994) and a question of Jones (SIAM J Appl Math 34:1–6, 1978). The highlight of this work is an application of the strong perfect graph theorem by Chudnovsky et al. (Ann Math 164:51–229, 2006) in the context of anticoncentration.
Permanent Link: https://hdl.handle.net/11104/0360400

Vlachos, Ioannis - Kugiumtzis, D. - Paluš, Milan
Causality from phases of high-dimensional nonlinear systems.
Detecting causal relations in large dynamical systems is a difficult endeavor. As system dimension increases only linear approaches can be used, under the not always reasonable assumption of linear dynamics, since applications of nonlinear approaches are computationally intractable. Herein we test our recently developed information theory-based approach for causality detection from phases, appropriate for time series that exhibit well-behaved oscillatory patterns, and we expand our previous analysis to large systems with intricate connection patterns. Other than periodic-like behavior, this approach does not require any assumptions and works well for large-dimensional systems. We assess its performance on artificial data from networks of 3 or 10 coupled Rössler oscillators and networks of 3 coupled Mackey-Glass equations. We then employ it to study the dynamics of the human brain in two test-cases, one of emotional state change in healthy subjects and one of pathological system change in epilepsy. In the course of our study, we identify some very interesting phenomena related to synchronization, which can lead any causality measure to failure. We finally discuss the steps needed to properly investigate causal relations, so that even if some real connections cannot be detected, at least false connections would not be inferred.
Permanent Link: https://hdl.handle.net/11104/0360399

Davoodi, Akbar - Holeňa, Martin - Brunovský, M. - Kathpalia, Aditi - Hlinka, Jaroslav - Bareš, M. - Paluš, Milan
Response prediction of antidepressants: Using graph theory tools for brain network connectivity analysis.

Depression, particularly in its serious form as major depressive disorder, is rapidly becoming a global health concern and is expected to become a leading cause of disability worldwide. Despite the critical role of antidepressant treatment, its effectiveness varies greatly among patients. Early prediction of the response to specific antidepressant regimens is vital. In this paper, we rely on the predictive efficacy of changes in EEG signals after the first week of treatment, supported by existing evidence in the literature. We use EEG markers and graph theory to create and compare brain networks from two patient visits. Our approach involves the application of a comprehensive set of powerful classifiers. Additionally, we propose a robust model for comparing multiple classifiers on the data using statistical analysis and graph theory, ensuring a trustworthy evaluation.
Permanent Link: https://hdl.handle.net/11104/0360405

Fejlek, Jiří - Ratschan, Stefan
Computation of feedback control laws based on switched tracking of demonstrations.

A common approach in robotics is to learn tasks by generalizing from special cases given by a so-called demonstrator. In this paper, we apply this paradigm and present an algorithm that uses a demonstrator (typically given by a trajectory optimizer) to automatically synthesize feedback controllers for steering a system described by ordinary differential equations into a goal set. The resulting feedback control law switches between the demonstrations that it uses as reference trajectories. In comparison to the direct use of trajectory optimization as a control law, for example, in the form of model predictive control, this allows for a much simpler and more efficient implementation of the controller. The synthesis algorithm comes with rigorous convergence and optimality results, and computational experiments confirm its efficiency.
Permanent Link: https://hdl.handle.net/11104/0360096

Latif, Yasir - Fan, K. - Wang, G. - Paluš, Milan
Cross-scale causal information flow from the El Niño–Southern Oscillation to precipitation in eastern China.

The El Niño–Southern Oscillation (ENSO) is a dominant mode of climate variability influencing temperature and precipitation in distant parts of the world. Traditionally, the ENSO influence is assessed considering its amplitude. Focusing on its quasi-oscillatory dynamics comprising multiple timescales, we analyze the causal influence of phases of ENSO oscillatory components on scales of precipitation variability in eastern China, using information-theoretic generalization of Granger causality. We uncover the causal influence of the ENSO quasi-biennial component on the precipitation variability on and around the annual scale, while the amplitude of the precipitation quasi-biennial component is influenced by the low-frequency ENSO components with periods of around 6 years. This cross-scale causal information flow is important mainly in the Yellow River basin (YWRB), while in the Yangtze River basin (YZRB) the causal effect of the ENSO amplitude is dominant. The presented results suggest that, in different regions, different aspects of ENSO dynamics should be employed for prediction of precipitation.
Permanent Link: https://hdl.handle.net/11104/0360093

Entropy, a key measure of chaos or diversity, has recently found intriguing applications in the realm of management science. Traditional entropy-based approaches for data analysis, however, prove inadequate when dealing with high-dimensional datasets. In this paper, a novel uncertainty coefficient based on entropy is proposed for categorical data, together with a pattern discovery method suitable for management applications. Furthermore, we present a robust fractal-inspired technique for estimating covariance matrices in multivariate data. The efficacy of this method is thoroughly examined using three real datasets with economic relevance. The results demonstrate the superior performance of our approach, even in scenarios involving a limited number of variables. This suggests that managerial decision-making processes should reflect the inherent fractal structure present in the given multivariate data. The work emphasizes the importance of considering fractal characteristics in managerial decision-making, thereby advancing the applicability and effectiveness of entropy-based methods in management science.
Permanent Link: https://hdl.handle.net/11104/0360027

Hlaváčková, Kateřina - **Melnykova, A.** - **Tubikanec, I.**
Granger Causal Inference in Multivariate Hawkes Processes by Minimum Message Length.
Journal of Machine Learning Research. Roč. 25 (2024), s. 1-26. ISSN 1532-4435

Multivariate Hawkes processes (MHPs) are versatile probabilistic tools used to model various real -life phenomena: earthquakes, operations on stock markets, neuronal activity, virus propagation and many others. In this paper, we focus on MHPs with exponential decay kernels and estimate connectivity graphs, which represent the Granger causal relations between their components. We approach this inference problem by proposing an optimization criterion and model selection algorithm based on the minimum message length (MML) principle. MML compares Granger causal models using the Occam's razor principle in the following way: even when models have a comparable goodness -of -fit to the observed data, the one generating the most concise explanation of the data is preferred. While most of the state -of -art methods using lasso -type penalization tend to overfitting in scenarios with short time horizons, the proposed MML-based method achieves high F1 scores in these settings. We conduct a numerical study comparing the proposed algorithm to other related classical and state -of - art methods, where we achieve the highest F1 scores in specific sparse graph settings. We illustrate the proposed method also on G7 sovereign bond data and obtain causal connections, which are in agreement with the expert knowledge available in the literature.
Permanent Link: https://hdl.handle.net/11104/0360229

Fussner, Daniel Wesley - **Santschi, S.**
Interpolation in Linear Logic and Related Systems.
ACM Transactions on Computational Logic. Roč. 25, č. 4 (2024), s. 1-19, č. článku 20. ISSN 1529-3785. E-ISSN 1557-945X

We prove that there are continuum-many axiomatic extensions of the full Lambek calculus with exchange that have the deductive interpolation property. Further, we extend this result to both classical and intuitionistic linear logic as well as their multiplicative-additive fragments. None of the logics we exhibit have the Craig interpolation property, but we show that the exhibited extensions of classical and intuitionistic linear logic all enjoy a guarded form of Craig interpolation. We also give continuum-many axiomatic extensions of classical linear logic without the deductive interpolation property.
Permanent Link: https://hdl.handle.net/11104/0360026

0602440 - ÚI 2025 US eng J - Journal Article
Hladká, Adéla - **Martinková, Patrícia** - **Brabec, Marek**
New iterative algorithms for estimation of item functioning (ACCEPTED).

When the item functioning of multi-item measurement is modeled with three or four-parameter models, parameter estimation may become challenging. Effective algorithms are crucial in such scenarios. This paper explores innovations to parameter estimation in generalized logistic regression models, which may be used in item response modeling to account for guessing/pretending or slipping/dissimulation and for the effect of covariates. We introduce a new implementation of the EM algorithm and propose a new algorithm based on the parametrized link function. The two novel iterative algorithms are compared to existing methods in a simulation study. Additionally, the study examines software implementation, including the specification of initial values for numerical algorithms and asymptotic properties with an estimation of standard errors. Overall, the newly proposed algorithm based on the parametrized link function outperforms other procedures, especially for small sample sizes. Moreover, the newly implemented EM algorithm provides additional information regarding respondents' inclination to guess or pretend and slip or dissimulate when answering the item. The study also discusses applications of the methods in the context of the detection of differential item functioning. Methods are demonstrated using real data from psychological and educational assessments.
Permanent Link: https://hdl.handle.net/11104/0359638

0602309 - ÚI 2025 RIV US eng J - Journal Article
Bočková, M. - **Vytvarová, E.** - **Lamoš, M.** - **Hlinka, Jaroslav** - **Goldemundová, S.** - **Rektor, I.**
Revealing Connectivity Patterns of Deep Brain Stimulation Efficacy in Parkinson's Disease.

The aim of this work was to study the effect of deep brain stimulation of the subthalamic nucleus (STN-DBS) on the subnetwork of subcortical and cortical motor regions using the functional connectivity analysis in Parkinson's disease (PD). The high-density source space EEG was acquired and analyzed in 43 PD subjects in DBS on and DBS off stimulation states (off medication) during a cognitive-motor task. Increased connectivity within subcortical regions and between subcortical and cortical motor regions in the high gamma band (50-100Hz) was significantly associated with the Movement Disorders Society – Unified Parkinson's Disease Rating Scale (MDS-UPDRS) III improvement. Further, the whole brain connectivity patterns were evaluated to complement this finding. The connectivity patterns in low gamma (30-50Hz) and high gamma band (50-100Hz) significantly correlated with the movement improvement. Neural correlates of cognitive performance were detected in the beta (12-30Hz) and high gamma (50-100Hz) bands. Finally, a whole brain multifrequency connectivity profile was found to classify optimal and suboptimal responders to DBS with a positive predictive value of 0.77, negative predictive value of 0.55, specificity of 0.73, and sensitivity of 0.60. Specific connectivity patterns related to motor symptoms improvement after DBS and therapy responsiveness predictive connectivity profiles were uncovered.
Permanent Link: https://hdl.handle.net/11104/0359446

Filip, P. - Vojtíšek, L. - Jičínská, A. M. - Valenta, Zdeněk - Horák, O. - Hrunka, M. - Mangia, S. - Michaeli, S. - Jabandžiev, P.
Wide-spread brain alterations early after the onset of Crohn's disease in children in remission—a pilot study.
BACKGROUND: The research on possible cerebral involvement in Crohn's disease (CD) has been largely marginalized and failed to capitalize on recent developments in magnetic resonance imaging (MRI). OBJECTIVE: This cross-sectional pilot study searches for eventual macrostructural and microstructural brain affection in CD in remission and early after the disease onset. METHODS: 14 paediatric CD patients and 14 healthy controls underwent structural, diffusion weighted imaging and quantitative relaxation metrics acquisition, both conventional free precession and adiabatic rotating frame transverse and longitudinal relaxation time constants as markers of myelination, iron content and cellular loss. RESULTS: While no inter-group differences in cortical thickness and relaxation metrics were found, lower mean diffusivity and higher intracellular volume fraction were detected in CD patients over vast cortical regions essential for the regulation of the autonomous nervous system, sensorimotor processing, cognition and behavior, pointing to wide-spread cytotoxic oedema in the absence of demyelination, iron deposition or atrophy. CONCLUSION: Although still requiring further validation in longitudinal projects enrolling larger numbers of subjects, this study provides an indication of wide-spread cortical oedema in CD patients very early after the disease onset and sets possible directions for further research
Permanent Link: https://hdl.handle.net/11104/0359452

Braunfeld, Samuel Walker - Laskowski, M.
Corrigenda to "Characterizations of monadic NIP".
ZÁKLADNÍ ÚDAJE: Transactions of the American Mathematical Society Series B. Roč. 11, October 2024 (2024), s. 1226-1232. ISSN 2330-0000. ABSTRAKT: The authors correct results in "Characterizations of monadic NIP" [Trans. Amer. Math. Soc. Ser. B 8 (2021), pp. 948–970]. The notion of endless indiscernible triviality is introduced and replaces indiscernible triviality throughout, in particular in Theorem 1.1. The claim regarding the failure of 4-wqo in Theorem 1.2 is withdrawn and remains unproved.
Permanent Link: https://hdl.handle.net/11104/0360117

0602729 - ÚI 2025 GB eng J - Journal Article
Sargsyan, K. - Kinkorová, J. - Hartl, G. - Pecen, Ladislav - Villar, S. - Wooton, T. - Kozlakidis, Z. - Babikyan, D. - Sarkisian, T.
Twinning for the Armenian research infrastructure on cancer research.
Open Research Europe. Roč. 4, č. 58 (2024). ISSN 2732-5121

The incidence of cancer is expected to rise globally, with low-and middle-income countries affected disproportionally. One of those countries, Armenia, also faces the challenge of exhibiting one of the lowest research and scientific publication rates within Europe on cancer research. This report presents the experiences of the Twinning for the Armenian Research Infrastructure on Cancer Research (ARICE) program, funded by the European Commission from 2019 – 2024. The project brought together experts from three leading research-intensive, cancer centres: the Medical University of Graz, Austria; the Charles University, Czechia; and the International Agency for Research on Cancer, World Health Organization (IARC/WHO), in partnership with the Yerevan State Medical University. The aim was to enhance the research capacity in Armenia in the field of infrastructure development for clinical genetic research, in particular targeting the collection and use of biological materials, and the data integration for downstream analyses in relation to chronic, non-communicable diseases such as cancer. To this end, training initiatives and educational programmes were developed throughout the duration of the grant and are discussed within their local context.
Permanent Link: https://hdl.handle.net/11104/0360015

0603182 - ÚI 2025 CZ cze J - Journal Article
Haniková, Zuzana
O metafoře světla ve Vopěnkových Meditacích (ACCEPTED).
Filosofický časopis. Accepted November 2024 (2025). ISSN 0015-1831
Permanent Link: https://hdl.handle.net/11104/0360421

0602747 - ÚI 2025 RIV DE eng C - Conference Paper (international conference)
Cabessa, Jérémie - Hernault, H. - Mushtaq, U.
Argument Mining in BioMedicine: Zero-Shot, In-Context Learning and Fine-tuning with LLMs.
Proceedings of the Tenth Italian Conference on Computational Linguistics (CLiC-it 2024). Aachen: Technical University & CreateSpace Independent Publishing, 2024 - (Dell'Orletta, F.; Lenci, A.; Montemagni, S.; Sprugnoli, R.). CEUR Workshop Proceedings. ISSN 1613-0073
Argument Mining (AM) aims to extract the complex argumentative structure of a text and Argument Type Classification (ATC) is an essential sub-task of AM. Large Language Models (LLMs) have shown impressive capabilities in most NLP tasks and beyond. However, fine-tuning LLMs can be challenging. In-Context Learning (ICL) has been suggested as a bridging paradigm between training-free and fine-tuning settings for LLMs. In ICL, an LLM is conditioned to solve tasks using a few solved demonstration examples included in its prompt. We focus on AM in the biomedical AbstRCT dataset.

We address ATC using quantized and unquantized LLaMA-3 models through zero-shot learning, in-context learning, and fine-tuning approaches. We introduce a novel ICL strategy that combines kNN-based example selection with majority vote ensembling, along with a well-designed fine-tuning strategy for ATC. In zero-shot setting, we show that LLaMA-3 fails to achieve acceptable classification results, suggesting the need for additional training modalities. However, in our ICL training-free setting, LLaMA-3 can leverage relevant information from only a few demonstration examples to achieve very competitive results. Finally, in our fine-tuning setting, LLaMA-3 achieves state-of-the-art performance on ATC task in AbstRCT dataset
Permanent Link: https://hdl.handle.net/11104/0360037

0602451 - ÚI 2025 RIV ES eng C - Conference Paper (international conference)
Pérez Cabrera, Iván - Vomlel, J.
Enhancing Bayesian Networks with Psychometric Models.
Proceedings of Machine Learning Research, Volume 246 : International Conference on Probabilistic Graphical Models. Almería: PMLR, 2024, s. 401-414. E-ISSN 2640-3498.
[International Conference on Probabilistic Graphical Models 2024 /12./. Nijmegen (NL), 11.09.2024-13.09.2024]
R&D Projects: GA ČR(CZ) GA22-11101S
Institutional support: RVO:67985807
Keywords : Bayesian networks * Parameter Learning * Hidden Variables * BN2A models * Cognitive Diagnostic Modeling * Psychometrics
OECD category: Computer sciences, information science, bioinformathics (hardware development to be 2.2, social aspect to be 5.8)
Result website:
https://raw.githubusercontent.com/mlresearch/v246/main/assets/perez24a/perez24a.pdf https://proceedings.mlr.press/v246/perez24a.html
Bayesian networks (BNs) are a popular framework in education and other fields. In this paper, we consider two-layer BNs, where the first layer consists of hidden binary variables that are assumed to be independent of each other, and the second layer consists of observed binary variables. The variables in the second layer depend on the variables in the first layer. The dependence is characterized by conditional probability tables, which represent Noisy-AND models. We refer to this class of models as BN2A models. We found that these models are also popular in the psychometric community, where they can be found under the name of Cognitive Diagnostic Models (CDMs), which are used to classify test takers into some latent classes according to the similarity of their responses to test questions. This paper shows the relation between some BN2A models and their corresponding CDMs. In particular, we compare the performance of these models on large-scale tests conducted in the Czech Republic in 2022. The BN2A model with general conditional probability tables produced the best absolute fit. However, when we added monotonic constraints to the General model, we obtained better predictive results.
Permanent Link: https://hdl.handle.net/11104/0359645

0602880 - ÚI 2025 RIV C - Conference Paper (international conference)
Kalina, Jan
On the information-based approaches in economics and finance.
The 18th International Days of Statistics and Economics Conference Proceedings. Slaný: Melandrium, 2024 - (Löster, T.; Pavelka, T.), s. 186-195. ISBN 978-80-87990-34-6.
[International Days of Statistics and Economics /18./. Prague (CZ), 05.09.2024-06.09.2024]
Grant - others:GA ČR(CZ) GA24-11146S
Institutional support: RVO:67985807
Keywords : information sciences * information flow * transfer learning * nonlinear regression *

robust estimation
OECD category: Applied Economics, Econometrics
Result website:

https://msed.vse.cz/msed_2024/article/msed-2024-756-paper.pdf

The amount of information relevant for decision making in economic and financial applications keeps dramatically increasing. This will allow a radical transformation of economic and financial practices towards the ideals that may be denoted as informationbased. These information-based procedures will exploit modern statistical tools for extracting useful knowledge from the available information in the form of data. This paper is devoted to a discussion of information-based approaches to investing, which will be based on portfolio diversification and optimization, or to transfer learning, where the last is based on information flow from given learning tasks (especially in finance) to a new related task. In addition, a novel robust procedure for estimating the parameters of the Gompertz curve is proposed here. On the whole, the information-based approaches in economics and finance will definitely go beyond the currently discussed evidence-based approaches, which are inspired by the currently popular concept of the evidence-based medicine.
Permanent Link: https://hdl.handle.net/11104/0360194

0602744 - ÚI 2025 RIV DE eng C - Conference Paper (international conference)
Tani Raffaelli, Giulio
Promises from an Inferential Approach in Classical Latin Authorship Attribution.
CHR 2024: Computational Humanities Research 2024: Proceedings of the Computational Humanities Research Conference 2024. Aachen: Technical University & CreateSpace Independent Publishing, 2024 - (Haverals, W.; Koolen, M.; Thompson, L.), s. 610-619. CEUR Workshop Proceedings, 3834. ISSN 1613-0073.
[CHR 2024: Computational Humanities Research Conference /5./. Aarhus (DK), 04.12.2024-06.12.2024]
Institutional support: RVO:67985807
Keywords : authorship attribution * inference * classical Latin * visualisation
OECD category: Computer sciences, information science, bioinformathics (hardware development to be 2.2, social aspect to be 5.8)
Result website:

https://ceur-ws.org/Vol-3834/paper121.pdf

Applying stylometry to Authorship Attribution requires distilling the elements of an author's style sufficient to recognise their mark in anonymous documents. Often, this is accomplished by contrasting the frequency of selected features in the authors' works. A recent approach, CP2D, uses innovation processes to infer the author's identity, accounting for their propensity to introduce new elements. In this paper, we apply CP2D to a corpus of Classical Latin texts to test its effectiveness in a new context and explore the additional insight it can offer the scholar. We show its effectiveness on a corpus of classical Latin texts and how—moving beyond maximum likelihood—we can visualise the stylistic relationships and gather additional information on the relationships among documents.
Permanent Link: https://hdl.handle.net/11104/0360031

0603021 - ÚI 2025 RIV US eng C - Conference Paper (international conference)
Figueroa-Garcia, J.C. - Franco, C. - Neruda, Roman
Random variate generation for discrete fuzzy numbers based on α-cuts.
2024 IEEE 7th International Conference on Big Data and Artificial Intelligence (BDAI)
Proceedings. Piscataway: IEEE, 2024, s. 259-264. ISBN 979-8-3503-5201-6.
[BDAI 2024: IEEE International Conference on Big Data and Artificial Intelligence /7./. Beijing (CN), 05.07.2024-07.07.2024]
Institutional support: RVO:67985807

Keywords : Discrete fuzzy numbers * Random variate generation * Fuzzy simulation
OECD category: Computer sciences, information science, bioinformathics (hardware development to be 2.2, social aspect to be 5.8)
Result website:
https://doi.org/10.1109/BDAI62182.2024.10692377
DOI: https://doi.org/10.1109/BDAI62182.2024.10692377

Probabilistic based random variate generation is the most popular method for representing randomness into simulation scenarios that could occur in real life. The main idea behind the use of random numbers to replicate the value of a uncertain variable can also be extended to fuzzy sets, including discrete fuzzy sets. This way, it is possible to use random numbers and the α-cut of a discrete fuzzy set to retrieve a random variate alongside its membership degree. To do so, a method for computing discrete fuzzy random variates based on α-cuts is proposed and applied to two examples: a comprehensive and a simulation example.
Permanent Link: https://hdl.handle.net/11104/0360286

0603024 - ÚI 2025 RIV DE eng C - Conference Paper (international conference)
Ladin, T. - Korel, L. - Holeňa, Martin
Textual embeddings with word-type-weighted word2vec.
Proceedings of the 24th Conference Information Technologies – Applications and Theory (ITAT 2024). Aachen: Technical University & CreateSpace Independent Publishing, 2024 - (Ciencialová, L.; Holeňa, M.; Jajcay, R.; Jajcayová, T.; Mačaj, M.; Mráz, F.; Ostertág, R.; Pardubská, D.; Plátek, M.; Stanek, M.), s. 37-42. CEUR Workshop Proceedings, 3792. ISSN 1613-0073.
[ITAT 2024: Conference Information Technologies – Applications and Theory /24./. Drienica (SK), 20.09.2024-24.09.2024]
Institutional support: RVO:67985807
Keywords : text representation learning * text embedding * text preprocessing * word2vec
OECD category: Computer sciences, information science, bioinformathics (hardware development to be 2.2, social aspect to be 5.8)
Result website:
https://ceur-ws.org/Vol-3792/paper4.pdf

The increasing use of artificial neural networks for knowledge processing often lacks precise knowledge representation. To address this issue, we propose using a word-type-weighted Word2Vec model to achieve more accurate representations of individual words within sentences. Our approach incorporates weighting vector embeddings of words based on parts-ofspeech predictions generated by the spaCy library. Experimental results demonstrate that, compared to simple Word2Vec, our model enhances the accuracy of recognizing the semantics of a sentence, while maintaining significantly lower computational requirements than large language models and various variants of Transformer.
Permanent Link: https://hdl.handle.net/11104/0360288

0603035 - ÚI 2025 RIV CH eng C - Conference Paper (international conference)
Koza, J. - Tumpach, J. - Pitra, Z. - Holeňa, Martin
Using Past Experience for Configuration of Gaussian Processes in Black-Box Optimization.
Learning and Intelligent Optimization. Revised Selected Papers. Cham: Springer, 2021 - (Simos, D.; Pardalos, P.; Kotsireas, I.), s. 167-182. Lecture Notes on Computer Science, 12931. ISBN 978-3-030-92120-0. ISSN 0302-9743.
[LION 15: Learning and Intelligent Optimization Conference /15./. Athens / online (GR), 20.06.2021-25.06.2021]
R&D Projects: GA ČR(CZ) GA18-18080S

This paper deals with the configuration of Gaussian processes serving as surrogate models in black-box optimization. It examines several different covariance functions of Gaussian processes (GPs) and a combination of GPs and artificial neural networks (ANNs). Different configurations are compared in the context of a surrogate-assisted version of the Covariance Matrix Adaptation Evolution Strategy (CMA-ES), a state-of-the-art evolutionary black-box optimizer. The configuration employs a new methodology, which consists of using data from past runs of the optimizer. In that way, it is possible to avoid demanding computations of the optimizer only to configure the surrogate model as well as to achieve a much more robust configuration relying on 4600 optimization runs in 5 different dimensions. The experimental part reveals that the lowest rank difference error, an error measure corresponding to the CMA-ES invariance with respect to monotonous transformations, is most often achieved using rational quadratic, squared exponential and Matérn 5/2 kernels. It also reveals that these three covariance functions are always equivalent, in the sense that the differences between their errors are never statistically significant. In some cases, they are also equivalent to other configurations, including the combination ANN-GP.
Permanent Link: https://hdl.handle.net/11104/0360305

Fernández-Duque, David - Montacute, Y.
Untangled: A Complete Dynamic Topological Logic.
Proceedings of the AAAI Conference on Artificial Intelligence 2023. Palo Alto: AAAI Press, 2023 - (Williams, B.; Chen, Y.; Neville, J.), s. 6355-6362. Proceedings of the AAAI Conference on Artificial Intelligence, Vol. 37 No. 5: AAAI-23 Technical Tracks 5. ISSN 2159-5399.
[AAAI 2023: The Annual Conference on Artificial Intelligence /37./. Washington, D. C. (US), 07.02.2023-14.02.2023]
Dynamical systems are general models of change or movement over time with a broad area of applicability to many branches of science, including computer science and AI. Dynamic topological logic (DTL) is a formal framework for symbolic reasoning about dynamical systems. DTL can express various liveness and reachability conditions on such systems, but has the drawback that the only known axiomatisation requires an extended language. In this paper, we consider dynamic topological logic restricted to the class of scattered spaces. Scattered spaces appear in the context of computational logic as they provide semantics for provability and enjoy definable fixed points. We exhibit the first sound and complete dynamic topological logic in the original language of DTL. In particular, we show that the version of DTL based on the class of scattered spaces is finitely axiomatisable, and that the natural axiomatisation is sound and complete.
Permanent Link: https://hdl.handle.net/11104/0360310

0602750 - ÚI 2025 eng C - Conference Paper (international conference)
Cabessa, Jérémie - Hernault, H. - Mushtaq, U.
Argument Mining with Fine-Tuned Large Language Models (ACCEPTED).
Proceedings of the COLING 2025 Thirty-First International Conference on Computational Linguistics.
[COLING 2025: International Conference on Computational Linguistics /31./. Abu Dhabi (AE),
19.01.2025-24.01.2025]
R&D Projects: GA ČR(CZ) GA22-02067S
Institutional support: RVO:67985807
OECD category: Computer sciences, information science, bioinformathics (hardware development to
be 2.2, social aspect to be 5.8)
Permanent Link: https://hdl.handle.net/11104/0360038

0602143 - ÚI 2025 RIV cze U - Conference, Workshop Arrangement
Geletič, Jan - Urban, Aleš
Odolnost městského prostředí vůči horku.
[Praha, 20.11.2024-20.11.2024, (W-EUR 30/1)]
EU Projects: European Commission(XE) 101137851 - CARMINE
Institutional support: RVO:67985807
OECD category: Meteorology and atmospheric sciences

Konzultační setkání a participativní workshop na téma 'Odolnost městského prostředí vůči horku'
probíhá v rámci projektů DESTINATION Earth: Urban Heat Use Case, Horizon Europe: CROSSEU a
Horizon Europe: CARMINE. akce je zaměřená na otázky přizpůsobení městských oblastí narůstajícímu
horku, sdílení vědeckých poznatků a účinných opatření ke zvýšení klimatické odolnosti města.
The consultation meeting and participatory workshop on the topic 'Resilience of the urban
environment to heat' is taking place within the framework of the projects DESTINATION Earth: Urban
Heat Use Case, Horizon Europe: CROSSEU and Horizon Europe: CARMINE. The event focuses on the
issues of adapting and mitigating urban areas to increasing heat load, sharing scientific knowledge
and effective measures to increase the climate resilience of the Prague city.
Permanent Link: https://hdl.handle.net/11104/0359355

0602142 - ÚI 2025 RIV cze U - Conference, Workshop Arrangement
Geletič, Jan
Praha-Holešovice – tepelné prostředí člověka.
[Praha, 14.11.2024-14.11.2024, (W-CST)]
Grant - others:AV ČR(CZ) StrategieAV21/23
Program: StrategieAV
Institutional support: RVO:67985807
OECD category: Meteorology and atmospheric sciences
Permanent Link: https://hdl.handle.net/11104/0359353

0602110 - ÚI 2025 DE eng A - Abstract
Janků, Zdeněk - Dobrovolný, Petr - Geletič, Jan - Lehnert, M.
The future changes in spatio-temporal distribution of urban heat load and factors that affect its
variability.
EGU General Assembly 2024 Abstracts. Munich: European Geosciences Union, 2024.
[EGU General Assembly 2024. 14.04.2024-19.04.2024, Vienna]
Institutional support: RVO:67985807
Result website:

Summer temperature extremes are increasing rapidly under the current global climate change. Urban environments are among those most exposed to temperature extremes due to the urban heat island, and these exacerbated conditions significantly affect human health and activities, making urban heat load one of the most fundamental concerns for people living in cities. Our research quantifies spatio-temporal changes in urban heat load in two Central-European cities (Brno and Ostrava, Czech Republic) in different geographical configurations. We applied the urban climate model MUKLIMO_3, combined with the cuboid method, to simulate recent and future distributions of four summer climate indices. The simulation results clearly indicate continuous climate warming and project a significant increase in the mean annual values of summer climate indices by the end of the 21st century, particularly in the built-up areas with a predominance of impervious surfaces. Both model simulations and in-situ observations confirm that the magnitude of these changes can differ significantly from city to city suggesting the distribution of urban heat load is not only influenced by climate change, but also by local geography and anthropogenic factors. To determine the causes of the differences in urban heat load variability, we applied land use/land cover configuration metrics and correlation analysis using various geographical factors. Our results show that a compact and less fragmented land use/land cover structure can significantly increase the urban heat load. Altitude also has a strong influence on the heat load pattern in complex terrain. Therefore, some cities are and may continue to be extremely vulnerable to adverse summer temperature extremes. We suggest that urban planners should take into account the current impact of land use/land cover structure on temperature conditions when designing effective adaptation measures to mitigate urban heat load.
Permanent Link: https://hdl.handle.net/11104/0359315

Lehnert, M. - Květoňová, V. - Koukalová, A. - Jurek, M. - Geletič, Jan
Investigation of diurnal/nocturnal and seasonal effect of blue and green features on thermal exposure in Czech cities.
Increasing intensity, frequency, and duration of hot extremes has been one of the most pronounced aspects of climate change in Central Europe. At the same time cities and towns, where the majority of the population live, are affected by added urban heat load. Such circumstances require effective adaptation of the municipalities to heat extremes. On that account, the influence of blue and green features and various surfaces on thermal exposure, represented by MRT and physiological indices of Universal Thermal Climate Index (UTCI) and Physiological Equivalent Temperature (PET), has been investigated over a period of five years in a set of short-term measurement campaigns in several Czech cities. The results showed that trees in open public areas of Czech cities lead to a substantial decrease of thermal exposure during the daytime whereas it might slightly increase on-site thermal exposure during the night. Maintained turfs in open areas characteristically reduce thermal exposure only slightly, depending on grass height and density and soil properties. Similarly, the cooling or warming effect of blue elements differs with their character. The effect of fountains and misting systems in open areas of thermal exposure is usually hardly detectable; however, ground-based fountains moisturising the pavement seem efficient. Further results from a recently launched measurement winter season campaign are expected soon.
Permanent Link: https://hdl.handle.net/11104/0359319

0602315 - ÚI 2025 RIV cze A - Abstract

Gajdoš, M. - Schejbalová, M. - Lamoš, M. - Říha, P. - Hlinka, Jaroslav - Mikl, M. - Rektorová, I.

Přínos rozšíření analýzy funkční konektivity o dynamické parametry u prodromálního stadia demence s Lewyho tělísky.

36.český a slovenský epileptologický sjezd a 70. český a slovenský sjezd klinické neurofyziologie. Abstrakta. Olomouc: Česká a Slovenská liga proti epilepsii, 2024. s. 46-47.

[36. český a slovenský epileptologický sjezd. 24.10.2024-25.10.2024, Olomouc]

R&D Projects: GA MŠMT(CZ) EH22_008/0004643

Institutional support: RVO:67985807

OECD category: Neurosciences (including psychophysiology

Result website:

https://www.sjezdvolomouci.cz/exe/file/a8dc9f5cd3a2599a798e3180e.pdf/abstrakta_EPI%20+%20KN_2024.pdf

Analýza klidových fMRI dat se často opírá o statistické metriky, které hodnotí vztahy signálů jako celků. V tomto příspěvku se chceme věnovat přínosu, který takové analýze mohou dodat parametry dynamické funkční konektivity (dFC). Demonstrujeme ho na schopnosti klasifikovat z klidových fMRI dat prodromální stadium demence s Lewyho tělísky (MCI-LB).

Permanent Link: https://hdl.handle.net/11104/0359451

0602115 - ÚI 2025 SK eng A - Abstract

Bauerová, P. - Keder, J. - Šindelářová, A. - Patiño, W. - Vlček, O. - Krč, Pavel - Resler, Jaroslav - Geletič, Jan - Řezníček, Hynek - Bureš, Martin - Eben, Kryštof - Belda, M. - Radović, J. - Fuka, V. - Jareš, R. - Sühring, M. - Ezau, I.

Measurement campaign focused on meteorology and air quality to support the validation of the PALM LES model in Prague.

EMS 2023 Annual Meeting Abstracts. Bratislava: EMS, 2023, č. článku EMS2023-536..

[EMS 2023 Annual Meeting. 03.09.2023-08.09.2023, Bratislava]

Institutional support: RVO:67985807

Result website:

https://meetingorganizer.copernicus.org/EMS2023/EMS2023-536.html

DOI: https://doi.org/10.5194/ems2023-536

The LES based modelling system PALM has been widely extended during recent years. A lot of the development focused on the processes needed for simulation of complex urban environments. Besides individual validations of the newly developed processes, an evaluation of the complete modelling system in a real urban environment is necessary to ensure the reliability of modelling results. Such comprehensive validation requires the construction of additional monitoring networks within the areas of interest to obtain sufficient data support. Our earlier campaigns, e.g. Resler et.al. (2017, 2020), focused mainly on validation of the energy exchange related processes in urban area. As part of the currently running international TURBAN project, a measurement campaign was implemented in the center of Prague, Czech Republic. It focuses mainly on evaluation of the street level meteorological and air quality dynamical processes by utilisation of a specially built sensor network placed in heavily polluted street canyons (traffic-related pollution). Twenty air quality sensors were complemented by a doppler lidar and microwave radiometer profile observations, and by observations from permanent meteorological and air quality monitoring stations operated by the Czech Hydrometeorological Institute (CHMI). These data were compared with PALM simulations performed for selected episodes of the year. The PALM model was configured in two nested domains with resolution of 10 m / 2 m and the extent of 8×8 km / 1.2×1.6 km. A significant challenge to the measurement campaign was the low accuracy and reliability of air quality sensor observations. The differences in the values of individual sensors as well as their deviations from the reference observations reached tens of percent.

Using sufficiently long co-measurement with the reference monitoring station and advanced statistical methods, sufficiently accurate and reliable data suitable for model evaluation were obtained. To ensure long-term quality control of the observations, two selected sensors were co-located with a continuous reference CHMI station within the simulation domain. Similarly, setting up a profile measurement (especially with Doppler LIDAR) to obtain the maximum possible information in a given space and processing a large amount of data was a challenge. The presentation shows the details of the observations and their processing as well as the preliminary results of the model evaluation.
Permanent Link: https://hdl.handle.net/11104/0359321

0602117 - ÚI 2025 DE eng A - Abstract
Radović, J. - Belda, M. - Resler, Jaroslav - Krč, Pavel - Eben, Kryštof - Bureš, Martin - Geletič, Jan
Sensitivity study of the PALM model system to different driving conditions.
EGU General Assembly 2023 Abstracts. Münich: Copernicus GmbH, 2023.
[EGU General Assembly 2023. 23.04.2023-28.04.2023, Vienna]
Institutional support: RVO:67985807
Result website:
https://meetingorganizer.copernicus.org/EGU23/EGU23-11730.html
DOI: https://doi.org/10.5194/egusphere-egu23-11730
The LES-based PALM model system 6.0 is a state-of-the-art atmospheric numerical model widely used among scientists for urban boundary layer and urban climate studies. Despite being subjected to many validation and sensitivity studies which tested the model's accuracy and applicability to urban environments, a major step is needed to test its sensitivity to different driving conditions. In this study, we performed a series of PALM model simulations for a given domain and two selected episodes during the year 2019. Each simulation lasts 72 h, and all of them were performed for an 8 km x 8 km domain in 10 m resolution encompassing a real built-up residential area in the southeast part of the city of Prague, Czech Republic. The simulation setups are identical apart from the initial and boundary conditions imposed. For that purpose we utilized the mesoscale WRF model and created an ensemble consisting of several members with different parameterization schemes. This study's findings are serving to better understand how different initial and boundary conditions affect the PALM model simulations. In addition, we present the process, complexity, and challenges one can encounter while trying to find the optimal set of initial and boundary conditions for a given PALM model simulation. Moreover, the performed simulations have shown that most of the variance in the ensemble comes from the driving conditions.
Permanent Link: https://hdl.handle.net/11104/0359323

0602114 - ÚI 2025 US A - Abstract
Radović, J. - Belda, M. - Resler, Jaroslav - Eben, Kryštof - Geletič, Jan - Bureš, Martin - Krč, Pavel - Řezníček, Hynek
The PALM-4U model's performance with regard to different mesoscale initial and boundary conditions.
AGU 23 Abstracts. San Francisco: American Geophysical Union, 2023.
[AGU23 Fall meeting. 11.12.2023-15.12.2023, San Francisco]
Institutional support: RVO:67985807
Result website:
https://agu.confex.com/agu/fm23/meetingapp.cgi/Paper/1278350
The microscale LES model PALM-4U is an open-source cutting-edge atmospheric numerical model used for urban environment modeling. Due to its ability to resolve the physical processes within the boundary layer and capture the effects of the small-scale processes within it, it's becoming more popular within the urban boundary modeling community. In this experiment PALM-4U model's response to different driving conditions was tested in order to see to what extent the microscale

model results are determined by the driving conditions, and what mesoscale model provides the most optimal boundary conditions. Several different mesoscale models were used for creating the initial and boundary conditions for the PALM-4U simulations (e.g, ICON, WRF, ALADIN). Firstly, the mentioned models were compared among themselves, and their accuracy was tested against the measurements. All PALM-4U model simulations were performed on a real densely built urban environment located in the city of Prague, Czech Republic for a three-day episode during the year 2022. Apart from differing in the driving data, the simulations have identical configurations and are performed in 10 m resolution. The PALM-4U outputs were compared against measurements and among themselves. This work's findings confirm that the microscale model is influenced to a large extent by the driving conditions and that the ICON mesoscale model has the best performance among the mesoscale models. In addition, we stress that the accuracy and precision of the mesoscale input data is of high importance for the microscale simulations due to the PALM-4U model's high dependence on the driving conditions.

Permanent Link: https://hdl.handle.net/11104/0359320

0603042 - PSÚ 2025 eng A - Abstract
Kollerová, Lenka - Lintner, T. - Klocek, Adam - Ropovik, I. - Hlinka, Jaroslav - Strohmeier, D.
Liking and disliking relations toward victimized students in varying classroom contexts.
[International Congress of Psychology /33./ Psychology for the Future: Together in Hope. Praha, 21.07.2024-26.07.2024]
Method of presentation: Prezentace
Event organizer: ICP
URL events: https://icp2024.com/
R&D Projects: GA ČR(CZ) GA23-06289S
Institutional support: RVO:68081740 ; RVO:67985807
Keywords : bullying * liking * peer rejection * victimization
OECD category: Psychology (including human - machine relations)
Victims of bullying have lower opportunities for friendships, particularly in classrooms with low numbers of victims and this process contributes to the healthy context paradox, i.e., heightened adverse outcomes of victimization in these classrooms. This study examined the healthy context paradox for school detachment and examined relevant relational dynamic, specifically how peers form friendships (operationalized as mutual liking) and disliking toward victimized classmates in varying classroom contexts. The study employed a follow-up design with two time-points (with a 6-month interval) and used an age-homogeneous sample of 39 classrooms of early adolescents (N = 751, 50.6% girls, Mage at Time 1 = 12.93 years, SD= 0.41). Co-development of liking and disliking of victims from the side of bullies, other victims, and defenders was investigated by stochastic actor-based modeling. Overall, while victimization did not decrease one's friendships, it increased chances of being more disliked. Importantly, a healthy context paradox was documented for the link between victimization and being disliked such as that victims were less disliked in classrooms with higher rates of victims. There was no selection effect among victims, bullies were not less likely to befriend with victims or more likely to dislike them, and defenders were not more likely to befriend with victims or less likely to dislike them. Next, we found a trend that victims tended to dislike one another, which is an alarming result that should be further investigated. Overall, the study gained important insights about how peers form friendships (operationalized as mutual liking) and disliking toward victimized classmates in varying classroom contexts.

Permanent Link: https://hdl.handle.net/11104/0360313

0602978 - ÚI 2025 RIV eng A - Abstract

Řasová, K. - Miznerová, B. - Raková, M. - Herynkova, A. - Rodina, L. - Tom, P. - Hlinovská, J. - Štětkářová, I. - Vasa, L. - Frank, J. - Rydlo, Jan - Tintera, Jaroslav

Physiotherapy on principles of neuroproprioceptive "facilitation, inhibition" using virtual reality leads to different brain activity changes.

RIMS abstracts 2024: Table of Contents. Sage Journals, 2024. s. 66-66.

[RIMS: 29th Annual Rehabilitation in Multiple Sclerosis Conference /29./. 27.06.2024-29.06.2024, Hasselt]

Institutional support: RVO:67985807

Permanent Link: https://hdl.handle.net/11104/0360254

0602304 - ÚI 2025 RIV cze A - Abstract

Hlinka, Jaroslav

Využití počítačového modelování v epileptochirurgii a optimalizaci neurostimulační léčby.

[36. český a slovenský epileptologický sjezd. Olomouc, 24.10.2024-25.10.2024]

Method of presentation: Zvaná přednáška

Event organizer: Česká a Slovenská liga proti epilepsii

URL events: https://www.sjezdvolomouci.cz/

R&D Projects: GA MŠMT(CZ) EH22_008/0004643

Institutional support: RVO:67985807

OECD category: Neurosciences (including psychophysiology

Result website:

https://www.sjezdvolomouci.cz/program

Permanent Link: https://hdl.handle.net/11104/0359442

0602746 - ÚI 2025 CZ cze V - Research Report

Brabec, Marek - Juruš, Pavel - Malý, Marek - Pelikán, Emil - Šrotýř, M. - Turčičová, Marie

Souhrnná zpráva projektu LINE za rok 2024.

Prague: ICS CAS, 2023. 126 s. Technical Report, LINE-2024.

Institutional support: RVO:67985807

Tato zpráva byla vytvořena řešitelským týmem Ústavu informatiky AV ČR, v.v.i. v Praze pro potřeby společnosti GasNet, s.r.o. na základě objednávky č. 4500041977. Ve zprávě jsou shrnuty výsledky činností prováděných v roce 2024. Je popsán proces zpracování vstupních dat a jsou řešeny úlohy detekce odlehlých pozorování spotřeby a analýzy bilančních rozdílů

Permanent Link: https://hdl.handle.net/11104/0360034

0602736 - ÚI 2025 CZ cze V - Research Report

Lukšan, Ladislav - Tůma, M. - Matonoha, Ctirad - Vlček, Jan - Ramešová, Nina - Šiška, M. - Hartman, J.

UFO 2024: Interactive System for Universal Functional Optimization.

Prague: ICS CAS, 2024. 463 s. Technical Report, V-1289.

Institutional support: RVO:67985807

Keywords : Numerical optimization * nonlinear programming * nonlinear approximation * algorithms * software system

This report contains a description of the interactive system for universal functional optimization UFO, version 2017. This version contains interfaces to the MATLAB and SCILAB graphics environments.

Permanent Link: https://hdl.handle.net/11104/0360023