

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

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

0581902 - ÚI 2024 DE eng J - Journal Article

**Liczbińska, G. - Vögele, J. P. - [Brabec, Marek](#)**

Climate and disease in historical urban space: evidence from 19th century Poznań, Poland.

*Climate of the Past*. Roč. 20, č. 1 (2024), s. 137-150. ISSN 1814-9324. E-ISSN 1814-9332

**Institutional support:** RVO:67985807

**Keywords :** generalized additive model \* multinomial \* death probability \* climatic effects \* historical population

**OECD category:** Statistics and probability

**Impact factor:** 4.3, year: 2022

**Method of publishing:** Open access

<https://doi.org/10.5194/cp-20-137-2024>

[DOI: 10.5194/cp-20-137-2024](https://doi.org/10.5194/cp-20-137-2024)

This study examines the relationship between temperature levels and precipitation amounts as explanatory variables for the probability of death due to waterborne and airborne diseases in historical urban space. To date, the literature has not focused on the climatological epidemiology of 19th century Polish urban areas. We used individual mortality data from Poznań parish death registers between 1850 and 1900. Each deceased individual was assigned average monthly temperature values and precipitation amounts in the month of death, LAG1 (1-month-lagged) temperature and LAG1 rainfall, and place of residence. We studied the relationship between weather conditions and mortality using formalized statistical models reflecting the discrete nature of the response data (via multinomial logistic regression). Lagged monthly average temperature levels and lagged monthly average precipitation amounts were better predictors of airborne and waterborne disease mortality than the concurrent (non-lagged) monthly averages. The lagged effects of temperature and precipitation on waterborne and airborne diseases were significant (except for the smooth lagged average monthly temperature effect for airborne diseases). There was also significant spatial heterogeneity (differences among city quarters) in the prevalence of deaths due to waterborne and airborne diseases.

**Permanent Link:** <https://hdl.handle.net/11104/0350048>

**Research data:** [Supplementary material \(publisher's web\)](#)

0580629 - ÚI 2024 RIV GB eng J - Journal Article

**Hůnová, I. - [Brabec, Marek](#) - [Malý, Marek](#)**

Major ions in Central European precipitation – Insight into changes in NO<sub>3</sub><sup>-</sup>/SO<sub>4</sub><sup>2-</sup>, NH<sub>4</sub><sup>+</sup>/NO<sub>3</sub><sup>-</sup> and NH<sub>4</sub><sup>+</sup>/SO<sub>4</sub><sup>2-</sup> ratios over the last four decades.

*Chemosphere*. Roč. 349, February 2024 (2024), č. článku 140986. ISSN 0045-6535. E-ISSN 1879-1298

**R&D Projects:** GA TA ČR(CZ) SS02030031

**Institutional support:** RVO:67985807

**Keywords :** Precipitation chemistry \* Czech Republic \* Time trends \* Ion concentrations \* INLA \* Bayesian modelling

**OECD category:** Statistics and probability

**Impact factor:** 8.8, year: 2022

**Method of publishing:** Limited access

[DOI: 10.1016/j.chemosphere.2023.140986](https://doi.org/10.1016/j.chemosphere.2023.140986)

Knowledge of precipitation composition is important, among other things, to reveal changes in atmospheric chemistry. Here we present the long-term time trends in ratios of major ions in precipitation, namely nitrate to sulphate ( $\text{NO}_3^-/\text{SO}_4^{2-}$ ), ammonium to sulphate ( $\text{NH}_4^+/\text{SO}_4^{2-}$ ) and ammonium to nitrate ( $\text{NH}_4^+/\text{NO}_3^-$ ). For this we explore the long-term time series recorded by the Czech Hydrometeorological Institute at eight monitoring sites situated in urban, rural and mountain regions of the Czech Republic between 1980 and 2020. To that end, we use innovative Bayesian inference with the Integrated Nested Laplace Approximation (INLA) computational method appropriate for investigating complicated large-scale data. Our results indicated: (i) increasing  $\text{NO}_3^-/\text{SO}_4^{2-}$  ratio in precipitation over time and distinct seasonal behaviour with higher values in winter and lower values in summer, (ii) increasing  $\text{NH}_4^+/\text{SO}_4^{2-}$  ratio in precipitation and distinct seasonal behaviour with higher values in summer and lower values in winter and (iii) relatively stable  $\text{NH}_4^+/\text{NO}_3^-$  ratio in precipitation with a mild recent increase and distinct seasonal behaviour with higher values in summer and lower values in winter. This behaviour pattern holds true for all the sites analysed, irrespective of their geographical position, altitude or environment. Though explored in detail rarely, the ion ratios are important to study as they reflect changes in atmospheric chemistry, mirroring changes in emissions and meteorology and suggesting changing impacts on ecosystems and the environment.

**Permanent Link:** <https://hdl.handle.net/11104/0349397>

0581953 - ÚI 2024 US eng J - Journal Article

**Pavez-Signé, M.** - [Sanhueza-Matamala, Nicolás](#) - **Stein, M.**

Dirac-type conditions for spanning bounded-degree hypertrees.

*Journal of Combinatorial Theory. B.* Roč. 165, March 2024 (2024), s. 97-141. ISSN 0095-8956. E-ISSN 1096-0902

**R&D Projects:** GA ČR(CZ) GA19-08740S

**Impact factor:** 1.4, year: 2022

<https://doi.org/10.1016/j.jctb.2023.11.002>

[DOI: 10.1016/j.jctb.2023.11.002](https://doi.org/10.1016/j.jctb.2023.11.002)

We prove that for fixed  $k$ , every  $k$ -uniform hypergraph on  $n$  vertices and of minimum codegree at least  $n/2 + o(n)$  contains every spanning tight  $k$ -tree of bounded vertex degree as a subgraph. This generalises a well-known result of Komlós, Sárközy and Szemerédi for graphs. Our result is asymptotically sharp. We also prove an extension of our result to hypergraphs that satisfy some weak quasirandomness conditions.

**Permanent Link:** <https://hdl.handle.net/11104/0350089>

0581658 - ÚI 2024 GB eng J - Journal Article

**Adnan, M.** - **Liu, S.** - **Saifullah, M.** - **Iqbal, M.** - **Saddique, Q.** - **Ul Hussan, W.** - [Latif, Yasir](#)

Estimation of changes in runoff and its sources in response to future climate change in a critical zone of the Karakoram mountainous region, Pakistan in the near and far future.

*Geomatics Natural Hazards & Risk.* Online: 26 December 2023 (2024). ISSN 1947-5705. E-ISSN 1947-5713

**Grant - others:**AV ČR(CZ) AP1901

**Program:** Akademická prémie - Praemium Academiae

**Institutional support:** RVO:67985807

**Keywords** : Gilgit River basin \* general circulation model \* shared socioeconomic pathways \* UBC WM \* climate change \* runoff

**Impact factor**: 4.2, year: 2022

**Method of publishing**: Open access

<https://doi.org/10.1080/19475705.2023.2291330>

[DOI: 10.1080/19475705.2023.2291330](https://doi.org/10.1080/19475705.2023.2291330)

The inconsistent pattern of precipitation, a shift in the seasonality of river flows, and the early onset of snow and glacier melt in recent decades across river basins of High Mountain Asia (HMA) has compelled us to further investigate future variations in sources of runoff under projected climate change scenarios. This will help in determining the timing and magnitude of runoff components and this will help in management of future water resources. The current study employed the University of British Columbia Watershed Model (UBC WM) to estimate the spatiotemporal variations in simulated runoff components (i.e. snowmelt, glacier melt, rainfall-runoff, and baseflow) and their relative contribution to total runoff of Gilgit River regarding the baseline period (1981–2010) in near (2021–2050) and far future (2071–2100) under low (SSP1), medium (SSP2) and high (SSP5) emission scenarios. A significant increase in the magnitude of mean annual temperature and precipitation is expected in the near future (2021–2050) than far future (2071–2100) under most SSPs. Moreover, high-altitude stations of the Gilgit River basin are expected to experience more warming in the near and far future than low altitudes under all SSPs. On average, regarding the baseline period, the simulated runoff is projected to increase in the near (27%, 30%, and 33%) and far future (30%, 53%, and 91%) under SSP1, SSP2, and SSP5, respectively. Moreover, an early onset of snow/glacier melting is predicted in the far future due to an increase in summer air temperature and a decline in winter (DJF) precipitation. Besides, the rise in high altitude temperature is expected to cause the melting of snow/glaciers even above 6000 m elevation in the far future.

**Permanent Link**: <https://hdl.handle.net/11104/0349766>

0581616 - ÚI 2024 GB eng J - Journal Article

[Kalina, Jan](#)

Regularized least weighted squares estimator in linear regression.

*Communications in Statistics - Simulation and Computation*. Online 08 January 2024 (2024). ISSN

0361-0918. E-ISSN 1532-4141

**R&D Projects**: GA ĀR(CZ) GA22-02067S

**Institutional support**: RVO:67985807

**Keywords** : Lasso estimator \* Outliers \* Regularization \* Robust regression \* Sparsity

**Impact factor**: 0.9, year: 2022

**Method of publishing**: Limited access

<https://doi.org/10.1080/03610918.2023.2300356>

[DOI: 10.1080/03610918.2023.2300356](https://doi.org/10.1080/03610918.2023.2300356)

This article is interested in estimating parameters of the linear regression model in a high-dimensional setting, i.e. with a large number of regressors. The lasso estimator does not possess high robustness with respect to the presence of outliers in the data. Our approach extends the least weighted squares estimator, which has appealing robustness and efficiency properties in linear regression with a small number of regressors. The novel LWS-lasso estimator is proposed here as an L1-regularized version of the least weighted squares. The analysis of a world tourism dataset as well as simulations show that LWS-lasso may outperform available regression estimators, especially in scenarios with high-dimensional data with a higher contamination by outliers.

**Permanent Link**: <https://hdl.handle.net/11104/0349720>

0581051 - ÚI 2024 RIV US eng J - Journal Article

**Griffiths, S. - Koch, Ch. - [Secco, Matheus](#)**

Deviation probabilities for arithmetic progressions and irregular discrete structures.

*Electronic Journal of Probability*. Roč. 28, č. 2023 (2023), č. článku 172. ISSN 1083-6489. E-ISSN 1083-6489

**R&D Projects:** GA ČR(CZ) GJ20-27757Y

**Institutional support:** RVO:67985807

**Keywords :** arithmetic progressions \* hypergraphs \* Martingales \* Moderate deviations \* Random processes

**Impact factor:** 1.4, year: 2022

**Method of publishing:** Open access

<https://doi.org/10.1214/23-EJP1012>

[DOI: 10.1214/23-EJP1012](https://doi.org/10.1214/23-EJP1012)

Let the random variable  $X := e(H[B])$  count the number of edges of a hypergraph  $H$  induced by a random  $m$ -element subset  $B$  of its vertex set. Focussing on the case that the degrees of vertices in  $H$  vary significantly we prove bounds on the probability that  $X$  is far from its mean. It is possible to apply these results to discrete structures such as the set of  $k$ -term arithmetic progressions in  $\{1, \dots, N\}$ . Furthermore, our main theorem allows us to deduce results for the case  $B \sim B_p$  is generated by including each vertex independently with probability  $p$ . In this setting our result on arithmetic progressions extends a result of Bhattacharya, Ganguly, Shao and Zhao [5]. We also mention connections to related central limit theorems.

**Permanent Link:** <https://hdl.handle.net/11104/0349622>

0580737 - ÚI 2024 GB eng J - Journal Article

**[Fernández-Duque, David](#) - Gougeon, Q.**

Fixed point logics and definable topological properties.

*Mathematical Structures in Computer Science*. Online 13 December 2023 (2023). ISSN 0960-1295. E-ISSN 1469-8072

**Institutional support:** RVO:67985807

**Keywords :** expressivity \* Mu-calculus \* topological semantics

**Impact factor:** 0.5, year: 2022

**Method of publishing:** Limited access

<https://doi.org/10.1017/S0960129523000385>

[DOI: 10.1017/S0960129523000385](https://doi.org/10.1017/S0960129523000385)

Modal logic enjoys topological semantics that may be traced back to McKinsey and Tarski, and the classification of topological spaces via modal axioms is a lively area of research. In the past two decades, there has been interest in extending topological modal logic to the language of the mu-calculus, but previously no class of topological spaces was known to be mu-calculus definable that was not already modally definable. In this paper, we show that the full mu-calculus is indeed more expressive than standard modal logic, in the sense that there are classes of topological spaces (and weakly transitive Kripke frames), which are mu-definable but not modally definable. The classes we exhibit satisfy a modally definable property outside of their perfect core, and thus we dub them imperfect spaces. We show that the mu-calculus is sound and complete for these classes. Our examples are minimal in the sense that they use a single instance of a greatest fixed point, and we show that least fixed points alone do not suffice to define any class of spaces that is not already modally definable.

**Permanent Link:** <https://hdl.handle.net/11104/0349498>

0580721 - ÚI 2024 RIV US eng J - Journal Article

**Kingston, L. - Kumaran, G. - [Ghosh, Anupam](#) - Kumarasamy, S. - Kapitaniak, T.**

Impact of time varying interaction: Formation and annihilation of extreme events in dynamical systems.

*Chaos*. Roč. 33, č. 12 (2023), č. článku 123134. ISSN 1054-1500. E-ISSN 1089-7682

**R&D Projects:** GA ČR(CZ) GA24-11113S

**Grant - others:**AV ČR(CZ) AP1901

**Program:** Akademická prémie - Praemium Academiae

**Institutional support:** RVO:67985807

**Keywords :** FitzHugh-Nagumo model \* Coupled oscillators \* Chaotic systems \* Phase transitions \* Network theory \* Probability theory \* Complex systems theory \* Neuron model

**OECD category:** Meteorology and atmospheric sciences

**Impact factor:** 2.9, year: 2022

**Method of publishing:** Limited access

<https://doi.org/10.1063/5.0174366>

[DOI: 10.1063/5.0174366](https://doi.org/10.1063/5.0174366)

This study investigates the emergence of extreme events in two different coupled systems: the FitzHugh-Nagumo neuron model and the forced Liénard system, both based on time-varying interactions. The time-varying coupling function between the systems determines the duration and frequency of their interaction. Extreme events in the coupled system arise as a result of the influence of time-varying interactions within various parameter regions. We specifically focus on elucidating how the transition point between extreme events and regular events shifts in response to the duration of interaction time between the systems. By selecting the appropriate interaction time, we can effectively mitigate extreme events, which is highly advantageous for controlling undesired fluctuations in engineering applications. Furthermore, we extend our investigation to networks of oscillators, where the interactions among network elements are also time dependent. The proposed approach for coupled systems holds wide applicability to oscillator networks.

**Permanent Link:** <https://hdl.handle.net/11104/0349476>

0581958 - ÚI 2024 GB eng J - Journal Article

**Lang, R. - [Sanhueza-Matamala, Nicolás](#)**

On sufficient conditions for spanning structures in dense graphs.

*Proceedings of the London Mathematical Society*. Roč. 127, č. 3 (2023), s. 709-793. ISSN 0024-6115. E-ISSN 1460-244X

**R&D Projects:** GA ČR(CZ) GA19-08740S

**Impact factor:** 1.8, year: 2022

**Method of publishing:** Open access

<https://doi.org/10.1112/plms.12552>

[DOI: 10.1112/plms.12552](https://doi.org/10.1112/plms.12552)

We study structural conditions in dense graphs that guarantee the existence of vertex-spanning substructures such as Hamilton cycles. It is easy to see that every Hamiltonian graph is connected, has a perfect fractional matching and, excluding the bipartite case, contains an odd cycle. A simple consequence of the Robust Expander Theorem of Kühn, Osthus and Treglown tells us that any large enough graph that robustly satisfies these properties must already be Hamiltonian. Our main result generalises this phenomenon to powers of cycles and graphs of sublinear bandwidth subject to natural generalisations of connectivity, matchings and odd cycles. This answers a question of Ebsen, Maesaka, Reiher, Schacht and Schülke and solves the embedding problem that underlies multiple lines of research on sufficient conditions for spanning structures in dense graphs. As applications, we

recover and establish Bandwidth Theorems in a variety of settings including Ore-type degree conditions, Pósa-type degree conditions, deficiency-type conditions, locally dense and inseparable graphs, multipartite graphs as well as robust expanders.

**Permanent Link:** <https://hdl.handle.net/11104/0350096>

0581959 - ÚI 2024 eng J - Journal Article

**Pavez-Signé, M. - [Sanhueza-Matamala, Nicolás](#) - Stein, M.**

Towards a hypergraph version of the Pósa-Seymour conjecture.

*Advances in Combinatorics*. Roč. 2023, July (2023), č. článku 3.

**R&D Projects:** GA ČR(CZ) GA19-08740S

**Method of publishing:** Open access

<https://doi.org/10.19086/aic.2023.3>

[DOI: 10.19086/aic.2023.3](https://doi.org/10.19086/aic.2023.3)

We prove that for fixed  $r \geq k \geq 2$ , every  $k$ -uniform hypergraph on  $n$  vertices having minimum codegree at least  $(1 - (r-1/k-1) + (r-2/k-2) - 1)n + o(n)$  contains the  $(r - k + 1)$ th power of a tight Hamilton cycle. This result may be seen as a step towards a hypergraph version of the Pósa-Seymour conjecture. Moreover, we prove that the same bound on the codegree suffices for finding a copy of every spanning hypergraph of tree-width less than  $r$  which admits a tree decomposition where every vertex is in a bounded number of bags

**Permanent Link:** <https://hdl.handle.net/11104/0350099>

0581984 - ÚI 2024 US eng J - Journal Article

**Lang, R. - [Sanhueza-Matamala, Nicolás](#)**

Minimum degree conditions for tight Hamilton cycles.

*Journal of the London Mathematical Society*. Roč. 105, č. 4 (2022), s. 2249-2323. ISSN 0024-6107. E-ISSN 1469-7750

**R&D Projects:** GA ČR(CZ) GA19-08740S

**Impact factor:** 1.2, year: 2022

**Method of publishing:** Open access

<https://doi.org/10.1112/jlms.12561>

[DOI: 10.1112/jlms.12561](https://doi.org/10.1112/jlms.12561)

We study structural conditions in dense graphs that guarantee the existence of vertex-spanning substructures such as Hamilton cycles. It is easy to see that every Hamiltonian graph is connected, has a perfect fractional matching and, excluding the bipartite case, contains an odd cycle. A simple consequence of the Robust Expander Theorem of Kühn, Osthus and Treglown tells us that any large enough graph that robustly satisfies these properties must already be Hamiltonian. Our main result generalises this phenomenon to powers of cycles and graphs of sublinear bandwidth subject to natural generalisations of connectivity, matchings and odd cycles. This answers a question of Ebsen, Maesaka, Reiher, Schacht and Schülke and solves the embedding problem that underlies multiple lines of research on sufficient conditions for spanning structures in dense graphs. As applications, we recover and establish Bandwidth Theorems in a variety of settings including Ore-type degree conditions, Pósa-type degree conditions, deficiency-type conditions, locally dense and inseparable graphs, multipartite graphs as well as robust expanders.

**Permanent Link:** <https://hdl.handle.net/11104/0350120>

0581049 - ÚI 2024 US eng J - Journal Article

**Garbe, F. - [Hladký, Jan](#) - [Šileikis, Matas](#) - Skerman, F.**

From flip processes to dynamical systems on graphons (ACCEPTED).

*Annales de L Institut Henri Poincare-Probabilites Et Statistiques*. ISSN 0246-0203

**R&D Projects:** GA ČR(CZ) GX21-21762X; GA ČR(CZ) GJ18-01472Y; GA ČR(CZ) GJ20-27757Y

**Institutional support:** RVO:67985807

**Permanent Link:** <https://hdl.handle.net/11104/0349619>

**Research data:** [Preprint at ArXiv.org](#)

0580645 - ÚI 2024 JP eng J - Journal Article

**[Pecen, Ladislav](#)**

Prescribing Patterns and Outcomes of Edoxaban in Atrial Fibrillation Patients From Asia: One-Year Data From the Global ETNA-AF Program (ACCEPTED).

*Circulation Reports*. (2024). E-ISSN 2434-0790

**Permanent Link:** <https://hdl.handle.net/11104/0349413>

0580655 - ÚI 2024 RIV US eng C - Conference Paper (international conference)

**[Fejlek, Jiří](#) - [Ratschan, Stefan](#)**

LQR-Trees with Sampling Based Exploration of the State Space.

*2023 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*. Detroit: IEEE, 2023, s. 4777-4782. ISBN 978-1-6654-9190-7.

[IROS 2023: The International Conference on Intelligent Robots and Systems. Detroit (US), 01.10.2023-05.10.2023]

**R&D Projects:** GA ČR(CZ) GA21-09458S

**Institutional support:** RVO:67985807

**Keywords :** Regulators \* Heuristic algorithms \* Aerospace electronics \* Ordinary differential equations \* Trajectory \* Feedback control \* Reliability

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

<https://doi.org/10.1109/IROS55552.2023.10341767>

[DOI: 10.1109/IROS55552.2023.10341767](https://doi.org/10.1109/IROS55552.2023.10341767)

This paper introduces an extension of the LQR-tree algorithm, which is a feedback-motion-planning algorithm for stabilizing a system of ordinary differential equations from a bounded set of initial conditions to a goal. The constructed policies are represented by a tree of exemplary system trajectories, so called demonstrations, and linear-quadratic regulator (LQR) feedback controllers. Consequently, the crucial component of any LQR-tree algorithm is a demonstrator that provides suitable demonstrations. In previous work, such a demonstrator was given by a local trajectory optimizer. However, these require appropriate initial guesses of solutions to provide valid results, which was pointed out, but largely unresolved in previous implementations. In this paper, we augment the LQR-tree algorithm with a randomized motion-planning procedure to discover new valid demonstration candidates to initialize the demonstrator in parts of state space not yet covered by the LQR-tree. In comparison to the previous versions of the LQR-tree algorithm, the resulting exploring LQR-tree algorithm reliably synthesizes feedback control laws for a far more general set of problems.

**Permanent Link:** <https://hdl.handle.net/11104/0349418>

0581711 - ÚI 2024 RIV CZ eng C - Conference Paper (international conference)

**[Kalina, Jan](#)**

From John Graunt to Adolphe Quetelet: on the Origins Of Demography.

*RELIK 2023. Conference Proceedings*. Prague: Prague University of Economics and Business, 2023 - (Langhamrová, J.; Vrabcová, J.), s. 113-122. ISBN 978-80-245-2499-3.

[RELİK 2023: Reproduction of Human Capital - mutual links and connections /16./. Praha (CZ), 23.11.2023-24.11.2023]

**Institutional support:** RVO:67985807

**Keywords :** history of demography \* history of statistics \* probability theory \* moral statistics \* mortality tables

**OECD category:** Philosophy, History and Philosophy of science and technology

<https://relik.vse.cz/2023/download/pdf/671-Kalina-Jan-paper.pdf>

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/11104/0349892>

0580817 - ÚI 2024 RIV CH eng C - Conference Paper (international conference)

**[Kalina, Jan](#) - [Janáček, Patrik](#)**

Robustness Aspects of Optimized Centroids.

*Classification and Data Science in the Digital Age*. Cham: Springer, 2023 - (Brito, P.; Dias, J.; Lausen, B.; Montanari, A.; Nugent, R.), s. 193-201. Studies in Classification, Data Analysis, and Knowledge Organization. ISBN 978-3-031-09033-2.

[IFCS 2022: The Conference of the International Federation of Classification Societies /17./. Porto (PT), 19.07.2022-23.07.2022]

**R&D Projects:** GA ČR(CZ) GA22-02067S

**Institutional support:** RVO:67985807

**Keywords :** Image processing \* Optimized centroids \* Robustness \* Sparsity \* Low-energy replacements

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

[https://doi.org/10.1007/978-3-031-09034-9\\_22](https://doi.org/10.1007/978-3-031-09034-9_22)

[DOI: 10.1007/978-3-031-09034-9\\_22](https://doi.org/10.1007/978-3-031-09034-9_22)

Centroids are often used for object localization tasks, supervised segmentation in medical image analysis, or classification in other specific tasks. This paper starts by contributing to the theory of centroids by evaluating the effect of modified illumination on the weighted correlation coefficient. Further, robustness of various centroid-based tools is investigated in experiments related to mouth localization in non-standardized facial images or classification of high-dimensional data in a matched pairs design. The most robust results are obtained if the sparse centroid-based method for supervised learning is accompanied with an intrinsic variable selection. Robustness, sparsity, and energy-efficient computation turn out not to contradict the requirement on the optimal performance of the centroids.

**Permanent Link:** <https://hdl.handle.net/11104/0349582>



0581699 - ÚI 2024 RIV CZ eng C - Conference Paper (international conference)

**Kalina, Jan**

Some Robust Approaches to Reducing the Complexity of Economic Data.

*The 17th International Days of Statistics and Economics Conference Proceedings*. Praha: Melandrium, 2023 - (Löster, T.; Pavelka, T.), s. 246-255. ISBN 978-80-87990-31-5.

[International Days of Statistics and Economics /17./ Praha (CZ), 07.09.2023-09.09.2023]

**R&D Projects:** GA ČR GA21-05325S

**Institutional support:** RVO:67985807

**Keywords :** dimensionality reduction \* Big Data \* variable selection \* robustness \* sparsity

**OECD category:** Statistics and probability

[https://msed.vse.cz/msed\\_2023/article/687-Kalina-Jan-paper.pdf](https://msed.vse.cz/msed_2023/article/687-Kalina-Jan-paper.pdf)

The recent advent of complex (and potentially big) data in economics requires modern and effective tools for their analysis including tools for reducing the dimensionality (complexity) of the given data. This paper starts with recalling the importance of Big Data in economics and with characterizing the main categories of dimension reduction techniques. While there have already been numerous techniques for dimensionality reduction available, this work is interested in methods that are robust to the presence of outlying measurements (outliers) in the economic data. Particularly, methods based on implicit weighting assigned to individual observations are developed in this paper. As the main contribution, this paper proposes three novel robust methods of dimension reduction. One method is a dimension reduction within a robust regularized linear regression, namely a sparse version of the least weighted squares estimator. The other two methods are robust versions of feature extraction methods popular in econometrics: robust principal component analysis and robust factor analysis.

**Permanent Link:** <https://hdl.handle.net/11104/0349888>

0581709 - ÚI 2024 RIV CZ eng C - Conference Paper (international conference)

**Kalina, Jan - Vidnerová, Petra - Večeř, M.**

The 2022 Election in the United States: Reliability of a Linear Regression Model.

*RELIK 2023. Conference Proceedings*. Prague: Prague University of Economics and Business, 2023 - (Langhamrová, J.; Vrabcová, J.), s. 123-132. ISBN 978-80-245-2499-3.

[RELIK 2023: Reproduction of Human Capital - mutual links and connections /16./ Praha (CZ), 23.11.2023-24.11.2023]

**Grant - others:**GA ČR(CZ) GA21-19311S

**Institutional support:** RVO:67985807

**Keywords :** elections results \* electoral demography \* linear regression \* reliability \* variability

**OECD category:** Statistics and probability

<https://relik.vse.cz/2023/download/pdf/689-Vidnerova-Petra-paper.pdf>

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/11104/0349891>

0581988 - ÚI 2024 RIV CZ eng C - Conference Paper (international conference)

**[Davoodi, Akbar](#) - [Piguet, Diana](#) - [Řada, Hanka](#) - [Sanhueza-Matamala, N.](#)**

Beyond the Erdős–Sós conjecture.

*EUROCOMB'23. Proceedings of the 12th European Conference on Combinatorics, Graph Theory and Applications*. Brno: MUNI Press, 2023 - (Kráľ, D.; Nešetřil, J.), s. 328-335. E-ISSN 2788-3116.

[EUROCOMB 2023: European Conference on Combinatorics, Graph Theory and Applications /12./.

Prague (CZ), 28.08.2023-01.09.2023]

**R&D Projects:** GA ČR(CZ) GA19-08740S

**Institutional support:** RVO:67985807

<https://doi.org/10.5817/CZ.MUNI.EUROCOMB23-045>

[DOI: 10.5817/CZ.MUNI.EUROCOMB23-045](https://doi.org/10.5817/CZ.MUNI.EUROCOMB23-045)

We prove an asymptotic version of a tree-containment conjecture of Klímašová, Piguet and Rozhoň [European J. Combin. 88 (2020), 103106] for graphs with quadratically many edges. The result implies that the asymptotic version of the Erdős–Sós conjecture in the setting of dense graphs is correct.

**Permanent Link:** <https://hdl.handle.net/11104/0350124>

0580726 - ÚI 2024 RIV PT eng C - Conference Paper (international conference)

**Korel, L. - Behr, A. S. - Kockmann, N. - [Holeňa, Martin](#)**

Using Paraphrasers to Detect Duplicities in Ontologies.

*Proceedings of the 15th International Joint Conference on Knowledge Discovery, Knowledge Engineering and Knowledge Management - Volume 2*. Setubal: SciTePress, 2023 - (Aveiro, D.; Dietz, J.; Poggi, A.; Bernardino, J.), s. 40-49. ISBN 978-989-758-671-2. ISSN 2184-3228.

[KEOD 2023: Conference on Knowledge Engineering and Ontology Development /15./. Rome / hybrid (IT), 13.11.2023-15.11.2023]

**Research Infrastructure:** ELIXIR CZ III - 90255; e-INFRA CZ II - 90254

**Institutional support:** RVO:67985807

**Keywords :** Classifiers \* Duplicity Detection \* Ontologies \* Paraphrasers \* Representation Learning \* Semantic Similarity

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

<https://doi.org/10.5220/0012164500003598>

[DOI: 10.5220/0012164500003598](https://doi.org/10.5220/0012164500003598)

This paper contains a machine-learning-based approach to detect duplicities in ontologies. Ontologies are formal specifications of shared conceptualizations of application domains. Merging and enhancing ontologies may cause the introduction of duplicities into them. The approach to duplicities proposed in this work presents a solution that does not need manual corrections by domain experts. Source texts consist of short textual descriptions from considered ontologies, which have been extracted and automatically paraphrased to receive pairs of sentences with the same or a very close meaning. The sentences in the received dataset have been embedded into Euclidean vector space. The classification task was to determine whether a given pair of sentence embeddings is semantically equivalent or different. The results have been tested using test sets generated by paraphrases as well as on a small real-world ontology. We also compared solutions by the most similar existing approach, based on GloVe and WordNet, with solutions by our approach. According to all considered metrics, our approach yielded better results than the compared approach. From the results of both experiments, the most suitable for the detection of duplicities in ontologies is the combination of BERT with support vector machines. Finally, we performed an ablation study to validate whether all paraphrasers used to create the training set for the classification were essential.

**Permanent Link:** <https://hdl.handle.net/11104/0349480>

0580808 - ÚI 2024 RIV CH eng C - Conference Paper (international conference)

**[Bílková, Marta](#) - [Frittella, S.](#) - [Kozhemiachenko, D.](#) - [Majer, Ondrej](#)**

Two-Layered Logics for Paraconsistent Probabilities.

*Logic, Language, Information, and Computation*. Cham: Springer, 2023 - (Hansen, H.; Scedrov, A.; de Queiroz, R.), s. 101-117. ISBN 978-3-031-39783-7. ISSN 0302-9743.

[WoLLIC 2023: Workshop on Logic, Language, Information and Computation /29./, Halifax (CA), 11.07.2023-14.07.2023]

**R&D Projects:** GA ČR(CZ) GA22-01137S

**EU Projects:** European Commission(XE) 101007627 - MOSAIC

**Institutional support:** RVO:67985807 ; RVO:67985955

**Keywords :** two-layered logics \* Łukasiewicz logic \* non-standard probabilities \* paraconsistent logics \* constraint tableaux

[https://doi.org/10.1007/978-3-031-39784-4\\_7](https://doi.org/10.1007/978-3-031-39784-4_7)

[DOI: 10.1007/978-3-031-39784-4\\_7](https://doi.org/10.1007/978-3-031-39784-4_7)

We discuss two-layered logics formalising reasoning with paraconsistent probabilities that combine the Łukasiewicz  $[0, 1]$ -valued logic with Baaz  $\Delta$  operator and the Belnap–Dunn logic. The first logic (introduced in [7]) formalises a ‘two-valued’ approach where each event  $\phi$  has independent positive and negative measures that stand for, respectively, the likelihoods of  $\phi$  and  $\neg \phi$ . The second logic that we introduce here corresponds to ‘four-valued’ probabilities. There,  $\phi$  is equipped with four measures standing for pure belief, pure disbelief, conflict and uncertainty of an agent in  $\phi$ . We construct faithful embeddings of and into one another and axiomatise using a Hilbert-style calculus. We also establish the decidability of both logics and provide complexity evaluations for them using an expansion of the constraint tableaux calculus for L.

**Permanent Link:** <https://hdl.handle.net/11104/0349571>

0581997 - ÚI 2024 RIV CH eng C - Conference Paper (international conference)

**Lang, R.** - **[Sanhueza-Matamala, Nicolás](#)**

On Sufficient Conditions for Hamiltonicity in Dense Graphs.

*Extended Abstracts EuroComb 2021*. Cham: Birkhäuser / Springer, 2021 - (Nešetřil, J.; Perarnau, G.; Rué, J.; Serra, O.), s. 527-532. Trends in Mathematics, 14. ISBN 978-3-030-83822-5. ISSN 2297-0215.

[EUROCOMB 2021: The European Conference on Combinatorics, Graph Theory and Applications. Barcelona / Online (ES), 06.09.2021-10.09.2021]

**R&D Projects:** GA ČR(CZ) GA19-08740S

**Institutional support:** RVO:67985807

[https://doi.org/10.1007/978-3-030-83823-2\\_85](https://doi.org/10.1007/978-3-030-83823-2_85)

[DOI: 10.1007/978-3-030-83823-2\\_85](https://doi.org/10.1007/978-3-030-83823-2_85)

We study structural conditions in dense graphs that guarantee the existence of vertex-spanning substructures such as Hamilton cycles. Recall that every Hamiltonian graph is connected, has an almost perfect matching and, excluding the bipartite case, contains an odd cycle. Our main result states that any large enough graph that robustly satisfies these properties must already be Hamiltonian. Moreover, the same holds for powers of cycles and the bandwidth setting subject to natural generalizations of connectivity, matchings and odd cycles. This solves the embedding problem that underlies multiple lines of research on sufficient conditions for Hamiltonicity. As an application, we recover several old and new results, and prove versions of the Bandwidth Theorem under Ore-type degree conditions, Pósa-type degree conditions, deficiency-type conditions and for balanced partite graphs.

**Permanent Link:** <https://hdl.handle.net/11104/0350132>

0581999 - ÚI 2024 RIV CH eng C - Conference Paper (international conference)

**Lang, R.** - [Sanhueza-Matamala, Nicolás](#)

Degree Conditions for Tight Hamilton Cycles.

*Extended Abstracts EuroComb 2021*. Cham: Birkhäuser / Springer, 2021 - (Nešetřil, J.; Perarnau, G.; Rué, J.; Serra, O.), s. 540-545. Trends in Mathematics, 14. ISBN 978-3-030-83822-5. ISSN 2297-0215.

[EUROCOMB 2021: The European Conference on Combinatorics, Graph Theory and Applications. Barcelona / Online (ES), 06.09.2021-10.09.2021]

**R&D Projects:** GA ČR(CZ) GA19-08740S

**Institutional support:** RVO:67985807

[https://doi.org/10.1007/978-3-030-83823-2\\_87](https://doi.org/10.1007/978-3-030-83823-2_87)

[DOI: 10.1007/978-3-030-83823-2\\_87](https://doi.org/10.1007/978-3-030-83823-2_87)

We develop a framework to study minimum  $d$ -degree conditions in  $k$ -uniform hypergraphs, which guarantee the existence of a tight Hamilton cycle. Our main theoretical result deals with the typical absorption, path-cover and connecting arguments for all  $k$  and  $d$  at once, and thus sheds light on the underlying structural problems. Building on this, we show that one can study minimum  $d$ -degree conditions of  $k$ -uniform tight Hamilton cycles by focusing on the inner structure of the neighbourhoods. This reduces the matter to an Erdős–Gallai-type question for  $(k-d)$ -uniform hypergraphs.

**Permanent Link:** <https://hdl.handle.net/11104/0350134>

0581994 - ÚI 2024 RIV CH eng C - Conference Paper (international conference)

**Pavez-Signé, M.** - [Sanhueza-Matamala, Nicolás](#) - **Stein, M.**

Dirac-Type Conditions for Spanning Bounded-Degree Hypertrees.

*Extended Abstracts EuroComb 2021*. Cham: Birkhäuser / Springer, 2021 - (Nešetřil, J.; Perarnau, G.; Rué, J.; Serra, O.), s. 586-592. Trends in Mathematics, 14. ISBN 978-3-030-83822-5. ISSN 2297-0215.

[EUROCOMB 2021: The European Conference on Combinatorics, Graph Theory and Applications. Barcelona / Online (ES), 06.09.2021-10.09.2021]

**R&D Projects:** GA ČR(CZ) GA19-08740S

**Institutional support:** RVO:67985807

[https://doi.org/10.1007/978-3-030-83823-2\\_94](https://doi.org/10.1007/978-3-030-83823-2_94)

[DOI: 10.1007/978-3-030-83823-2\\_94](https://doi.org/10.1007/978-3-030-83823-2_94)

We prove that for fixed  $k$ , every  $k$ -uniform hypergraph on  $n$  vertices and of minimum codegree at least  $n/2 + o(n)$  contains every spanning tight  $k$ -tree of bounded vertex degree as a subgraph. This generalises a well-known result of Komlós, Sárközy and Szemerédi for graphs. Our result is asymptotically sharp.

**Permanent Link:** <https://hdl.handle.net/11104/0350128>

0581803 - ÚI 2024 eng C - Conference Paper (international conference)

**Cerna, David M.** - **Cropper, A.**

Generalisation through Negation and Predicate Invention (ACCEPTED).

[AAAI 2024: The Annual Conference on Artificial Intelligence /38./. Vancouver (CA), 20.02.2024-27.02.2024]

**Institutional support:** RVO:67985807

**Permanent Link:** <https://hdl.handle.net/11104/0349954>

**Research data:** [Preprint - ArXiv.org](#)

0580350 - ÚI 2024 RIV CZ cze D - Thesis

**[Vařejková, Michaela](#)**

Modely pro vyvažování kognitivních testů.

[Models for equating in cognitive tests.]

Univerzita Karlova, Matematicko-fyzikální fakulta. **Defended:** Praha. 15. 6. 2023. - Praha: Univerzita Karlova, Matematicko-fyzikální fakulta, 2023. 72 s.

**R&D Projects:** GA ČR(CZ) GA21-03658S

**Institutional support:** RVO:67985807

**Keywords :** vyvažování kognitivních testů \* modely teorie odpovědi napoložku (IRT modely) \* jádrové odhady \* test equating \* item-response theory (IRT) models \* kernel smoothing

<https://dspace.cuni.cz/handle/20.500.11956/182164>

Tato práce se věnuje statistickým metodám pro vyvažování kognitivních testů, což je proces používaný k transformaci skóre z více verzí testu tak, aby byla mezi sebou porovnatelná. Teoretická část práce je rozčleněna do tří kapitol, kde každá se zabývá jedním z možných přístupů k procesu vyvažování. V první kapitole jsou představeny tradiční vyvažovací metody, ve druhé kapitole metody vyvažování za pomoci jádrových odhadů a ve třetí kapitole metody vyvažování pomocí modelů teorie odpovědi na položku. Závěrečná část práce je věnována empirické studii, ve které je ilustrováno použití vyvažovacích metod na konkrétním datovém souboru. Jedná se o odpovědi na dvě verze znalostního testu z matematiky, které byly zadávány studentům 4. ročníků základních škol v České republice v rámci mezinárodního šetření TIMSS v roce 2015.

This thesis focuses on statistical methods for equating cognitive tests, which is the process of transforming scores from multiple test versions to ensure their comparability. Divided into three chapters, the theoretical part of the thesis addresses different approaches to test equating. The first chapter presents traditional equating methods, the second explores kernel equating methods, while the third covers equating methods using Item Response Theory models. The concluding part of the thesis showcases an empirical study demonstrating the application of equating methods on a real dataset. This dataset contains responses to two versions of a math test taken by fourth-grade students in the Czech Republic as part of the 2015 TIMSS international survey.

**Permanent Link:** <https://hdl.handle.net/11104/0349133>

0580347 - ÚI 2024 RIV CZ cze D - Thesis

**[Netík, Jan](#)**

Úzkost u Parkinsonovy nemoci a její měření.

[Anxiety in Parkinson's Disease and Its Measurement.]

Univerzita Karlova, Filozofická fakulta. **Defended:** Praha. 11. 9. 2023. - Praha: Univerzita Karlova, Filozofická fakulta, 2023. 124 s.

**R&D Projects:** GA ČR(CZ) GA21-03658S

**Institutional support:** RVO:67985807

**Keywords :** úzkost \* měření úzkosti \* Parkinsonova nemoc \* normy \* State-Trait Anxiety Inventory \* anxiety \* anxiety measurement \* Parkinson's disease \* norms \* State-Trait Anxiety Inventory

<https://dspace.cuni.cz/handle/20.500.11956/185661>

Práce představuje úzkost jako jeden z nejčastějších a nejvýznamnějších neuropsychiatrických příznaků Parkinsonovy nemoci (PN). Úzkost zasazuje do kontextu dalších, motorických i non-motorických projevů, popisuje okolnosti jejího vzniku a její možnou úlohu v časně diagnostice ještě před samotnou klinickou diagnózou a rozvojem charakteristických motorických symptomů. Dále se práce dotýká potíží při měření úzkosti u PN a zabývá se popisem vybraných modelů úzkosti a psychodiagnostických metod určených k jejímu měření, přičemž staví zejm. na Spielbergerově koncepci stavové a rysové úzkosti. Z ní vychází inventář State-Trait Anxiety Inventory (STAI), pro který v empirické části sestavujeme

první české normy a ověřujeme některé psychometrické vlastnosti metody na populaci anamnesticky zdravých respondentů. Ve druhé studii práce zkoumá validitu při měření úzkosti na vzorku doposud neléčených pacientů s idiopatickou PN, u nichž dle literatury již časně existuje měřitelný nárůst úzkosti. Ověřujeme, zdali STAI dovede rozdíly mezi normativním souborem a pacienty s nově diagnostikovanou PN zachytit. Výsledky ukazují, že STAI je schopen detekovat zvýšenou úzkost u těchto pacientů, přestože nástroj má některé nedostatky. Práce zdůrazňuje potřebu dalšího výzkumu a možné revize některých položek inventáře.

This thesis introduces anxiety as one of the most common and important neuropsychiatric symptoms of Parkinson's disease (PD). It places anxiety in the context of other motor and non-motor symptoms and describes the circumstances of its onset and its potential role in early recognition of PD even before a clinical diagnosis is established and before the onset of characteristic motor symptoms. The thesis also touches on the difficulties in measuring anxiety in PD and discusses selected models of anxiety and psychodiagnostic methods for its measurement, building in particular on Spielberger's concept of state and trait anxiety, which represents the basis for the State-Trait Anxiety Inventory (STAI), for which we construct the first Czech norms in the empirical part of the work and verify some psychometric properties of the method on a population of healthy respondents. In the second study, the thesis examines the validity of measuring anxiety in a sample of previously untreated patients with idiopathic PD, who, according to the literature, have an early measurable increase in anxiety. We test whether the STAI can capture the difference between the normative sample and patients with newly diagnosed PD. The results show that the STAI can detect increased anxiety in these patients, although...

**Permanent Link:** <https://hdl.handle.net/11104/0349124>

0580479 - ÚI 2024 RIV BE eng A - Abstract

**Vařejková, Michaela - Martinková, Patrícia - Potužníková, E.**

A simulation study of repeated covariate equating.

*The 10th European Congress of Methodology (EAM2023) Book of Abstracts.* Ghent: Ghent University, 2023. s. 267-267.

[EAM2023: European Congress of Methodology /10./ 11.07.2023-13.07.2023, Ghent]

**R&D Projects:** GA ČR(CZ) GA21-03658S

**Institutional support:** RVO:67985807

[https://eam2023.ugent.be/images/eam2023\\_abstracts\\_book.pdf](https://eam2023.ugent.be/images/eam2023_abstracts_book.pdf)

When performing test equating with non-equivalent groups and without an anchor test, one potential solution how to adjust for group differences is to substitute the anchor test score with covariates, such as grades or scores from another test. A key assumption for this approach is that the conditional distribution of test scores, given the covariates, is the same in all groups. In this work, we conduct a simulation study to investigate how different types of violations of the same conditional distribution assumption can affect the resulting equated scores. We consider two non-equivalent groups differing in ability. As covariates, we use two binary variables (which can, for example, refer to student's educational status and school type) and one continuous variable referring to a score from another test. The continuous variable was generated to be correlated with the other two binary variables. In the simulations, we explore several scenarios differing in sample size and the relationship between the test score and the continuous covariate. We show that if the assumption of equal conditional distribution is not met due to the fact that the covariate itself is measured using different test forms, the accuracy of the resulting equated scores can be improved by equating the covariate before incorporating it into the primary test scores equating algorithm.

**Permanent Link:** <https://hdl.handle.net/11104/0349249>

0580425 - ÚI 2024 RIV US eng A - Abstract

[Bartoš, František](#) - [Martinková, Patrícia](#) - [Brabec, Marek](#)

Bayesian location-scale model for assessing reliability differences with ordinal ratings.

*IMPS 2023: Abstract Book: Talks*. Psychometric Society, 2023. s. 88-88.

[IMPS 2023: International Meeting of the Psychometric Society. 23.07.2023-28.07.2023, Washington DC]

**R&D Projects:** GA ČR(CZ) GA21-03658S

**Institutional support:** RVO:67985807

<https://www.psychometricsociety.org/sites/main/files/file-attachments/imps2023-abstracts.pdf>

The quality of ratings and quantitative assessments depends on the reliability of the rating instrument. Especially important is the measurement error – a high measurement error results in high uncertainty of the resulting scores. Detected systematic differences in measurement error due to applicant/raters-related characteristics might provide guidance on which groups to focus on in interventions designed to lower the measurement error. A flexible approach for detecting differences in measurement error was proposed in (Martinková et al., 2023) for cases when scores are assumed to be continuous. In this work, we build on this approach by focusing on ordinal ratings. We highlight cases where treating ordinal rating as continuous might result in biased estimates and outline a Bayesian cumulative probit multi-level location-scale model to mitigate the issue. We use spike-and-slab prior distributions to obtain inclusion Bayes factors of individual predictors and model-averaged posterior distributions within a single model fit. We demonstrate the superiority of the proposed ordinal approach with a simulation study.

**Permanent Link:** <https://hdl.handle.net/11104/0349214>

0580441 - ÚI 2024 RIV US eng A - Abstract

[Martinková, Patrícia](#) - [Hladká, Adéla](#)

Computational aspects of modelling item responses.

*IMPS 2023: Abstract Book: Talks*. Psychometric Society, 2023. s. 202-202.

[IMPS 2023: International Meeting of the Psychometric Society. 23.07.2023-28.07.2023, Washington DC]

**R&D Projects:** GA ČR(CZ) GA21-03658S

**Institutional support:** RVO:67985807

<https://www.psychometricsociety.org/sites/main/files/file-attachments/imps2023-abstracts.pdf>

Item response theory models can be derived in factor analytic framework as well as in the framework of generalized linear and nonlinear mixed-effect models. In this work, we focus on the latter one. We first describe step-by-step development of IRT models via empirical characteristic curves and generalized linear and nonlinear models (GLNM) with emphasis on didactic value of such approach. In addition to that, we discuss wide usage possibilities of GLNM in terms of criterion-related item validity and we demonstrate these aspects with real data examples. Finally, we present some novel approaches to parameter estimation in this framework together with their challenges in practical implementation.

**Permanent Link:** <https://hdl.handle.net/11104/0349218>

0580489 - ÚI 2024 eng A - Abstract

[Bartoš, František](#)

Accounting for Publication Bias with Robust Bayesian Meta-Analysis, Statistical and machine learning approaches for the social science.

[Statistical and machine learning approaches for the social sciences, Winter 2023. Seattle/Online, 11.01.2023-15.03.2023]

**Method of presentation:** Zvaná přednáška

**Event organizer:** University of Washington

**R&D Projects:** GA ČR(CZ) GA21-03658S

**Institutional support:** RVO:67985807

**Permanent Link:** <https://hdl.handle.net/11104/0349261>

0580482 - ÚI 2024 RIV BE eng A - Abstract

[Netík, Jan](#) - [Martinková, Patrícia](#)

Enhancing Psychometrics with Interactive ShinyItemAnalysis Modules.

*The 10th European Congress of Methodology (EAM2023) Book of Abstracts*. Ghent: Ghent University, 2023. s. 273-273.

[EAM2023: European Congress of Methodology /10./, 11.07.2023-13.07.2023, Ghent]

**R&D Projects:** GA ČR(CZ) GA21-03658S

**Institutional support:** RVO:67985807

[https://eam2023.ugent.be/images/eam2023\\_abstracts\\_book.pdf](https://eam2023.ugent.be/images/eam2023_abstracts_book.pdf)

ShinyItemAnalysis is an R package and Shiny application widely used to teach psychometric concepts and conduct psychometric analyses without any coding experience (Martinková & Hladká, forthcoming). In this work, we present a new feature that has been introduced in the latest version of ShinyItemAnalysis, called "SIA modules". These modules, written completely in R using the Shiny package, allow researchers and practitioners to offer new analytical methods for wider use. SIA modules are designed to integrate with and build upon the ShinyItemAnalysis app (Martinková & Hladká, 2018), enabling them to leverage the existing infrastructure for tasks such as data uploading and processing. They can access a range of outputs from various analyses, including item response theory models, exploratory factor analysis, or differential item functioning models. Because SIA modules come in R packages (or extend the existing ones), they may come bundled with their own datasets, use compiled code, etc. We provide two SIA modules for demonstration: A module for estimation of inter-rater reliability in grant proposal peer-reviews under range restriction (Erosheva et al., 2021), and a didactic showcase of computerized adaptive testing (CAT) that covers the main CAT ideas and demonstrates the possibility to use the module's own data as well as the data uploaded by the user. In summary, the SIA modules offer an innovative and interactive way for psychometricians to share their research and advances in methodology. This feature makes it easier for researchers and practitioners to explore psychometric concepts and analyses in a user-friendly way.

**Permanent Link:** <https://hdl.handle.net/11104/0349250>

0580488 - ÚI 2024 eng A - Abstract

[Martinková, Patrícia](#)

Statistical and machine learning methods in psychometrics, Statistical and machine learning approaches for the social sciences.

[Statistical and machine learning approaches for the social sciences Fall 2022. Seattle / Online, 30.09.2022-21.12.2022]

**Method of presentation:** Zvaná přednáška

**Event organizer:** University of Washington, Seattle

**R&D Projects:** GA ČR(CZ) GA21-03658S

**Institutional support:** RVO:67985807

**Permanent Link:** <https://hdl.handle.net/11104/0349257>

0580357 - ÚI 2024 RIV CZ cze A - Abstract

[Martinková, Patrícia](#)

Výpočetní aspekty odhadu reliability v případě vlivu kovariát a další témata z psychometrie.

*ROBUST 2022. Sborník abstraktů*. Praha: MFF UK, 2022. s. 10-11.

[ROBUST 2022: letní škola JČMF /22./, 12.06.2022-17.06.2022, Volyně]



**R&D Projects:** GA ČR(CZ) GA21-03658S

**Institutional support:** RVO:67985807

<https://www.karlin.mff.cuni.cz/~antoch/robust22/abstrakty.pdf>

Měření v psychologii, pedagogice a dalších sociálních, ale i lékařských vědách jsou často značně nepřesná a využívají většího množství položek a hodnotitelů. Z toho plynou některá specifika statistických úloh, které se v těchto oblastech vyskytují. V příspěvku pojednáme o výpočetních aspektech metod odhadů reliability a o dalších statistických úlohách. Nejdříve se zaměříme na model analýzy rozptylu jednoduchého třídění s náhodnými efekty a na případy, kdy jsou odhady reliability nulové, viz (1). Poté navrhne flexibilní přístup k odhadu reliability v případě heterogenity způsobené větším množstvím kovariát. V závěru pojednáme o dalších tématech z psychometrie s důrazem na analýzu jednotlivých položek vícepoložkových měření.

**Permanent Link:** <https://hdl.handle.net/11104/0349148>

0580447 - ÚI 2024 RIV BE eng A - Abstract

**Štěpánek, Lubomír - Dlouhá, Jana - Martinková, Patrícia**

Machine-learning prediction of test item difficulty using item text wordings: Comparison of algorithms' and domain experts' predictive performance.

*The 10th European Congress of Methodology (EAM2023) Book of Abstracts.* Ghent: Ghent University, 2023. s. 26-26.

[EAM2023: European Congress of Methodology /10./ 11.07.2023-13.07.2023, Ghent]

**R&D Projects:** GA ČR(CZ) GA21-03658S

**Institutional support:** RVO:67985807

[https://eam2023.ugent.be/images/eam2023\\_abstracts\\_book.pdf](https://eam2023.ugent.be/images/eam2023_abstracts_book.pdf)

Various properties of text wording of a given test item determine how difficult the item is for a test-taker. While the item difficulty is commonly estimated using item response theory (IRT) models based on test-takers' responses, information on item difficulty is encoded in its text and could be predicted using machine-learning algorithms. In this work, we used text wordings of test items of the reading comprehension part of a test of English as a foreign language. For each item, we tokenized and lemmatized item text, removed stopwords, and calculated various features such as word counts, readability indices, lexical frequencies, and measures of item parts' similarity. Then, the resulting dataset containing text features in rows was enriched by item difficulty estimated using the Rasch model. The item difficulty was predicted using multiple machine-learning supervised algorithms of regression task. Firstly, we applied regularization algorithms, i.e., LASSO, ridge regression, and elastic net, to select appropriate features, reduce dimensionality, and predict the (continuous) difficulty. Besides that, we employed support vector machines, regression trees and forests, and neural networks. Once we categorized the difficulty into disjunctive intervals, we switched the regression into a classification task, also applying the naïve Bayes classifier. To compare the algorithms to each other and domain experts' difficulty predictions, we learned algorithms many times within cross-validation and estimated root mean square errors and predictive accuracies for each approach. Regularization algorithms in regression tasks and random forests in classification seemed to outperform other algorithms and predicted item difficulty similarly to domain experts

**Permanent Link:** <https://hdl.handle.net/11104/0349220>

0580475 - ÚI 2024 RIV BE eng A - Abstract

**Martinková, Patrícia - Pavlech, Ján**

Measurement invariance in factor analytic and item response theory framework.

*The 10th European Congress of Methodology (EAM2023) Book of Abstracts.* Ghent: Ghent University, 2023. s. 193-193.

[EAM2023: European Congress of Methodology /10./ 11.07.2023-13.07.2023, Ghent]

**R&D Projects:** GA ČR(CZ) GA21-03658S

**Institutional support:** RVO:67985807

[https://eam2023.ugent.be/images/eam2023\\_abstracts\\_book.pdf](https://eam2023.ugent.be/images/eam2023_abstracts_book.pdf)

The relations between binary factor analysis (FA) model and 2-parameter item response theory (IRT) model were established some time ago (Takane & de Leeuw, 1987; Kamata & Bauer, 2008). However, when accounting for multiple groups and testing for between-group differences on an item level, the methods based on FA and IRT frameworks are usually considered supplementary rather than equivalent. This work focuses on relations between FA models used for testing measurement invariance and IRT models used for testing differential item functioning (DIF). We focus on equivalence of the two types of group-specific models under a set of conditions. Different types of invariance are discussed, namely configural, weak (metric), strong (scalar), and partial, together with models testing for non-uniform DIF, uniform DIF, and no DIF in all items, respectively. Computational aspects and extensions to multiple groups and ordinal items are considered. A real data example is provided to demonstrate the presented relations.

**Permanent Link:** <https://hdl.handle.net/11104/0349244>

0580486 - ÚI 2024 RIV NO eng A - Abstract

[Martinková, Patrícia](#) - [Vařejková, Michaela](#) - [Potužníková, E.](#)

Obtaining comparable scores from multiple test forms in case of non-equivalent groups via repeated covariate equating.

*Frontier Research in Educational Measurement (FREMO): Conference Abstracts.* Oslo: Centre for Educational Measurement, University of Oslo, 2023. s. 19-19.

[FREMO 2023: Frontier Research in Educational Measurement. 05.09.2023-07.09.2023, Oslo]

**R&D Projects:** GA ČR(CZ) GA21-03658S

**Institutional support:** RVO:67985807

[https://eam2023.ugent.be/images/eam2023\\_abstracts\\_book.pdf](https://eam2023.ugent.be/images/eam2023_abstracts_book.pdf)

The traditional way to equate scores from alternate test forms is to include anchor items which are administered to all test takers and are used to adjust for possible differences in ability between the groups taking different forms (Kolen & Brennan, 2004, von Davier, 2011, von Davier, 2013, González & Wiberg, 2017). In the absence of anchor items, one approach is the so-called covariate equating, in which the anchor items are substituted by covariates, such as grades or other test scores (Wiberg & Bränberg, 2015, Longford, 2015, Wallin & Wiberg 2019). This procedure assumes that the covariates can account for differences in ability and that the conditional distribution of the test scores, given the covariates, is the same for both groups. In this work, we consider different violations of the assumptions of the covariate equating method, motivated by real data examples from Czech matura examinations. We consider the case in which the correlation between the covariate and the test score is weak, thus the assumption that the covariates explain the difference in ability is not met. We also consider the case in which the covariate itself is measured using different test forms, thus violating the assumption of the same conditional distribution. We conduct a simulation study showing that, for the latter case, equating the covariate before incorporating it into the primary test scores equating algorithm can improve the accuracy of the resulting equated scores. The real data example demonstrates the proposed repeated covariate method, as well as the effect of low correlation between the score and the covariate.

**Permanent Link:** <https://hdl.handle.net/11104/0349253>

0580478 - ÚI 2024 RIV BE eng A - Abstract

[Martinková, Patrícia](#) - [Hladká, Adéla](#)

Modeling item responses under different frameworks.

*The 10th European Congress of Methodology (EAM2023) Book of Abstracts.* Ghent: Ghent University, 2023. s. 230-230.

[EAM2023: European Congress of Methodology /10./ 11.07.2023-13.07.2023, Ghent]

**R&D Projects:** GA ČR(CZ) GA21-03658S

**Institutional support:** RVO:67985807

[https://eam2023.ugent.be/images/eam2023\\_abstracts\\_book.pdf](https://eam2023.ugent.be/images/eam2023_abstracts_book.pdf)

Item responses may be modeled in the factor analytic framework as well as in the framework of generalized linear and nonlinear mixed-effect models (also referred as item response theory, IRT). In this work, we first discuss the relationships between the two frameworks and advantages of each of them. We then focus on the latter one, and describe a step-by-step development of IRT models via empirical characteristic curves and generalized linear and nonlinear models (GLNM), while emphasizing the didactic value of such an approach (Martinková & Hladká, 2023). We outline possible further uses of GLNM in testing criterion-related item validity and we demonstrate them with real data examples. Finally, we present some novel approaches to parameter estimation in the GLNM framework and discuss their challenges in practical implementation. Martinková, P., & Hladká, A. (2023) Computational Aspects of Psychometric Methods. With R. Chapman and Hall/CRC (In Press). ISBN 9780367515386.

**Permanent Link:** <https://hdl.handle.net/11104/0349246>

0580452 - ÚI 2024 RIV CH eng A - Abstract

**[Martinková, Patrícia](#) - [Netík, Jan](#)**

SIAModules: Modules for ShinyItemAnalysis.

*Psychoco 2023: Program*. Zurich: University of Zurich, 2023. s. 88-88.

[PSYCHOCO: International Workshop on Psychometric Computing. 08.06.2023-09.06.2023, Zurich]

**R&D Projects:** GA ČR(CZ) GA21-03658S

**Institutional support:** RVO:67985807

<https://www.psychoco.org/2023/program.html>

ShinyItemAnalysis (Martinková & Hladká, 2018) is an R package and Shiny application for interactive presentation of psychometric methods and for measurement data analysis. In this work, we present a new feature which is being introduced in the latest version of ShinyItemAnalysis, called "SIA modules". Add-on modules allow researchers and practitioners to offer new analytical methods for wider use. SIA modules are designed to integrate with and build upon the ShinyItemAnalysis interactive application, enabling them to leverage the existing infrastructure for tasks such as data uploading and processing. They can access a range of outputs from various analyses, including item response theory models, exploratory factor analysis, or differential item functioning models. Because SIA modules come in R packages (or extend the existing ones), they may come bundled with their own datasets, use compiled code, etc. We demonstrate the concepts using sample modules from the newly introduced SIAModules R package.

**Permanent Link:** <https://hdl.handle.net/11104/0349222>

581665 - ÚI 2024 PK eng A - Abstract

**Ali, H. - Yaseen, M. - Shahid, S. U. - [Latif, Yasir](#) - Abbas, S.**

Evaluation of Global Gridded Evapotranspiration Datasets across the Upper Indus Basin, Pakistan by Using Remote Sensing and GIS.

*Abstract Book of 4th International Conference on Emerging Trends in Earth & Environmental Sciences (ETEES 2023)*. Lahore: College of Earth and Environmental Sciences, University of the Punjab, 2023. s. 49-49.

[ETEES 2023: International Conference on Emerging Trends in Earth & Environmental Sciences /4./ 04.12.2023-06.12.2023, Lahore]

**Institutional support:** RVO:67985807

**Keywords :** Evapotranspiration \* Upper Indus Basin \* MODIS

<http://cees.edu.pk/wp-content/uploads/2023/12/ETEES-2023-CONFERENCE-PROGRAM.pdf>

Achieving water security in poorly gauged basins is critically hindered by a lack of in situ river discharge data to assess past, current, and future evolution of water resources. To overcome this challenge, there has been a shift towards the use of freely available satellite and reanalysis data products. Estimating evapotranspiration (ET), the main water output flux within basins, is an important step in assessing hydrological changes and water availability. However, direct measurements of ET are challenging, especially for large regions. Global products now provide gridded estimates of ET at different temporal resolution, each with its own method of estimating ET based on various data sources. In this study we estimated the spatiotemporal Evapotranspiration (ET) in Upper Indus Basin by MODIS data model using Remote Sensing satellite images from USGS. Zonation map of Evapotranspiration (EP) by using remote sensing and geographic information system. Actual Evapotranspiration is the one measured through using METRIC model approach by either completely or partially resolving the energy balance equation. A satellite image-based processing model uses images from satellite and calculates Evapotranspiration as an additional outcome balancing of the surface energy. The results of this study indicated that highest evapotranspiration (61.95mm) was observed in the month of May during the year 2020 and the minimum evapotranspiration(15.24mm) was found in the month of January in year of 2020. In the year of 2010 the highest evapotranspiration was found in the month of August (65.62 mm) and the minimum mean monthly evapotranspiration was found in the month of December (5.02mm) in the year of 2010. The minimum mean monthly evapotranspiration was observe in the year of 2000, which was in the month of November (7.350mm) and the maximum Monthly Evapotranspiration was in the month of August which are approximately (46.540mm).The result were compared by MODIS data and Climate Engine data. The results from this study suggest that gridded ET products are a useful source of data for assessing water security in poorly gauged basins.

**Permanent Link:** <https://hdl.handle.net/11104/0349771>

0581669 - ÚI 2024 PK eng A - Abstract

**Anjum, N. - Yaseen, M. - Shahid, S. U. - [Latif, Yasir](#) - Abbas, S.**

Integrated Flood Risk Assessment and Management Framework of Hill Torrent Floods for the Dera Ghazi Khan, Sulaiman Range in Perspective of The flood Faced During 2022.

*Abstract Book of 4th International Conference on Emerging Trends in Earth & Environmental Sciences (ETEES 2023)*. Lahore: College of Earth and Environmental Sciences, University of the Punjab, 2023. s. 90-90.

[ETEES 2023: International Conference on Emerging Trends in Earth & Environmental Sciences /4./ 04.12.2023-06.12.2023, Lahore]

**Institutional support:** RVO:67985807

**Keywords :** Flood \* Hazards \* Risk \* Sulaiman Range

<http://cees.edu.pk/wp-content/uploads/2023/12/ETEES-2023-CONFERENCE-PROGRAM.pdf>

This study focused on addressing the critical issue of flood risk assessment and management for hill torrents in the Dera Ghazi Khan division of Pakistan. The region experiences a distinct monsoon season, typically spanning from July to mid-September, which brings heavy rainfall. Unfortunately, in 2022, Dera Ghazi Khan and Rajan Pur faced severe devastation due to flash floods triggered by hill torrents, leading to the disruption of various human activities. To understand the severity of the 2022 flood event, hydrological indices were employed, providing insights into its unprecedented nature, making it the most extreme flood in the past twenty years. In order to estimate the extent of the flood, remote sensing and Geographic Information System (GIS) techniques were utilized. The analysis of Sentinel satellite imagery showed that the flood affected an extensive area of approximately 3204 km<sup>2</sup> (791,859 acres) across Dera Ghazi Khan and Rajan Pur. The results of this study indicated that the 2022 flood faced in 2022 was extremely severe in the last twenty years. The precipitation in monsoon season (June, July, August and September) had contributed most in the flood faced in 2022, especially the month of august. Sentinel satellite imagery having spatial resolution

more than 5 meter was used to estimate the accurate extent of flood. In Dera ghazi khan and Rajan Pur, 296669 Acre and 495190 Acre area was flooded respectively due to flood in 2022. Flood damages assessment was carried out by supervised classification. The flood damage assessment exercise was planned by identifying flood damage extent through pre and post flood satellite images. The remote sensing techniques such as; image processing and image classification were used to map the extent of the flood by analyzing the before and after flood images. Forty-nine people were died in Dera Ghazi Khan and thirty-one people were died in Rajan Pur due to flooding in 2022. The numbers of injuries were fifty-three in district Dera Ghazi Khan. Flood has damaged 26539 houses in Dera ghazi khan and it has damaged 28608 houses in Rajan Pur. The result of this study showed that a number of roads, bridges and infrastructure were damaged due to flood faced in 2022.

**Permanent Link:** <https://hdl.handle.net/11104/0349776>

0581667 - UI 2024 PK eng A - Abstract

**Muhammad, S. - Yaseen, M. - Shahid, S. U. - [Latif, Yasir](#) - Abbas, S.**

Integrated Land and Water Resources Management fFor Food Security And Environmental Sustainability in Quetta Region Pakistan.

*Abstract Book of 4th International Conference on Emerging Trends in Earth & Environmental Sciences (ETEES 2023)*. Lahore: College of Earth and Environmental Sciences, University of the Punjab, 2023. s. 50-50.

[ETEES 2023: International Conference on Emerging Trends in Earth & Environmental Sciences /4./ 04.12.2023-06.12.2023, Lahore]

**Institutional support:** RVO:67985807

**Keywords :** Food Security \* Water Resources \* Land Resources \* Environmental Sustainability

<http://cees.edu.pk/wp-content/uploads/2023/12/ETEES-2023-CONFERENCE-PROGRAM.pdf>

This research highlights the different threats to Quetta district about water scarcity, land degradation and food security. The amount of water and land needed for agriculture today is far less than what is available, yet local shortages are frequent and have a negative influence on food security. The results of the study reveals that the statistical trend of temperature shows an increase from 24.2°C in 1975 to 25.8°C during 2020 with an overall increase of 1.6°C in the last 45 years. The precipitation represents a considerable decreasing trend. The increasing trend in temperature with a decreasing trend of precipitation autocorrelates during the whole period. Changes in climate have altered local hydrologic cycles and considerably impact on quantity of surface water and recharge of groundwater (GW) resources. From 2005 to 2018, the GW declined from 3-18m in Quetta Valley. Subsequently, the water demand has increased to 139 Mm<sup>3</sup>. The existing surface water resource in the area is namely Hanna. Water of this lake is highly saline and unfit for any kind of use. The total cropped area irrigated by different means is about 91.3 Km<sup>2</sup>. The land is irrigated by utilizing dug-wells, tubewells, springs, and Karezes, there is no canal system exists in subbasin. In Balochistan, the agriculture sector is the most prominent among all for water utilization. 53% area is under salinity, 38% non-saline and rest with slight salinity. The Rabi crops production increased from 3000 hectares to in between 3000-4000 hectares of area whereas the Kharif crops production were same as the previous years over less than 9000 hectares of total area. The annual intercensal growth rates during 1998-2017 of Balochistan was 3.4% and for Quetta District 5.8%. The statistical analysis represents that decrease in precipitation and increase in temperature triggers the high ETO rates and reduction in recharge, resulted in depletion of GW levels. Identify the many issues and solutions required in lands with various stresses and qualities. Implement mechanisms for tracking the local state of land and water, connecting user-driven bottom-up participatory evaluations with subnational and basin-wide indicators that may inform policymaking and evaluate policy responses for food security and sustainable development. Increase agricultural production by supplemental irrigation and fertilizers in locations with sufficient biophysical potential for rain-fed agriculture. Priority activities are suggested so they can improve both environmental and food security at the same time. Integrating integrated methods to land and water management, enhancing the enabling environment, expanding the use of

good management practices and eco-friendly technology, strengthening of partnerships at the local, national, and international levels and the expansion and acceleration of capacity building initiatives to offer a vehicle for a coordinated response to the challenge of food and environmental security.

**Permanent Link:** <https://hdl.handle.net/11104/0349773>

0581672 - ÚI 2024 PK eng A - Abstract

**Ullah, A. - Usman, M. - Yaseen, M. - Shahid, S. U. - [Latif, Yasir](#) - Abbas, S.**

Flood Hazards Risk Assessment by Integrated Remote Sensing and GIS Based Morphometric Approach of Swat River Basin.

*Abstract Book of 4th International Conference on Emerging Trends in Earth & Environmental Sciences (ETEES 2023)*. Lahore: College of Earth and Environmental Sciences, University of the Punjab, 2023. s. 91-91.

[ETEES 2023: International Conference on Emerging Trends in Earth & Environmental Sciences /4./ 04.12.2023-06.12.2023, Lahore]

**Institutional support:** RVO:67985807

**Keywords :** Flood \* Hazards \* Risk \* Morphometric \* Swat River

<http://cees.edu.pk/wp-content/uploads/2023/12/ETEES-2023-CONFERENCE-PROGRAM.pdf>

Flash floods caused by strong rainstorms are widespread in Pakistan and have frequently resulted in massive damage to lives and infrastructure. Morphometric factors can be helpful in providing a basic understanding of the physical properties of a drainage basin in terms of floods. Thunderstorm-caused flash floods are common in the high mountainous area of Hindukush Himalaya in northern Pakistan. In the current study, three different morphometric analysis methods (morphometric ranking method, morphometric hazard degree method, and compound factor calculating method) were used to assess the risk of flash floods and generate flooding susceptibility maps in the Swat River basin, district Swat, Pakistan. Using the Arc GIS, the watershed and drainage network were delineated using the digital elevation model (DEM). For flash flood simulation, 32 morphometric parameters were used. According to the findings of this study, the morphometric Ranking approach suggests that 71.25% of the area is considered high flood risk probability, 23.83% of the whole subbasin area is considered moderate flood risk probability, and 5.90% of the overall catchment area is considered low flood risk probability. The results of the morphometric hazard degree for flash floods assessment method show that 27.54% of the whole area is high risk susceptibility, 38.02% is moderate flood risk susceptibility, and 5.90% is low flood susceptibility. This indicates that 27.54% of the area is in high danger and directly threatens the town, wetland reserve, and important roadways with predicted flooding. According to the compound factor technique, 24.18% of the region has a high flood risk, 31.88% has a moderate flood risk, and 43.93% has a low flood risk due to a low Relief Ratio (Rh) and a high time of concentration (Tc). The study's findings were thought to aid in the implementation of appropriate corrective measures to mitigate the risk of flash floods in the study area. The most prominent elements launching flash floods in the Swat Catchment area include exceptional repeated heavy rain storms, morphometric properties of drainage networks, pronounced/sharp morphology, and inadequate land cover.

**Permanent Link:** <https://hdl.handle.net/11104/0349783>

0581675 - ÚI 2024 PK eng A - Abstract

**Imran, M. - Yaseen, M. - Shahid, S. U. - [Latif, Yasir](#) - Abbas, S.**

Landslide Hazard Risk Assessment by Integrated Hydro-Geomorphological Approach for Soan River Basin in Potohar Region, Pakistan.

*Abstract Book of 4th International Conference on Emerging Trends in Earth & Environmental Sciences (ETEES 2023)*. Lahore: College of Earth and Environmental Sciences, University of the Punjab, 2023. s. 92-92.

[ETEES 2023: International Conference on Emerging Trends in Earth & Environmental Sciences /4./

04.12.2023-06.12.2023, Lahore]

**Institutional support:** RVO:67985807

**Keywords :** Landslide \* Hazards \* Risk \* Morphometric \* Soan River \* Potohar Region

<http://cees.edu.pk/wp-content/uploads/2023/12/ETEES-2023-CONFERENCE-PROGRAM.pdf>

Natural hazards such as landslides, avalanches, floods, and debris flow can cause huge property damage and human casualties in mountainous areas. Potohar region in the Himalayan foothills is one of the mountainous places in Pakistan prone to landslides. This study focuses on the identification and delineation of likely landslide danger zones using a multi-criteria approach in a GIS and remote sensing environment based on the analysis of various morphometric data. The hydro geomorphological properties of the research area can be depicted using these morphometric metrics. Based on this, all of the morphometric data are combined to create a landslide susceptibility map, which has been shown to be beneficial in predicting potential landslide susceptibility zones. The basin area of this investigation is only 6545 square kilometers. According to the findings of this study, the high landslide sensitive zone is located mostly in the upper portion of the basin, and in a dispersed way around the very high zone in the upper middle and lower middle parts of the basin. This zone encompasses around 27% of the total area. The basin's intermediate landslide susceptibility zone accounts for 17% of its total area. Other morphometric indicators have a significantly lower value than very high and high LSZ. As a result, in terms of vulnerability, this zone is classified as moderate. The low zone covers 38% of the basin. . The study in this basin revealed the following fact: (1) A very high landslide susceptibility zone is associated with locations that are vulnerable due to both drainage and topography conditions. (2) Morphometric indicators imply that high drainage density and steep rock surface are the primary causes of landslides in this region, which are almost definitely induced by rainfall during monsoon months. (3) The zone of extremely high landslide susceptibility is associated with heavy runoff, seasonally saturated bedrock, and high intensity of erosion, whereas the zone of low susceptibility is related with excellent slope stability and moderate intensity of erosion.

**Permanent Link:** <https://hdl.handle.net/11104/0349785>

0580685 - ÚI 2024 RIV CZ cze V - Research Report

[Brabec, Marek](#) - [Malý, Marek](#) - [Malá, Ivana](#)

*DC 5.3 Odhady kovariancí odhadnutého pole koncentrací.*

[Estimates of covariances for estimated concentration field.]

1. - Praha: ICS CAS, 2023. 22 s. SS02030031-V95.

**R&D Projects:** GA TA ČR(CZ) SS02030031

**Institutional support:** RVO:67985807

**Keywords :** spatial estimation \* covariances \* uncertainty

**OECD category:** Statistics and probability

BIBLIOGRAFICKÉ ÚDAJE: Výzkumná zpráva č. SS02030031-V95. Praha: ICS CAS, 2023. 22 s.

ANOTACE: Obsahem tohoto dokumentu je popis výsledku typu O: SS02030031-V95, Odhady kovariancí odhadnutého prostorového pole koncentrací. Jde o postup odhadu kovariančních parametrů jak samotného latentního Gaussovského prostorového pole, tak o odhad kovariance regresních parametrů v modelu. Dále též formulace modelu malého měřítka vybraného z dříve testovaných variant. Testování algoritmu optimalizace umístění stanic na předvybraném scénáři.

Developing estimation of relevant covariance matrix entries for the spatial model as a necessary part for computing pointwise standard errors (as formalizations of local uncertainty for the gridded estimates). They, in turn are precursors for optimization algorithms aimed at measurement network design problems (location of added and/or deleted measurement points).

**Permanent Link:** <https://hdl.handle.net/11104/0349446>

0580826 - ÚI 2024 eng V - Research Report

**[Juškevičius, Tomas](#) - Kurauskas, V.**

*Anticoncentration of random vectors via the strong perfect graph theorem.*

Cornell University: Cornell University, 2023. 34 s. arXiv.org e-Print archive, arXiv:2306.11904.

**R&D Projects:** GA ČR(CZ) GJ20-27757Y

**Institutional support:** RVO:67985807

**Keywords :** concentration function \* Littlewood-Offord problem \* perfect graph

<https://arxiv.org/abs/2306.11904>

[DOI: 10.48550/arXiv.2306.11904](https://doi.org/10.48550/arXiv.2306.11904)

In this paper we give anticoncentration bounds for sums of independent random vectors in finite-dimensional vector spaces. In particular, we asymptotically establish a conjecture of Leader and Radcliffe (1994) and a question of Jones (1978). The highlight of this work is an application of the strong perfect graph theorem by Chudnovsky, Robertson, Seymour and Thomas (2003) in the context of anticoncentration.

**Permanent Link:** <https://hdl.handle.net/11104/0349588>

0580827 - ÚI 2024 US eng V - Research Report

**[Campos Araújo, Pedro](#) - Mattos, L.**

*Local central limit theorem for triangle counts in sparse random graphs.*

Cornell: Cornell University, 2023. 24 s. arXiv.org e-Print archive, arXiv:2307.09446.

**R&D Projects:** GA ČR(CZ) GJ20-27757Y

**Institutional support:** RVO:67985807

<https://arxiv.org/abs/2307.09446>

[DOI: 10.48550/arXiv.2307.09446](https://doi.org/10.48550/arXiv.2307.09446)

**Permanent Link:** <https://hdl.handle.net/11104/0349592>

0581047 - ÚI 2024 US eng V - Research Report

**[Campos Araújo, Pedro](#) - Martins, T. - Mattos, L. - Mendonça, W. - Moreira, L. - Mota, G.O.**

*On the anti-Ramsey threshold for non-balanced graphs.*

Cornell: Cornell University, 2022. 22 s. arXiv.org e-Print archive, arXiv:2201.05106.

**R&D Projects:** GA ČR(CZ) GJ20-27757Y

**Institutional support:** RVO:67985807

<https://arxiv.org/abs/2201.05106>

[DOI: 10.48550/arXiv.2307.09446](https://doi.org/10.48550/arXiv.2307.09446)

**Permanent Link:** <https://hdl.handle.net/11104/0349613>