

Záznamy vložené do ASEP za UI (1. 6. – 30. 6. 2024)

New ICS records in ASEP (1. 6. – 30.6. 2024)

0586397 - ÚI 2025 RIV US eng B - Monografie kniha jako celek

Jenkins, R. - Černý, David - Hříbek, T.

Autonomous Vehicle Ethics. The Trolley Problem and Beyond.

New York: Oxford University Press, 2022. 500 s. ISBN 978-0-19-763919-1

Institutional support: RVO:67985807

Keywords: autonomous vehicles * trolley problem * philosophy, ethics

This book represents a substantial and purposeful effort to move the academic discussion beyond the trolley problem to the broader ethical, legal, and social implications that autonomous vehicles present. There are still urgent questions waiting to be addressed, for example: how AVs might interact with human drivers in mixed or "hybrid" traffic environments, how AVs might reshape our urban landscapes, what unique security or privacy concerns are raised by AVs as connected devices in the "Internet of Things", how the benefits and burdens of this new technology, including mobility, traffic congestion, and pollution, will be distributed throughout society, and more. An attempt to map the landscape of these next-generation questions and to suggest preliminary answers, this volume draws on the disciplines of philosophy, sociology, economics, urban planning and transportation engineering, business ethics and more, and represents a global range of perspectives.

Permanent link: <https://hdl.handle.net/11104/0353936>

0586495 - ÚI 2025 RIV US eng M - Monography Chapter

Černý, David

Autonomous Vehicles, the Badness of Death, and Discriminations.

Autonomous Vehicle Ethics. The Trolley Problem and Beyond. New York: Oxford University Press, 2022 - (Jenkins, R.; Černý, D.; Hříbek, T.), s. 20-40. ISBN 978-0-19-763919-1

Institutional support: RVO:67985807

This chapter is dedicated to a specific topic concerning autonomous vehicles and their decision-making processes in trolley-like situations, where harm reduction is at stake. The main question at hand is whether the use of age as a criterion for decision-making constitutes a case of age discrimination. This inquiry is divided into three key parts. The first part delves into the concept of discrimination, scrutinizing it in detail, and providing a precise definition of this complex notion. The second part deals explicitly with the issue of the badness of death, exploring the deprivation conception of the badness of death, analyzing it, and offering a defense against possible objections. Through this analysis, the chapter ultimately concludes that age serves as an indicator of the badness of death, with younger individuals experiencing a greater harm from death than their older counterparts. The final section applies the foregoing conclusions, along with the definition of discrimination, to the context of autonomous vehicle decision-making. Based on this investigation, the chapter concludes that differentiation based on age is not necessarily an instance of discrimination. In sum, the chapter provides a thorough examination of the question of whether using age as a criterion for decision-making by autonomous vehicles in trolley-like situations would constitute age discrimination. By drawing on a detailed analysis of the concept of discrimination, the problem of the badness of death, and the relationship between age and harm, this chapter provides a nuanced and insightful analysis of this crucial topic.

Permanent link: <https://hdl.handle.net/11104/0353964>

0587243 - ÚI 2025 RIV CH eng M - Monography Chapte

Blaauwbroek, L. - [Cerna, David M.](#) - Gauthier, T. - [Jakubův, J.](#) - Kaliszky, C. - Suda, M. - Urban, J.

Learning Guided Automated Reasoning: A Brief Survey.

Logics and Type Systems in Theory and Practice. Essays in Honor of the 60th Birthday of Herman Geuvers. Cham: Springer, 2024 - (Capretta, V.; Krebbers, R.; Wiedijk, F.). Lecture Notes in Computer Science, 14560. ISBN 978-3-031-61715-7

Institutional support: RVO:67985807

https://link.springer.com/chapter/10.1007/978-3-031-61716-4_4

[DOI: 10.1007/978-3-031-61716-4_4](https://doi.org/10.1007/978-3-031-61716-4_4)

Automated theorem provers and formal proof assistants are general reasoning systems that are in theory capable of proving arbitrarily hard theorems, thus solving arbitrary problems reducible to mathematics and logical reasoning. In practice, such systems however face large combinatorial explosion, and therefore include many heuristics and choice points that considerably influence their performance. This is an opportunity for trained machine learning predictors, which can guide the work of such reasoning systems. Conversely, deductive search supported by the notion of logically valid proof allows one to train machine learning systems on large reasoning corpora. Such bodies of proof are usually correct by construction and when combined with more and more precise trained guidance they can be bootstrapped into very large corpora, with increasingly long reasoning chains and possibly novel proof ideas. In this paper we provide an overview of several automated reasoning and theorem proving domains and the learning and AI methods that have been so far developed for them. These include premise selection, proof guidance in several settings, AI systems and feedback loops iterating between reasoning and learning, and symbolic classification problems.

Permanent link: <https://hdl.handle.net/11104/0354482>

0586504 - ÚI 2025 NL eng J - Journal Article

[Fussner, Daniel Wesley](#) - Galatos, N.

Semiconic idempotent logic I: Structure and local deduction theorems.

Annals of Pure and Applied Logic. Roč. 175, č. 7 (2024), č. článku 103443. ISSN 0168-0072. E-ISSN 1873-2461

Institutional support: RVO:67985807

Keywords: Substructural logics * Semiconic idempotent logic * Semilinear residuated lattices * Congruence extension property * Deduction theorems

OECD Category: Applied mathematics

Impact factor: 0.8, year:2022

Method of publishing: Omezený přístup

[DOI: 10.1016/j.apal.2024.103443](https://doi.org/10.1016/j.apal.2024.103443)

Semiconic idempotent logic is a common generalization of intuitionistic logic, relevance logic with mingle, and semilinear idempotent logic. It is an algebraizable logic and it admits a cut-free hypersequent calculus. We give a structural decomposition of its characteristic algebraic semantics, conic idempotent residuated lattices, showing that each of these is an ordinal sum of simpler partially ordered structures. This ordinal sum is indexed by a totally ordered residuated lattice, which serves as its skeleton and is both a subalgebra and nuclear image. We equationally characterize the totally ordered residuated lattices appearing as such skeletons. Further, we describe both congruence and subalgebra generation in conic idempotent residuated lattices, proving that every variety generated by these enjoys the congruence extension property. In particular, this holds for semilinear idempotent residuated lattices. Based on this analysis, we obtain a local deduction theorem for semiconic idempotent logic, which also specializes to semilinear idempotent logic.

Permanent link: <https://hdl.handle.net/11104/0353977>

0587191 - ÚI 2025 RIV CZ cze J - Journal Article

Brožová, K. - Michalec, J. - [Brabec, Marek](#) - [Bořilová, P.](#) - Povolná, E. - Kohout, P. - Brož, J.
Dynamika změn koncentrace glukózy při zahájení ketogenní diety u dětských pacientů s refrakterní epilepsií – analýza hodnot glykemií u jednotlivých pacientů.

[Dynamics of glucose concentration changes during ketogenic diet initiation in pediatric patients with refractory epilepsy – analysis of glucose values in individual patients.]

Česká a Slovenská neurologie a neurochirurgie. 87/120, č. 3 (2024), s. 1-11. ISSN 1210-7859. E-ISSN 1802-4041

Institutional support: RVO:67985807

Keywords: ketogenic diet * drug-resistant epilepsy * glucose concentration * pediatric patients * ketogenní dieta * farmakorezistentní epilepsie * koncentrace glukózy * dětské pacienty

OECD Category: Statistics and probability

Impact factor: 0.5, year:2022

Method of publishing: Omezený přístup

<https://doi.org/10.48095/cccsnn20241>

[DOI: 10.48095/cccsnn20241](https://doi.org/10.48095/cccsnn20241)

AIM: The aim of this study was to analyze individual changes in glucose concentration before starting the ketogenic diet (KD) and during the first 5 days of its use in individual non-diabetic children with drug-resistant epilepsy. **SUBJECTS AND METHODOLOGY:** Ten pediatric patients with pharmacoresistant epilepsy started on KD according to a non-fasting KD protocol with a ketogenic ratio (KR) that gradually increased day by day from 1 : 1, 2 : 1, 3 : 1 to 3.5 : 1. Continuous glucose monitoring (CGM) was performed 36 hours before initiation and then over 5 days during increasing KR. **RESULTS:** Mean glycemic control estimates for each dietary ratio ranged from 6.03 (95% confidence interval [CI] (CI 95% 5.92–6.14) mmol/l on a normal diet to 2.56 (CI 95%: 2.46–2.66) mmol/l on 3.5 KP: 1 within all measured values and from 4.91 (CI 95%: 4.75–5.06) mmol/l on a normal diet to 1.85 (CI 95%: 1.53–2.17) mmol/l on KP 3.5 : 1 within fasting values measured between 5:00 am and 6:00 am. CGM showed hypoglycemic events during KD initiation in 9 patients. **CONCLUSION:** Analysis of individual patient data showed a trend of gradually decreasing glycemia with increasing KR. This trend seems to be stronger for all data obtained compared to those during fasting (period 05.00–06.00 am). In most patients, episodes of asymptomatic hypoglycemia were captured during diet initiation.

Permanent link: <https://hdl.handle.net/11104/0354459>

0586660 - ÚI 2025 NL eng J - Journal Article

[Hofmeister, Jeňýk](#) - Pouska, V. - [Palice, Zdeněk](#) - [Šoun, Jaroslav](#) - Gloor, R. - [Brabec, Marek](#) - [Vondrák, Jan](#)

Hot-spots of epiphytic and epixylic lichens in fragmented temperate forests are underpinned by microhabitat heterogeneity and spatiotemporal habitat continuity

Biological Conservation. Roč. 292 (2024), č. článku 110563. ISSN 0006-3207. E-ISSN 1873-2917

CEP Project: GA TA ČR SS01010270; GA TA ČR SS06010420

Institutional support: RVO:67985807

Keywords: Biodiversity * Forest management * Microhabitat * Near-natural forest * Species richness * Species turnover

Impact factor: 5.9, year:2022

Method of publishing: Omezený přístup

[DOI: 10.1016/j.biocon.2024.110563](https://doi.org/10.1016/j.biocon.2024.110563)

Habitat loss, fragmentation and degradation are major causes of the ongoing decline of epiphytic and epixylic lichen species in temperate forests throughout Europe. We investigated how extant species richness and composition of epiphytic and epixylic lichen communities in ten hot-spots of lichen diversity in the Czech Republic reflected the occurrence and properties of potentially suitable microhabitats and habitats. At each hot-spot, we surveyed a pair of 1-ha square plots, one in (over-)

mature managed and the second in unmanaged forest. In total, we recorded 513 epiphytic and epixylic lichen species which represent a substantial part of lichen biota in Central Europe. Species richness and composition of lichen communities were explained by microhabitat heterogeneity, and also by the area of near-natural forest habitats (habitat extent) at the landscape scale. In addition, lichen species richness and number of red-listed species were explained by a categorical variable distinguishing mature managed and unmanaged plots, used as a proxy of temporal continuity of natural succession. This finding illustrates that temporal continuity of natural succession in unmanaged forests likely had an extra stimulus for lichen communities that may not be reflected by observed aspects of forest habitats. Hence, we confirmed indispensable positive effects of (micro)habitat heterogeneity, and spatial and temporal continuity for preserved hot-spots of lichen diversity in Central Europe. Due to generally slow colonization-extinction dynamics of epiphytic and epixylic lichens we call for strengthening microhabitat heterogeneity, and the spatial and temporal continuity of European temperate forests at the landscape scale.

Permanent link: <https://hdl.handle.net/11104/0354097>

0587193 - ÚI 2025 RIV NL eng J - Journal Article

Mráz, J. - Hanzlíková, I. - [Brabec, Marek](#)

Toxicokinetic relationship between the adducts in globin and their cleavage products in the urine: Implications for human biomonitoring.

Toxicology Letters. Roč. 398, July (2024), s. 82-88. ISSN 0378-4274. E-ISSN 1879-3169

Institutional support: RVO:67985807

Keywords: Globin adducts * Compartmental toxicokinetic model * Cleavage products * Human biomonitoring * Non-invasive biomarkers

OECD Category: Statistics and probability

Impact factor: 3.5, year:2022

Method of publishing: Omezený přístup

<https://doi.org/10.1016/j.toxlet.2024.06.007>

[DOI: 10.1016/j.toxlet.2024.06.007](https://doi.org/10.1016/j.toxlet.2024.06.007)

Globin adducts of various chemicals, persisting in organism over the whole lifetime of erythrocytes, have been used as biomarkers of cumulative exposures to parent compounds. After removal of aged erythrocytes from the bloodstream, cleavage products of these adducts are excreted with urine as alternative, non-invasively accessible biomarkers. In our biomonitoring studies on workers exposed to ethylene oxide, its adduct with globin, N-(2-hydroxyethyl)valine, and the related urinary cleavage product N-(2-hydroxyethyl)-L-valyl-L-leucine have been determined. To describe a toxicokinetic relationship between the above types of biomarkers, a general compartmental model for simulation of formation and removal of globin adducts has been constructed in the form of code in R statistical computing environment. The essential input variables include lifetime of erythrocytes, extent of adduct formation following a single defined exposure, and parameters of exposure scenario, while other possible variables are optional. It was shown that both biomarkers reflect the past exposures differently as the adduct level in globin is a mean value of adduct levels across all compartments (subpopulations of erythrocytes of the same age) while excretion of cleavage products reflects the adduct level in the oldest compartment. Application of the model to various scenarios of continuous exposure demonstrated its usefulness for human biomonitoring data interpretation.

Permanent link: <https://hdl.handle.net/11104/0354462>

0586997 - ÚI 2025 RIV US eng J - Journal Article

Liczbińska, G. - Antosik, S. - [Brabec, Marek](#) - Tomczyk, A. M.

Ambient temperature-related sex ratio at birth in historical urban populations: the example of the city of Poznań, 1848–1900.

Scientific Reports. Roč. 14, č. 1 (2024), č. článku 14001. ISSN 2045-2322. E-ISSN 2045-2322

Institutional support: RVO:67985807

OECD Category: Statistics and probability

Impact factor: 4.6, year:2022

Method of publishing: Open access

<https://doi.org/10.1038/s41598-024-64799-7>

DOI: [10.1038/s41598-024-64799-7](https://doi.org/10.1038/s41598-024-64799-7)

This study examines whether exposure to ambient temperature in nineteenth-century urban space affected the ratio of boys to girls at birth. Furthermore, we investigate the details of temperature effects timing upon sex ratio at birth. The research included 66,009 individual births, aggregated in subsequent months of births for the years 1847–1900, i.e. 33,922 boys and 32,087 girls. The statistical modelling of the probability of a girl being born is based on logistic GAM with penalized splines and automatically selected complexity. Our research emphasizes the significant effect of temperature in the year of conception: the higher the temperature was, the smaller probability of a girl being born was observed. There were also several significant temperature lags before conception and during pregnancy. Our findings indicate that in the past, ambient temperature, similar to psychological stress, hunger, malnutrition, and social and economic factors, influenced the viability of a foetus. Research on the effects of climate on the sex ratio in historical populations may allow for a better understanding of the relationship between environmental factors and reproduction, especially concerning historical populations since due to some cultural limitations, they were more prone to stronger environmental stressors than currently.

Permanent link: <https://hdl.handle.net/11104/0354324>

0586998 - ÚI 2025 RIV CZ cze J - Journal Article

Šípek, A. - Gregor, V. - Šípek jr., A. - Friedová, N. - [Klaschka, Jan](#) - [Malý, Marek](#) - Jírová, J.

Spina bifida v České republice - incidence a prenatální diagnostika.

[Spina bifida in the Czech Republic – incidence and prenatal diagnostics.]

Vox pediatrics. Roč. 23, č. 10 (2023), s. 18-21. ISSN 1213-2241

Institutional support: RVO:67985807

Keywords: rozštěpy neurální trubice * vrozené vady * Česká republika

Method of publishing: Omezený přístup

<https://detskylekar.cz/vox-pediatrics-10-2023>

Cíl: Retrospektivní epidemiologická analýza výskytu a prenatální diagnostiky rozštěpu páteře v ČR v období 1994–2015 z databází Národního registru vrozených vad (NRVV) a dat Společnosti lékařské genetiky a genomiky v ČR. Materiál a metodika: V práci jsme využili údaje z NRVV vedeného v rámci Registru reprodukčního zdraví v Ústavu zdravotnických informací a statistiky ČR za období 1994–2015. Druhým zdrojem dat byly údaje o prenatální diagnostice evidované pod garancí Společnosti lékařské genetiky a genomiky. Analyzovali jsme roční četnosti a jejich změny jak u narozených dětí, tak i u prenatálně diagnostikovaných případů. Dále jsme analyzovali i týdny těhotenství u prenatálně diagnostikovaných případů. Výsledky: V období 1994–2015 bylo celkem diagnostikováno 981 případů rozštěpu páteře. Prenatálně byl diagnostikován a gravidita předčasně ukončena v 635 případech, u narozených dětí bylo zachyceno 346 případů. V relativních počtech byla celková incidence 4,36: incidence u případů prenatálně diagnostikovaných byla 2,82 a u narozených dětí byla 1,54 na 10 000 živě narozených. Statisticky významně stoupala efektivita záchytu prenatální diagnostiky ($p < 0,001$) a incidence prenatálně diagnostikovaných případů ($p < 0,001$). Zároveň byl patrný statisticky významný pokles incidencí u narozených ($p < 0,001$). Oba zmíněné trendy šly proti sobě, a proto celkový trend nebyl statisticky významný ($p = 0,082$). Ve sledovaném období se neměnil týden těhotenství při prenatální diagnostice. Závěr: Díky úspěšné prenatální diagnostice došlo ve sledovaném období ke statisticky významnému poklesu výskytu diagnózy rozštěpu páteře u narozených dětí.

Aim: Retrospective epidemiological analysis of the incidence and prenatal diagnosis of spina bifida in the Czech Republic from 1994–2015 taken from the databases of the National Registry of Congenital Defects (NRVV) and data from the Czech Society of Medical Genetics and Genomics. **Materials and methods:** We used the data from the NRVV kept in the Register of Reproductive Health at the Institute of Health Information and Statistics of Czech Republic from 1994–2015. The second source were data on prenatal diagnosis collected under the guidance of the Czech Society of Medical Genetics and Genomics. In our work, we analyzed the annual frequencies and their changes in both born children and prenatally-diagnosed cases. We also analyzed weeks of pregnancy in prenatally-diagnosed cases. **Results:** From 1994–2015, 981 cases of spina bifida were diagnosed. Prenatally-diagnosed spina bifida and pregnancies that were prematurely terminated included 635 cases, while 346 cases were detected in infants. In relative numbers, the overall incidence rate was 4.36, the incidence of prenatally-diagnosed cases was 2.82, and 1.54 in newborns (per 10,000 live births). The effectiveness of prenatal diagnosis ($P < 0.001$) and the incidence of prenatally-diagnosed cases ($P < 0.001$) increased significantly. At the same time, there was a statistically significant decrease in the incidence in newborns ($P < 0.001$). Both of these trends went against each other, therefore the overall trend was not statistically significant ($P = 0.082$). There was no change in the pregnancy week during prenatal diagnosis. **Conclusion:** Due to the successful prenatal diagnosis, there was a statically significant decrease in the diagnosis of spina bifida in children born during the observed period.

Permanent link: <https://hdl.handle.net/11104/0354325>

0587007 - PSÚ 2025 RIV GB eng J - Journal Article

[Klocek, Adam](#) - [Kollerová, Lenka](#) - [Havrdová, E.](#) - [Kotrbová, M.](#) - [Netík, Jan](#) - [Pour, M.](#)

Effectiveness of the KiVa anti-bullying program in the Czech Republic: A cluster randomized control trial.

Evaluation and Program Planning. Roč. 106, říjen (2024), č. článku 102459. ISSN 0149-7189. E-ISSN 1873-7870

CEP Project: GA MŠMT(CZ) LX22NPO5101

Institutional support: RVO:68081740 ; RVO:67985807

Keywords: anti-bullying programs * bullying * KiVa * effectiveness * victimization * well-being

OECD Category: Psychology (including human - machine relations); Education, general; including training, pedagogy, didactics [and education systems] (UIVT-O)

Impact factor: 1.6, year:2022

Method of publishing: Omezený přístup

<https://www.sciencedirect.com/science/article/pii/S0149718924000612?via%3Dihub>

DOI: [10.1016/j.evalprogplan.2024.102459](https://doi.org/10.1016/j.evalprogplan.2024.102459)

Aims One of the most widely used evidence-based anti-bullying programs, KiVa, originates from Finland and aims to change students' peer context, activate teachers, and inform parents with two main components (universal preventive actions and indicated actions when bullying occurs), complemented by monitoring. Because research documented somewhat varied KiVa outcomes in different countries and because there is a lack of research focusing solely on the effectiveness of the universal and indicated actions, this study aimed to evaluate the effectiveness of KiVa main components when implemented in a new country. This two-arm parallel cluster randomized control trial (RCT) evaluated the effectiveness of the KiVa anti-bullying program in elementary schools in the Czech Republic. It examined the effects of the universal and indicated actions on self-reported bullying and victimization as primary outcomes and well-being as a secondary outcome, while keeping monitoring constant across the intervention and control schools. The study also examined the role of implementation fidelity on the proposed outcomes. **Methods** Schools were allocated via stratified randomization into a KiVa intervention group (12 schools, 35 classes, $N = 407$ students) or a wait-list control group (12 schools, 32 classes, $N = 400$ students). The study employed data from baseline and

post-measurement waves, which were 10 months apart. Results The data were analyzed using linear mixed effects models, which showed no significant intervention or fidelity effects for bullying, victimization, and well-being. However, promising trends (at $\alpha < .10$) were revealed, such as lower levels of bullying observed in the intervention group and in schools with high implementation fidelity. Additional analysis using Bayes factors supported these promising trends and provided moderate support for lower levels of victimization in the intervention group compared to the control schools. Conclusions Evaluation of effectiveness of anti-bullying programs could benefit from a more targeted fidelity assessment at the classroom or individual level and from distinguishing between the effects of the main components of the programs and the effects of monitoring. The promising yet non-significant intervention and fidelity effects suggest that schools may require enhanced support and longer implementation time frames than a single school year, especially when implementation faces structural obstacles, such as the Covid-19 pandemic.

Permanent link: <https://hdl.handle.net/11104/0354332>

0586841 - ÚI 2025 GB eng J - Journal Article

[Rehák Bučková, Barbora](#) - Frazá, Ch. - Rehák, R. - Kolenič, M. - Beckmann, Ch. - Španiel, F. - Marquand, A. - Hlinka, Jaroslav

Using normative models pre-trained on cross-sectional data to evaluate longitudinal changes in neuroimaging data.

eLife. Online April 29 (2024). ISSN 2050-084X. E-ISSN 2050-084X

CEP Project: GA MZd(CZ) NU21-08-00432; GA MŠMT(CZ) EH22_008/0004643; GA MŠMT(CZ) EF18_053/0017594

Institutional support: RVO:67985807

Impact factor: 7.7, year:2022

Method of publishing: Open access

<https://doi.org/10.7554/eLife.95823.1>

[DOI: 10.7554/eLife.95823.1](https://doi.org/10.7554/eLife.95823.1)

Longitudinal neuroimaging studies offer valuable insight into intricate dynamics of brain development, ageing, and disease progression over time. However, prevailing analytical approaches rooted in our understanding of population variation are primarily tailored for cross-sectional studies. To fully harness the potential of longitudinal neuroimaging data, we have to develop and refine methodologies that are adapted to longitudinal designs, considering the complex interplay between population variation and individual dynamics. We build on normative modelling framework, which enables the evaluation of an individual's position compared to a population standard. We extend this framework to evaluate an individual's change compared to standard dynamics. Thus, we exploit the existing normative models pre-trained on over 58,000 individuals and adapt the framework so that they can also be used in the evaluation of longitudinal studies. Specifically, we introduce a quantitative metric termed "z-diff" score, which serves as an indicator of change of an individual compared to a population standard. Notably, our framework offers advantages such as flexibility in dataset size and ease of implementation. To illustrate our approach, we applied it to a longitudinal dataset of 98 patients diagnosed with early-stage schizophrenia who underwent MRI examinations shortly after diagnosis and one year later. Compared to cross-sectional analyses, which showed global thinning of grey matter at the first visit, our method revealed a significant normalisation of grey matter thickness in the frontal lobe over time. Furthermore, this result was not observed when using more traditional methods of longitudinal analysis, making our approach more sensitive to temporal changes. Overall, our framework presents a flexible and effective methodology for analysing longitudinal neuroimaging data, providing insights into the progression of a disease that would otherwise be missed when using more traditional approaches.

Permanent link: <https://hdl.handle.net/11104/0354237>

0586900 - ÚI 2025 RIV US eng J - Journal Article

McWhinney, S. R. - [Hlinka, Jaroslav](#) - Bakštejn, E. - Hájek, T. ... celkem 91 autorů

Principal component analysis as an efficient method for capturing multivariate brain signatures of complex disorders-ENIGMA study in people with bipolar disorders and obesity.

Human Brain Mapping. Roč. 45, č. 8 (2024), č. článku e26682. ISSN 1065-9471. E-ISSN 1097-0193

Institutional support: RVO:67985807

Keywords: bipolar disorder * body mass index * MRI * obesity * principal component analysis * psychiatry

Impact factor: 4.8, year:2022

Method of publishing: Open access

<https://doi.org/10.1002/hbm.26682>

[DOI: 10.1002/hbm.26682](https://doi.org/10.1002/hbm.26682)

Multivariate techniques better fit the anatomy of complex neuropsychiatric disorders which are characterized not by alterations in a single region, but rather by variations across distributed brain networks. Here, we used principal component analysis (PCA) to identify patterns of covariance across brain regions and relate them to clinical and demographic variables in a large generalizable dataset of individuals with bipolar disorders and controls. We then compared performance of PCA and clustering on identical sample to identify which methodology was better in capturing links between brain and clinical measures. Using data from the ENIGMA-BD working group, we investigated T1-weighted structural MRI data from 2436 participants with BD and healthy controls, and applied PCA to cortical thickness and surface area measures. We then studied the association of principal components with clinical and demographic variables using mixed regression models. We compared the PCA model with our prior clustering analyses of the same data and also tested it in a replication sample of 327 participants with BD or schizophrenia and healthy controls. The first principal component, which indexed a greater cortical thickness across all 68 cortical regions, was negatively associated with BD, BMI, antipsychotic medications, and age and was positively associated with Li treatment. PCA demonstrated superior goodness of fit to clustering when predicting diagnosis and BMI. Moreover, applying the PCA model to the replication sample yielded significant differences in cortical thickness between healthy controls and individuals with BD or schizophrenia. Cortical thickness in the same widespread regional network as determined by PCA was negatively associated with different clinical and demographic variables, including diagnosis, age, BMI, and treatment with antipsychotic medications or lithium. PCA outperformed clustering and provided an easy-to-use and interpret method to study multivariate associations between brain structure and system-level variables.

Permanent link: <https://hdl.handle.net/11104/0354274>

0586902 - ÚI 2025 RIV US eng J - Journal Article

[Šanda, Pavel](#) - [Hlinka, Jaroslav](#) - van der Berg, M. - Škoch, A. - Bazhenov, M. - Keliris, G. A. - Krishnan, G. P.

Cholinergic modulation supports dynamic switching of resting state networks through selective DMN suppression.

PLoS Computational Biology. Roč. 20, č. 6 (2024), č. článku e1012099. ISSN 1553-734X. E-ISSN 1553-7358

CEP Project: GA ČR(CZ) GA21-32608S

Institutional support: RVO:67985807

Keywords: Spiking Neural Networks * Cholinergic Neuromodulation * Default Mode Network * Functional Connectivity

OECD Category: Neurosciences (including psychophysiology)

Impact factor: 4.3, year:2022

Method of publishing: Open access

<https://doi.org/10.1371/journal.pcbi.1012099>

[DOI: 10.1371/journal.pcbi.1012099](https://doi.org/10.1371/journal.pcbi.1012099)

Brain activity during the resting state is widely used to examine brain organization, cognition and alterations in disease states. While it is known that neuromodulation and the state of alertness impact resting-state activity, neural mechanisms behind such modulation of resting-state activity are unknown. In this work, we used a computational model to demonstrate that change in excitability and recurrent connections, due to cholinergic modulation, impacts resting-state activity. The results of such modulation in the model match closely with experimental work on direct cholinergic modulation of Default Mode Network (DMN) in rodents. We further extended our study to the human connectome derived from diffusion-weighted MRI. In human resting-state simulations, an increase in cholinergic input resulted in a brain-wide reduction of functional connectivity. Furthermore, selective cholinergic modulation of DMN closely captured experimentally observed transitions between the baseline resting state and states with suppressed DMN fluctuations associated with attention to external tasks. Our study thus provides insight into potential neural mechanisms for the effects of cholinergic neuromodulation on resting-state activity and its dynamics.

Permanent link: <https://hdl.handle.net/11104/0354275>

0586406 - ÚI 2025 RIV eng J - Journal Article

Fink, C. G. - Šanda, Pavel - Bayer, L. - Abeysinghe, E. - Bazhenov, M. - Krishnan, G. P.

Python/NEURON code for simulating biophysically realistic thalamocortical dynamics during sleep. *SOFTWARE IMPACTS*. Roč. 21, September 2024 (2024), č. článku 100667. ISSN 2665-9638

CEP Project: GA MŠMT(CZ) EH22_008/0004643

Institutional support: RVO:67985807

Keywords: Computational neuroscience * Sleep * Neuromodulation * NEURON

Impact factor: 2.1, year:2022

Method of publishing: Open access

<https://doi.org/10.1016/j.simpa.2024.100667>

[DOI: 10.1016/j.simpa.2024.100667](https://doi.org/10.1016/j.simpa.2024.100667)

Understanding the function of sleep and its associated neural rhythms is an important goal in neuroscience. While many theoretical models of neural dynamics during sleep exist, few include the effects of neuromodulators on sleep oscillations and describe transitions between sleep and wake states or different sleep stages. Here, we started with a C++-based thalamocortical network model that describes characteristic thalamic and cortical oscillations specific to sleep. This model, which includes a biophysically realistic description of intrinsic and synaptic channels, allows for testing the effects of different neuromodulators, intrinsic cell properties, and synaptic connectivity on neural dynamics during sleep. We present a complete reimplementaion of this previously-published sleep model in the standardized NEURON/Python framework, making it more accessible to the wider scientific community.

Permanent link: <https://hdl.handle.net/11104/0353942>

Scientific Data: [Software at GitHub.com](#), [Preprint at OSF.io](#)

0586742 - ÚI 2025 GB eng J - Journal Article

Rahvar, S. - Reihani, E. S. - Golestani, N. - Hamounian, A. - Aghaei, F. - Sahimi, M. - Manshour, Pouya - Paluš, Milan - Feudel, U. - Freund, J.A. - Lehnertz, K. - Rings, T. - Tabar, M.

Characterizing time-resolved stochasticity in non-stationary time series.

Chaos Solitons & Fractals. Roč. 185, August 2024 (2024), č. článku 115069. ISSN 0960-0779. E-ISSN 1873-2887

Project - other: AV ČR(CZ) AP1901

Program: Akademická prémie - Praemium Academiae

Institutional support: RVO:67985807

Keywords: Complex systems * Time series analysis * Stochastic processes * Non-stationary

Impact factor: 7.8, year:2022

Method of publishing: Limited access

DOI: [10.1016/j.chaos.2024.115069](https://doi.org/10.1016/j.chaos.2024.115069)

Time series often exhibit a combination of long-range drift and short-term stochastic fluctuations. Traditional methods for analyzing such series involve fitting regression models to capture the drift component and using the residuals to estimate the random component. We demonstrate, however, that estimating the drift in a real-time (time-resolved) manner poses significant challenges. We find, surprisingly, that contrary to conventional expectations, estimation of the drift is less accurate than evaluating short-term fluctuations in data with a given number of data points. Two factors contribute to this unexpected complexity: measurement noise, and the slower convergence rate of the drift estimation. As a result, real-time estimation of stochastic fluctuations can be more accurate. We introduce the term stochasticity, as the square of the estimated short-term fluctuations within a time window of length dt , which can be estimated in real-time (time-resolved) for given non-stationary time series and those exhibiting unique trajectories. To demonstrate the practical applications of the concept of real-time stochasticity, we calculate it for synthetic time series generated by both linear and nonlinear dynamical equations, which generate stationary and non-stationary trajectories for which we have access to the ground truth. We have also analyzed various real-world datasets: global temperature anomalies in 12 distinct geographical regions, keystroke time series from Parkinson's disease patients, fluctuations in gold prices, atmospheric CO₂ concentration, wind velocity data, and earthquake occurrences. Our method exclusively provides the time dependency, rather than both state and time dependencies, of the stochasticity.

Permanent link: <https://hdl.handle.net/11104/0354174>

0586993 - ÚI 2025 RIV CH eng C - Conference Paper (international conference)

Sedlár, Igor

Completeness of Finitely Weighted Kleene Algebra with Tests.

Logic, Language, Information, and Computation. Cham: Springer, 2024 - (Metcalf, G.; Studer, T.; de Queiroz, R.), s. 210-224. Lecture Notes in Computer Science, 14672. ISBN 978-3-031-62686-9. ISSN 0302-9743.

[WoLLIC 2024: Workshop on Logic, Language, Information, and Computation /30./, Bern (CH), 10.06.2024-13.06.2024]

CEP Project: GA ČR(CZ) GA22-16111S

Institutional support: RVO:67985807

Keywords: Kleene algebra * many-valued logic * semirings * weighted programs

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

https://doi.org/10.1007/978-3-031-62687-6_14

DOI: [10.1007/978-3-031-62687-6_14](https://doi.org/10.1007/978-3-031-62687-6_14)

Building on Ésik and Kuich's completeness result for finitely weighted Kleene algebra, we establish relational and language completeness results for finitely weighted Kleene algebra with tests. Similarly as Ésik and Kuich, we assume that the finite semiring of weights is commutative, partially ordered and zero-bounded, but we also assume that it is integral. We argue that finitely weighted Kleene algebra with tests is a natural framework for equational reasoning about weighted programs in cases where an upper bound on admissible weights is assumed.

Permanent link: <https://hdl.handle.net/11104/0354318>

0587051 - ÚI 2025 eng C - Conference Paper (international conference)

[Kadlecová, Gabriela](#) - [Lukasik, J.](#) - [Pilát, Martin](#) - [Vidnerová, Petra](#) - [Safari, M.](#) - [Neruda, Roman](#) - [Hutter, F.](#)

Surprisingly Strong Performance Prediction with Neural Graph Features.

[ICML 2024: International Conference on Machine Learning /41./, Vienna (AT), 21.07.2024-27.07.2024]

CEP Project: GA ČR(CZ) GA22-02067S

Infrastructure: e-INFRA CZ II - 90254

Institutional support: RVO:67985807

Keywords: Neural architecture search * Zero-cost proxies * Performance prediction

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

Performance prediction has been a key part of the neural architecture search (NAS) process, allowing to speed up NAS algorithms by avoiding resource-consuming network training. Although many performance predictors correlate well with ground truth performance, they require training data in the form of trained networks. Recently, zero-cost proxies have been proposed as an efficient method to estimate network performance without any training. However, they are still poorly understood, exhibit biases with network properties, and their performance is limited. Inspired by the drawbacks of zero-cost proxies, we propose neural graph features (GRAF), simple to compute properties of architectural graphs. GRAF offers fast and interpretable performance prediction while outperforming zero-cost proxies and other common encodings. In combination with other zero-cost proxies, GRAF outperforms most existing performance predictors at a fraction of the cost.

Permanent link: <https://hdl.handle.net/11104/0354383>

0586691 - ÚI 2025 DE eng A - Abstract

[Latif, Yasir](#) - [Paluš, Milan](#)

Causal information flow and information transfer delay from ENSO and IOD to precipitation variability in the Upper Indus Basin, Pakistan.

EGU General Assembly 2024 Abstracts. Munich: European Geosciences Union, 2024.

[EGU General Assembly 2024. 14.04.2024-19.04.2024, Vienna]

Project - other: AV ČR(CZ) AP1901; AV ČR(CZ) NSFC-23-08

Program: Akademická prémie - Praemium Academiae; Bilaterální spolupráce

Institutional support: RVO:67985807

<https://meetingorganizer.copernicus.org/EGU24/EGU24-12884.html>

[DOI: 10.5194/egusphere-egu24-12884](https://doi.org/10.5194/egusphere-egu24-12884)

In 2022, La Niña and negative Indian Ocean Dipole (IOD) coincided, causing abnormally warm sea surface conditions in the eastern Indian Ocean (near Indonesia). This provided additional moisture to feed monsoon depressions, resulting in heavy rainfall in Pakistan. El Niño-Southern Oscillation (ENSO) and Indian Ocean Dipole (IOD) are two modes of sea surface temperature variability that can significantly impact precipitation in Pakistan's Upper Indus Basin. The current study used in situ observations and reanalysis ERA 5 precipitation data to determine the causal influence of ENSO and IOD on precipitation variability using an information-theoretic generalization of Granger causality. The predicted causal effect and causal delay obtained using conditional mutual information, a.k.a. transfer entropy, were further validated using conditional means ("composites") - precipitation means computed for different ENSO states; El Niño (positive), La Niña (negative), and neutral. Uncovering the causal and delayed effects of ENSO and IOD, as well as associated mechanisms, on subsequent precipitation in the UIB could provide a stronger foundation for improving seasonal climate predictions with a longer lead time, as well as understanding how regional and large-scale drivers affect regional precipitation.

Permanent link: <https://hdl.handle.net/11104/0354123>

0586674 - ÚI 2025 DE eng A - Abstract

[Kathpalia, Aditi](#) - [Manshour, Pouya](#) - [Paluš, Milan](#)

Compression-complexity based estimation of Causality: Applications in Earth and Climate Sciences
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

<https://meetingorganizer.copernicus.org/EGU24/EGU24-14429.html>

[DOI: 10.5194/egusphere-egu24-14429](https://doi.org/10.5194/egusphere-egu24-14429)

Many approaches to time series causality exist and have been inspired from fields such as statistics, information theory, physics and topology. We have proposed a method called compression-complexity causality (CCC) [1] inspired from the field of data compression in computer science. It is based on the idea that the compressibility of the 'effect' time series changes when the 'cause' time series is considered in the evolution of the future dynamics of the effect. Compressibility is estimated using compression-complexity estimator for time series called 'effort-to-compress', which employs a lossless data compression algorithm for complexity estimation. CCC makes minimal assumptions on given time series data and has been seen to work well for short length data, irregularly sampled data as well as data with low temporal resolution. We have also introduced a multidimensional version of CCC, called Permutation CCC (PCCC) [2], which uses Takens' embedding for appropriate high dimensional representation of time series. This representation is subsequently encoded using ordinal patterns before computation of CCC. PCCC formulation retains the original robustness of CCC. This is demonstrated with its application on simulated multidimensional systems. We apply this formulation to infer causality between CO₂ emissions – temperature recordings on three different time scales, El Niño–Southern Oscillation phenomena – South Asian Summer Monsoon on two different time scales, as well as North Atlantic Oscillations – European temperature recordings on two different time scales. These paleoclimate and climate datasets suffer from the issues of missing samples, low temporal resolution and short length data and so a reliable inference of these climatic interactions requires a robust causality estimator.

Finally, we explore another variation of CCC which can help to infer causality in the multivariate cases. This variation helps to infer the existence of causal influences to a particular variable (from each other variable considered) while conditioning out the additional variables present. The presence of causal influences to each variable is decided by choosing the model of least compression-complexity which can help to explain the evolution of the future of that particular variable. In case more than one model has least complexity, the smallest model is chosen. We apply this formulation to understand interactions in space-weather system, particularly the solar wind-magnetosphere-ionosphere system interactions, which manifest as geomagnetic storms and substorms. We compare the performance of CCC formulations with existing methods in case of simulations as well as real data applications.

Permanent link: <https://hdl.handle.net/11104/0354109>

0586693 - ÚI 2025 DE eng A - Abstract

[Paluš, Milan](#)

Many shades in three dimensions and parallel universes of causality analysis.

EGU General Assembly 2024 Abstracts. Munich: European Geosciences Union, 2024.

[EGU General Assembly 2024. 14.04.2024-19.04.2024, Vienna]

Project - other: AV ČR(CZ) NSFC-23-08; AV ČR(CZ) AP1901

Program: Bilaterální spolupráce; Akademická prémie - Praemium Academiae

Institutional support: RVO:67985807

<https://meetingorganizer.copernicus.org/EGU24/EGU24-8450.html>

[DOI: 10.5194/egusphere-egu24-8450](https://doi.org/10.5194/egusphere-egu24-8450)

Many approaches to infer causal relations from time series in Earth sciences have been proposed and applied in order to identify diverse interactions, such as the influence of large-scale circulation modes on local temperature and precipitation, variability of Euroasian winters due to changing Arctic Sea ice

cover, or interactions of solar activity and interplanetary medium conditions with the Earth's magnetosphere-ionosphere systems. The methods usually depend on "dimensions" in which the understanding of underlying phenomena is located: The phenomena or processes can be linear or nonlinear; deterministic, or random. The third abstract "dimension" is the actual dimensionality of the problem, given either by the dimension of the state space of the underlying mechanism or the number of involved variables. We will conduct a short flight inside these "dimensions," shedding light on some of the shades, comparing some of the causality inference methods using model and real data from the Earth sciences.

Permanent link: <https://hdl.handle.net/11104/0354125>

0587082 - ÚI 2025 CZ cze A - Abstract

Šípek jr., A. - Gregor, V. - Šípek, A. - [Klaschka, Jan](#) - [Malý, Marek](#)

Incidence gastroschízy v České republice.

Kaprasův den 2024: Sborník příspěvků. Praha: ÚBLG 1. LF UK, VFN, OLG FTN, 2024. s. 7-8.

[Kaprasův den 2024: Pracovní den lékařské genetiky. 14.02.2024-14.02.2024, Praha]

Institutional support: RVO:67985807

Celková četnost gastroschízy se v České republice zvyšuje. Efektivita prenatalního zachytu této vady stoupá díky rozvoji ultrazvukové prenatalní diagnostiky. Od poloviny devadesátých let se stále větší část těhotných žen v České republice, stejně jako jinde ve světě, rozhoduje pro pokračování gravidity plodu s diagnostikovanou gastroschízou a následným postnatálním řešením defektu. Při rozdělení podle pohlaví jsme celkově našli statisticky nevýznamně vyšší podíl postižených chlapců oproti dětem bez vrozených vad. Prokázali jsme statisticky významně vyšší riziko gastroschízy u mladších rodičů. V práci jsou prezentována data získaná z Ústavu zdravotnických informací a statistiky České republiky (Národní registr vrozených vad) a také data získaná v rámci hlášení prenatalně diagnostikovaných případů pod záštitou SLG ČLS JEP.

Permanent link: <https://hdl.handle.net/11104/0354379>

0587081 - ÚI 2025 CZ cze A - Abstract

Šípek jr., A. - Gregor, V. - Šípek, A. - [Klaschka, Jan](#) - [Malý, Marek](#)

Prenatální diagnostika chromozomových aberací v ČR.

Kaprasův den 2024: Sborník příspěvků. Praha: ÚBLG 1. LF UK, VFN, OLG FTN, 2024. s. 3-3.

[Kaprasův den 2024: Pracovní den lékařské genetiky. 14.02.2024-14.02.2024, Praha]

Institutional support: RVO:67985807

Hlavními typy diagnóz zachycených v rámci prenatalní diagnostiky chromozomální aberací jsou tři hlavní autozomální trizomie, syndromy Downův, Edwardsův a Patauův. Tyto diagnózy tvoří dlouhodobě přibližně 2/3 všech prenatalně diagnostikovaných chromozomálních aberací. Tyto syndromy jsou v naprosté většině případů zachyceny již v rámci prenatalní diagnostiky. V přednášce ukazujeme vývoj trendů v oblasti úspěšnosti prenatalní diagnostiky, průměrného týdne těhotenství při diagnóze a také měnící se průměrný věk rodiček. V práci jsou prezentována data získaná z Ústavu zdravotnických informací a statistiky České republiky (Národní registr vrozených vad) a také data získaná v rámci hlášení prenatalně diagnostikovaných případů pod záštitou SLG ČLS JEP.

Permanent link: <https://hdl.handle.net/11104/0354377>