

Záznamy vložené do ASEP za UI (1. 11. – 31. 12. 2023)

New ICS records in ASEP (1. 11. – 31. 12. 2023)

0579685 - ÚI 2024 RIV US eng M - Monography Chapter

[Kalina, Jan](#)

Appropriate artificial intelligence algorithms will ultimately contribute to health equity.

Artificial intelligence, Big data, blockchain and 5G for the digital transformation of the healthcare industry. Cambridge: Academic Press / Elsevier, 2023 - (Ordonez de Pablos, P.; Zhang, X.). ISBN 9780443215988

R&D Projects: GA MZd(CZ) NU21-08-00432

Institutional support: RVO:67985807

<https://shop.elsevier.com/books/artificial-intelligence-big-data-blockchain-and-5g-for-the-digital-transformation-of-the-healthcare-industry/de-pablos/978-0-443-21598-8>

The ideals of an inclusive society with equal opportunities for all individuals without respect, for example, to race, gender, age, or social class have recently been promoted by the United Nations or the European Union (EPRS, 2022). Sociologists, psychologists, economists, or political scientists describe inclusion as the extent to which citizens feel a subjective acceptance within the society or the extent to which they feel being integrated. Inclusion goes hand in hand with environmental responsibility, sustainability, and resilience and is connected with equity and diversity (Shaw et al., 2012). Equity in healthcare (health equity, equity in health) is defined as healthcare with fair opportunities for participation and with equal chances leading to disparate health outcomes for all. Health equity represents an intensively discussed topic with a number of references giving current examples of exclusion (as the contrary of inclusion) and its societal impacts. Inclusive healthcare means equitable access for everybody and supporting health equity is an important aspect of the movement toward an inclusive society. The rapid progress of emerging artificial intelligence (AI) technologies with a potential for a radical shift of clinical practices naturally brings consequences on health equity and a number of recent papers already described particular negative effects of AI on health equity. In the literature, an increase in health inequities is expected (Krouse, 2020) in the near future as a consequence of increasing diversity in populations and also as a result of the COVID-19 pandemic.

Permanent Link: <https://hdl.handle.net/11104/0348496>

0579949 - ÚI 2024 NL eng J - Journal Article

Weiss, V. - Kokošová, V. - [Valenta, Zdeněk](#) - Doležalová, I. - Baláž, M. - Mangia, S. - Michaeli, S. - Vojtíšek, L. - Nestrašil, I. - Herzig, R. - Filip, P.

Distance from main arteries influences microstructural and functional brain tissue characteristics. *Neuroimage*. Roč. 285, January 2024 (2024), s. 120502. ISSN 1053-8119. E-ISSN 1095-9572

R&D Projects: GA MŠk(CZ) LM2018129

Institutional support: RVO:67985807

Keywords : Quantitative MRI * Relaxometry * Diffusion weighted imaging * Resting-state functional * MRI * Arterial distance

Impact factor: 5.700, year: 2022

Method of publishing: Open access

<https://doi.org/10.1016/j.neuroimage.2023.120502>

[DOI: 10.1016/j.neuroimage.2023.120502](https://doi.org/10.1016/j.neuroimage.2023.120502)

Given the substantial dependence of neurons on continuous supply of energy, the distribution of major cerebral arteries opens a question whether the distance from the main supply arteries constitutes a modulating factor for the microstructural and functional properties of brain tissue. To tackle this question, multimodal MRI acquisitions of 102 healthy volunteers over the full adult age span were utilised. Relaxation along a fictitious field in the rotating frame of rank $n = 4$ (RAFF4), adiabatic T1 ρ , T2 ρ , and intracellular volume fraction (fICVF) derived from diffusion-weighted imaging were implemented to quantify microstructural (cellularity, myelin density, iron concentration) tissue characteristics and degree centrality and fractional amplitude of low-frequency fluctuations to probe for functional metrics. Inverse correlation of arterial distance with robust homogeneity was detected for T1 ρ , T2 ρ and RAFF4 for cortical grey matter and white matter, showing substantial complex microstructural differences between brain tissue close and farther from main arterial trunks. Albeit with wider variability, functional metrics pointed to increased connectivity and neuronal activity in areas farther from main arteries. Surprisingly, multiple of these microstructural and functional distance-based gradients diminished with higher age, pointing to uniformization of brain tissue with ageing. All in all, this pilot study provides a novel insight on brain regionalisation based on artery distance, which merits further investigation to validate its biological underpinnings.

Permanent Link: <https://hdl.handle.net/11104/0348745>

0578518 - ÚI 2024 DE eng J - Journal Article

Bodík, Juraj - Paluš, Milan - Pawlas, Z.

Causality in extremes of time series.

Extremes. Online 31 October 2023 (2023). ISSN 1386-1999. E-ISSN 1572-915X

R&D Projects: GA ČR(CZ) GA19-16066S

Grant - others:AV ČR(CZ) AP1901

Program: Akademická prémie - Praemium Academiae

Institutional support: RVO:67985807

Keywords : Granger causality * Causal inference * Nonlinear time series * Causality-in-tail * Extreme value theory * Heavy tails

Impact factor: 1.300, year: 2022

Method of publishing: Open access

<https://doi.org/10.1007/s10687-023-00479-5>

[DOI: 10.1007/s10687-023-00479-5](https://doi.org/10.1007/s10687-023-00479-5)

Consider two stationary time series with heavy-tailed marginal distributions. We aim to detect whether they have a causal relation, that is, if a change in one causes a change in the other. Usual methods for causal discovery are not well suited if the causal mechanisms only appear during extreme events. We propose a framework to detect a causal structure from the extremes of time series, providing a new tool to extract causal information from extreme events. We introduce the causal tail coefficient for time series, which can identify asymmetrical causal relations between extreme events under certain assumptions. This method can handle nonlinear relations and latent variables. Moreover, we mention how our method can help estimate a typical time difference between extreme events. Our methodology is especially well suited for large sample sizes, and we show the performance on the simulations. Finally, we apply our method to real-world space-weather and hydro-meteorological datasets.

Permanent Link: <https://hdl.handle.net/11104/0347507>

0579923 - ÚI 2024 RIV CH eng J - Journal Article

Tang, X. - Chappa, G. K. - Viera, L. - [Holeňa, Martin](#) - Dropka, N.

Decision Tree-Supported Analysis of Gallium Arsenide Growth Using the LEC Method.

Crystals. Roč. 13, č. 12 (2023), s. 1659. ISSN 2073-4352. E-ISSN 2073-4352

Institutional support: RVO:67985807

Keywords : LEC growth * gallium arsenide * CFD * regression tree

OECD category: Computer sciences, information science, bioinformatics (hardware development to be 2.2, social aspect to be 5.8)

Impact factor: 2.700, year: 2022

Method of publishing: Open access

<https://doi.org/10.3390/cryst13121659>

[DOI: 10.3390/cryst13121659](https://doi.org/10.3390/cryst13121659)

In this study, an axisymmetric Czocharlski furnace model for the LEC growth of gallium arsenide is presented. We produced 88 datasets through computational fluid dynamics simulations. Among the many parameters that affect crystal growth, a total of 13 input parameters were selected, including the geometry and material parameters of the hot zone (crucible, heaters, radiation shield, and crystal), as well as the process parameters (such as pulling and rotation rates, heating power, etc.). Voronkov criteria (v/Gn), interface deflection, and the average interface temperature gradient were selected as the output parameters. We carried out a correlation analysis between the variables and used decision trees to study the impact of the 13 input variables on the output variables. The results indicated that in the growth of gallium arsenide, the main factor affecting interface deflection and the average interface thermal gradients is the crucible rotation rate. For v/Gn , it is the pulling rate.

Permanent Link: <https://hdl.handle.net/11104/0348712>

0579733 - ÚI 2024 US eng J - Journal Article

Kolek, L. - [Martinková, Patrícia](#) - [Vařejková, Michaela](#) - Šisler, V. - Brom, C.

Is video games' effect on attitudes universal? Results from an empirical study comparing video games' impact on the attitude change of players with different backgrounds.

Journal of Computer Assisted Learning. Online first 22 November 2023 (2023). ISSN 0266-4909. E-ISSN 1365-2729

R&D Projects: GA ČR(CZ) GA21-03658S

Institutional support: RVO:67985807

Keywords : attitude importance * explicit attitudes * game-based learning * history representation * implicit attitudes * video games

Impact factor: 5.000, year: 2022

Method of publishing: Open access

[DOI: 10.1111/jcal.12911](https://doi.org/10.1111/jcal.12911)

BACKGROUND: Existing studies confirm that some video games can change players' attitudes. However, since we do not know the specific elements responsible for attitude change, the potential of video games to achieve desired educational or behavioural outcomes often remains unfulfilled. **OBJECTIVES:** To fill the research gap, our study examined whether the perspective-taking game mechanic in the serious game Czechoslovakia 38–89: Borderlands, which had previously been shown to affect attitudes, would have the same effect on another sample of players with different characteristics. **METHODS:** We have assessed the effect of a historical video game using a perspective-taking mechanic on players' explicit and implicit attitudes. Explicit attitude changes were measured at a general level, meaning a broad evaluation of a depicted historical event, and at a specific level, meaning a more detailed evaluation of specific aspects of the event. Simultaneously, we

measured the effect of players' perceived attitude importance on attitude change. The study used a sample of 137 young adults. RESULTS AND CONCLUSIONS: This study's results indicate a significant pretest-posttest explicit attitude change on the general level and on a specific level in comparison to the control group. Perspective-taking game mechanics is particularly important for explicit attitude change. No change was found in implicit attitudes. The effect of the perceived attitude importance on attitude change was not confirmed. TAKEAWAYS: As one of the first to focus on the effects of specific game mechanics on attitudes, this study confirmed that perspective-taking has stable, short-term effects on attitude change even across different research samples.

Permanent Link: <https://hdl.handle.net/11104/0348536>

0579668 - ÚI 2024 NL eng J - Journal Article

Chien, Vincent Shih Cheng - Wang, P. - Maess, B. - Fishman, Y. - Knösche, T. R.

Laminar neural dynamics of auditory evoked responses: Computational modeling of local field potentials in auditory cortex of non-human primates.

Neuroimage. Volume281, November 2023 (2023), č. článku 120364. ISSN 1053-8119. E-ISSN 1095-9572

Institutional support: RVO:67985807

Keywords : Auditory processing * Cortical microcircuits * Lateral inhibition * Neural mass model

Impact factor: 5.700, year: 2022

Method of publishing: Open access

<https://doi.org/10.1016/j.neuroimage.2023.120364>

[DOI: 10.1016/j.neuroimage.2023.120364](https://doi.org/10.1016/j.neuroimage.2023.120364)

Evoked neural responses to sensory stimuli have been extensively investigated in humans and animal models both to enhance our understanding of brain function and to aid in clinical diagnosis of neurological and neuropsychiatric conditions. Recording and imaging techniques such as electroencephalography (EEG), magnetoencephalography (MEG), local field potentials (LFPs), and calcium imaging provide complementary information about different aspects of brain activity at different spatial and temporal scales. Modeling and simulations provide a way to integrate these different types of information to clarify underlying neural mechanisms. In this study, we aimed to shed light on the neural dynamics underlying auditory evoked responses by fitting a rate-based model to LFPs recorded via multi-contact electrodes which simultaneously sampled neural activity across cortical laminae. Recordings included neural population responses to best-frequency (BF) and non-BF tones at four representative sites in primary auditory cortex (A1) of awake monkeys. The model considered major neural populations of excitatory, parvalbumin-expressing (PV), and somatostatin-expressing (SOM) neurons across layers 2/3, 4, and 5/6. Unknown parameters, including the connection strength between the populations, were fitted to the data. Our results revealed similar population dynamics, fitted model parameters, predicted equivalent current dipoles (ECD), tuning curves, and lateral inhibition profiles across recording sites and animals, in spite of quite different extracellular current distributions. We found that PV firing rates were higher in BF than in non-BF responses, mainly due to different strengths of tonotopic thalamic input, whereas SOM firing rates were higher in non-BF than in BF responses due to lateral inhibition. In conclusion, we demonstrate the feasibility of the model-fitting approach in identifying the contributions of cell-type specific population activity to stimulus-evoked LFPs across cortical laminae, providing a foundation for further investigations into the dynamics of neural circuits underlying cortical sensory processing.

Permanent Link: <https://hdl.handle.net/11104/0348483>

Research data: [Supplementary material](#)

0579704 - ÚI 2024 GB eng J - Journal Article

[Ghosh, Anupam](#)

Measure synchronization in interacting Hamiltonian systems: A brief review.

Chaos Solitons & Fractals. Roč. 177, December 2023 (2023), č. článku 114237. ISSN 0960-0779. E-ISSN 1873-2887

R&D Projects: GA ČR(CZ) GA24-11113S

Grant - others:AV ČR(CZ) AP1901

Program: Akademická prémie - Praemium Academiae

Institutional support: RVO:67985807

Keywords : Coupled dynamical systems * Hamiltonian systems * Measure synchronization

Impact factor: 7.800, year: 2022

Method of publishing: Limited access

<https://doi.org/10.1016/j.chaos.2023.114237>

[DOI: 10.1016/j.chaos.2023.114237](https://doi.org/10.1016/j.chaos.2023.114237)

This paper aims to review the measure synchronization, a weak form of synchronization observed in coupled Hamiltonian systems, briefly. This synchronization is characterized by a Hamiltonian system that displays either quasiperiodic or chaotic dynamics. Each system, in the presence of either linear or nonlinear coupling, shares a phase space domain with an identical invariant measure in the measure synchronized state. It is important to note that while the trajectories are identical in measure, they do not necessarily exhibit complete temporal synchrony. This synchronization has been observed in various physical systems, such as coupled pendulums, Josephson junctions, and lasers.

Permanent Link: <https://hdl.handle.net/11104/0348510>

0579762 - FZÚ 2024 RIV US eng J - Journal Article

Acero, M. A. - Adamson, P. - Agam, G. - Filip, Peter - Haki, František - Lokajíček, Miloš - Zálešák, Jaroslav ... Total 207 authors

Measurement of $\nu\mu$ charged-current inclusive π^0 production in the NOvA near detector.

Physical Review D. Roč. 107, č. 11 (2023), č. článku 112008. ISSN 2470-0010. E-ISSN 2470-0029

Research Infrastructure: Fermilab-CZ II - 90113

Institutional support: RVO:68378271 ; RVO:67985807

Keywords : NOvA * detector

OECD category: Particles and field physics; Particles and field physics (UIVT-O)

Impact factor: 5.000, year: 2022

Method of publishing: Open access

[DOI: 10.1103/PhysRevD.107.112008](https://doi.org/10.1103/PhysRevD.107.112008)

Cross sections for the interaction $\nu\mu A \rightarrow \mu\pi^0 X$ with neutrino energies between 1 and 5 GeV are measured using a sample of 165,000 selected events collected in the NOvA experiment's near detector, a hydrocarbon-based detector exposed to the Neutrinos from the Main Injector beam at the Fermi National Accelerator Laboratory. Results are presented as a flux-averaged total cross section and as differential cross sections in the momenta and angles of the outgoing muon and π^0 , the total four-momentum transfer, and the invariant mass of the hadronic system.

Permanent Link: <https://hdl.handle.net/11104/0348566>

0579756 - ÚI 2024 US eng J - Journal Article

[Campos Araújo, Pedro](#) - [Hladký, Jan](#) - [Hng, Eng Keat](#) - [Šileikis, Matas](#)

Prominent examples of flip processes.

Random Structures and Algorithms. Online 07 November 2023 (2023). ISSN 1042-9832. E-ISSN 1098-2418

R&D Projects: GA ČR(CZ) GX21-21762X; GA ČR(CZ) GJ20-27757Y

Institutional support: RVO:67985807

Keywords : differential equation * graph limit * graph process * random graph processes

Impact factor: 1.000, year: 2022

Method of publishing: Open access

<https://doi.org/10.1002/rsa.21192>

[DOI: 10.1002/rsa.21192](https://doi.org/10.1002/rsa.21192)

Flip processes, introduced in [Garbe, HladkATIN SMALL LETTER Y WITH ACUTE, Sileikis, Skerman: From flip processes to dynamical systems on graphons], are a class of random graph processes defined using a rule which is just a function $\mathcal{R}: \mathcal{H}_k \rightarrow \mathcal{H}_k$ from all labelled graphs of a fixed order k into itself. The process starts with an arbitrary given n -vertex graph G_0 . In each step, the graph G_i is obtained by sampling k random vertices v_1, \dots, v_k of G_{i-1} and replacing the induced graph $G_{i-1}[v_1, \dots, v_k]$ by $\mathcal{R}(G_{i-1}[v_1, \dots, v_k])$. Using the formalism of dynamical systems on graphons associated to each such flip process from *ibid.* we study several specific flip processes, including the triangle removal flip process and its generalizations, 'extremist flip processes' (in which $\mathcal{R}(H)$ is either a clique or an independent set, depending on whether $e(H)$ has less or more than half of all potential edges), and 'ignorant flip processes' in which the output $\mathcal{R}(H)$ does not depend on H .

Permanent Link: <https://hdl.handle.net/11104/0348552>

0578058 - ÚI 2024 RIV US eng J - Journal Article

Brom, C. - Diviák, T. - Drbohlav, J. - [Korbel, Václav](#) - [Levínský, René](#) - [Neruda, Roman](#) - [Kadlecová, Gabriela](#) - Šlerka, J. - [Šmíd, Martin](#) - Trnka, J. - [Vidnerová, Petra](#)

Rotation-based schedules in elementary schools to prevent COVID-19 spread: a simulation study. *Scientific Reports*. Roč. 13, č. 1 (2023), č. článku 19156. ISSN 2045-2322. E-ISSN 2045-2322

Institutional support: RVO:67985807 ; RVO:67985556 ; RVO:67985998

Keywords : agent-based model * covid-19 * epidemiological modelling * SEIR

OECD category: Computer sciences, information science, bioinformathics (hardware development to be 2.2, social aspect to be 5.8); Applied Economics, Econometrics (NHU-N); Statistics and probability (UTIA-B)

Impact factor: 4.600, year: 2022

Method of publishing: Open access

<https://doi.org/10.1038/s41598-023-45788-8>

[DOI: 10.1038/s41598-023-45788-8](https://doi.org/10.1038/s41598-023-45788-8)

Rotations of schoolchildren were considered as a non-pharmacological intervention in the COVID-19 pandemic. This study investigates the impact of different rotation and testing schedules. We built an agent-based model of interactions among pupils and teachers based on a survey in an elementary school in Prague, Czechia. This model contains 624 schoolchildren and 55 teachers and about 27 thousands social contacts in 10 layers. The layers reflect different types of contacts (classroom, cafeteria, etc.) in the survey. On this multi-graph structure we run a modified SEIR model of covid-19 infection. The parameters of the model are calibrated on data from the outbreak in the Czech Republic in spring 2020. Weekly rotations of in-class and distance learning are an effective preventative measure in schools reducing the spread of covid-19 by 75–81%. Antigen testing twice a week or PCR

once a week significantly reduces infections even when using tests with a lower sensitivity. The structure of social contacts between pupils and teachers strongly influences the transmission. While the density of contact graphs for older pupils is 1.5 times higher than for younger pupils, the teachers' network is an order of magnitude denser. Teachers moreover act as bridges between groups of children, responsible for 14–18% of infections in the secondary school compared to 8–11% in the primary school. Weekly rotations with regular testing are a highly effective non-pharmacological intervention for the prevention of covid-19 spread in schools and a way to keep schools open during an epidemic.

Permanent Link: <https://hdl.handle.net/11104/0347085>

0579758 - ÚI 2024 DE J - Journal Article

Ferguson, Thomas Macaulay - Logan, S. A.

Topic Transparency and Variable Sharing in Weak Relevant Logics.

Erkenntnis. Online November 2023 (2023). ISSN 0165-0106

R&D Projects: GA ČR(CZ) GA22-01137S

Institutional support: RVO:67985807

Keywords : Relevant logic * Topic transparency * Variable sharing

Impact factor: 0.900, year: 2022

Method of publishing: Limited access

<https://doi.org/10.1007/s10670-023-00748-6>

[DOI: 10.1007/s10670-023-00748-6](https://doi.org/10.1007/s10670-023-00748-6)

In this paper, we examine a number of relevant logics' variable sharing properties from the perspective of theories of topic or subject-matter. We take cues from Franz Berto's recent work on topic to show an alignment between families of variable sharing properties and responses to the topic transparency of relevant implication and negation. We then introduce and defend novel variable sharing properties stronger than strong depth relevance—which we call cn-relevance and lossless cn-relevance—showing that the properties are satisfied by the weak relevant logics B and BM, respectively. We argue that such properties address a sort of semantic lossiness of strong depth relevance.

Permanent Link: <https://hdl.handle.net/11104/0348557>

0579461 - ÚI 2024 eng C - Conference Paper (international conference)

Ratschan, Stefan

Deciding Predicate Logical Theories Of Real-Valued Functions.

48th International Symposium on Mathematical Foundations of Computer Science (MFCS

2023). Dagstuhl: Schloss Dagstuhl - Leibniz-Zentrum für Informatik, 2023 - (Leroux, J.; Lombardy, S.; Peleg, D.), 76:1-76:15. Leibniz International Proceedings in Informatics, 272. ISBN 978-3-95977-292-1. ISSN 1868-8969.

[MFCS 2023: International Symposium on Mathematical Foundations of Computer Science /48./.

Bordeaux (FR), 28.08.2023-01.09.2023]

R&D Projects: GA ČR(CZ) GA21-09458S

Institutional support: RVO:67985807

Keywords : decision procedures * first-order predicate logical theories * real numbers * real-valued functions

OECD category: Computer sciences, information science, bioinformatics (hardware development to be 2.2, social aspect to be 5.8)

<https://doi.org/10.4230/LIPIcs.MFCS.2023.76>

[DOI: 10.4230/LIPIcs.MFCS.2023.76](https://doi.org/10.4230/LIPIcs.MFCS.2023.76)

The notion of a real-valued function is central to mathematics, computer science, and many other scientific fields. Despite this importance, there are hardly any positive results on decision procedures for predicate logical theories that reason about real-valued functions. This paper defines a first-order predicate language for reasoning about multi-dimensional smooth real-valued functions and their derivatives, and demonstrates that – despite the obvious undecidability barriers – certain positive decidability results for such a language are indeed possible.

Permanent Link: <https://hdl.handle.net/11104/0348265>

Research data: [ArXiv.org \(preprint\)](https://arxiv.org/abs/2304.04203)

0579589 - ÚI 2024 CH eng C - Conference Paper (international conference)

Neruda, Roman - Figueroa-Garcia, J.C.

Feature Selection for Performance Estimation of Machine Learning Workflows.

International Conference on Information Technology and Systems: ICITS 2023, Volume 1. Cham: Springer, 2023 - (Rocha, A.; Ferrás, C.; Ibarra, W.), s. 351-359. Lecture Notes in Networks and Systems, 691. ISBN 978-3-031-33257-9. ISSN 2367-3370.

[ICITS 2023: International Conference on Information Technology and Systems /6./, Cusco (PE), 24.04.2023-26.04.2023]

Institutional support: RVO:67985807

Keywords : Auto-ML * Machine learning * Performance estimation

OECD category: Computer sciences, information science, bioinformatics (hardware development to be 2.2, social aspect to be 5.8)

https://doi.org/10.1007/978-3-031-33258-6_33

[DOI: 10.1007/978-3-031-33258-6_33](https://doi.org/10.1007/978-3-031-33258-6_33)

Performance prediction of machine learning models can speed up automated machine learning procedures and it can be also incorporated into model recommendation algorithms. We propose a meta-learning framework that utilizes information about previous runs of machine learning workflows on benchmark tasks. We extract features describing the workflows and meta-data about tasks, and combine them to train a regressor for performance prediction. This way, we obtain the model performance prediction without any training, just by means of feature extraction and inference via the regressor. The approach is tested on OpenML-CC18 Curated Classification benchmark estimating the 75th percentile value of area under the ROC curve (AUC) of the classifiers. We were able to obtain consistent predictions with R^2 score of 0.8 for previously unseen data.

Permanent Link: <https://hdl.handle.net/11104/0348401>

0579713 - ÚI 2024 RIV DE eng C - Conference Paper (international conference)

Tumpach, J. - Koza, J. - Holeňa, Martin

Improving Optimization With Gaussian Processes in the Covariance Matrix Adaptation Evolution Strategy.

Proceedings of the 23st Conference Information Technologies – Applications and Theory (ITAT 2023). Aachen: Technical University & CreateSpace Independent Publishing, 2023 - (Brejová, B.; Cencialová, L.; Holeňa, M.; Jajcay, R.; Jajcayová, T.; Lexa, M.; Mráz, F.; Pardubská, D.; Plátek, M.), s. 82-88. CEUR Workshop Proceedings, 3498. ISSN 1613-0073.

[ITAT 2023: Conference Information Technologies – Applications and Theory /23./, Tatranské Matliare (SK), 22.09.2023-26.09.2023]

Grant - others: Ministerstvo školství, mládeže a tělovýchovy - GA MŠK(CZ) LM2018140

Institutional support: RVO:67985807

OECD category: Computer sciences, information science, bioinformatics (hardware development to be 2.2, social aspect to be 5.8)

<https://ceur-ws.org/Vol-3498/paper10.pdf>

This paper explores the use of Gaussian processes (GPs) in the covariance matrix adaptation evolution strategy (CMA-ES) for black-box optimization. GPs are powerful probabilistic models that capture complex relationships, making them suitable for modeling uncertain objective functions. Integrating GPs into the CMA-ES improves exploration and adaptation in the search space, enhancing convergence speed and solution quality. The paper describes a novel implementation framework allowing to use GPs as surrogate models for the CMA-ES. That framework findings encourage further research to advance the application of GPs in black-box optimization.

Permanent Link: <https://hdl.handle.net/11104/0348533>

0579691 - ÚI 2024 RIV DE eng C - Conference Paper (international conference)

Pérez, Ivan - Vomlel, J.

On Identifiability of BN2A Networks.

Symbolic and Quantitative Approaches to Reasoning with Uncertainty. ECSQARU 2023. Cham: Springer, 2023 - (Bouraoui, Z.; Vesic, S.), s. 136-148. Lecture Notes in Computer Science, Lecture Notes in Artificial Intelligence, 14294. ISBN 978-3-031-45607-7.

[ECSQARU 2023: European Conference on Symbolic and Quantitative Approaches to Reasoning with Uncertainty /23./. Arras (FR), 19.09.2023-22.09.2023]

R&D Projects: GA ČR(CZ) GA21-03658S; GA ČR(CZ) GA22-11101S

Institutional support: RVO:67985807

Keywords : Bayesian networks * BN2A networks * Cognitive Diagnostic Modeling * Psychometrics * Model Identifiability

https://doi.org/10.1007/978-3-031-45608-4_11

[DOI: 10.1007/978-3-031-45608-4_11](https://doi.org/10.1007/978-3-031-45608-4_11)

In this paper, we consider two-layer Bayesian networks. The first layer consists of hidden (unobservable) variables and the second layer consists of observed variables. All variables are assumed to be binary. The variables in the second layer depend on the variables in the first layer. The dependence is characterised by conditional probability tables representing Noisy-AND or simple Noisy-AND. We will refer to this class of models as BN2A models. We found that the models known in the Bayesian network community as Noisy-AND and simple Noisy-AND are also used in the cognitive diagnostic modelling known in the psychometric community under the names of RRUM and DINA, respectively. In this domain, the hidden variables of BN2A models correspond to skills and the observed variables to students' responses to test questions. In this paper we analyse the identifiability of these models. Identifiability is an important concept because without it we cannot hope to learn correct models. We present necessary conditions for the identifiability of BN2As with Noisy-AND models. We also propose and test a numerical approach for testing identifiability.

Permanent Link: <https://hdl.handle.net/11104/0348500>

0579680 - ÚI 2024 RIV CH eng C - Conference Paper (international conference)

Kalina, Jan - Peštová, Barbora

On the Bayesian Interpretation of Penalized Statistical Estimators.

Artificial Intelligence and Soft Computing. 22nd International Conference, ICAISC 2023, Proceedings, Part 2. Cham: Springer, 2023 - (Rutkowski, L.; Scherer, R.; Korytkowski, M.; Pedrycz, W.; Tadeusiewicz, R.; Zurada, J.), s. 343-352. Lecture Notes in Computer Science, 14126. ISBN 978-3-031-42507-3.

[ICAISC 2023: International Conference on Artificial Intelligence and Soft Computing /22./. Zakopane (PL), 18.07.2023-22.07.2023]

R&D Projects: GA ČR GA21-05325S

Institutional support: RVO:67985807

Keywords : Bayesian estimation * regularization * penalization * robustness * regression

https://doi.org/10.1007/978-3-031-42508-0_31

[DOI: 10.1007/978-3-031-42508-0_31](https://doi.org/10.1007/978-3-031-42508-0_31)

The aim of this work is to search for intuitive interpretations of penalized statistical estimators. Penalized estimates of the parameters of three models obtained by Bayesian reasoning are explained here to correspond to the intuition. First, the paper considers Bayesian estimates of the mean and covariance matrix for the multivariate normal distribution. Second, a connection of a robust regularized version of Mahalanobis distance with Bayesian estimation is discussed. Third, regularization networks, which represent a common nonparametric tool for regression modeling, are presented as Bayesian methods as well. On the whole, selected important multivariate and/or regression models are considered and novel interpretations are formulated.

Permanent Link: <https://hdl.handle.net/11104/0348492>

0579655 - ÚI 2024 RIV CH eng A - Abstract

[Martinková, Patrícia](#)

Generalized linear and nonlinear regression models for DIF detection in longitudinal designs with binary and polytomous responses.

International Meeting on Detecting Differential Item Functioning in Polytomous IRT Models and/or Multiple Groups Programme. Zurich, 2023. s. 7-7.

[International Meeting on Detecting Differential Item Functioning in Polytomous IRT Models and/or Multiple Groups 2023. 12.06.2023-13.06.2023, Zurich]

R&D Projects: GA ČR(CZ) GA21-03658S

Institutional support: RVO:67985807

In this work we focus on modelling item responses in the framework of generalized logistic and non-linear models (GLNM). We first discuss a step-by-step development of item response theory (IRT) models via empirical characteristic curves and GLNM, while emphasizing the didactic value of such an approach (Martinkova & Hladka, 2023). We outline possible further uses of GLNM in analyzing criterion-related item validity, detection of differential item functioning (DIF) and differential item functioning in change (DIF-C, Martinkova et al., 2020) suitable for longitudinal designs with binary as well as polytomous responses (Kolek et al., 2022). Finally, we discuss some novel approaches to parameter estimation in the GLNM framework and their practical implementation in the difNLR and ShinyItem Analysis package.

Permanent Link: <https://hdl.handle.net/11104/0348453>

0579765 - ÚI 2024 RIV CZ cze A - Abstract

[Geletič, Jan](#)

Modelování počasí ve městech.

Program Týdne Akademie věd ČR. Praha: Akademie věd ČR, 2023.

[Týden AV 2023. 06.11.2023-12.11.2023, Praha]

R&D Projects: GA TA ČR(CZ) TO01000219

Grant - others:AV ČR(CZ) StrategieAV21/23

Program: StrategieAV

Institutional support: RVO:67985807

Keywords : počasí * město * předpověď * modelování * biometeorologie

OECD category: Meteorology and atmospheric sciences

<https://www.tydenavcr.cz/program/akce?id=5164&a=modelovani-pocasi-ve-mestech>

Za jednu z největších výzev pro lidskou společnost 21. století je možné považovat klimatickou změnu. Změna klimatu se v Evropě projevuje stále častěji a intenzivněji. Mezi nejčastější projevy patří zejména zvýšená extremita počasí, jako jsou častější výskyt vln veder, silné bouře, bleskové povodně nebo déle trvající a intenzivní sucha. Extremita se týká také obyvatel měst, ve kterých aktuálně žije přes 70 % světové populace a pro Českou republiku je uváděn ještě vyšší podíl. Moderní města se proto musí naučit reagovat na aktuální výzvy související s klimatickou změnou. Jak se liší standardní meteorologické modely od modelů určených pro města? Jaká jsou specifika měst a jak může lidská činnost ovlivňovat počasí ve městech? Jaká může být role stromů přímo v ulicích měst? Jaký efekt má tvar koruny nebo výška stromu na pocitovou teplotu chodce jdoucího po ulici? Jaký dopad může mít implementace tzv. Green Deal na znečištění ovzduší v Praze? Značné množství procesů odehrávajících se v prostoru měst, např. vliv stromů na proudění nebo znečištění ovzduší, běžně probíhá v prostorovém rozlišení jednotek metrů. Tato úroveň detailu představuje výrazné nároky na výpočetní výkon využitých superpočítačů, kvalitu prostorových dat a samotnou implementaci fyzikálních procesů do numerických modelů. Výše uvedeným tématům se ve výzkumu věnují vědci z Ústavu informatiky AV ČR, kteří spolupracují na vývoji volně dostupného městského meteorologického modelu PALM.

Permanent Link: <https://hdl.handle.net/11104/0348568>

0579595 - ÚI 2024 US eng A - Abstract

Peleška, J. - Mužík, J. - Holubová, A. - Čamek, R. - Navrátil, V. - Fiala, D. - Doksanský, M. - Hána, K. - Vranka, J. - Doležil, D. - Jozifová, M. - [Reissigová, Jindra](#)

Potential Contribution of Home Blood Pressure Telemonitoring (Hbptm), with Concurrent Measurement Of Physical Activity, to Aid the Control of Both Hypertension and Heart Failure.

Journal of Hypertension. Lippincott Williams & Wilkins. Roč. 41, Suppl. 3 (2023), E245-E245. ISSN 0263-6352. E-ISSN 1473-5598

Institutional support: RVO:67985807

Permanent Link: <https://hdl.handle.net/11104/0348409>

0579763 - ÚI 2024 RIV cze U - Conference, Workshop Arrangement

[Geletič, Jan](#) - [Krč, Pavel](#) - Belda, M.

Workshop Kvalita ovzduší a tepelného komfortu na území hl. m. Prahy.

[Praha, 06.11.2023-06.11.2023, (W-CST)]

R&D Projects: GA TA ČR(CZ) TO01000219

Grant - others: AV ČR(CZ) StrategieAV21/23

Program: StrategieAV

Institutional support: RVO:67985807

Permanent Link: <https://hdl.handle.net/11104/0348565>

0579446 - ÚI 2024 CZ cze O - Others

[Kalina, Jan](#)

Informace. (In: Poezie 2023 aneb Řeky slov. Jindřichův Hradec: Epika, 2023 (TYLŠAR, František, a spol. 52 českých a světových autorů), s. 65. ISBN 978-80-7608-087-4.

2023

Institutional support: RVO:67985807

Keywords : Popularizace vědy * Popularisation of science * poezie * poetry

Permanent Link: <https://hdl.handle.net/11104/0348251>

0579445 - ÚI 2024 CZ cze V - Research Report

[Černý, David](#) - Trčka, M. - Kolaříková, L. - Hvorecký, J. - [Pelikán, Emil](#) - Hříbek, T. -

Novotný, D. - [Wiedermann, Jiří](#)

Etika AI: Přehled současné debaty v kontextu energetiky.

Praha: ICS CAS, 2023. 44 s. Technical Report, V-1295.

Institutional support: RVO:67985807

Permanent Link: <https://hdl.handle.net/11104/0348247>

0579455 - ÚI 2024 CZ cze N - Newspaper Article

[Hakl, František](#) - John, R.

I PowerPoint už je umělá inteligence.

Lidové noviny. Roč. 2023, 20. května 2023, příloha Orientace (2023), s. 17-17. ISSN 0862-5921

Institutional support: RVO:67985807

Keywords : popularizace vědy * popularisation of science

Permanent Link: <https://hdl.handle.net/11104/0348262>