Záznamy vložené do ASEP za UI (1. 4 – 30. 4. 2024)

New ICS records in ASEP (1. 4. – 30. 4. 2024)

0585230 - ÚI 2025 RIV CH eng M - Monography Chapter
Geletič, Jan - Belda, M. - **Bureš, Martin** - **Krč, Pavel** - Lehnert, M. - **Resler, Jaroslav** - **Řezníček, Hynek**
Complex Micro-meteorological Effects of Urban Greenery in an Urban Canyon: A Case Study of Prague-Dejvice, Czech Republic.
Nature-based Solutions for Circular Management of Urban Water. Cham: Springer, 2024 - (Stefanakis, A.; Oral, H.; Calheiros, C.; Carvalho, P.), s. 391-404. ISBN 978-3-031-50724-3
R&D Projects: GA TA ČR(CZ) TO01000219
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Program: StrategieAV
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Keywords : Large-eddy simulation * PALM * Mitigation * Tree planting * Air pollution * Meteorology
OECD category: Meteorology and atmospheric sciences
https://doi.org/10.1007/978-3-031-50725-0_22
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This contribution explains and summarizes the latest findings on the positive and negative effects of greenery at the street level. The LES-based PALM modeling system was used for simulations on a previously validated domain. Dense planting of trees can improve thermal comfort by decreasing thermal comfort indices up to 15 °C, surface temperature reduction can even reach several tens of degrees. Air temperature drop is an order of magnitude lower, specifically around 1 °C. Their effect is mostly local, effects in their surroundings were found only in case of air temperature. Dense tree planting close to heavy traffic roads could increase the relative daily-averaged concentration of PM2.5 by more than 30%. The method of planting plays an important role, one row of trees in the middle of the street (+7.5%) has a different effect than two rows on their sides (+18.6%). The hourly averaged maximum concentrations, typically in times of morning and afternoon peak, can increase from 50% to 300%. The increase is dependent on the intensity of traffic or other local emission sources in the planned planting sites, as well as on the quantity, location, and characteristics of the planted greenery.
Permanent Link: https://hdl.handle.net/11104/0352999

0585407 - ÚI 2025 eng J - Journal Article
Bartoš, František - **Martinková, Patrícia**
Assessing quality of selection procedures: Lower bound of false positive rate as a function of inter-rater reliability.
British Journal of Mathematical & Statistical Psychology. Online 15 April 2024 (2024). ISSN 0007-1102. E-ISSN 2044-8317
R&D Projects: GA ČR(CZ) GA21-03658S; GA MŠMT(CZ) EH22_008/0004583
Institutional support: RVO:67985807
Impact factor: 2.6, year: 2022
Method of publishing: Open access
https://doi.org/10.1111/bmsp.12343
DOI: 10.1111/bmsp.12343

Inter-rater reliability (IRR) is one of the commonly used tools for assessing the quality of ratings from multiple raters. However, applicant selection procedures based on ratings from multiple raters usually result in a binary outcome; the applicant is either selected or not. This final outcome is not considered

in IRR, which instead focuses on the ratings of the individual subjects or objects. We outline the connection between the ratings' measurement model (used for IRR) and a binary classification framework. We develop a simple way of approximating the probability of correctly selecting the best applicants which allows us to compute error probabilities of the selection procedure (i.e., false positive and false negative rate) or their lower bounds. We draw connections between the IRR and the binary classification metrics, showing that binary classification metrics depend solely on the IRR coefficient and proportion of selected applicants. We assess the performance of the approximation in a simulation study and apply it in an example comparing the reliability of multiple grant peer review selection procedures. We also discuss other possible uses of the explored connections in other contexts, such as educational testing, psychological assessment, and health-related measurement, and implement the computations in the R package IRR2FPR.
Permanent Link: https://hdl.handle.net/11104/0353116

We study a constrained version of the Geometric Hitting Set problem where we are given a set of points, partitioned into pairwise disjoint subsets, and a set of intervals. The objective is to hit all the intervals with a minimum number of points such that if we select a point from a subset, we must select all the points from that subset. We consider two special cases of the problem where each subset can have at most 2 and 3 points. If each subset contains at most 2 points and the intervals are disjoint, we show that the problem admits a polynomial-time algorithm. On the contrary, if each subset contains at most t points, where t >= 2, and the intervals are overlapping, we show that the problem becomes NP-Hard. Further, when each subset contains at most t points where t >= 3, and the intervals are disjoint, we prove that the problem is NP-Hard, and we provide two constant factor approximation algorithms for this problem. We also study the problem from the parameterized complexity perspective. If the intervals are disjoint, then we prove that the problem is in FPT when parameterized by the size of the solution. We also complement this result by giving a lower bound in the size of the kernel for disjoint intervals, and we also provide a polynomial kernel when the size of all subsets is bounded by a constant.
Permanent Link: https://hdl.handle.net/11104/0352882

In Cz–Si growth, the shape of the solid–liquid interface and the v/G ratio significantly impact crystal quality. This study utilizes a data-driven approach, employing multilayer perceptron (MLP) neural networks and Bayesian optimization, to investigate the scale-up process of Cz–Si under conditions of partial similarity. The focus is on exploring the influence of various process and furnace geometry parameters, as well as radiation shield material properties, on the critical measures of crystal quality. Axisymmetric CFD modeling produces 340 sets of 18D raw data, from which 14-dimensionless derived data tuples are generated for the design and training of the MLP. The best MLP obtained demonstrates the ability to accurately assess the complex nonlinear dependencies among dimensionless numbers derived from CFD data and, on the output side, interface deflection and v/G. These relationships, crucial for scale-up, are successfully generalized across a wide range of parameters.
Permanent Link: https://hdl.handle.net/11104/0353135

Prabhu, S. - Manimozhi, V. - Davoodi, Akbar - García Guirao, J. L.
Fault-tolerant basis of generalized fat trees and perfect binary tree derived architectures.

The ability to uniquely identify all nodes in a network based on network distances has proven to be highly beneficial despite the computational challenges involved in discovering minimal resolving sets within an interconnection network.
A subset R of vertices of a graph G is referred to as a resolving set of the graph if each node can be uniquely identified by its distance code with respect to R, with its minimal cardinality defining the metric dimension of G. Similarly, a resolving set $F \subseteq V$ is designated as a fault-tolerant resolving set if $F \setminus \{s\}$ serves as a resolving set for each $s \in F$. The minimum cardinality of F represents the fault-tolerant metric dimension of G. Although determining the precise metric dimension of a given graph remains challenging, various effective techniques and meaningful constraints have been developed for different graph families. However, no notable technique has been developed to find fault-tolerant metric dimension of a given graph. Recently, Prabhu et al. have shown that each twin vertex of G belongs to every fault-tolerant resolving set of G. Consequently, the fault-tolerant metric dimension is equal to the order of the graph G if and only if each vertex of G is a twin vertex, a characterization proved in [Appl. Math. Comput. \textbf{420} (2022) 126897] corrects a wrong characterization in the literature. It is also interesting to note from the above literature correction that the twin vertices are necessary to form the fault-tolerant resolving set, but determining whether they are sufficient is challenging. Evidence of this context is also discussed in this paper through the amalgamation of perfect binary trees. This article focuses on determining the exact value of the fault-tolerant metric dimension of generalized fat trees. For the amalgamation of perfect binary trees, both the metric dimension and fault-tolerant metric dimension were precisely found.
Permanent Link: https://hdl.handle.net/11104/0352872

Kalina, Jan
Exploring the impact of post-training rounding in regression models.

Post-training rounding, also known as quantization, of estimated parameters stands as a widely adopted technique for mitigating energy consumption and latency in machine learning models. This theoretical endeavor delves into the examination of the impact of rounding estimated parameters in key regression methods within the realms of statistics and machine learning. The proposed approach allows for the perturbation of parameters through an additive error with values within a specified interval. This method is elucidated through its application to linear regression and is subsequently extended to encompass radial basis function networks, multilayer perceptrons, regularization networks, and logistic regression, maintaining a consistent approach throughout.
Permanent Link: https://hdl.handle.net/11104/0352867

0585138 - ÚI 2025 US eng J - Journal Article
Bartoš, František - Maier, M. - Wagenmakers, J. E. - Nippold, F. - Doucouliagos, H. - Ioannidis, J. P. A. - Otte, W. M. - Sladekova, M. - Deresssa, T. K. - Bruns, S. B. - Fanelli, D. - Stanley, T. D.
Footprint of publication selection bias on meta-analyses in medicine, environmental sciences, psychology, and economics.
Research Synthesis Methods. Online 07 February 2024 (2024). ISSN 1759-2879. E-ISSN 1759-2887

Publication selection bias undermines the systematic accumulation of evidence. To assess the extent of this problem, we survey over 68,000 meta-analyses containing over 700,000 effect size estimates from medicine (67,386/597,699), environmental sciences (199/12,707), psychology (605/23,563), and economics (327/91,421). Our results indicate that meta-analyses in economics are the most severely contaminated by publication selection bias, closely followed by meta-analyses in environmental sciences and psychology, whereas meta-analyses in medicine are contaminated the least. After adjusting for publication selection bias, the median probability of the presence of an effect decreased from 99.9% to 29.7% in economics, from 98.9% to 55.7% in psychology, from 99.8% to 70.7% in environmental sciences, and from 38.0% to 29.7% in medicine. The median absolute effect sizes (in terms of standardized mean differences) decreased from $d = 0.20$ to $d = 0.07$ in economics, from $d = 0.37$ to $d = 0.26$ in psychology, from $d = 0.62$ to $d = 0.43$ in environmental sciences, and from $d = 0.24$ to $d = 0.13$ in medicine.
Permanent Link: https://hdl.handle.net/11104/0352876

0585220 - ÚI 2025 RIV GB eng J - Journal Article
Le Vu, M. - Matthes, K. L. - Brabec, Marek - Riou, J. - Skrivankova, V. W. - Hösli, I. - Rohrmann, S. - Staub, K.
Health of singleton neonates in Switzerland through time and crises: a cross-sectional study at the population level, 2007-2022.
BMC Pregnancy and Childbirth. Roč. 24, č. 1 (2024), č. článku 218. E-ISSN 1471-2393

BACKGROUND: Being exposed to crises during pregnancy can affect maternal health through stress exposure, which can in return impact neonatal health. We investigated temporal trends in neonatal outcomes in Switzerland between 2007 and 2022 and their variations depending on exposure to the economic crisis of 2008, the flu pandemic of 2009, heatwaves (2015 and 2018) and the COVID-19 pandemic. METHODS: Using individual cross-sectional data encompassing all births occurring in Switzerland at the monthly level (2007-2022), we analysed changes in birth weight and in the rates of preterm birth (PTB) and stillbirth through time with generalized additive models. We assessed whether the intensity or length of crisis exposure was associated with variations in these outcomes. Furthermore, we explored effects of exposure depending on trimesters of pregnancy. RESULTS: Over 1.2 million singleton births were included in our analyses. While birth weight and the rate of stillbirth have remained stable since 2007, the rate of PTB has declined by one percentage point. Exposure to the crises led to different results, but effect sizes were overall small. Exposure to COVID-19, irrespective of the pregnancy trimester, was associated with a higher birth weight (+12 grams [95% confidence interval (CI) 5.5 to 17.9 grams]). Being exposed to COVID-19 during the last trimester was associated with an increased risk of stillbirth (odds ratio 1.24 [95%CI 1.02 to 1.50]). Exposure to the 2008 economic crisis during pregnancy was not associated with any changes in neonatal health outcomes, while heatwave effect was difficult to interpret. CONCLUSION: Overall, maternal and neonatal health demonstrated resilience to the economic crisis and to the COVID-19 pandemic in a high-income country like Switzerland. However, the effect of exposure to the COVID-19 pandemic is dual, and the negative impact of maternal infection on pregnancy is well-documented. Stress exposure and economic constraint may also have had adverse effects among the most vulnerable subgroups of Switzerland. To investigate better the impact of heatwave exposure on neonatal health, weekly or daily-level data is needed, instead of monthly-level data.
Permanent Link: https://hdl.handle.net/11104/0352986

Like many intensional logics, William Parry's logic of analytic implication PAI admits extensions determined by imposing semantic conditions on its account of modality. PAI is unique, however, in its allowing a second dimension—a topic-theoretic dimension—along which extensions can be defined. The recent introduction by Francesco Berto of topic-sensitive intentional modals (TSIMs)—which disagree with PAI on this type of condition—provide further motivations to examine such topic-theoretic extensions. In this paper, we introduce, motivate, and characterize a number of such extensions of PAI, paying special attention to applications to Berto's framework and to ways in which the modal and topic-theoretic dimensions influence one another.
Permanent Link: https://hdl.handle.net/11104/0353142

Cintula, Petr - Metcalfe, G. - Tokuda, N.
One-variable fragments of first-order logics.

The one-variable fragment of a first-order logic may be viewed as an "S5-like" modal logic, where the universal and existential quantifiers are replaced by box and diamond modalities, respectively. Axiomatizations of these modal logics have been obtained for special cases — notably, the modal counterparts S5 and MIPC of the one-variable fragments of first-order classical logic and first-order intuitionistic logic, respectively — but a general approach, extending beyond first-order intermediate logics, has been lacking. To this end, a sufficient criterion is given in this paper for the one-variable fragment of a semantically-defined first-order logic — spanning families of intermediate, substructural, many-valued, and modal logics — to admit a certain natural axiomatization. More precisely, an axiomatization is obtained for the one-variable fragment of any first-order logic based on a variety of algebraic structures with a lattice reduct that has the superamalgamation property, using a generalized version of a functional representation theorem for monadic Heyting algebras due to Bezhanishvili and Harding. An alternative proof-theoretic strategy for obtaining such axiomatization results is also developed for first-order substructural logics that have a cut-free sequent calculus and admit a certain interpolation property
Permanent Link: https://hdl.handle.net/11104/0352990

Ferenz, Nicholas
One Variable Relevant Logics are S5ish.

Here I show that the one-variable fragment of several first-order relevant logics corresponds to certain S5ish extensions of the underlying propositional relevant logic. In particular, given a fairly standard translation between modal and one-variable languages and a permuting propositional relevant logic L, a formula A of the one-variable fragment is a theorem of LQ (QL) iff its translation is a theorem of L5 (L.5). The proof is model-theoretic. In one direction, semantics based on the Mares-Goldblatt [15] semantics for quantified L are transformed into ternary (plus two binary) relational semantics for S5-like extensions of L (for a general presentation, see Seki [26, 27]). In the other direction, a valuation is given for the full first-order relevant logic based on L into a model for a suitable S5 extension of L. I also discuss this work's relation to finding a complete axiomatization of the constant domain, non-general frame ternary relational semantics for which RQ is incomplete [11]
Permanent Link: https://hdl.handle.net/11104/0353225

Lehnert, M. - Jirmus, R. - Květoňová, V. - Geletič, Jan - Jurek, M. - Středová, H. - Frajer, J.
Overheated children's playgrounds in Central European cities: The effects of surfaces and shading on thermal exposure during hot summer days.

Thermal exposure in children's playgrounds is a specific issue in relation to outdoor thermal comfort. In moderate climate regions, playgrounds are prone to overheating on hot summer days. When aiming for a safe design for playgrounds, different thermal conditions with various active surfaces and shading solutions, both natural and artificial, should be considered. Twelve case studies were performed in four Czech cities to quantify the differences in thermal exposure between individual types of active surface and shading, using mean radiant temperature and the biometeorological indices UTCI and PET (plus its experimental child-specific adjustments) as an expression of the thermal environment on hot summer days. The highest thermal exposure appeared above gravel, followed by rubber. Nevertheless, apart from a slightly lower thermal exposure above maintained lawn, substantial positive microclimatic effect of natural surfaces, such as bark mulch, sand, or a small water pool, was not confirmed. In terms of shading, trees provide more pronounced cooling effect than shade sails, but even the latter are effective in substantially reducing heat stress. Analyses of experimental adjustment of PET further indicate the importance of considering the specifics of a child's organism and behavioural adaptation measures when addressing thermal comfort and heat stress in playgrounds.
Permanent Link: https://hdl.handle.net/11104/0352998

Radović, J. - Belda, M. - Resler, Jaroslav - Eben, Kryštof - Bureš, Martin - Geletič, Jan - Krč, Pavel - Řezníček, Hynek - Fuka, V.
Challenges of constructing and selecting the "perfect" boundary conditions for the large-eddy simulation model PALM.

We present the process of and difficulties in acquiring the proper boundary conditions (BCs) for the state-of-the-art large-eddy simulation (LES)-based PALM model system. We use the mesoscale Weather Research and Forecasting (WRF) model as a source of inputs for the PALM preprocessor and investigate the influence of the mesoscale model on the performance of the PALM model. A total of 16 different WRF configurations were used as a proxy for a multi-model ensemble. We developed a technique for selecting suitable sets of BCs, performed PALM model simulations driven by these BCs, and investigated the consequences of selecting a sub-optimal WRF configuration. The procedure was tested for four episodes in different seasons of the year 2019, during which WRF and PALM outputs

were evaluated against the atmospheric radiosounding observations. We show that the PALM model outputs are heavily dependent on the imposed BCs and have different responses at different times of the day and in different seasons. We demonstrate that the main driver of errors is the mesoscale model and that the PALM model is capable of attenuating but not fully correcting them. The PALM model attenuates the impact of errors in BCs in wind speed, while for the air temperature, PALM shows variable behavior with respect to driving conditions. This study stresses the importance of high-quality driving BCs and the complexity of the process of their construction and selection.
Permanent Link: https://hdl.handle.net/11104/0353148
Research data: GMD - Supplement

0585236 - ÚI 2025 US eng J - Journal Article
Campos Araújo, Pedro - Martins, T. - Mattos, L. - Mendonça, W. - Moreira, L. - Mota, G.O.
On the Anti-Ramsey Threshold for Non-Balanced Graphs.
Electronic Journal of Combinatorics. Roč. 31, č. 1 (2024), č. článku P1.70. ISSN 1077-8926. E-ISSN 1077-8926
R&D Projects: GA ČR(CZ) GJ20-27757Y
Impact factor: 0.7, year: 2022
Method of publishing: Open access
https://doi.org/10.37236/11449
DOI: 10.37236/11449
Permanent Link: https://hdl.handle.net/11104/0353002

0585040 - ÚI 2025 RIV GB eng J - Journal Article
Adámek, P. - Grygarová, D. - Jajcay, Lucia - Bakštein, E. - Fürstová, P. - Juríčková, V. - Jonáš, J. - Langová, V. - Neskoroďana, I. - Kesner, L. - Horáček, J.
The Gaze of Schizophrenia Patients Captured by Bottom-up Saliency.
Schizophrenia. Roč. 10, 20 February 2024 (2024), č. článku 21. E-ISSN 2754-6993
R&D Projects: GA MZd(CZ) NU22-04-00143
Institutional support: RVO:67985807
Keywords : visual perception * visual saliency * schizophrenia
OECD category: Neurosciences (including psychophysiology
Method of publishing: Open access
https://doi.org/10.1038/s41537-024-00438-4
DOI: 10.1038/s41537-024-00438-4

Schizophrenia (SCHZ) notably impacts various human perceptual modalities, including vision. Prior research has identified marked abnormalities in perceptual organization in SCHZ, predominantly attributed to deficits in bottom-up processing. Our study introduces a novel paradigm to differentiate the roles of top-down and bottom-up processes in visual perception in SCHZ. We analysed eye-tracking fixation ground truth maps from 28 SCHZ patients and 25 healthy controls (HC), comparing these with two mathematical models of visual saliency: one bottom-up, based on the physical attributes of images, and the other top-down, incorporating machine learning. While the bottom-up (GBVS) model revealed no significant overall differences between groups (beta = 0.01, p = 0.281, with a marginal increase in SCHZ patients), it did show enhanced performance by SCHZ patients with highly salient images. Conversely, the top-down (EML-Net) model indicated no general group difference (beta = −0.03, p = 0.206, lower in SCHZ patients) but highlighted significantly reduced performance in SCHZ patients for images depicting social interactions (beta = −0.06, p < 0.001). Over time, the disparity between the groups diminished for both models. The previously reported bottom-up bias in SCHZ patients was apparent only during the initial stages of visual exploration and corresponded with progressively shorter fixation durations in this group. Our research proposes an innovative approach to understanding early visual information processing in SCHZ patients, shedding light on the interplay between bottom-up perception and top-down cognition.
Permanent Link: https://hdl.handle.net/11104/0352816

0585428 - ÚI 2025 RIV NL J - Journal Article
Arinyo i Prats, Andreu - López-Madrona, V. J. - **Paluš, Milan**
Lead/Lag directionality is not generally equivalent to causality in nonlinear systems: Comparison of phase slope index and conditional mutual information.
Neuroimage. Roč. 292, 15 April 2024 (2024), č. článku 120610. ISSN 1053-8119. E-ISSN 1095-9572

Applications of causal techniques to neural time series have increased extensively over last decades, including a wide and diverse family of methods focusing on electroencephalogram (EEG) analysis. Besides connectivity inferred in defined frequency bands, there is a growing interest in the analysis of cross-frequency interactions, in particular phase and amplitude coupling and directionality. Some studies show contradicting results of coupling directionality from high frequency to low frequency signal components, in spite of generally considered modulation of a high-frequency amplitude by a low-frequency phase. We have compared two widely used methods to estimate the directionality in cross frequency coupling: conditional mutual information (CMI) and phase slope index (PSI). The latter, applied to infer cross-frequency phase–amplitude directionality from animal intracranial recordings, gives opposite results when comparing to CMI. Both metrics were tested in a numerically simulated example of unidirectionally coupled Rössler systems, which helped to find the explanation of the contradictory results: PSI correctly estimates the lead/lag relationship which, however, is not generally equivalent to causality in the sense of directionality of coupling in nonlinear systems, correctly inferred by using CMI with surrogate data testing.
Permanent Link: https://hdl.handle.net/11104/0353138

0585239 - ÚI 2025 RIV GB eng J - Journal Article
Lukačišinová, A. - Reissigová, Jindra - Ortner-Hadžiabdić, M. - Brkić, J. - Okuyan, B. - Volmer, D. - Tadić, I. - Modamio, P. - Mariño, E. L. - Tachkov, K. - Liperotti, R. - Onder, G. - Finne-Soveri, H. - van Hout, H. - Howard, E. P. - Fialová, D.
Prevalence, country-specific prescribing patterns and determinants of benzodiazepine use in community-residing older adults in 7 European countries.
BMC Geriatrics. Roč. 24, 07 March 2024 (2024), č. článku 240. E-ISSN 1471-2318

BACkGROUND: The use of benzodiazepines (BZDs) in older population is often accompanied by drug-related complications. Inappropriate BZD use significantly alters older adults' clinical and functional status. This study compares the prevalence, prescribing patterns and factors associated with BZD use in community-dwelling older patients in 7 European countries. METHODS: International, cross-sectional study was conducted in community-dwelling older adults (65 +) in the Czech Republic, Serbia, Estonia, Bulgaria, Croatia, Turkey, and Spain between Feb2019 and Mar2020. Structured and standardized questionnaire based on interRAI assessment scales was applied. Logistic regression was used to evaluate factors associated with BZD use. RESULTS: Out of 2,865 older patients (mean age 73.2 years ± 6.8, 61.2% women) 14.9% were BZD users. The highest prevalence of BZD use was identified in Croatia (35.5%), Spain (33.5%) and Serbia (31.3%). The most frequently prescribed BZDs were diazepam (27.9% of 426 BZD users), alprazolam (23.7%), bromazepam (22.8%) and lorazepam (16.7%). Independent factors associated with BZD use were female gender (OR 1.58,

95%CI 1.19–2.10), hyperpolypharmacy (OR 1.97, 95%CI 1.22–3.16), anxiety (OR 4.26, 95%CI 2.86–6.38), sleeping problems (OR 4.47, 95%CI 3.38–5.92), depression (OR 1.95, 95%CI 1.29–2.95), repetitive anxious complaints (OR 1.77, 95%CI 1.29–2.42), problems with syncope (OR 1.78, 95%CI 1.03–3.06), and loss of appetite (OR 0.60, 95%CI 0.38–0.94). In comparison to Croatia, residing in other countries was associated with lower odds of BZD use (ORs varied from 0.49 (95%CI 0.32–0.75) in Spain to 0.01 (95%CI 0.00–0.03) in Turkey), excluding Serbia (OR 1.11, 95%CI 0.79–1.56). CONCLUSIONS: Despite well-known negative effects, BZDs are still frequently prescribed in older outpatient population in European countries. Principles of safer geriatric prescribing and effective deprescribing strategies should be individually applied in older BZD users.
Permanent Link: https://hdl.handle.net/11104/0353005

ÚVOD A CÍLE: Retrospektivní analýza četnosti a poměru pohlaví narozených dětí s brániční kýlou v České republice v období 1961–2020. MATERIÁL A METODIKA: V práci jsme využili údaje z Národního registru vrozených vad vedeného v rámci Registru reprodukčního zdraví v Ústavu zdravotnických informací a statistiky České republiky (ÚZIS ČR) a data z předchozích grantových analýz našeho kolektivu. Dalším zdrojem dat byly údaje o prenatální diagnostice ze Společnosti lékařské genetiky a genomiky ČLS JEP za roky 1961 až 2020. VÝSLEDKY: Ve sledovaném období se narodilo více než 7,5 milionu dětí. Z tohoto celkového počtu bylo zachyceno 1 742 případů diagnóz u narozených dětí s brániční kýlou, 973 chlapců, 758 dívek a v 11 případech bylo pohlaví neznámé/neurčeno. Z celkového počtu narozených dětí bylo 51,22 % chlapců a 48,78 % dívek bez brániční kýly. V případě dětí narozených s brániční kýlou bylo statisticky významně více chlapců 56,21 % oproti 43,79 % dívek (P < 0,001). Zastoupení chlapců a dívek se v průběhu sledovaného období mění, v prvních dvaceti letech nebyla převaha chlapců nad dívkami tak výrazná a statisticky významná oproti skupině bez VV. Celková incidence vady v průběhu sledovaného období nemá jednoznačný zřetelný trend plynulého poklesu ani nárůstu incidence. Vliv prenatální diagnostiky na četnost vady v populaci jsme hodnotili po pětiletých obdobích. Hodnoty podílu prenatální diagnostiky v prvních pěti pětiletých obdobích rostou, pouze v posledním období 2016–2020 se již vzestup zastavil. ZÁVĚR: Celková incidence brániční kýly se v průběhu sledovaného období výrazně nemění. Podíl prenatální diagnostiky se však zvyšuje. Vada se vyskytuje častěji u chlapců než u dívek, tento rozdíl je statisticky významný.

INTRODUCTION AND OBJECTIVES: Retrospective analysis of the frequency and sex ratio of children born with diaphragmatic hernia in the Czech Republic in the period 1961–2020. MATERIAL AND METHODOLOGY: In the work, we used data from the National Registry of Congenital Anomalies kept within the National Registry of Reproductive Health at the Institute of Health Information and Statistics of the Czech Republic (ÚZIS ČR) and data from previous grant analyzes by our team. Another data source was prenatal diagnosis data from the Czech Society of Medical Genetics and Genomics for the years 1961 to 2020. RESULTS: More than 7.5 million children were born in the observed period. From this total number, 1,742 cases of diagnoses were recorded in children born with diaphragmatic hernia, 973 were boys, 758 were girls, and in 11 cases, the gender was unknown/undetermined. Of the total number of children born, 51.22% were boys and 48.78% were girls without diaphragmatic hernia. In the case of children born with a diaphragmatic hernia, there were statistically significantly more boys 56.21% versus 43.79% girls (P<0.001). The representation of boys and girls changes during the observed period, in the first twenty years the predominance of boys over girls was not so pronounced and statistically significant compared to the group without diaphragmatic hernia. The overall incidence of the defect during the monitored period does not have a clear trend of continuous decrease or increase in incidence. We evaluated the influence of prenatal

diagnosis on the frequency of the defect in the population after five-year periods. The values of the share of prenatal diagnostics are increasing in the first five five-year periods, only in the last period 2016-2020 has the rise stopped. CONCLUSION: The overall incidence of diaphragmatic hernia does not change significantly during the observed period. However, the share of prenatal diagnosis is increasing. The defect occurs more often in boys than in girls, this difference is statistically significant.
Permanent Link:

Cerna, David M. - Buran, M.
One or Nothing: Anti-unification over the Simply-Typed Lambda Calculus.

Generalization techniques have many applications, including template construction, argument generalization, and indexing. Modern interactive provers can exploit advancement in generalization methods over expressive type theories to further develop proof generalization techniques and other transformations. So far, investigations concerned with anti-unification (AU) over λ-terms and similar type theories have focused on developing algorithms for well-studied variants. These variants forbid the nesting of generalization variables, restrict the structure of their arguments, and are unitary. Extending these methods to more expressive variants is important to applications. We consider the case of nested generalization variables and show that the AU problem is nullary (using capture-avoiding substitutions), even when the arguments to free variables are severely restricted.
Permanent Link:

Dudášová, J. - Valenta, Zdeněk - Sachs, J. R.
Elucidating vaccine efficacy using a correlate of protection, demographics, and logistic regression.
Permanent Link:

Šíma, Jiří - Vidnerová, Petra - Mrázek, V.
Energy Complexity of Convolutional Neural Networks.
Permanent Link:

Acharyya, A. - Keikha, Vahideh - Saumell, M. - Silveira, R.I.
Computing Largest Minimum Color-Spanning Intervals of Imprecise Points.

We study a geometric facility location problem under imprecision. Given n unit intervals in the real line, each with one of k colors, the goal is to place one point in each interval such that the resulting minimum color-spanning interval is as large as possible. A minimum color-spanning interval is an interval of minimum size that contains at least one point from a given interval of each color. We prove that if the input intervals are pairwise disjoint, the problem can be solved in O (n) time, even for intervals of arbitrary length. For overlapping intervals, the problem becomes much more difficult. Nevertheless, we show that it can be solved in O (n2 log n) time when k = 2, by exploiting several structural properties of candidate solutions, combined with a number of advanced algorithmic techniques. Interestingly, this shows a sharp contrast with the 2-dimensional version of the problem, recently shown to be NP hard.
Permanent Link: https://hdl.handle.net/11104/0352881

0585192 - ÚI 2025 RIV ES eng C - Conference Paper (international conference)
Hlinka, Jaroslav - Tomeček, D. - Kolenič, M. - **Rehák Bučková, Barbora** - **Tintěra, J. - Horáček, J. - Španiel, F.**
Role of fMRI Denoising for Classification of Schizophrenia from Functional Brain Connectivity.
Advances in Signal Processing and Artificial Intelligence: Proceedings of the 6th International Conference on Advances in Signal Processing and Artificial Intelligence. Barcelona: IFSA Publishing, 2024 - (Yurish, S.), s. 162-165. ISBN 978-84-09-60540-8. ISSN 2938-5350.
[ASPAI 2024: The International Conference on Advances in Signal Processing and Artificial Intelligence /6./. Funchal (PT), 17.04.2024-19.04.2024]
R&D Projects: GA MŠMT(CZ) EH22_008/0004643
Institutional support: RVO:67985807
Keywords : Functional connectivity * Schizophrenia * fMRI * Classification * Denoising
OECD category: Neurosciences (including psychophysiology
https://sensorsportal.com/ASPAI_2024/ASPAI_2024_Proceedings.pdf

This study explores the impact of denoising strategies on classifying first-episode psychosis (FEP) patients from healthy controls using functional connectivity measures derived from fMRI data. Leveraging a dataset of 100 FEP patients and
90 healthy controls, the research evaluates how different preprocessing approaches—ranging from raw data to moderate and stringent denoising – affect the classification accuracy when applying logistic regression on dimension-reduced features via PCA. The findings reveal that both moderate and stringent denoising methods significantly enhance classification performance compared to using raw data, with moderate denoising reaching an 82 % accuracy with 24 principal components and stringent denoising achieving 81 % accuracy with 45 components. The study underscores the importance of denoising in improving the reliability of functional connectivity measures for schizophrenia classification. However, it also suggests that the choice between moderate and stringent denoising may not be critical, as combining multiple strategies did not substantially improve performance. This research highlights the potential of optimized fMRI data preprocessing in psychiatric diagnosis, providing insights into the neurodevelopmental and neurodegenerative processes underlying schizophrenia.
Permanent Link: https://hdl.handle.net/11104/0352937

0584853 - ÚI 2025 eng C - Conference Paper (international conference)
Ayala-Rincón, M. - Cerna, David M. - Barragán, A. F. G. - Kutsia, T.
Equational Anti-Unification over Absorption Theories (accepted).
IJCAR 2024 Proceedings (to appear). 2024.
[IJCAR 2024: International Joint Conference on Automated Reasoning /12./. Nancy (FR), 01.07.2024-06.07.2024]
R&D Projects: GA ČR(CZ) GF22-06414L
Institutional support: RVO:67985807

Interest in anti-unification, the dual problem of unification, is on the rise due to applications within the field of software analysis and related areas. For example, anti-unification-based techniques have found uses within clone detection and automatic program repair methods. While syntactic forms of anti-unification are enough for many applications, some aspects of software analysis methods are

more appropriately modeled by reasoning modulo an equational theory. Thus, extending existing anti-unification methods to deal with important equational theories is the natural step forward. This paper considers anti-unification modulo pure absorption theories, i.e., some operators are associated with a special constant satisfying the axiom f(x,εf)≈f(εf,x)≈εf. We provide a sound and complete rule-based algorithm for such theories. Furthermore, we show that anti-unification modulo absorption is infinitary. Despite this, our algorithm terminates and produces a finitary algorithmic representation of the minimal complete set of solutions. We also show that the linear variant is finitary.
Permanent Link: https://hdl.handle.net/11104/0352643
Research data: Preprint - ArXiv.org

0584859 - ÚI 2025 CH eng C - Conference Paper (international conference)
Blaauwbroek, L. - Cerna, David M. - Gauthier, T. - Jakubův, J. - Kaliszyk, C. - Suda, M. - Urban, J.
Learning Guided Automated Reasoning: A Brief Survey (Accepted).
Essays in Honor of the 60th Birthday of Herman Geuvers (to appear). Springer, 2024 - (Capretta, V.; Krebbers, R.; Wiedijk, F.)
EU Projects: European Commission(XE) CA20111
Institutional support: RVO:67985807

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 boostrapped 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/11104/0352646
Research data: Preprint - ArXiv.org

0585521 - ÚI 2025 RIV CH L4 - Software
Bureš, Martin - Resler, Jaroslav
PALM-GeM: Geospatial Data Merging and Preprocessing into PALM.
2024
Technical parameters: PALM-GeM is built using Python and the geospatial data processing is based on the PostGIS database.
Economic parameters: PALM-GeM is an advanced tool for PALM's static driver preparation. PALM-GeM is developed to work effectively with publicly available dataset in standard GIS format. It is distributed under the GNU GPL v3+ license.
R&D Projects: GA TA ČR(CZ) TO01000219
Institutional support: RVO:67985807
OECD category: Meteorology and atmospheric sciences
https://doi.org/10.5281/zenodo.11067859

PALM-GeM (Geospatial Data Merging and Preprocessing into PALM) is an advanced tool for PALM's static driver preparation. PALM-GeM is developed to work effectively with publicly available dataset in standard GIS format. This enables to prepare a static driver for most larger european cities in spatial resolution 5-10m. Current data sources are UrbanAtlas, OpenStreepMap, EU-DEM.
Permanent Link: https://hdl.handle.net/11104/0353203
Research data: Zenodo.org

0585486 - ÚI 2025 RIV CZ eng L4 - Software
Krč, Pavel - **Bureš, Martin** - Sühring, M. - **Geletič, Jan** - **Resler, Jaroslav**
Cut-cell extension with non-orthogonal surfaces for the PALM model.
Internal code: TO01000219-V4 ; 2024
Technical parameters: The palm_source subdirectory contains the modified source code based on the feature branch in the PALM gitlab repository. To install, extract the source code archive and follow the README.md file. Further support is available on the PALM website.
Economic parameters: This dataset contains the cut-cell extension of the PALM model system. This is a significant modification which allows grid cells to be partially atmospheric and partially obstacle, as opposed to just full-atmosphere or full-obstacle, as is the case of the standard PALM model. Available under GNU GPL v3.
R&D Projects: GA TA ČR(CZ) TO01000219
Institutional support: RVO:67985807
OECD category: Meteorology and atmospheric sciences
https://doi.org/10.5281/zenodo.10999709

This dataset contains the cut-cell extension of the PALM model system. This is a significant modification which allows grid cells to be partially atmospheric and partially obstacle, as opposed to just full-atmosphere or full-obstacle, as is the case of the standard PALM model. The most significant changes are in the LES atmospheric model, the Radiative Transfer Model (RTM) and in the model data structures and initialization code. More details will be provided in the referencing research paper.
Permanent Link: https://hdl.handle.net/11104/0353170
Research data: Zenodo.org

0585520 - ÚI 2025 RIV CH L4 - Software
Krč, Pavel - **Bureš, Martin** - **Resler, Jaroslav** - Belda, M.
PALM-METEO: Advanced modular tool for preparing meteorological inputs to the PALM model.
2024
Technical parameters: PALM-METEO is built using Python and several open-source libraries. It may be used out-of-the box with the project directory as long as the all required libraries are available. For each dynamic driver, a YAML configuration file needs to be prepared.
Economic parameters: PALM-METEO is an advanced and modular tool to create PALM's dynamic driver with initial and boundary conditions (IBC) and other time-varying data, typically using (but not limited to) outputs from mesoscale models. It is distributed under the GNU GPL v3+ license.
R&D Projects: GA TA ČR(CZ) TO01000219
Institutional support: RVO:67985807
OECD category: Meteorology and atmospheric sciences
https://doi.org/10.5281/zenodo.11061001

PALM-METEO is an advanced and modular tool to create PALM's dynamic driver with initial and boundary conditions (IBC) and other time-varying data, typically using (but not limited to) outputs from mesoscale models.
Permanent Link: https://hdl.handle.net/11104/0353202
Research data: Zenodo.org

0585546 - ÚI 2025 L4 - Software
Esau, I.
Data fusion technology - kriging (TURBAN - D11).
Internal code: TURBAN - D11
Technical parameters: The package scripts combine and interpolate provided heterogenioes datasets of high resolution (NETATMO data and PALM simulations). The software package accepts diverse meteorological data sets, namely, the meteorological observations from stations (here given by the NETATMO set of stations from the Bergen data collected for theproject, see Esau, 2023) and results of PALM simulations (here, the PALM run in large domain set2, see Esau et al., 2024). The package also utilized the digital elevation model (DEM) of the Norwegian Mapping Authorities profived in geo-tiff format.

Economic parameters: The package consists of software (python scripts) and a demonstration example of usage. The aim is to obtain statistically optimal meteorological map on a regular spatial grid of high resolution. It is available under CC BY 4.0 licence.
R&D Projects: GA TA ČR(CZ) TO01000219
Keywords : kriging * statistical interpolation and mapping * urban meteorology
OECD category: Meteorology and atmospheric sciences
https://doi.org/10.5281/zenodo.11073317

This package is the deliverable D11 in WP4 of the TURBAN project. The package consists of software (python scripts) and a demonstration example of usage. The aim is to obtain statistically optimal meteorological map on a regular spatial grid of high resolution.
Permanent Link: https://hdl.handle.net/11104/0353259
Research data: Zenodo.org

0585526 - ÚI 2025 RIV CH eng L2 - Special Maps
Esau, I. - Miles, V. - Bureš, Martin - Resler, Jaroslav - Eben, Kryštof
Scenarios simulations of Bergen (TURBAN - D06).
Internal code: TURBAN - D06 ; 2024
R&D Projects: GA TA ČR(CZ) TO01000219
Institutional support: RVO:67985807
Keywords : large-eddy simulations * PALM modeling system * air quality * micro-meteorology
OECD category: Meteorology and atmospheric sciences
https://doi.org/10.5281/zenodo.11045535

This dataset contains simulation results for the so-called Danmarksplass domain, an area in the city of Bergen, Norway. Danmarksplass is the major trafic conjunction point in Bergen. Danmarksplass is located in a densely built-up and populated urban district subjected to many environmental challenges among them air pollution by NOx and aerosols (particulate matter PM2.5 and PM10) are considered as significant health threats. Detailed studies of the Danmarksplass meteorological conditions, air quality, and structure of the air polution could be found in Wolf et al. (2014a,b; 2017; 2020; 2021).
This dataset contains two collections of new simulations of air quality at Danmarksplass. The simulations were performed with the PALM modeling system v23.04 with additional modules developed in the TURBAN project (Radovic et al., 2024; Resler et al. to be submitted). This two collections of the PALM runs spans two air pollution episodes :
Summer episode (2019-07-20 to 2019-07-27) of the record breaking summer heat wave in Bergen (on July 26, 2019; https://www.bt.no/nyheter/lokalt/i/QoE3rA/naa-er-334-den-nye-varmerekorden-i-bergen) when considerable problems (haze, smell) from the aerosol air pollution (PM2.5 and PM10) were noted (Esau et al., 2022). The main sources of pollution are ships in the port of Bergen and road traffic. Winter episode (2021-02-04 to 2021-02-12) of the prolonged cold wave in Bergen (https://www.bt.no/nyheter/lokalt/i/IEOVm9/kulde-med-historisk-sus-i-bergen) when considerable problems (haze, smell) from the aerosol air pollution (PM2.5 and PM10) were noted (Esau et al., 2022). the main source of pollution is household wood combustion for heating.
Thus, the dataset presents multiple daily (24 h) runs driven by the results of model downscaling of ERA5 reanalysis with WRF model (produced by K. Eben and M. Bures). The aerosol emission sources are described in Wolf et al. (2020; 2021). The runs where combined into a single dataset in post-processing. The observational data for these two episodes collected in the TURBAN project are avaialble in Esau et al. (2023). For more detailed description of the experiments see the TURBAN project website at https://www.project-turban.eu/.
Permanent Link: https://hdl.handle.net/11104/0353206
Research data: Zenodo.org

0585525 - ÚI 2025 RIV CH eng L2 - Special Maps
Esau, I. - Resler, Jaroslav - Bureš, Martin
Sensitivity assessment of the scenario simulations (Bergen) (TURBAN - D22).
Internal code: TURBAN - D22 ; 2024

Sensitivity assessment of the model scenario simulations is essential for model verification and uncertainty assessment. Open question in any simulations is to what degree the obtained results are sensitive to specific selection of the model configuration and setup conditions. This map-based infographics (TURBAN-D22) explores sensitivity and uncertainty in the PALM scenario simulations fro Bergen. The baseline scenario simulation results for Bergen could be found in Esau et al. (2024). The map (the Nmap delivery type) presents variations of critical simulation parameters and brief answers to the model sensitivity questions received during the co-production workshop with the Norwegian project stakeholders (3-5 April 2024, Bergen-Ålesund-Trondheim). This result include analysis of the model sensitivity to grid refinements. The selected day for the model sensitivity study is 21st July 2019.
Content:
The map-based inforgraphics (poster of the A0 format)
Supplementary digital materials:
Maps (*.png) for all PALM runs for 2024-07-21
The PALM model output, input, and configuration files to reproduce the runs
Permanent Link: https://hdl.handle.net/11104/0353205
Research data: Zenodo.org

0585436 - ÚI 2025 RIV CH eng L2 - Special Maps
Geletič, Jan - Bauerová, P. - Belda, M. - **Bureš, Martin** - **Eben, Kryštof** - Fuka, V. - Jareš, R. - Karel, J. - **Krč, Pavel** - Patiño, W. - Radović, J. - **Resler, Jaroslav** - **Řezníček, Hynek** - **Vlček, O.**
Maps of the simulations and observations (TURBAN-D17).
Internal code: TURBAN-D17 ; 2024

Technical parameters: General organisation: Each selected epizode (s1-s6) has three folders; post-processed results from the PALM model as averaged ASCII (output-ascii) or GeoTiff (output-gis) files that can be viewed in many GIS applications and maps in the PNG format (output-png). Each variable was averaged from original 10min values to 1 and 24-hour averages. Modelled variables: Each subfolder includes 3 subfolders with variables. Variable bio_pet is the Physiological Equivalent Temperature (PET), bio_utci is the Universal Thermal Climate Index (UTCI) and kc_PM10 is the concentration of PM10 at 3m above ground. Episodes s4 and s6 includes 3 more subfolders: kc_NO is the concentration of NO, kc_NO2 is the concentration of NO2 and kc_PM25 is the concentration of PM2.5 at 3m above ground. File nomenclature: Each file (PRJ, TIF, ASC or PNG) has the same nomenclature. An example (bio_utci_abs-01h_20190724_1200-1300.png) could be parsed as: variable name (bio_utci), processed output (abs-01h), date (20190724) and averaged period (1200-1300). So, the result is a map with hourly averaged UTCI for 24 Jul 2019 between 12:00 and 13:00 UTC. Important note: During the processing phase a few potentially important problems were identified and need to be analysed in detail. One of them are extremely overestimated concentrations due to stable conditions from boundary condition inputs. In certain situations, it can happen that the overall best regional meteorological model can provide inappropriate input conditions for some episode. This needs to be checked in detail before any following interpretation. The issue will be addressed in an upcoming manuscript that will be available through the project website.
Economic parameters: This dataset contains two folders; in output-measurements are daily averaged TURDATA (see https://zenodo.org/records/10655033) results for air quality measurements. In folder output-simulations contains simulation results for the so-called Legerova domain, an area in the city of Prague, Czech Republic, centered around the traffic-heavy streets Legerova and Sokolská. This is the first output in a similar level of detail simulated using LES and freely available for state administration. It is available under CC BY 4.0 licence.
R&D Projects: GA TA ČR(CZ) TO01000219

Basic information
This dataset contains two folders, in output-measurements are daily averaged TURDATA (see
https://zenodo.org/records/10655033) results for air quality measurements. In folder output-
simulations contains simulation results for the so-called Legerova domain, an area in the city of
Prague, Czech Republic, centered around the traffic-heavy streets Legerova and Sokolská. All times
are in UTC (local time in winter, CET, is UTC +01:00, summer time, CEST, is UTC +02:00). In total 6
episodes in 2022 and 2023 was selected:

s1 2022-07-17 00:00:00 - 2022-07-20 00:00:00
s2: 2022-08-02 00:00:00 - 2022-08-05 00:00:00
s3: 2022-09-22 00:00:00 - 2022-09-25 00:00:00
s4: 2022-12-08 00:00:00 - 2022-12-11 00:00:00
s5: 2023-01-27 00:00:00 - 2023-01-30 00:00:00
s6: 2023-02-13 00:00:00 - 2023-02-16 00:00:00
For all episode's boundary conditions from regional model ICON (see icon in folder nomenclature)
were used. However, for a very stable condition during s6 two additional regional models were used
(WRF and ALADIN, see wrf or alad) that provided boundary conditions closer to the observed
meteorology. For more detailed description of the experiments see the TURBAN project website at
https://www.project-turban.eu/.

Permanent Link: https://hdl.handle.net/11104/0353145
Research data: Zenodo.org

0585437 - ÚI 2025 RIV CH eng L2 - Special Maps
Geletič, Jan - Bauerová, P. - Belda, M. - **Bureš, Martin** - **Eben, Kryštof** - Fuka, V. - Jareš, R.
- Karel, J. - **Krč, Pavel** - Patiño, W. - **Radović, J.** - **Resler, Jaroslav** - **Řezníček, Hynek** -
Vlček, O.
Maps of the detailed spatially and temporally attributed emission for area of Legerova and Sokolska
(TURBAN-D18).
Internal code: TURBAN-D18 ; 2024
Technical parameters: Each selected epizode (s1-s6) has three subfolders; input files in ASCII
(output-ascii) or GeoTiff (output-gis) formats that can be viewed in many GIS applications. In the
third subfolder are maps in the PNG format (output-png). Each subfolder includes 4 subfolders with
emissions summarized in all layers above ground. Variable vsrc_PM10 is the concentration of volume
source emissions (VSRC) of the PM10, vsrc_PM25 is the concentration of PM2.5, vsrc_NO is the
concentration of NO and vsrc_NO2 is the concentration of NO2. Each file (PRJ, TIF, ASC or PNG) has
the same nomenclature. An example (vsrc_NO_abs-01h_20220717_1200-1300.png) could be parsed
as: variable name (vsrc_NO), processed input (abs-01h), date (20220717) and period (1200-1300).
So, the result is a map with emission fluxes of NO between 12:00 and 13:00 UTC 24 Jul 2019.
Economic parameters: This dataset contains six folders with maps of input data for simulations
published in project TURBAN as result D17 (see https://zenodo.org/records/10982836). Each folder
contains air quality inputs for the so-called Legerova domain, an area in the city of Prague, Czech
Republic, centred around the traffic-heavy streets Legerova and Sokolská. They are the first outputs in
a similar level of detail simulated using LES and freely available for state administration. It is available
under CC BY 4.0 Licence.

Basic information

This dataset contains six folders with maps of input data for simulations published in project TURBAN as result D17 (see https://zenodo.org/records/10982836). Each folder contains air quality inputs for the so-called Legerova domain, an area in the city of Prague, Czech Republic, centred around the traffic-heavy streets Legerova and Sokolská. All times are in UTC (local time in winter, CET, is UTC +01:00, summer time, CEST, is UTC +02:00). In total 6 episodes in 2022 and 2023 were selected:

s1 2022-07-17 00:00:00 - 2022-07-20 00:00:00
s2: 2022-08-02 00:00:00 - 2022-08-05 00:00:00
s3: 2022-09-22 00:00:00 - 2022-09-25 00:00:00
s4: 2022-12-08 00:00:00 - 2022-12-11 00:00:00
s5: 2023-01-27 00:00:00 - 2023-01-30 00:00:00
s6: 2023-02-13 00:00:00 - 2023-02-16 00:00:00

For more detailed description of the experiments see the TURBAN project website at https://www.project-turban.eu/.
Permanent Link: https://hdl.handle.net/11104/0353146
Research data: Zenodo.org

0585235 - ÚI **DATA Scientific data** 2024
Geletič, Jan - Bauerová, P. - Belda, M. - **Bureš, Martin** - **Eben, Kryštof** - Fuka, V. - Karel, J. - Keder, J. - **Krč, Pavel** - Jareš, R. - Patiño, W. - **Radović, J.** - **Resler, Jaroslav** - **Řezníček, Hynek** - Šindelářová, A. - Vlček, O.

Scenarios simulations of Prague (D05).

Description: Basic information

This dataset contains simulation results for the so-called Holešovičky domain, an area in the city of Prague, Czech Republic, expected to undergo major traffic infrastructure changes in the near future. Three scenarios were modelled: current infrastructure with traffic intensity projections for 2023 (C1), future outlook with a finished part of city inner ring-road in 2030 (C2) and effect of finishing the northern part of the Prague outer ring-road (C3), which will decrease heavy traffic in the domain. Note that all scenarios have slightly different landcover (trees, buildings, bridges, tunnels etc.), so there could be small areas containing NA values in the maps and GIS files. All times are in UTC (local time, CEST is UTC +02:00).
For more detailed description of the experiments see the TURBAN project website at https://www.project-turban.eu/.
General organisation

Each scenario has two folders; post-processed results from the PALM model as averaged ASCII files that can be viewed in many GIS applications (output-gis) and maps in the PNG format (output-png). Each variable was averaged from original 10min values to 1, 3 and 24-hour averages. The C1 scenario was used as a baseline. In addition to that, also differences for all variables were calculated for the scenarios C2 and C3. In total, the C1 scenario has 3 subfolders with absolute values (prefix abs), the scenarios C2 and C3 have 6 (3 with absolute values and 3 with differences; prefix diff).

Modelled variables

Each subfolder includes 7 subfolders with variables. Variable bio_mrt is the Mean Radiant Temperature (MRT), bio_pet is the Physiological Equivalent Temperature (PET), bio_utci is the Universal Thermal Climate Index (UTCI), kc_PM10_02m is the concentration of PM10 at 2m above ground, theta_2m is the potential temperature at 2m above ground, tsurf is the surface temperature and wspeed_10m is the wind speed at 10m above ground.
File nomenclature

Each file (PRJ or ASC, PNG) has the same nomenclature. An example (bio_utci_abs-01h_20190724_1200-1300.png) could be parsed as: variable name (bio_utci), processed output (abs-01h), date (20190724) and averaged period (1200-1300). So, the result is a map with hourly averaged UTCI for 24 Jul 2019 between 12:00 and 13:00 UTC.
Important note

During the processing phase a few potentially important problems were identified and need to be

analysed in detail. One of them are extremely overestimated concentrations due to stable conditions from boundary condition inputs. In certain situations it can happen that the best regional meteorological model can provide inappropriate input conditions for some episode. This needs to be checked in detail before any following interpretation.

Keywords : air quality * thermal comfort * micro-scale * CFD modeling * cities
OECD category: Meteorology and atmospheric sciences
Permanent Link: https://hdl.handle.net/11104/0353007
Depositor: admin
Date of release: 17.4.2024

Storage   Accessibility Commentary

Zenodo.org open-access

0585178 - ÚI **DATA Scientific data**   2024
Bauerová, P. - Šindelářová, A. - Keder, J. - **Vlček, O.** - Patiño, W. - **Resler, Jaroslav** - **Krč, Pavel** - **Řezníček, Hynek** - **Geletič, Jan** - **Bureš, Martin** - **Eben, Kryštof** - Belda, M. - **Radović, J.** - Fuka, V. - Jareš, R. - Ezau, I.
TURDATA: a database of low-cost air quality and remote sensing measurements for the validation of micro-scale models in the real Prague urban environments.

Description: TURDATA is a supplementary data set for the TURBAN project Prague observation campaign described in the manuscript Bauerová et al. 2024 (submitted for publication). The measurement campaign focused on air pollution and meteorological measurement, including vertical profiles in selected part of Prague city centre called here as Legerova domain. Within this area, one professional meteorological station (MS) Prague Karlov and one reference traffic air quality monitoring (AIM) station Prague 2-Legerova (classified as traffic hotspot) are located. To gain high spatial and temporal resolution data, the supplementary measurement network was established, which consisted of:
- 20 combined low-cost sensor (LCS) stations for monitoring of PM10, PM2.5, NO2 and O3 concentrations (using Plantower PMS7003 particle counters and Envea Cairsense electrochemical sensors) placed in different sites and different height levels AGL (higher = H, lower = L),
- 1 mobile telescopic meteorological mast for measuring temperature, relative humidity, wind velocity and direction and air pressure (using 2D ultrasonic anemometer Gill WindSonic 60 and weather station Gill MetConnect THP),
- 1 MTP-5-He microwave radiometer (MWR; Attex) for temperature vertical profile,
- 1 StreamLine XR Doppler LIDAR (HALO Photonics) for wind vertical profile.
Keywords : air quality * monitoring * low-cost sensor network * street * LIDAR
OECD category: Meteorology and atmospheric sciences
Permanent Link: https://hdl.handle.net/11104/0352954
Depositor: admin
Date of release: 16.4.2024

Storage   Accessibility Commentary

Zenodo.org open-access

0585232 - ÚI **DATA Scientific data**   2024
Geletič, Jan
Satellite remote sensing dataset for urban climate in Bergen and Prague.

Description: Shared dataset contains remote sensing data necessary for a land surface temperature (LST) calculation. Layers were processed for two cities; Bergen (Norway) and Prague (Czech Republic). Original data were downloaded from the U.S. Geological Survey (https://doi.org/10.5066/P975CC9B). For a LST calculation, a land surface emissivity (LSE) algorithm was used.

Processing of LANDSAT-8 and LANDSAT-9 data
Reading metadata file for each scene (*MTL.txt)
Reprojection of scene (note: Bergen scenes have two UTM Zones; 31N and 32N)
Cloud cover raster (see folder 01_CloudCover)
Calculation Top-Of-Atmosphere (TOA) reflectance for bands 10 and 11 (TB_10 and TB_11), saving to folder 02_TOA-reflectance
Calculating of NDVI and Fractional Vegetation Cover (FVC), saving to folder 03_FVC-NDVI
Calculating of LSE for both bands, same as different and mean LSE (folder 04_LSE)
Calculating of LST
Saving of metadata file (see *metadata.txt)
Keywords : land and surface temperature * landsat * Prague * Bergen * Land surface emissivity
OECD category: Meteorology and atmospheric sciences
Permanent Link: https://hdl.handle.net/11104/0353010
Depositor: admin
Date of release: 17.4.2024

Storage   Accessibility Commentary

Zenodo.org open-access

0585413 - ÚI 2025 RIV eng U - Conference, Workshop Arrangement
Geletič, Jan - Belda, M. - **Resler, Jaroslav** - **Krč, Pavel**
D15 Workshop for public authorities.
[Bergen, Ålesund, Trondheim, 03.04.2024-05.04.2024, (W-WRD)]
R&D Projects: GA TA ČR(CZ) TO01000219
Grant - others:AV ČR(CZ) StrategieAV21/23
Program: StrategieAV
Institutional support: RVO:67985807
OECD category: Meteorology and atmospheric sciences
It took place in Norway between 2-4 April 2024. It was organized jointly with the education and networking project "URban Sustainability in Action: Multi-disciplinary Approach through Jointly Organized Research schools" (URSA MAJOR). This workshop had ambitious goals and an extensive agenda. The TURBAN participants used an opportunity to communicate with urban stakeholders in three major Norwegian cities, namely, Bergen, Ålesund, and Trondheim. Three joint workshop sessions were organized (see the attached agenda). In addition, participants shared a joint working lunch and mingled with all staff of NERSC and municipality delegates in Bergen; they had an introduction session in the Augmented City - the new way of visually communicating digital city twins in Ålesund; and they experienced mobile urban laboratory (MoBa) work at the Norwegian University of Technology (NTNU) in Trondheim. Prof. Agnar Johansen (NTNU) - teaches research project communication and collaboration with municipal stakeholders - has shared his experience with project communication to the Norwegian stakeholders.
Permanent Link: https://hdl.handle.net/11104/0353126

0585527 - ÚI 2025 RIV CZ cze E - Electronic Document
Miles, V. - Vlček, O. - Šindelářová, A. - Bauerová, P. - Keder, J. - **Geletič, Jan** - **Krč, Pavel** - **Bureš, Martin** - **Řezníček, Hynek** - **Resler, Jaroslav** - Belda, M.
Web-GIS story including most of the suitable project results (D21).
[Web-GIS story including most of the suitable project results (D21).]
Prague: TURBAN team, 2024
R&D Projects: GA TA ČR(CZ) TO01000219
Institutional support: RVO:67985807
OECD category: Meteorology and atmospheric sciences
https://project-turban.eu/stories/ https://www.project-turban.eu/pribehy https://storymaps.arcgis.com/briefings/8338e7e76d054b19bbe1fdcd13556e7a https://storymaps.arcgis.com/briefings/b433d210cc5b48f98e68eeb36795c65e

Moderní svět zažívá nepředstavitelný počet extrémních povětrnostních událostí velkého rozsahu. Kvalita života obyvatel měst je ovlivněna dlouhými obdobími extrémně vysokých a nízkých teplot. Projekt TURBAN je příběhem toho, jak výzkumníci vyvíjejí nové způsoby modelování kvality ovzduší a tepelného komfortu ve městech. S růstem měst a urbanizací roste obava o dopady urbanizace na kvalitu ovzduší a tepelný komfort.

The modern world is experiencing an unprecedented number of extreme weather events of great magnitude. The quality of life of people in cities is affected by long periods of extremely high and low temperatures.

The TURBAN project is a story of how researchers are developing new ways to model air quality and thermal comfort in urban areas. With the growth of cities and urbanization, there is a growing concern about the impact of urbanization on air quality and thermal comfort.
Permanent Link: https://hdl.handle.net/11104/0353210

Kalina, Jan
Statistická analýza dat Gregora Mendela.
Praha: Akademie věd České republiky, 2018
Institutional support: RVO:67985807
Keywords : popularizace vědy * popularisation of science * Gregor Mendel
https://www.avcr.cz/export/sites/avcr.cz/.content/galerie-obrazku/aktuality/2017/0612217_ROcenka_s_odkazy/AV_CR_20162017_s_odkazy.pdf
Permanent Link: https://hdl.handle.net/11104/0353009

Černoch, V. - Černý, David - Wiedermann, Jiří - Hakl, František - Hříbek, T.
Svérázná říše umělé inteligence.
A / Magazín. Roč. 7, č. 3 (2023), s. 19-31. ISSN 2788-2918
Institutional support: RVO:67985807
Keywords : popularizace vědy * popularisation of science * umělá inteligence * artificial intelligence
https://www.avcr.cz/cs/veda-a-vyzkum/matematika-fyzika-a-informatika/Sverazna-rise-umele-inteligence.-Mame-se-jako-lidstvo-bat-nebo-byt-nadseni

Technologický pokrok by neměl být motivován primárně profitem, ale společností, která z něj bude mít prospěch. I to je jedna z vizí, kterou si přejí prosadit odborníci napříč výzkumnými organizacemi Evropské unie. Vydali stanovisko, ve kterém doporučují vybudování evropského centra pro umělou inteligenci ve vědě. Centrum by mělo nabídnout velkou výpočetní kapacitu, udržitelný cloudový prostor i infrastrukturu a tréninky pro vědce, jak s nástroji umělé inteligence zacházet. Zároveň by vědce mělo (nejen) finančně motivovat, aby možnosti umělé inteligence při svých výzkumech využívali. V současné době tolik diskutované problematice umělé inteligence se věnoval také článek Svérázná říše umělé inteligence, který vyšel v A / Magazínu – oficiálním čtvrtletníku Akademie věd ČR.
Permanent Link: https://hdl.handle.net/11104/0353260

Dimai, M. - Brabec, Marek
A Bayesian Model for Age at Death with Cohort Effects.
Social Science Research Network, 2024. 34 s. SSRN Papers, 4763050.
Institutional support: RVO:67985807
Keywords : mortality * age at death * mixture model * cohort effects * bayesian
https://doi.org/10.2139/ssrn.4763050
DOI: 10.2139/ssrn.4763050
BACKGROUND: Ongoing mortality trends affect the distribution of ages at death, typically described by parametric models. Cohort effects can markedly perturbate the distribution and reduce fit of such models, which must therefore account for them. OBJECTIVE: This study examines the integration of cohort effects in a three-component parametric model for the age at death distribution, applying it to

data with significant cohort effects. METHODS: We employed a mixture model with a half-Normal and two Skew-Normal components, adapted into a Bayesian framework to include multiplicative cohort effects. The model was applied to data from five Italian regions, with cohort effects estimated for the 1915-1925 cohorts. RESULTS: Incorporating cohort effects significantly improved the model's fit. A notable finding is the shift in Italy from premature to middle-age mortality components over time. CONCLUSIONS: The study underscores the importance of including cohort effects in mortality models, providing a more detailed picture of mortality trends. CONTRIBUTION: This work introduces a novel application of a Bayesian mixture model with cohort effects, offering enhanced tools for demographic analysis and new insights into the evolution of mortality components in Italy. This approach can be valuable for demographic studies in other regions as well.
Permanent Link: https://hdl.handle.net/11104/0353143

0585301 - ÚI 2025 CZ cze V - Research Report
Lukšan, Ladislav
Numerické optimalizační metody.
Prague: ICS CAS, 2024. Technical Report, V-1296.
Institutional support: RVO:67985807
Keywords : Numerická optimalizace * nelineární aproximace * systémy nelineárních rovnic * algoritmy
Tato zpráva popisuje teoretické i praktické vlastnosti numerických metod pro nepodmíněnou optimalizaci. Studují se metody pro obecné i speciální optimalizační úlohy, mezi které patří minimalizace součtu čtverců, součtu absolutních hodnot, maximní hodnoty a dalších nehladkých funkcí. Kromě metod pro standardní úlohy středních rozměrů jsou studovány i metody pro rozsáhlé řídké a strukturované úlohy. Velká pozornost je věnována soustavám nelineárních rovnic.
Permanent Link: https://hdl.handle.net/11104/0353012

0585037 - ÚI 2025 CZ eng A - Abstract
Kalina, Jan - **Vidnerová, Petra** - **Večeř, M.**
The 2022 Election in the United States: Reliability of a Linear Regression Model.
16th INTERNATIONAL SCIENTIFIC CONFERENCE RELIK 2023: Book of Abstracts. Prague: University of Economics and Business, 2023 - (Langhamrová, J.; Vrabcová, J.). s. 27-28
[RELIK 2023: Reproduction of Human Capital - mutual links and connections /16./. 23.11.2023-24.11.2023, Praha]
Institutional support: RVO:67985807

In this paper, the 2022 United States election to the House of Representatives is analyzed by means of a linear regression model. After the election process is explained, the popular vote is modeled as a response of 8 predictors (demographic characteristics) on the state-wide level. The main focus is paid to verifying the reliability of two obtained regression models, namely the full model with all predictors and the most relevant submodel found by hypothesis testing (with 4 relevant predictors). Individual topics related to assessing reliability that are used in this study include confidence intervals for predictions, multicollinearity, and also outlier detection. While the predictions in the submodel that includes only relevant predictors are very similar to those in the full model, it turns out that the submodel has better reliability properties compared to the full model, especially in terms of narrower confidence intervals for the values of the popular vote.
Permanent Link: https://hdl.handle.net/11104/0352803

0585470 - ÚI 2025 eng A - Abstract
Kalina, Jan
The minimum weighted covariance determinant estimator for high-dimensional data.
25th International Conference on Computational Statistics (COMPSTAT 2023): Full Programme. IASC-ERS, 2023.
[COMPSTAT 2023: The International Conference on Computational Statistics /25./. 22.08.2023-25.08.2023, London]
https://www.cmstatistics.org/RegistrationsV2/COMPSTAT2023/viewSubmission.php?in=170&token=126pn0p20pr33q4831n47sqrrqs7p7o3

In a variety of diverse applications, it is very desirable to perform a robust analysis of high-dimensional measurements without being harmed by the presence of a possibly larger percentage of outlying measurements. The minimum weighted covariance determinant (MWCD) estimator, based on implicit weights assigned to individual observations, represents a promising and flexible extension of the popular minimum covariance determinant (MCD) estimator of the expectation and scatter matrix of multivariate data. A regularized version of the MWCD, denoted as the minimum regularized weighted covariance determinant (MRWCD) estimator, is proposed. At the same time, it is accompanied by an outlier detection procedure. The novel MRWCD estimator is able to outperform other available robust estimators in several simulation scenarios, especially in estimating the scatter matrix of contaminated high-dimensional data.
Permanent Link: https://hdl.handle.net/11104/0353160

0585036 - ÚI 2025 CZ eng A - Abstract
Kalina, Jan
From John Graunt to Adolphe Quetelet: on the Origins Of Demography.
16th INTERNATIONAL SCIENTIFIC CONFERENCE RELIK 2023: Book of Abstracts. Prague: University of Economics and Business, 2023 - (Langhamrová, J.; Vrabcová, J.). s. 26-26
[RELIK 2023: Reproduction of Human Capital - mutual links and connections /16./. 23.11.2023-24.11.2023, Praha]
Institutional support: RVO:67985807
John Graunt (1620-1674) and Adolphe Quetelet (1796-1874) were two important personalities, who contributed to the origins of demography. As they both developed statistical techniques for the analysis of demographic data, they are important also from the point of view of history of statistics. The contributions of both Graunt and Quetelet especially to the development of mortality tables and models are recalled in this paper. Already from the 17th century, the available mortality tables were exploited for computing life annuities. Also the contribution of selected personalities inspired by Graunt are recalled here; the work of Christian Huygens, Jacob Bernoulli, or Abraham de Moivre is discussed to document that the historical development of statistics and probability theory was connected with the development of demography.
Permanent Link: https://hdl.handle.net/11104/0352802

0584887 - ÚI 2025 eng A - Abstract
Wiedermann, Jiří
Robot and his Soul.
[Does Robot Have a Soul? Karel Čapek Symposium on the Ethics in Robotics and A. I. Tokyo - Miraikan - The National Museum of Emerging Science and Innovation / Online, 21.11.2021-21.11.2021]
Method of presentation: Zvaná přednáška   **URL events**:
https://mzv.gov.cz/tokyo/en/kalendar_akci/stoleti_robota_sympozium_karla_capka_k.html
Permanent Link: https://hdl.handle.net/11104/0352673

585421 - ÚI 2025 DE eng A - Abstract
Hůnová, I. - Brabec, Marek - Malý, Marek
Vertical concentration gradient of ambient ozone – insight into seven-year continuous measurements at a rural Central European site tall tower.
EGU General Assembly 2024 Abstracts. Munich: European Geosciences Union, 2024.
[EGU General Assembly 2024. 14.04.2024-19.04.2024, Vienna / Online]
Research Infrastructure: ACTRIS -CZ - 90037
Institutional support: RVO:67985807
https://meetingorganizer.copernicus.org/EGU24/EGU24-2874.html
DOI: 10.5194/egusphere-egu24-2874
The vertical representativeness of ambient air pollutant concentration measurements is addressed rarely though it is a very important aspect influencing the use and correct interpretation of measured values. Presently not much information on the vertical distribution of ambient ozone (O3) from sites representing relatively unpolluted rural areas is available. We explored the daily mean O3 concentrations measured at four heights above the ground (2, 8, 50 and 230 m) at the rural Central

European site Košetice in 2015–2021. We aimed to explore in detail the O3 behaviour above the measuring point in close vicinity of the ground. We used the semiparametric GAM (generalised additive model) approach (with complexity or roughness-penalised splines implementation) to analyse the data with sufficient flexibility. Our models for both O3 concentration and O3 gradients used (additive) decomposition into annual trend and seasonality. Our results indicated consistently increasing O3 with increasing height above the ground. The vertical O3 concentration gradient in 2–230 m is not uniform, however, but changes substantially with increasing height and shows by far the highest dynamics near the ground between 2 and 8 m, differing in both the seasonal and annual aspects for all the air columns inspected. Study of O3 concentrations at one site at several different heights above the ground brings useful results complementing ground-based ambient air quality monitoring, provides a deeper insight into the 3D structure of the atmosphere and the pollution, and provides valuable information for environmental studies exploring processes above the ground (Hůnová et al., 2023). Knowledge on vertical distribution of O3 concentrations near ground is for example an important input to ecological and environmental studies associating the air pollution with its impact on birds flying tens or hundred meters above the ground or impacts on tree canopies localised some tens of meters above the ground (Reif et al., 2023).
Permanent Link: https://hdl.handle.net/11104/0353131

0585377 - ÚI 2025 eng A - Abstract
Turčičová, Marie - Stepanova, N.
Sparse signal recovery in regression models with Gaussian white nois.
[Annual Meeting of the Statistical Society of Canada /50./, 28.05.2023-31.05.2023]
Method of presentation: Zvaná přednáška
Event organizer: Carleton University
URL events: https://ssc.ca/en/meetings/annual/2023-ssc-annual-meeting-ottawa
https://ssc.ca/en/meetings/annual/2023-ssc-annual-meeting-ottawa
Permanent Link: https://hdl.handle.net/11104/0353099

0585443 - ÚI 2025 GB eng A - Abstract
Morrone, D. - Chao, T. F. - Chen, C. - Choi, E. - De Groot, J. - Kirchhof, P. - Pecen, Ladislav - Tse, H. - Unverdorben, M. - De Caterina, R.
Baseline demographic and clinical characteristics as predictors of adverse outcomes to improve management of patients with AF receiving edoxaban: a subanalysis of the ETNA-AF registry.
European Heart Journal. Roč. 44, Suppl. 2 (2023). ISSN 0195-668X. E-ISSN 1522-9645
Institutional support: RVO:67985807
Permanent Link: https://hdl.handle.net/11104/0353152

0585442 - ÚI 2025 GB eng A - Abstract
Fumagalli, S. - Diemberger, I. - Bakhai, A. - Pecen, Ladislav - Lamparter, M. - Kirchhof, P. - De Caterina, R.
Effect of perceived and objectively-assessed frailty on outcomes in edoxaban-treated patients with atrial fibrillation: data from the ETNA-AF-Europe 4-year follow-up.
European Heart Journal. Roč. 44, Suppl. 2 (2023). ISSN 0195-668X. E-ISSN 1522-9645
Institutional support: RVO:67985807
Permanent Link: https://hdl.handle.net/11104/0353151

0585444 - ÚI 2025 GB eng A - Abstract
Diemberger, I. - Chen, C. - Choi, J. - De Groot, J. - Kirchhof, P. - Unverdorben, M. - Wang, C. - Yamashita, T. - De Caterina, R.
Persistence to edoxaban treatment in patients with atrial fibrillation: Analysis from the Global ETNA-AF program.
European Heart Journal. Roč. 44, Suppl. 2 (2023). ISSN 0195-668X. E-ISSN 1522-9645
Institutional support: RVO:67985807
Permanent Link: https://hdl.handle.net/11104/0353153